STEAMitUP Impact Assessment Study

National Workshop Implementation and Practice Recommendations

Project Number: ***2019-1-UK01-KA201-061990***

Contents

Executive Summary

This document covers an extensive impact assessment study undertaken by the consortium across the six partner countries. The impact assessment study involved each organisation implementing a selection of practical workshops with both primary and secondary school teachers in order to measure the impact of the project resources on the key target groups. These workshops included twenty hours of blended learning activities utilising the educational materials developed by the consortium. Each organisation was tasked with engaging with twenty teachers (ten primary and ten secondary) with participants completing the workshops and providing detailed feedback on all aspects of project impact via surveys undertaken at different stages of the assessment process. Upon completion of the workshops, each organisation supported two participating teachers to run national implementation sessions using selected resources with at least two classes in their schools.

This phase of the project was especially impacted by the COVID-19 pandemic and the strain it put upon the educational systems of countries across the EU. Despite the national restrictions and issues faced by each organisation, the consortium was able to engage with a total of one hundred and four primary and secondary school teachers, with twelve teachers implementing elements of the materials in their classrooms with over two hundred students.

As a result of implementing the impact assessment workshops the consortium was able to gather an extensive amount of quantitative and qualitative information. This has enabled the partners to assess the impact of the project on multiple levels and to develop a selection of practice recommendations to support the implementation of STEAMitUP beyond the project lifetime and immediate beneficiaries.

Introduction

STEAMitUP: Preparing Teachers and Students for a Digital World is an *Erasmus+* funded Key Action 2 Strategic Partnership for School Education research project. The project began in November 2019 and involved a selection of schools, colleges, universities and research institutes from six European countries:

Lancaster and Morecambe College (LMC) is a further education college based in Lancaster in the North West of England;

CARDET is an NGO, research institute and education centre based in Nicosia Cyprus;

Doukas School is a school based in Athens, Greece that covers primary, secondary and further education;

Future in Perspective Limited (FIPL) is an SME who specialise in educational research projects and training based in Virginia, Ireland;

University of Groningen (UoG) is a higher educational institution based in Groningen, Netherlands;

Fundación Siglo22 is an NGO and educational research centre based in Madrid, Spain.

The aim of the project was to develop an interdisciplinary STEAM program to empower teachers, school leaders and school communities to apply STEAM activities, robotics and digital tools to develop 21st century skills in students. Throughout the course of the project the consortium has engaged with well over 30 primary and secondary schools, 200 teachers, 50 school and/or faculty leaders and over 1000 students.

The STEAMitUP impact assessment study was designed to measure the impact of the project on the key target audiences and provide a selection of practice recommendations for future iterations. The study was implemented in three individual phases in all partner countries as outlined below:

Phase A – Implementing 20 hours of blended learning workshops offered to 20 school teachers in each partner country. These training workshops were designed to support the participants to utilise the STEAMitUP Toolkit and E-learning Platform while also gaining feedback on their impact from a frontline educator's perspective;

Phase B – Upon completion of the workshops, at least 2 participating teachers from each country utilised a selection of the STEAMitUP educational materials with learners in their schools and provided further feedback on the impact on learners;

Phase C – Partner organisations created national implementation reports to be submitted for collation, analysis and the creation of this final impact assessment study report.

This entire process was overseen by LMC who created the workshop guidelines, presentations, resources and supported the implementation of all phases of the impact assessment. LMC then collated and analysed all of participant survey responses and national implementation reports to produce this final impact assessment study report. The exact methodology used for this impact study is outlined in the following chapter.

Methodology

The methodology used for this impact assessment study involved a combination of structured teacher training workshops, participant impact surveys and classroom based practical implementation sessions. All elements of the assessment were developed in line the EU *Erasmus+ Impact+* guidance.

Teacher Training Workshops

A total of 20 hours of blended learning and training, delivered to 20 teachers in each partner country. This training was delivered as three separate workshops covering all aspects of the STEAMitUP project. Each workshop followed a flexible action plan using a selection of resources (e.g. links, activities and presentations) to train the participants how to use the project resources:

Workshop 1: A 4-hour session to introduce the project rationale, outline the key aims & objectives of STEAMitUP, provide an overview of the content of the educational toolkit and e-learning platform;

Workshop 2: 12 hours of engagement with the e-learning platform content including 2 hours of trainer-led activities followed by 10 hours of self-directed learning. The aim was to support the participants to access and navigate the e-learning platform, gain a basic understanding of the different module content and provide constructive feedback on all elements of the resource;

Workshop 3: A final 4-hour session to support participants to utilise the STEAMitUP project as part of their teaching practices and facilitate group work activities including the development of multidisciplinary STEAM lessons.

Participant Impact Assessment Surveys

Each workshop included an impact assessment survey to be completed at the end of the session. These surveys were based on the content of the workshop with the aim of assessing the quality, usability and impact of the resources from a user perspective.

Each impact assessment survey included a range of open and closed questions that gathered both quantitative and qualitative information to be used for later analysis. The results and finding from the impact assessment surveys are included in a later chapter of this report, with the raw data included within the annexes.

Practical Implementation Sessions

The final element of the impact assessment study involved each partner organisation supporting two of their participating teachers to deliver practical implementation sessions with two classes. The aim was for those teachers to use their experience from the workshops, along with the project resources, to run multidisciplinary STEAM sessions in their schools in order to assess the impact on students.

As a result of implementing all these elements of the impact assessment study, the consortium was able to gain a detailed understanding of the project impact on all key target audiences.

This phase of the project was heavily impacted by the COVID-19 pandemic due to the nature of the planned activities and face-to-face interactions necessary to effectively assess the impact of the project. Partner organisations were given some flexibility in the delivery of their impact assessment study activities to account for differing national situations at the time of implementation. The following chapter provides each national implementation report covering participant profiles, specific methodologies used and an overview of the findings from each partner organisation.

National Implementation Reports

Upon completion of the impact assessment activities the partner organisations submitted a national implementation report outlining how the process was managed in each country. The 6 national implementation reports include the specific methodology used, an overview of the findings and a brief conclusion from each partner.

Lancaster & Morecambe, United Kingdom

Introduction - The implementation phase in the UK took place in August and September of 2021 at the beginning of the academic year. The workshops were delivered in a virtual format due to restrictions in place as a result of the COVID-19 pandemic. The participants included 10 primary school 10 secondary or further education teachers who represented a range of local schools and institutions.

The planning for the workshops took place in the summer of 2021. As the lead partner for the Impact Assessment Study, LMC created all of the deliverable materials (session plans, presentations and activity resources) to be used in the workshops along with a 'how-to' guidance document to support the partners national implementation phases.

Methodology - As already mentioned, the UK impact assessment workshops were delivered virtually online and followed the structure outlined in the workshop plans (see annexes). The workshops were implemented with two separate sets of participating teachers, one set of three workshops with primary school teachers and one set of three workshops with secondary school teachers. Each set of three workshops included the full 20 hours of blended learning content that was slightly adjusted to suit the educational level taught by each group.

The workshops were delivered by a member of the LMC International Project Team who had been involved in every phase of STEAMitUP. The content of the workshops utilised

the developed workshop resources, STEAMitUP website & e-learning platform and the three separate impact assessment surveys completed electronically by each participant at specific points within the workshops.

Participants were guided through each workshop and encouraged to provide as much constructive feedback as possible in relation to the quality, usability and impact of the STEAMitUP resources. The impact assessment surveys were completed within the workshop at the required stages, with the trainer available to answer any questions participants may have had.

The final workshop involved a selection of group activities which were originally planned to be completed in person in physical workshops. The activities had to be slightly adjusted for virtual delivery and 'breakout rooms' were used to create separate groups within the virtual setting.

Upon completion of the impact assessment workshops, one teacher representing each educational level then moved onto the practical classroom implementation sessions. This involved each teacher delivering a selection of the STEAMitUP materials as a full-day STEAM themed workshop with their students. The content of these workshops was chosen from the toolkit and e-learning platform by each teacher as a result of their experience during the training workshops. This took place with a class of 29 primary students (aged 7-8) and a class of 25 secondary school students (aged 14-15) in two local schools.

As a result of the pandemic, the LMC International Project Team were unable to join the workshops in person due to restrictions on external visitors into schools at the time of implementation. However, we were able to join virtually to introduce the workshops and then re-join at the end of the day to facilitate a debriefing session with the groups. We then held a final virtual debriefing meeting with the 2 teachers to gather further information regarding the impact of the sessions from their perspective.

Results and Findings - The workshops were an overwhelming success, despite having to be completed virtually. All the participating teachers provided excellent constructive feedback on all elements of the project and the impact of the resources used. All of the participants completed the three separate assessment surveys and those results are included in the relevant chapter later in this report, the following is a brief overview of the debriefing discussions that took place at the end of each workshop.

Workshop 1: The first part of workshop 1 provided a great deal of background information and context for the STEAMitUP project. All the participants were new to the project and had not been involved in any of the previous planning or implementation phases so the introductory activities were vital. Participants found the project rationale, key objectives and methodology to be relevant to their experience of STEAM education. Participants also found the project website to be professionally made, presented in an attractive manner and extremely user friendly.

The session and activities utilising the STEAMitUP Toolkit worked well, with participants finding the content of the toolkit well-presented, varied and easy to use. The lessons and workshops plans were received extremely well with the best practices providing excellent supporting resources if required.

The final section of workshop 1 was a brief introduction to the STEAMitUP e-learning platform with the workshop facilitator supporting the participants to create an account in order to be able to access the modules. There were no issues in relation to the technical aspects and account creation and participants provided positive feedback from their initial impressions of the platform.

Workshop 2: The two hours of delivered content for workshop 2 provided participants with all the necessary guidance information required to engage with the content of the 6

learning modules within the platform. The session facilitator provided participants with an overview of the module structure as well as all of the technical aspects that users may want to consider. The participating teachers were impressed with the layout, structure and volume of content included with the e-learning platform. Participants did not encounter any technical issues and found that the platform worked effectively on both laptops and desktop computers.

After completing the additional 10 hours of self-directed learning and individual exploration of the e-learning module content, the participants were given the opportunity to provide a more detailed analysis of the platform. All participants found the platform to be an excellent resource that contained a wide range of content and was structured in a user-friendly format. There were some minor issues raised around how the platform recorded user progress throughout the modules. This originally required the user to actively 'tick' a box after completing each section or activity, as a result of this feedback we altered this mechanism so that the platform automatically registered progress after interacting with each element of the modules.

Workshop 3: The final workshop involved a great deal of group interaction and practical activities which were originally designed to be completed in person. As the workshops had to be delivered virtually it was always going to be difficult to facilitate everything as effectively. The practical group activities undertaken still achieved the desired outcomes and participants enjoyed to opportunity to work together in virtual breakout rooms. The results from the two activities were excellent and provided the project team with a range of new perspectives to including into our work.

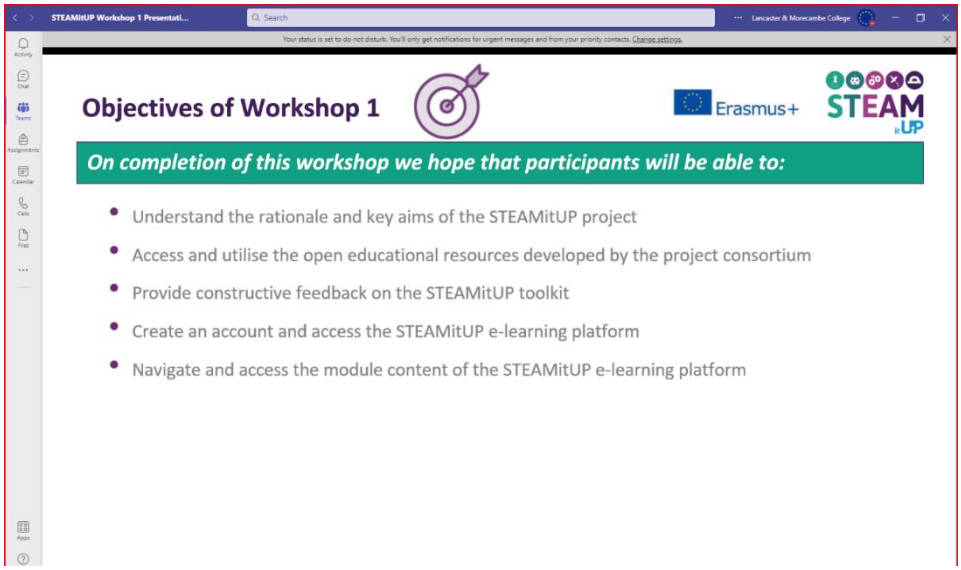
The final debriefing session provided an opportunity for a group discussion in relation to the workshops and the STEAMitUP project as a whole, which then lead into the final impact assessment survey. All of the participant feedback was positive and the workshop facilitator tried to address some of the issues raised by participants.

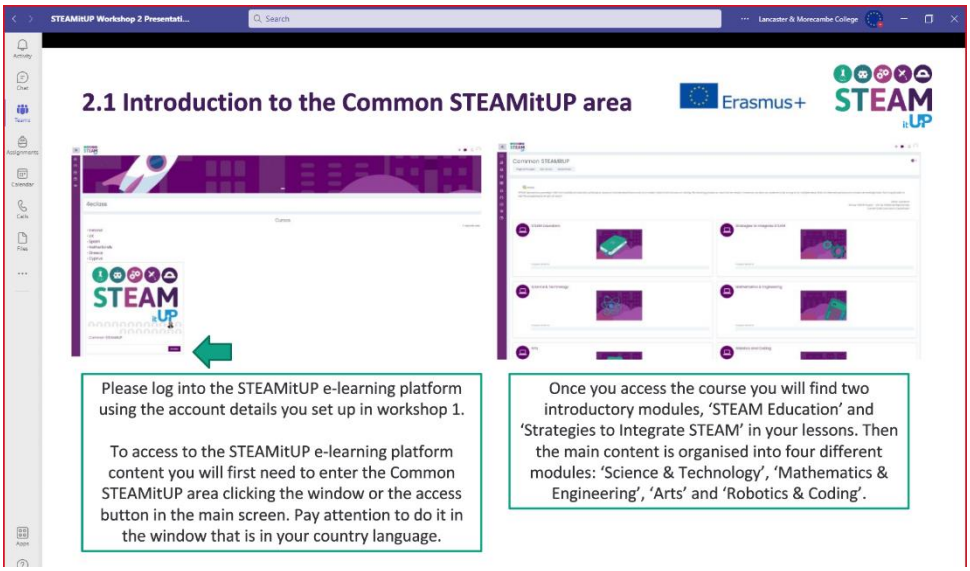
Post-workshop classroom implementations: After the two sets of workshops had been completed, LMC supported one of the primary and one of the secondary school teachers to implement elements of the STEAMitUP toolkit and e-learning platform with their classes. This classroom implementation included a full-day of STEAM related activities, workshops and experiments utilising the elements of the STEAMitUP resources best suited to the age and educational level of the learners. The two implementation days were supported by LMC in a virtual capacity as we were unable to attend the days in person due to the pandemic.

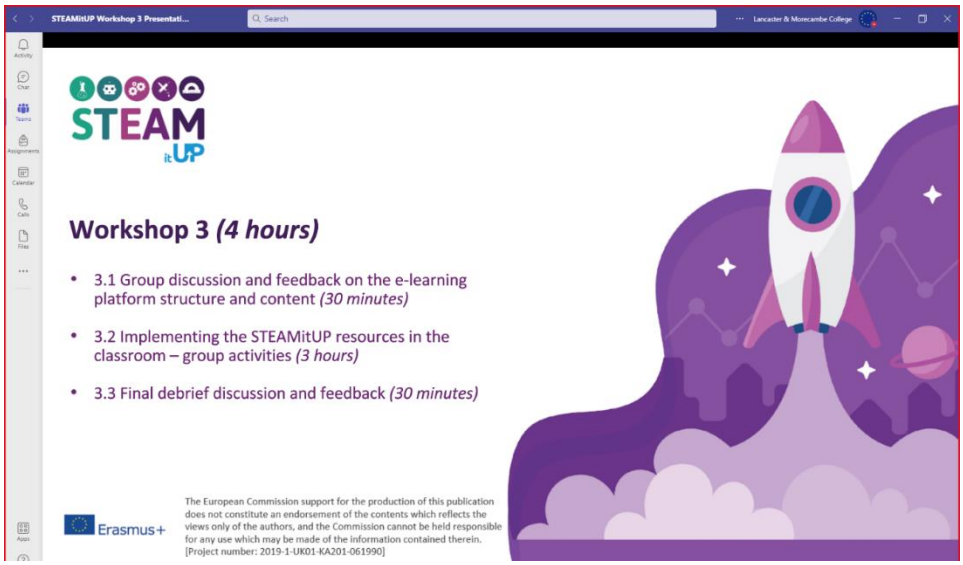
The content of these days was designed and facilitated by the teachers as a result of their experience during the STEAMitUP workshops and using only elements of the toolkit and e-learning platform. Each implementation day went well and the teachers shared their experiences in post-implementation debrief meetings with LMC. They felt that the learners had engaged with the content and found the different activities and experiments fun and interesting.

Conclusion - As a result of the teacher training workshops and classroom implementations, LMC are extremely pleased with the feedback received in relation to the impact of the STEAMitUP project and developed resources. All workshop phases of the impact study went well despite the disruption caused by them having to be delivered virtually. The classroom implementations gave us confidence that the resources are suited to the key target audiences and have practical applications in all levels of primary and secondary education.

The issues identified and raised by the participants were valid and contributed to some minor alterations made to the e-learning platform. This also helped guide the remaining practical activities undertaken during the final implementation phase of the project lifecycle.


Objectives of Workshop 1
Erasmus+
STEAM
On completion of this workshop we hope that participants will be able to:
Understand the rationale and key aims of the STEAMitUP project
Access and utilise the open educational resources developed by the project consortium
Provide constructive feedback on the STEAMitUP toolkit
Create an account and access the STEAMitUP e-learning platform
Navigate and access the module content of the STEAMitUP e-learning platform


2.1 Introduction to the Common STEAMitUP area
Erasmus+
STEAM
Please log into the STEAMitUP e-learning platform using the account details you set up in workshop 1.
To access to the STEAMitUP e-learning platform content you will first need to enter the Common STEAMitUP area clicking the window or the access button in the main screen. Pay attention to do it in the window that is in your country language.
Once you access the course you will find two introductory modules, 'STEAM Education' and 'Strategies to Integrate STEAM' in your lessons. Then the main content is organised into four different modules: 'Science & Technology', 'Mathematics & Engineering', 'Arts' and 'Robotics & Coding'.


STEAM
Workshop 3 (4 hours)
3.1 Group discussion and feedback on the e-learning platform structure and content (30 minutes)
3.2 Implementing the STEAMitUP resources in the classroom – group activities (3 hours)
3.3 Final debrief discussion and feedback (30 minutes)
Erasmus+
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Nicosia & Larnaca, Cyprus

Introduction - For the requirements of the Impact Assessment Study, CARDET delivered three local workshops with the aim of introducing the STEAMitUP project and material (Toolkit & e-learning platform) to the teachers. A total of 18 primary school teachers attended the workshop physically. Following the training, two of the teachers who participated in the workshops, designed, and delivered a series of STEAM lessons using a variety of technological equipment. Around 40 students participated in the implementation phase of the project. All the activities are thoroughly explained in the following sections.

Methodology - In the framework of IO3 "STEAMitUP Impact assessment study and practice recommendations", a series of workshops were conducted with primary school teachers. More precisely, on Thursday June 17th, 2021, the first (4 hours) and second workshops (2 hours/10 Self-directed learning) were organised in the form of an all-day seminar at Potamos Germasogeias Primary school in Limassol. A total of 18 primary school teachers participated in the workshop activities.

During the delivery of the first workshop, teachers were introduced to the rationale of the STEAMitUP project focusing on its main purpose and key objectives. Participating teachers were also given the opportunity to review the first two outputs of the project. At the first stage, teachers worked in groups as a medium to review the best practices, the lesson plans and additional resources included in the Toolkit and provide their feedback through the completion of an online survey.

Regarding the second phase of the workshops, teachers had to gain access to navigate through the E-learning platform. For this purpose, each participant created a personal account. The aim of this activity was to get an overview of the content of the platform and familiarise themselves with the 6th module of the course.

Following a short break, the trainer along with the teachers proceeded to the second workshop that was also scheduled to be delivered within the same day. The trainer projected the video "*What is STEAM Education*" and allowed teachers to reflect on any other objectives that could be introduced into STEAM education rather than innovation that was already given. A discussion followed where teachers discussed the importance of STEAM in addressing inclusiveness and promoting interdisciplinarity.

Furthermore, participants were divided into small groups to discuss the impact that STEAM related subjects could bring into their teaching practices and how this would affect their learners. Even though, teacher participants were highly encouraged and motivated to post some of their thoughts on a digital wall called Padlet (a web app that lets users post notes on a digital wall), no evidence of interaction were shown. Following this, teachers focused on the strategies they can employ to create more equal STEAM classes for girls. Indicatively, teachers mentioned that it would be a good strategy to form mixed groups with equal numbers of boys and girls, to assign roles to each member of the group (e.g. someone will be the facilitator, the motivator, the researcher, other the presenter, etc.), to monitor groups' progress and student's engagement, encourage active participation and finally, to avoid stereotypical phrases that distinguish boys from girls and vice versa.

Moving on to the next activity, teachers continued working in groups with the aim to identify different strategies that could be implemented in their STEAM lessons to enhance and cultivate the following skills: discover, focus, detail, present, apply, link. Teachers pointed out the technological tools as a mean to enrich their lessons (e.g. tablets, robotic kits, Augmented reality - AR and/or Virtual Reality - VR games) as well as the provision of opportunities for outdoor activities and educational visits. They also referred to the importance of integrating interdisciplinary teaching approaches like the Inquiry-based learning.

In addition to that, teachers watched the video "STEAM Education Experience" and discussed through brainstorming technique, possible activities that they could implement in their lessons. A great idea that emerged was the exploration of the stability of a structure (Engineering/Design and Technology) while learning about 3D objects (Mathematics). More specifically, students will be called to test the stability of a rectangular (4 corners), cylinder (no corners) and triangular prism (3 corners) by placing notebooks on the top of each other. Students will form hypotheses and confirm or reject them afterwards. The teacher along with students will conclude that the cylinder is more stable than the other two 3D objects because the weight is evenly distributed to the surface of the object in contrast to the other two where the weight stresses their corners forcing them to collapse.

The last hour was dedicated to the exploration of the content in the platform where each group was assigned to one educational area. The second workshop was completed once teachers spent a 10-hour task (SDL) investigating and working through some of the content of each of the main modules.

The third workshop was held on the following day (Friday June 18th, 2021) with the same teachers serving as participants. The trainer initiated a discussion on the use and the content of the e-learning platform. Overall, most of the teachers expressed positive comments regarding the usability of the platform and the quality of the material, highlighting the need of such platforms for their professional development. The interactive activities draw their attention, and they are willing to develop and integrate such educational practices in their classroom.

The additional sources and videos were also acted supportively to them. In terms of the structure of the chapters, several teachers would like to be able to access the units more easily instead of scrolling down to reach each one.

Following the brief discussion, teachers were split into groups to produce their own STEM lesson plan, utilizing the STEAMitUP material as well as their knowledge and experience. During that time, teachers exchanged ideas and communicated their thoughts. Before the end of the third workshop, teachers presented a draft version of their lesson plan. Over the next few days, teachers submitted their final lesson plans to the trainer via email.

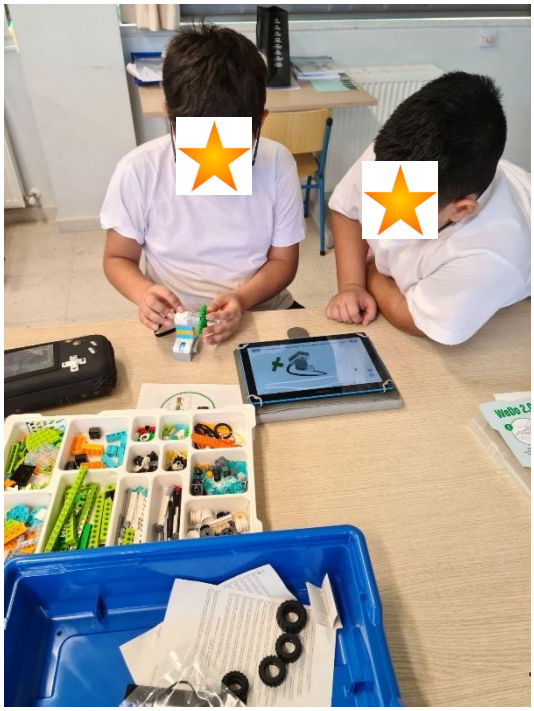
The school implementations took place during the first week of October 2021 (4th-8th) at Potamos Germasogeia Primary school with the participation of 2 teachers. Each teacher created one workshop (80-90 minutes long) which consisted of different stations. In each station, students aged 10-12 years old were able to experiment with different STEAM technological equipment following the guidelines provided.

Around 40 students participated in the implementation phase. A total of 5 stations were designed to support the needs of the implementation phase and to meet pandemic protocols (small groups of students per station). Each station had its relevant technological equipment along the student guidelines for the completion of the activities.

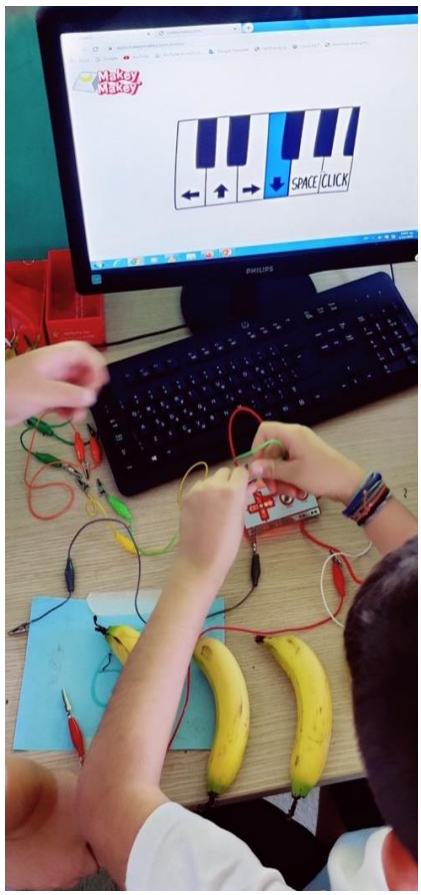
The title together with a reference picture for each station is outlined below:

Station 1: Pro-Bot - programme the Pro-Bot to solve various problems (e.g. create a letter or a shape);

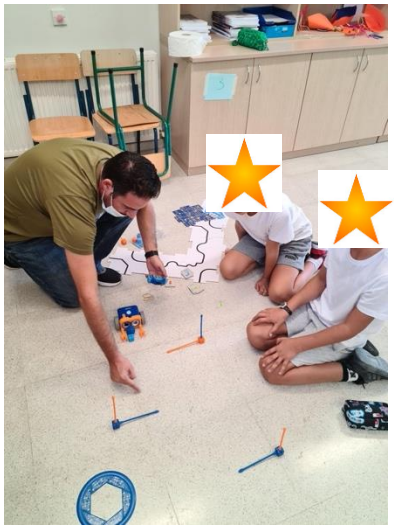
Station 2: Craft with Lego We Do 2.0 - create a simple craft using the Lego We Do kit and programme it to perform certain instructions;



Station 3: Makey Kit – create a simple circuit with Makey;



Station 4: Lego Mindstorms Robot – create and programme a robot.



Results and Findings - The combined results and findings of the impact assessment surveys completed by teachers are presented later in this report. Herewith, we only present the summarised overall testimonials and comments of the teachers as emerged from the evaluation of the STEAMitUP Toolkit, the e-Learning platform, and the workshops.

These include but are not limited to the following:

- Teachers found the toolkit and the platform useful;
- Both are teacher-friendly environments;
- The ready-to-use material (lesson plans etc and the modules) allows teachers to gain both theoretical and practical knowledge;
- Teachers were willing to use some of the materials in the future;
- Since most of them were not familiar with the term "STEAM education", they needed an introduction at the kick-off slot of the workshop;
- Teachers also mentioned that it would be interesting if they were given the opportunity to experiment with some robotic kits;
- Teachers overall feedback was positive.

Conclusion - Overall, both workshops and implementations worked well. Despite the uncertain times with the pandemic, our impact assessment study has been successfully completed. Teachers during training as well as students in the implementation phase were actively engaged in the process and we received positive feedback.

According to the training, the participating teachers found the STEAMitUP materials and platform useful tools to be used as a basis to develop STEAM lessons in their classrooms. Considering the audience, we had and since from the very beginning we realised that the vast majority of our teachers were unaware of the term "STEAM education" and what this educational approach entails, we provided some theoretical and practical knowledge that weren't included in the initial presentations provided by the project.

Therefore, a good strategy would have been to introduce the STEAM education first and then, move on to the STEAMitUP project and the rest of the activities. The above adjustment supported teachers in understanding the philosophy of STEAM education and the project's products that they were called to discuss and evaluate. Another challenge we overcame was the technical support that our teachers needed to access the e-learning platform. Our teachers weren't familiar with the process (e.g. creating and verifying an account) and this ended up in consuming more time than expected.

Regarding the implementations, students were divided into groups and experimented with different STEAM kits. The teachers were very pleased that they had the opportunity to organise and deliver STEAM lessons, but they also reported to us that due to lack of time they had only two teaching periods available for the activities. The time was not enough for the students to reap the pedagogical benefits. They strongly believe that STEAM activities should be integrated in the school curricula.

Athens, Greece

Introduction - For the impact assessment study, Doukas school team organized two online workshops. Due to the COVID-19 pandemic, it was considered that an online event would be more efficient. However, we needed to adjust the designed plan to a new one that would fit the current situation. For this reason, it was decided to have 2 workshops, instead of 3, with a duration of 2 hours each. The number of participants differed between the first workshop and the second. In the first one, 42 participants joined, whereas in the second one 18 people took part. The reason why only half of the people participated in the second one is due to the time and date constraints. We asked our participants to vote for the most appropriate suggested date and we chose the one when most them were available.

In the first online workshop, trainers presented the toolkit and the Moodle platform whereas in the second one, participants were asked to join break-out rooms so that they can work together making use of all the available sources created by the project team.
At the end of these two workshops all participants were satisfied and gave positive feedback to what they have learnt. The most common negative comment was that they expected to have all the material translated in Greek.

Methodology - The delivery of the workshops occurred only virtually via Microsoft Teams. Doukas School organised two workshops. The aim of this division was to firstly present all the material designed and implemented during the project and then provide hands-on activities in which participants were asked to discuss and express their opinion on the different modules of the platform and create lesson plans with the help of the material given by the platform. In the first session all trainees visited the toolkit and the platform and created their own account in the Moodle platform. Participants were asked to have a look at the platform and ask any inquiries either via email to the trainers after the first session or during the first hour of the second session.

The second session that was the most interesting for the participants as well, trainers gave them one module from the platform and divided them into teams giving them 20 minutes so as to discuss and reflect on the content. It is worth mentioning that the teams were divided randomly, participants did not know each other and most of the times they come from different background. Also, there were teams that consisted of both primary and secondary teachers. In a later break-out room four teams of teachers were asked to create their own lesson plan and then present their results on the plenary session. In the Annex III all four lesson plans created during the workshop are presented.

For the needs of the workshops, Doukas school team used the Microsoft Teams, that it seemed to fit for the purpose as we had the chance to create break-out rooms and all participants had access to the tool even without using a certain application.

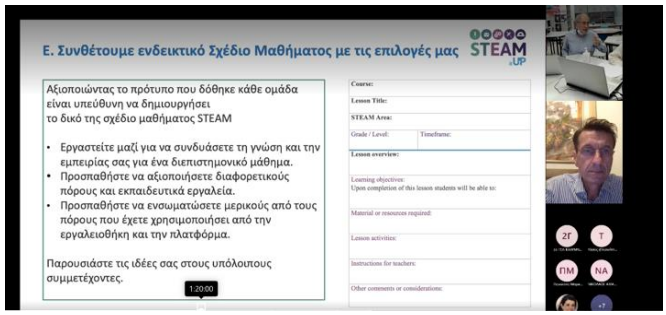
Results and Findings - Participants gave a positive feedback on what they have shown and learned. Organising it virtually was of great importance since teachers from all around Greece had the chance to participate.

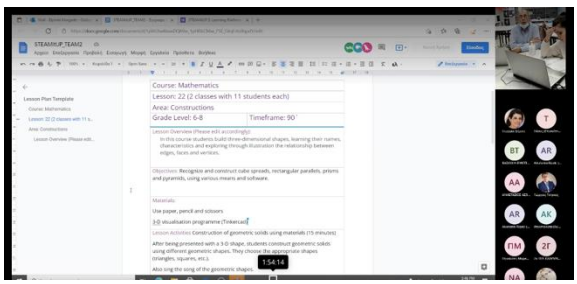
For IO1 – Toolkit, they commented that they expected all the material translated in Greek so as to be easier for them to use it but they expressed the opinion that all the information is clear and well-organised. Participants, also, commented that they will use the suggested lesson plans in their classroom as the subjects are thought-provoking and they will contribute to students' skills and knowledge.

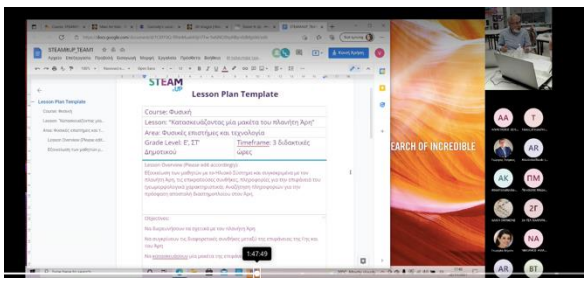
For IO2 – Platform, teachers commented that it helped them to gain basic knowledge of other disciplines that they were not so familiar with. Moreover, they have not seen all tools used for the presentation of the content such as genial.ly and that gave them ideas on how to use them in their classroom as well.

Separating them in teams that were heterogeneous was also interested as they found out that it is not so hard to start cooperating with their colleagues. Finally, in one of the teams there were teachers from primary and secondary education and showed to the plenary talk how a lesson plan can be adjusted in order to fit for two different age groups with not so many changes.

Conclusion - All participants found that the workshop helped them to their professional development, they also commented that what is interesting is that all the information provided is in an organized way, an attribute that will make them use it in their everyday teaching file. Finally, they expressed their enthusiasm about the break-out rooms as they had the chance to cooperate and create inter-disciplinary lesson plans for the STEAM teaching. To strengthen this point it is worth mentioning that participants exchange email and kept working on their lesson plans until they are finalized even after the end of the workshop hour.







County Cavan, Ireland

Introduction - The implementation of the impact assessment took place in Ireland through online sessions with 17 teachers. Due to the COVID-19 pandemic, it was not possible to host these workshops in person, so we delivered five online workshops in September 2021, and invited all teachers to test the STEAMitUP toolkit resources and to provide feedback through the impact assessment surveys to reflect on their experience of using the STEAMitUP resources. It was not possible to engage all 17 teachers on the same online workshop, as they were from different schools and taught at different levels, so we held three online workshops targeting secondary school teachers, comprising upper and lower secondary teachers.

We tried to limit the participation to STEAM teachers, but due to the low-teacher numbers in some rural schools, we had to expand the scope of our pilot testing group to include teachers form humanities disciplines and sports disciplines also. We then held one online workshop with local primary school teachers. They were interested in STEAM but found little application for the STEAMitUP toolkit as it did not link directly to their curriculum. We did engage them in testing some materials in their schools, and we also supported them by answering questions about the STEAMitUP approach by telephone and email.

Lastly, we recruited the final teachers through linking with a second-chance education school in Cavan. Here we engaged some teachers in completing the impact assessment and the testing phase. These teachers provide second-chance education programmes to young people aged 15 to 18, who have left formal education. As such, they are always interested in finding and piloting new educational approaches to keep students interested and engaged. Through these different workshops, we were able to reach as close as possible to the target number of 20 teachers. We invited these 17 teachers to register on the platform, and we took their details and created accounts for them, to ensure that they had access to the full suite of materials developed.

Methodology - In Ireland, we initially targeted teachers in secondary schools for our piloting, as the primary school curriculum in Ireland does not include the teaching of STEAM subjects explicitly. Science, for example, is only taught during second-level education, and so there was little value in testing the STEAMitUP resources with younger students. However, two factors impeded our ability to reach 20 teachers in secondary schools.

Firstly, due to the lockdowns in Ireland, and the summer holidays, we were only able to engage teachers in the testing in September 2021, when Ireland was still under several COVID-19 restrictions, when our vaccine programme was still being delivered and when schools were only slowly re-opening to students in September, so we had an issue trying to get teachers to let us into the school environment.

Our second issue was that secondary school teachers were also busy preparing for the new teaching semester at this stage, and due to the school closures due to COVID in the previous academic year, they had a lot of additional work in delivering the full curriculum in preparation for state examinations. They were therefore less engaged in the testing process than we initially would have expected. We did receive some very positive feedback from teachers about the project, but they were unable to provide time in their busy schedules to test the workshop materials in their classes. So therefore, we widened the participation in the testing phase to include primary school teachers and second-chance education teachers, who follow a curriculum, but a curriculum that is not as strict as lower and upper secondary schools. Through this approach, we were able to ensure that the resources were tested with teachers in Ireland.

To ensure that secondary school students could also benefit from the STEAMitUP resources, we also attended three secondary schools – Ratoath College, Eureke Secondary School and St.Bricin's Secondary School – during national science week which took place

on 7-11th October. During this week, staff from FIP took on the role of teachers, and delivered exercises from the STEAMitUP toolkit directly to 228 students across the three schools. We received very positive feedback from this testing from the students.

While this is not the methodology that is outlined in the IO3 Impact Assessment Guidelines, we have dedicated significant time, energy, and resources to ensure that the STEAMitUP materials were sufficiently tested and validated by students and teachers in Ireland. We have been constantly battling against the very strict COVID-19 lockdowns in Ireland, and we have had a significant achievement in being able to reach so many teachers and students during a very difficult and testing period.

Results and Findings - Through our varied approach to testing the STEAMitUP Toolkit in Ireland, we have received the following feedback from teachers:

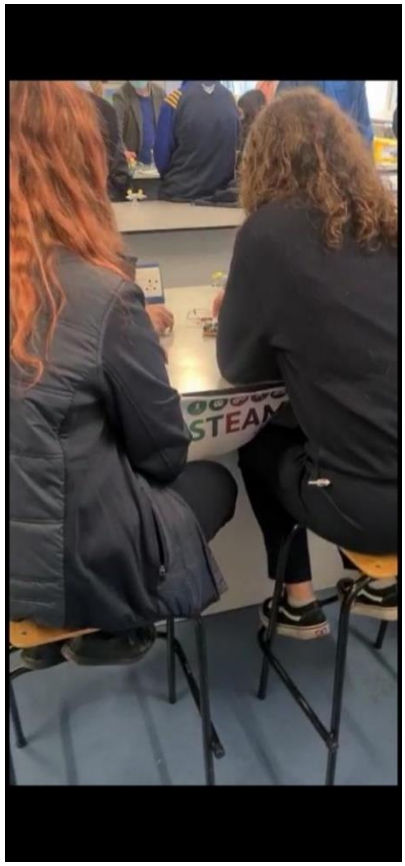
- The resources and activities are a fantastic support to teachers and introduce a new approach to teaching these subjects in a cross-curricular way;
- Schools do require equipment loans to be able to make the most of the robotics and technology activities – this is particularly the case with rural schools where many schools are without reliable internet connection;
- There is scope for this toolkit to be used in non-exam years in secondary school – such as the transition year programme which most schools offer, and which does not follow a formal curriculum. However, if the toolkit is to be applied to exam year syllabi, then the activities would need to address the learning objectives of the school syllabus. Otherwise, there is no time for extra-curricular activities in an already tight school curriculum;
- The toolkit and activities could be further expanded to teach cross-curriculum approaches in other disciplines, such as drama and humanities; but the approach is interesting and thought-provoking for teachers.

The online module content is very effective at supporting the continuous professional development of teachers; but of course, teachers would have preferred in-person training.

Conclusion - What our results show is that the STEAMitUP toolkit and approach is very attractive to teachers. Especially during National Science Week, we repeatedly heard that teachers had 'never seen anything like it' before. There was genuine shock and disbelief that such a programme existed for schools, and that most of all, it was available for free for schools to use. However, finding a place for the STEAMitUP project in a second-level curriculum proved to be a challenge.

The primary school teachers who initially participated in the testing also failed to complete all 3 surveys, which shows that they saw little value in the toolkit as it did not address the subjects that they were teaching. For example, if Maths was taught with Art, rather than Engineering in the modules, they shared an insight that this would have been more useful to them; however, Engineering is not a subject that is taught even in second-level in Ireland, and so they did not see a value to the toolkit for their teaching practice.

Given the opportunity, we would obviously have delivered this training in person and had many more in-person sessions with teachers and students to test the resources and to promote the activities; however, we were severely impeded and impacted by COVID-19 throughout the implementation of this project; and considering these limitations, we are very happy with the impact that we have been able to achieve through our piloting. The greatest impact was achieved in the in-person sessions during National Science Week, so we know that when it happens in person, the STEAMitUP project can be very effective in inspiring the next generation of learners to follow STEAM careers.


LEGO education
SPIKE

STEAM


Groningen, Netherlands

Introduction - The implementation phase of STEAMitUP (IO3 - Impact Assessment Study) involved training school teachers to utilise the STEAMitUP Toolkit and E-Learning Platform and to support their professional development. The University of Groningen delivered two workshops series to support teachers to use the project resources and incorporate new innovative approaches to deliver STEAM subjects. The narrative and outline for these workshops were provided by Lancaster & Morecambe College. Due to the COVID pandemic the workshops were adjusted to fit the required measurements and circumstances in the Netherlands. The training and implementation workshops involve a blended approach with ten teachers in total. Upon completion of the workshops, two participating teachers developed a lesson plan inspired by the STEAMitUP resources and have implemented the lesson plans in their classrooms. The workshops provided valuable feedback on the practical uses of the resources and enabled the workshop participants to share experiences and ideas on the implementation of STEAM in the Netherlands. This report covers the implementation of the workshops and the additional sessions delivered by trained teachers in their classrooms after the workshops.

Methodology - For the impact assessment of IO3 the University of Groningen organized two workshop sessions, one in June and one in September. The COVID-pandemic made the organization and implementation of the workshops challenging, since teachers were overworked and tired of online teaching. Additionally, around the summer holiday (June and September) teachers are famously busy with finalizing the school year and starting the next one.

Due to the COVID pandemic the workshop in June had to be a hybrid event. The length of the workshop needed to be adjusted to the online environment and to make the workshop as accessible and as possible, we decided to organize one 4-hour workshop on June 18 in which we would focus on discussing the STEAMitUP materials and work on an

action plan for implementation in the classroom. Before joining the workshop, the teachers were invited to explore the Toolkit (IO1) and E-learning Platform (IO2) through self-guided learning. Through the STEAMitUP website they were introduced to the rationale and key objectives of the project. Due to the low participation rate for the workshop in June we decided to organize a second workshop in September.

The workshop in September had a slightly different set up to make the workshops even more accessible; two workshops of each 2 hours with a week in between. The first workshop on September 8 focused on reviewing the materials and sharing ideas and feedback.

The second workshop on September 15 focused on creating an action plan and a brainstorm about possible implementations of the STEAMitUP materials and STEAM education in general. Before the first workshop teachers were introduced to the materials and website of STEAMitUP to explore in their own time. Also in between the two workshops there was time for self-guided learning of the Toolkit and E-learning platform. The first workshop was online, the second took place in the E-Lab of the Praedinius Gymnasium, a secondary school in Groningen. After the workshop in June and September some of the participants worked in their own time on developing a lesson plan, which resulted in two lesson plans inspired by the STEAMitUP workshops.

Science LinX, the science centre of the University of Groningen, has contact with several primary and secondary schools. To recruit participants for the workshop, more than 50 teachers of different schools and BedrijfsDOT (a teacher development network) were approached personally. Additionally, a call for participation was sent out to several schools, teachers and networks in both primary and secondary education, via the Science LinX newsletter (510 subscribers) and social media. As a result, 4 teachers signed up.
In September we used the same channels and approach. Additionally, we ask teachers who participate in the workshop in June to personally invite their peers.

As a result, 6 people signed up for the workshops, 2 of whom could only make it to the first workshop on September 8. Additionally, teachers who could not attend the workshop, but were interested in the STEAMitUP materials were asked to review the toolkit and e-learning platform through self-guided learning and provide feedback through the corresponding surveys.

Results and Findings - Overall the reactions to the lesson plans and best practices were positive. Participants found the materials inspiring and a great starting point to explore further. The Toolkit's focus on learning by doing was also well received and considered a great approach to learning.

> *"Students are stimulated and encouraged to participate and to create their own ideas."* - Bas, workshop participant

Another aspect that participants appreciated is that some of the lesson plans can be adapted to different levels. Furthermore, they noted that the toolkit also provides good concrete examples to work with and contains useful keywords and links. For example, the lesson plan *STEAM Concept Programmed* links to great web sources and robotics.

However, for some of the lesson plans some information seems to be missing, for example there is no template for the *Solar Snacks*, even though in the text it refers to a template (under point 2, step 1). And there is only very limited information and no clear lesson structure with the Lesson Plan *Coding and Programming*.

Furthermore, it was suggested that the related Best Practices and Materials should be linked to the lesson plans and vice versa, now the link is often lacking even though there are some good opportunities to connect the different contents. For example, the lesson plan *Build your own salt sculpture* should link to the *Salt Activities* under Materials & resources.

Participants remarked that, even though there are many great ideas and lesson plans in the Toolkit, teachers still have to google the ideas and terms for themselves to fully engage with the idea and find more resources or more information on the scientific background. It was suggested that it would be great if there would be an option for teachers to add ideas and/or resources, maybe via a feedback option on the site? Additionally, another idea was to let teachers fill in a short survey after using a lesson plan, max 3 questions;

- Was this useful for you?
- Do you have any feedback or suggestions?
- Do you have STEAM examples or resources you would like to share?

In this way the site becomes more alive and interactive, and feedback between teachers is shared directly. Another suggestion was to maybe add an internal search option, especially when there will be more lesson plans and materials added. Search keys could link to the learning objectives, age ranges, and disciplines used.

Participants of the workshops responded positively to the E-learning platform. They praised its contents for the great resources and materials and remarked that it offers a great introduction to STEAM. The interactive elements were especially well received and made the content fun to explore. However, there were also some suggestions for improvement and questions about the presentation. For example, questions were raised about the division of disciplines. From the perspective of the participants it seemed a shame that the E-learning platform is divided into separate disciplines, while STEAM is all about the integration of these disciplines. In the current structure of the E-learning platform, Arts is only about the arts itself, and not on how to integrate it within the other discipline nor on interdisciplinarity in general. It would have been great to get more insight and ideas in how to use arts within science and vice versa.

Furthermore, there were some practical remarks and suggestions, such as; the default of the website seems to be in Spanish, regardless of the language you choose when you enter. It would be great if the default language was changed to English.

When entering the E-learning platform, it was not immediately clear to the participants what the purpose of the platform was. What are teachers supposed to do? What can they find? For who is it meant? And how should they go about exploring? It would be nice to add an introduction on the first page when you enter that explains these questions and triggers teachers to explore the platform further. The same remark was made about the STEAMitUP website; the homepage opens with the project information. However, teachers are not at first interested in the project information, they want to know what the site can do for them; What is the purpose of the site? What information can they find? How can they use it? Preferably, the STEAMitUP homepage should immediately guide the viewer to the toolkit and e-platform by making the text more user friendly towards teachers and students.

> *"It would be good if teachers who visit the site don't only visit to 'get' something, but can also 'bring' something. For example, it would be wonderful if there would be a possibility on the platform through which teachers could give feedback to each other."* - Hylke, workshop participant

During the workshop the participants brainstormed on the function and needs for a platform and about connecting platforms, knowledge and information. They envisioned a Wikipedia for teaching, supported by the community of STEAM teachers. Another idea was to create a platform to lent out materials and machines to be used for STEAM education.

The international context of the project gives a broader perspective on STEAM education, however, because of the EU character some participants feel less relation to the materials. The international character for them creates barriers regarding language and the Dutch education frameworks. Their concern is that a significant part of the content and additional resources are in English, which will be limiting for some Dutch teachers. Furthermore, some lesson plans have parts in Greek, which makes it hard to use them.

Regarding the education framework, the Netherlands works with '*Kerndoelen onderwijs Nederland*' ('Core goals of education in the Netherlands'). There are 58 of them and they cover the learning areas: Dutch, English language, (Frisian language), arithmetic/mathematics, individual and world orientation, artistic orientation and physical education. The core objectives for each learning area are preceded by a description of the characteristics of the learning area. All education materials in the Netherlands refer to the core goals they address. Additionally, the Dutch education system emphasizes the '*Onderzoekend en Ontwerpend Leren*' (inquiry-based learning). Even though these concerns might create limitations in the immediate use of the content, the e-learning platform materials could be used and restructured to serve the Dutch approach concerning the core goals and inquiry-based learning.

> *"The international character of the project requires the integration of different tasks and educational structures, you could consider this a weakness, but also a strength and inspiration."* - Andre, workshop participant

Two of the participants of the workshop have created a lesson plan that they have implemented in their classroom. They created a Lesson Plan *'Pop-up Chart and Circuit'* and a Lesson Plan *'Propeller Car'*.

Testimonial of implementing Lesson Plan Pop-up Chart and Circuit:

> *"The high school students were all very enthusiastic. The less skilled and technical students asked for more guidance, but continued to enjoy the lesson. The nature of the lesson (creative and not 100% technically oriented) means that many children also enjoy the lesson. You do not have to be specifically interested in e.g. robots, cars on planes. I noticed that working with copper tape is difficult. The promised conductivity of the adhesive can give problems. Some practice is required. This lesson contains many parts and it is quite long. Splitting it into several intermediate steps might be better. My advice for other teachers; be sure to practice yourself. See what you come across and experiment with the kids."* - Leen van Wijngaarden, teacher Lesson Plan Pop-up Chart and Circuit

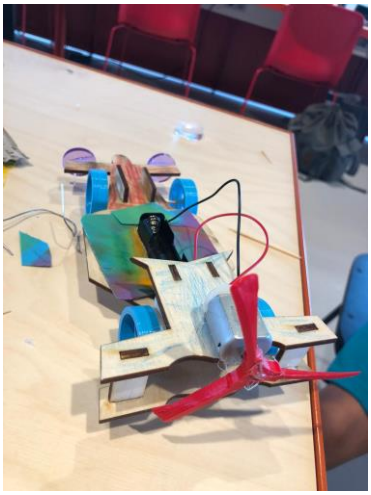
Testimonial of implementing Lesson Plan Propeller Car:

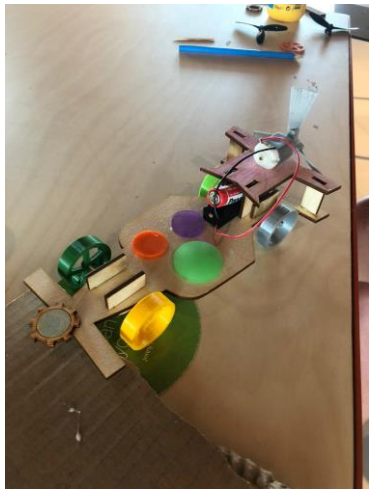
> *"The primary school students are totally impressed that the cars are working and moving forward (or backward...). They understand by making the care themselves that the motor can also run the other way around and how you can fix that. That is very nice to see.""* - Kerensa Strijker, teacher Lesson Plan Propeller Car

Conclusion - Overall, the workshop participants expressed their enthusiasm for STEAM education and how they value projects such as STEAMitUP to stimulate awareness and share knowledge. However, due to the pandemic the workload and difficulties that teachers have to deal with in their daily work made it difficult to find the time to participate in the workshops on a voluntary basis. To make the workshops more flexible and accessible for teachers, they were adjusted to extend the self-directed learning and shorten the group workshop. The participants who joined the workshop were all active in STEAM education and motivated to discuss how to implement STEAM in the classroom. The workshop gave space to this discussion and to provide feedback on the STEAMitUP Toolkit and E-learning Platform.

The participants had several suggestions for improvement and also brainstormed about additional possibilities to enhance the materials. One of their suggestions was to add an option on the site and/or e-learning platform for teachers to share ideas and/or resources. This could be a blank 'comment' box or more structured via a short survey after using for example a lesson plan. In this way teachers could learn from each other and add to the existing materials. It also provides the opportunity for teachers to become part of a community and give back by adding and/or creating more content. Another suggestion was to maybe add an internal search option, especially when there will be more lesson plans and materials added. Search keys could link to the learning objectives, age ranges, and disciplines used.

In general, both the website and e-learning platform could be more user friendly. Who is the website for, what is the target group? If it is teachers, the homepage should immediately guide the viewer to the toolkit and e-platform clarifying why they should explore these materials, how it can benefit them and how they can implement them. The international context of the website and materials limits the direct implementation of the materials in the national context, since each country has their own educational framework and goals. However, the content can be used and restructured to serve the national approach. Most importantly the international context shows different perspectives and provides a source of inspiration on STEAM education.





Madrid, Spain

Introduction - Due to the pandemic situation of COVID-19 and the lack of space to carry it out, the implementation of the workshops in Spain has been done virtually through video conferences. In addition, the sessions were divided into different days and small groups due to the lack of coordination in the times and days of the people who participated.

In total, we had a participation of 12 teachers, between primary and secondary, as well as the participation of some early childhood education teachers. Unfortunately, only 6 could attend the virtual workshops, the rest of them, received the workshop in an asynchronously way. All participants gave us positive feedback on the workshops and showed their interest in the project. In general, all the participants were interested in using the resources and results of the project in their teaching practice.

The development of the workshops had to be adapted to the virtual situation in which they took place. Even so, the participants liked the workshops and received the information in a positive way. They were also participative in recommending other possible resources and tools to be included in such a project.

Methodology - The methodology used for the delivery of the workshops was entirely virtual. We used videoconferencing tools to deliver the workshops to the participating teachers. Although the situation in Spain with regard to COVID-19 is much better, we were unable to hold the workshops in person due to the lack of a suitable space.

On the other hand, we had to divide the workshop sessions and adapt the time of delivery. As they were online, we reduced the timetable and merged workshops one and three into a single session. This was done on two different days, as the participating teachers did not coincide in terms of days and times.

We had a total participation of 12 teachers, between primary and secondary, as well as some early childhood education teachers. Due to the situation and that the teachers we reached had different timing, only six of the participants could attend the virtual workshop in a synchronous way. It is because of this that we had to rearrange the workshops and delivered them mostly asynchronous.

The Zoom tool for the delivery of the workshops was a positive feature. It allowed easy access for the participants. Also, the participation of the teachers, who gave us a very complete and positive feedback.

As a negative aspect of the workshops, we would like to highlight the fact that it was not possible to do them in person, and that we had to divide the groups into two. We would have liked to be able to bring them all together in the same room and give the whole workshop.

Results and Findings - In general, the feedback received was very positive. All participants have found the project interesting and useful and would be interested in using it in their teaching practice. They have highlighted different elements of the results, and have also advised and provided us with new tools or elements that they would include.

Regarding the IO1: Toolkit, they highlighted its practicality and organisation. They consider that it is motivating for the learner and that it includes all the necessary areas. They also highlight that it is very easy to use.

On the other hand, they have highlighted that they miss more material in Spanish, as many of them do not speak English.

Regarding the e-learning platform, IO2, they highlighted the design, as they found it very attractive and practical. They also referred to the usefulness of the platform and also commented that they would recommend it.

As improvements, they advised us to add, for future editions, the Roblox video game platform. A platform for educational games made for more advanced ages.

Finally, they have highlighted, as suggestions, to make more use of social networks and advertising to disseminate the project. They also suggest creating messages, posters or advertisements in schools where the protagonists are women or providing examples of the importance of women scientists in history, in order to remember them and to work on gender stereotypes in the scientific world.

In order to be able to carry out this type of project in their schools, they also highlight the support of the institutions, or good training and coordination of the teaching staff in STEAM.

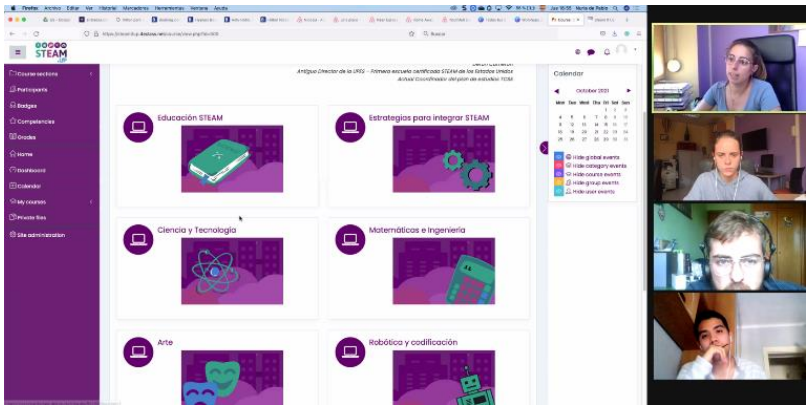
In general, they found the project useful, clear and recommendable, as it offers realistic ideas that can be easily applied in their teaching practice.

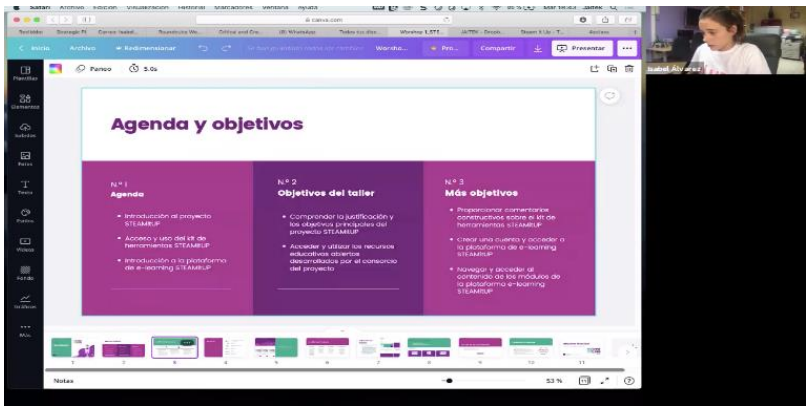
Conclusion - From our point of view, the workshops were positive. However, we have to highlight the difficulty we have encountered in getting the teaching staff to show the necessary prior interest in participating. Although the project seems useful and interesting to them, due to the last few years they have spent at COVID-19, they are under a level of stress that makes it difficult for them to participate actively in this type of project.

In spite of this, the teachers who took part showed their interest and liking for the project. They told us that it is a useful and recommendable project, and that they would like to implement it in their teaching practice.

They also recommended tools and practices to include in this type of project, more tools to work with STEAM in a dynamic and motivating way for the students. On the other hand, they did mention the problem of language and that there are resources that they will not be able to use because they are not in Spanish.

In the end, the workshops have been very beneficial both for us and for the teachers who participated, and we believe that the project can have a very positive impact on the students and teachers of infant, primary and secondary schools.





Impact Assessment Survey Results and Analysis

As covered in the previous chapter of this report, the participating teachers involved in all of the national impact assessment workshops were asked to complete a series of surveys at various points during the workshop implementation phases. These surveys were aimed at collecting valuable qualitative and quantitative data from the participants in relation to the quality and impact of the STEAMitUP resources being presented.

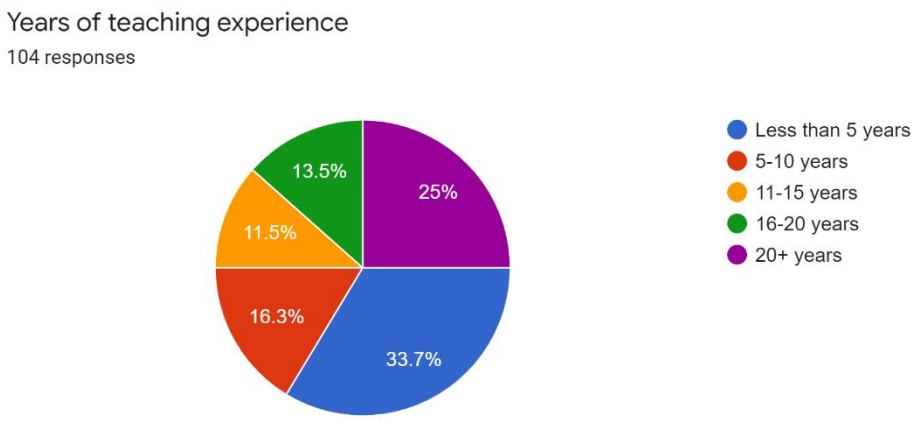
An overview and analysis of the collective findings is outlined in this chapter and the complete data sets are available in the annexes of this report.

Demographic Information of Participating Teachers

A total of 104 teachers participated in the national impact assessment workshops across the 6 partner countries.

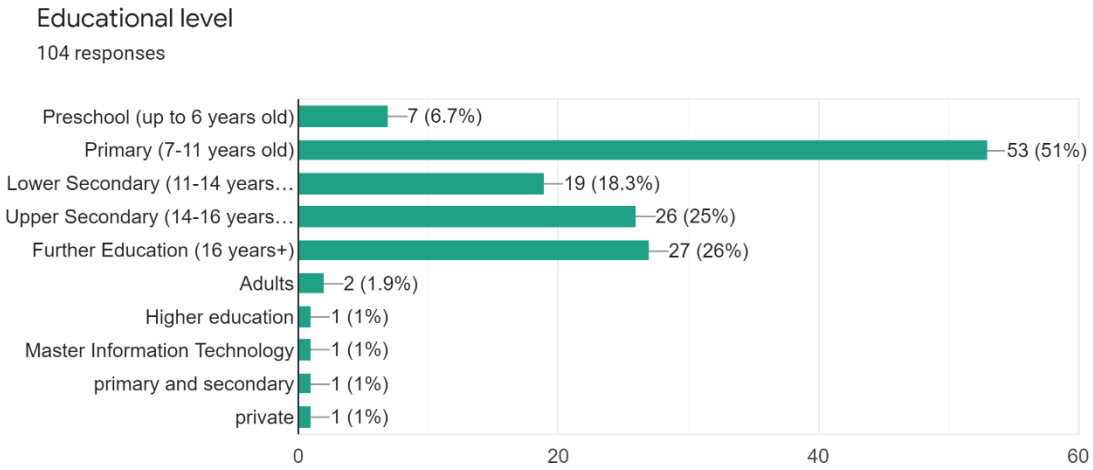
The participating teachers had a varied range of experience with 50% having over 10 years, and 33% having less than 5 years teaching experience. This was a positive outcome for the project and impact assessment process as we gained a diverse range of perspectives and could call on the extensive teaching experience of the participants.

Table 5.1: *Years of Teaching Experience of Participating Teachers*



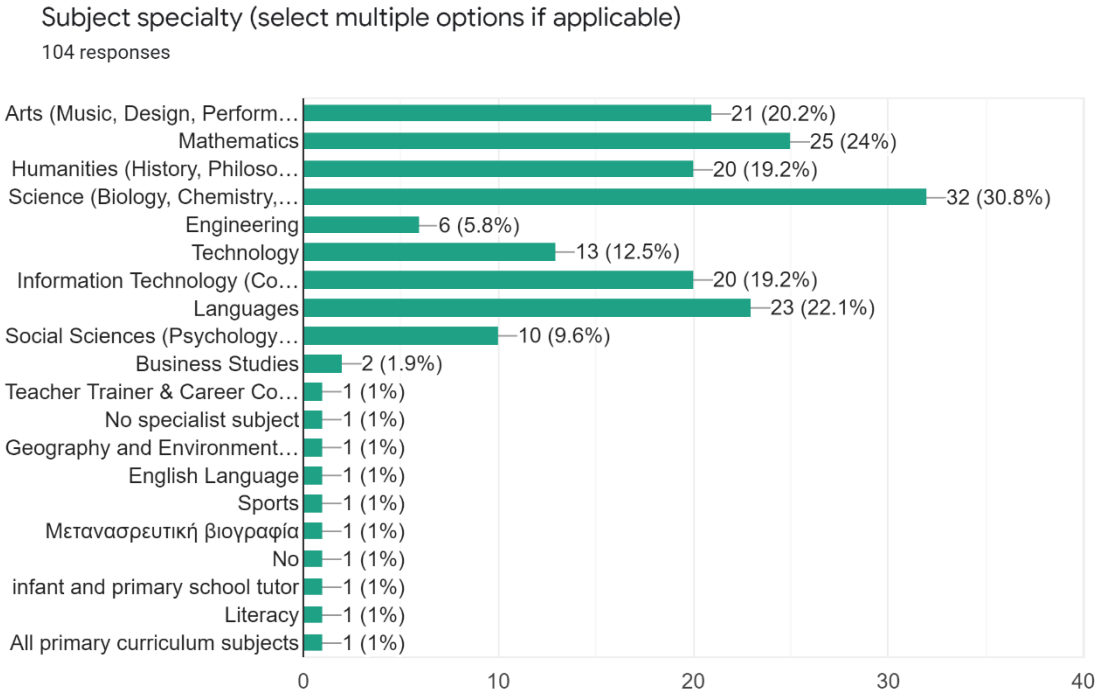
The participating teachers taught at a wide range of educational levels with many teachers covering multiple levels and student age groups. We found that 60 taught at primary level and 78 covered secondary, further or higher education. Again, this provided the project with a diverse selection of teachers covering a wide cross-section of educational levels.

Table 5.2: *Educational Level Taught by Participating Teachers*



The participating teachers also specialised in a broad range of subjects, with some teachers specialising in one specific area and others covering many subject areas. We found that 97 of the teachers stated that they had some experience and/or responsibility for teaching one or more of the STEAM fields.

Table 5.3: *Subject Specialities of Participating Teachers*



STEAMitUP Toolkit Evaluation Survey (Workshop 1)

Upon completion of the first workshop each teacher was asked to provide constructive feedback on the structure and content of the STEAMitUP Toolkit by rating certain elements of each on a scale of 1 to 5. The responses are shown in tables 5.4 and 5.5 below.

Table 5.4: *Participant Ratings of Aspects of the Structure of the STEAMitUP Toolkit*

On a scale of 1 to 5 (where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree"), please rate the following statements in relation to the structure of the STEAMitUp Toolkit.

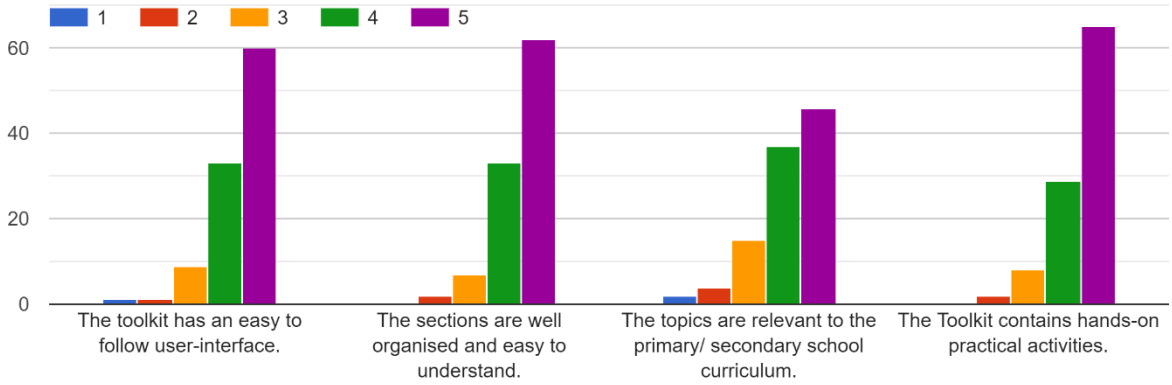
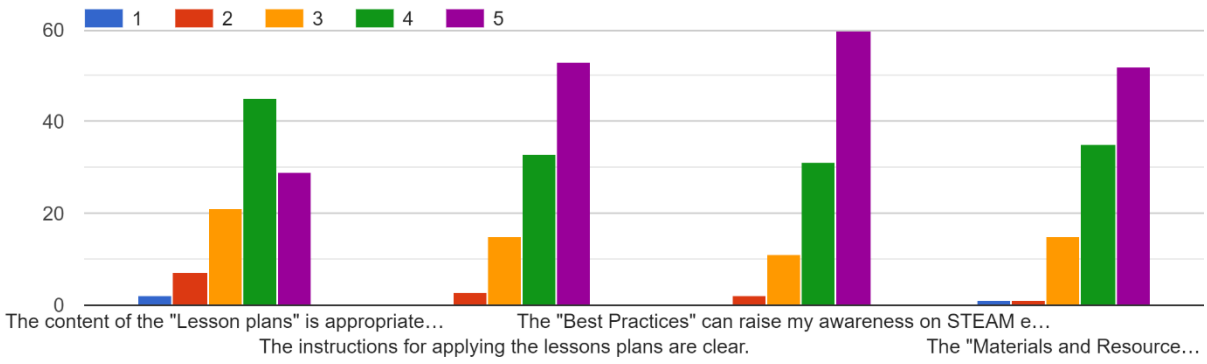


Table 5.5: *Participant Ratings of Aspects of the Content of the STEAMitUP Toolkit*

On a scale of 1 to 5 (where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree"), please rate the following statements in relation to the content of the STEAMitUp Toolkit.



From the responses to these questions we can see that the vast majority of the participants provided positive feedback on all elements of the STEAMitUP Toolkit:

- 93/104 participants agreed or strongly agreed that the toolkit has an easy to follow user-interface;
- 95/104 participants agreed or strongly agreed that the sections of the toolkit are well-organised and easy to understand;
- 83/104 participants agreed or strongly agreed that the topics in the toolkit are relevant to the primary/secondary school curriculum;
- 94/104 participants agreed or strongly agreed that the toolkit contains useful practical activities;
- 74/104 participants agreed or strongly agreed that content of the lesson plans is well-formulated and appropriate for their students;
- 86/104 participants agreed or strongly agreed that the instructions for implementation the lessons plans are clear;
- 91/104 participants agreed or strongly agreed that the best practices can raise their awareness of STEAM education;
- 87/104 participants agreed or strongly agreed that the materials and resources can support them to employ STEAM-related practices in their teaching.

Participating teachers were also asked to provide some suggestions on any additional content or sections that could be added to the STEAMitUP Toolkit, a selection of the answers is provided below:

- *"More lesson plans for primary school";*
- *"Language activities and more topics in maths";*
- *"Higher secondary education lessons about hydrophobic and hydrophilic compounds (make a density tower or make hydrophobic sand) or electricity conduction (use static electricity to light a lamp) would be nice";*
- *"More subjects such as AI and AR";*

- *"More robotics content";*
- *"There seems to be a good selection of resources but maybe more art focused elements as there does seem to be more of a focus on the STEM subject areas";*
- *"There are some elements of IT, coding and programming but there could be much more content around these areas, especially at different levels of difficulty from entry level to advanced. Maybe CAD or similar types of content too, more industry standard content to make students ready for the workplace";*
- *"The best practices, lesson plans and additional materials seem to cover a lot of different elements from within the STEAM subjects. There a lot of things to utilise as a teacher, however, as a Mathematician I would like to see more practical applications of the different branches of Mathematics";*
- *"As an IT teacher I would have liked to see more content covering Coding, Programming and general IT competences".*

The final question asked the participating teachers to provide any additional comments, ideas or recommendations that they would like to add in relation to the toolkit, a selection of the answers is provided below:

- *"More ideas for primary education would be helpful";*
- *"Everything is great and really useful. I'm excited to try this out. Maybe it would have been nice to get a bit more information on the overview screen of the different sections. For example, the lesson plan site. I don't know anything except for titles. That makes it hard to compare them. Or what if I'm looking for one specifically under 60 minutes. Now I have to click on all of them individually. Maybe a bit more basic info would have been nice on that page. Similarly, for the other sections";*
- *"It would be nice to have a reference to the materials and tools in the lesson plan PDF, so the teachers immediately know where to find the additional material";*
- *"I think it would be very helpful if teachers can add personal notes, based on in-classroom experiences, and share them with other teachers using the platform/tool";*

- *"Add an evaluation system for the practises, lesson plans and material so new users would have an idea of the usefulness of the content";*
- *"I like how the toolkit was presented and the variety of different resources provided. As a Teacher it is very helpful to have access to as many different resources as possible especially for subject you do not feel confident delivering";*
- *"I specialise in the Arts but I do have to teach all subjects to my students so this toolkit is very useful to me. There are a good selection of different lessons, resources and links use across all the subjects and I really like how many of the resources are interdisciplinary";*
- *"Overall, I liked the toolkit, it is presented well on the website and each resource seems relatively easy to use. The lessons are interesting although none are really suitable for my IT classes. The best practices provide a lot of good links and initiatives to research";*
- *"The website is fantastically presented and I especially love the landing page. The toolkit is easy to access and navigate around. The toolkit content is clear and easy to use, especially the lesson plans";*
- *"The toolkit is motivating, practical and in line with the tastes of the new generations. As an improvement, provide more material in Spanish";*
- *"The toolkit is well-presented and relatively easy to use. The distinct areas are clearly defined and contain a broad range of different resources. My only issue is that you need to click in to each individual lesson plan, workshop or resource to know if it is suitable for your need";*
- *"I specialise in History but I teach all subjects to my Primary class so this toolkit was really useful. I think it covers many useful topics and provides multidisciplinary lessons for all ages";*
- *"The content of the materials and resources section is intertwined with the lesson plans. However, by presenting it in two different sections, the interesting examples might be missed by anyone focussing on the lesson plans only";*

- *"The lesson plans, best practice examples and supporting materials are great. Obviously, they are aimed at a variety of different target audiences so not all of them were suited to the educational level I teach at";*
- *"The toolkit is easy to access via the website and is presented in really attractive way. The three areas of the toolkit are clearly defined and easy to access. The only negative I can find is that you have to go into the lesson plans to see if they are actually suitable for your specific subject/age group";*
- *"I liked the lesson plans provided, they are interesting and well-structured. The best practices provide some good links to additional resources. The materials and resources section also includes a good selection of varied activities. Overall, the toolkit is easy to use and presented really effectively on the website. It would be helpful for the resources to be labelled a little clearer so you know what subject and age group they are aimed at without having to click into the pages";*
- *"I liked how the toolkit is presented on the website. It would be helpful to have the toolkit resources separated into sections for each STEAM subject and targeted age group so teachers could identify suitable resources easier";*
- *"Although they are good, the lesson plans are a little limited as there only appears to be 12 lessons across all Primary and Secondary educational levels / subjects. The best practices are good and provide some interesting resources. The workshops and additional resources are also interesting and some of them link back to the content of the lesson plans which provides good opportunities for extending the subjects beyond a single lesson".*

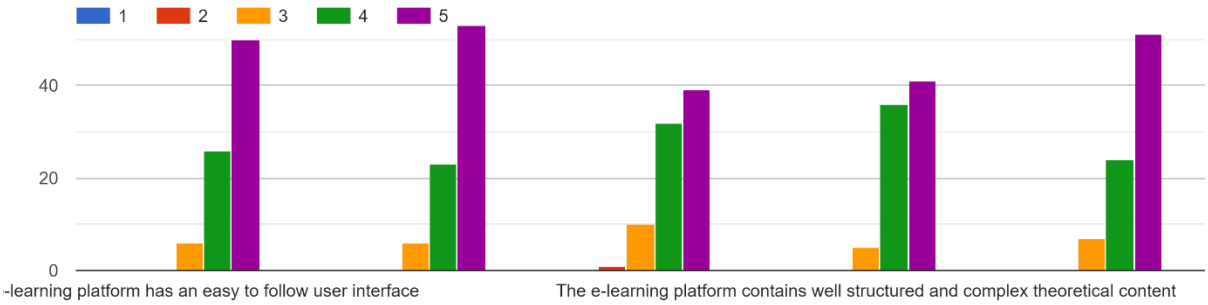
Overall, the participant feedback was overwhelmingly positive. The project team altered some elements of the toolkit as a result of some issues raised by the teachers. After analysing these findings, we are confident the STEAMitUP Toolkit meets the needs of the target audience and has had the desired impact outlined in the project brief.

STEAMitUP E-learning Platform Impact Survey (Workshop 2)

Upon completion of the second workshop and self-directed engagement with the STEAMitUP e-learning platform, participating teachers were asked to provide constructive feedback on the structure and content of the resource by rating certain elements of each on a scale of 1 to 5. The responses are shown in tables 5.6 and 5.7 below.

Table 5.6: *Participant Ratings of Aspects of the Structure of the STEAMitUP E-learning Platform*

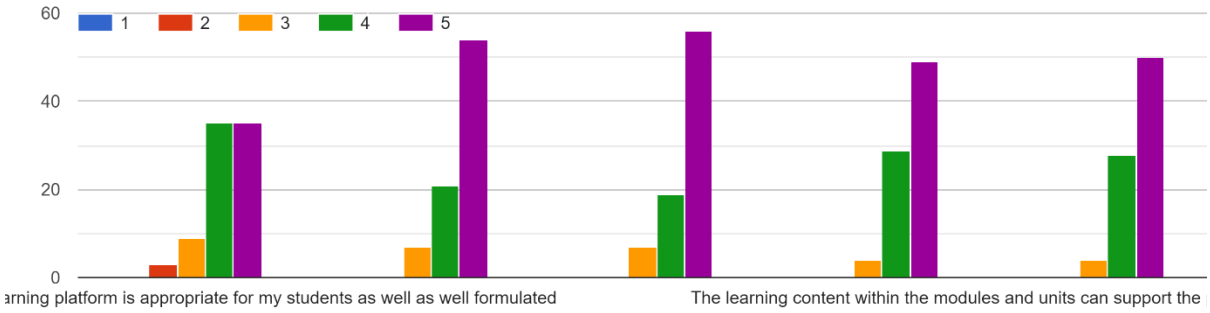
On a scale of 1 to 5 (where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree"), please rate the following statements in relation to the structure of the STEAMitUP e-learning platform.



- 92% of the participants agreed or strongly agreed that the e-learning platform has an easy to follow user-interface;
- 92% of the participants agreed or strongly agreed that the modules are well-organised and easy to understand;
- 86% of the participants agreed or strongly agreed that the topics are relevant to the primary/secondary school curriculum;
- 94% of the participants agreed or strongly agreed that the e-learning platform contains well-structured and complex theoretical content;
- 91% of the participants agreed or strongly agreed that the e-learning platform contains hands-on practical activities.

Table 5.7: *Participant Ratings of Aspects of the Content of the STEAMitUP E-learning Platform*

On a scale of 1 to 5 (where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree"), please rate the following statements in relation to the content of the STEAMitUP e-learning platform.



- 85% of the participants agreed or strongly agreed that the content of the e-learning platform is appropriate for their students and is well-formulated;
- 91% of the participants agreed or strongly agreed that the instructions and tips given within the e-learning platform are clear and useful;
- 91% of the participants agreed or strongly agreed that the two introductory modules on the e-learning platform can raise their awareness of STEAM education;
- 95% of the participants agreed or strongly agreed that the materials and resources provided within the e-learning platform can support them to implement STEAM-related practices in their teaching;
- 95% of the participants agreed or strongly agreed that the learning content within the modules and units can support the professional development of teachers.

From the responses to these questions, we can see that the vast majority of the participating teachers found the structure and content of the e-learning platform to be very good. There were no negative responses to any of the questions with only one participant stating that they felt the content of the platform was not suitable for their students.

Participating teachers were then asked to provide some suggestions on any additional subjects or topics that could be covered within the STEAMitUP E-learning platform, a selection of the answers is provided below:

- *"Giving the hands-on and practical features of the topics already covered, I would say learning about DNA, let primary students become "space explorers" or embark them in a multidisciplinary project (physics, chemistry, math...) through cooking";*
- *"Maybe something about bacteria growth would be nice to include to let the students see that bacteria are everywhere and that washing your hands is important. This could be done in an experiment by placing agar plates around the classroom or letting them touch the agar plates before and after washing hands. An experiment that could be attached to this to show that not all bacteria are bad is making yoghurt";*
- *"Again, there is almost an endless number of topics or subjects that could be covered under the STEAM subjects. I think you have to limit yourselves or you will have an overwhelming amount of content. I think that for the aims you are working towards; the content is sufficient";*
- *"I think there is sufficient content for all subjects and the Arts section seems to have a lot of great information for those teachers unfamiliar with the subject. You can always add more content but then the user may get overwhelmed if there is too much to go through";*
- *"Maybe more for Information Technology, I like the sections on Coding and Robotics but maybe some content on basic programming etc";*
- *"The six modules include a great deal of content and I like how some of the subjects are presented together to show how they interlink. There is always more content you could include but that would make the modules too large";*
- *"It would be good to have more content on visual arts, mixed medium and materials, textures, etc. and how they could relate to construction/engineering/math, etc.";*

- *"I would additionally suggest some initial instruction about epistemology: what is Science, what is Mathematics etc. as well as some reflection about what connections do they see between them in the topic. As topics, Climate Change is quite interdisciplinary and real-world relevant";*
- *"The modules have a lot of content in each and I like how some of them link the STEAM areas together. It would be very difficult to cover all of the STEAM areas in full detail as there would be far too much content to work through. I think the content is sufficient to support teachers to try new delivery methods".*

The final question asked the participating teachers to provide any additional comments, ideas or recommendations that they would like to add in relation to the e-learning platform, a selection of the answers is provided below:

- *"A short introduction of this platform would have been nice at the start. What can we find here? What is the purpose? What can I learn? etc. Although the lay out of the platform is very natural and intuitive, still a few welcome words as context would have been nice";*
- *"The platform itself is great. Intuitive, easy to navigate and presents the content in a well-structured manner. Nonetheless, I am not sure for a person with a disability how easy it would be to access to the slides or the pdfs";*
- *"I really liked the platform presentation and content. It has a lot of information to work through and supports you to try out new ideas in your classroom";*
- *"I like how all areas seem to have a practical element and try to frame the subject into a world around us. Everything has been presented well and looks aesthetically pleasing on the screen. I am not sure about the progress bar as it seems that it is not recording my progress for each module correctly";*
- *"None. I really liked the platform. It is visually appealing and the content is varied. I also like how a lot of the content is presented via videos or animations etc. It makes it very easy to work through";*

- *"The content of the different modules is varied and covers a lot of different areas from within the STEAM subjects. I am a Science Teacher and I found the Science/Technology sections well-made and useful at a certain level. The Math/Engineering & Arts sections are interesting and provided me with some ideas for how to incorporate inter-disciplinary elements to my lessons. My only real issue was with the 'progress' monitoring, it is not made explicitly clear that you have to 'tick' the boxes at the end of each video/activity. Therefore, you can easily work through all the content in a section and still show 0% progress, meaning you then have to go back a tick all the boxes to record your progress. I am sure this could be solved with a simpler mechanism";*
- *"The platform is very well-made and presented excellently. The colour scheme is great and it is easy to access the content via the main page and module windows. I like the visual presentation of all the content and each module is easy to scroll through";*
- *"I like the presentation and interface of the platform. It is relatively easy to navigate from the first screen with the 6 topic windows. I like that each module has an introductory presentation outlining the content and learning outcomes. My only issue is how you have to keep scrolling down to access all the content, it can be easy to lose track of your progress because of this";*
- *"I think there is already a lot of content across the modules. The introductory modules are interesting and provide a good base of understanding. The other subject specific modules then provide a great deal of information specific to the STEAM topics. I found the content useful and gave me some good ideas of how I can liven up some of my lessons";*
- *"There seems to be a lot of information, covering a lot of different topics across the different modules. As an Art teacher, I found the Art section to be good and the other sections useful for teachers who do not specialise in those subject areas";*

- *"I would suggest some more open-ended activities for the assessment/testing knowledge from the topics presented in the videos. Overall, it seems a great work!";*
- *"I think you could have made more efforts to link the STEAM subject areas together even more than you have, especially to show how Science, Technology, Engineering, Arts and Mathematics are all intrinsically linked";*
- *"The platform contains a great deal of information across the STEAM subjects. The six module windows are clearly defined and easy to navigate. My only problem is that you have to scroll down the content and complete it as you go, it would be better to have a quick link to each sub-module for ease of access";*
- *"The platform is well-made and easy to navigate. The six modules are clearly defined and logically structured. The interface is intuitive and makes it easy to progress through all the content of each module. I really enjoyed the Robotics module and I will be using some of that content in my classes";*
- *"The Arts module is really good and provides the user with some really useful information for teachers who are not familiar with the Arts disciplines. The other modules are also really good and provide a lot of content for teachers to explore. I especially liked the Robotics and Coding module as this is an area I did not feel confident with";*
- *"The platform was relatively easy to access and create an account. It is easy to find the different modules on the main page. The content within each module is interesting and helpful but slightly awkward to navigate as you have to work down the page to access all the content. It may be useful to have the sub-topics within each module outlined at the top of each page with links so you can go straight to the relative content you want to use";*
- *"The MOODLE was structured in user friendly manner and looked really effective with the module windows. Once you access the content within the modules it was easy to progress through all the sections by simply scrolling down the screen. I found some of the activities really interesting and helpful";*

- *"The modules contain a lot of different content across the subject areas, although each are only just scratches the surface of the amount of content covered in the curricula for each subject. The content provided is interesting and presented in a pleasing way";*
- *"The platform looks really good and is easy to use. I found a lot of useful information that will help me in some of my lessons. I like how all the modules are structured and presented using the windows and presentations";*
- *"The platform is simple to access and use. The different modules are well defined and clearly titled. The module content is presented in an engaging way and there are lots of activities to undertake. To make it easier to navigate you could have sub-topic icons within the modules that take the user directly to the content they wish to use without having to scroll down the page each time".*

Again, the vast majority of the responses were overwhelmingly positive with the participating teachers providing some interesting and useful feedback. As a result of the comments, the project team made some alterations to the platform interface and progress recording mechanism. The suggestions for additional subjects/topics were also helpful but it was decided that the 6 modules already contained a wide range of STEAM content that was sufficient for the required purposes.

After analysing all of the participating teacher feedback, the project team are confident that the STEAMitUP E-learning platform had been produced to a high standard and that it meets the requirements of the key target groups. The e-learning platform content compliments the toolkit extremely well and the combined resources offer a fantastic suite of OERs that support the delivery of interdisciplinary STEAM lessons and teacher CPD.

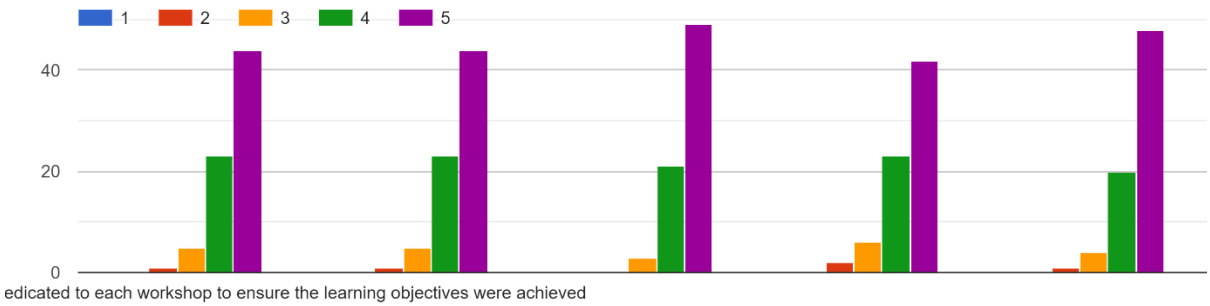
STEAMitUP Workshop Impact Assessment Survey (Workshop 3)

Upon completion of the final workshop the participating teachers were asked to complete a third impact assessment survey that covered a wide range of elements of the STEAMitUP project. The teachers were asked to provide feedback on the implementation of the training workshops, the usefulness of the resources presented and the project impact on the key target groups. The participant responses to these survey questions are outlined in the following sections.

Implementation of STEAMitUP Training Workshops

Table 5.8: *Participant Ratings of Aspects of the STEAMitUP Training Workshops*

On a scale of 1 to 5 (where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree"), please rate the following statements in relation to the workshops.



- 92% of the participants agreed or strongly agreed that there was sufficient time dedicated to each workshop to ensure the learning objectives were achieved;
- 92% of the participants agreed or strongly agreed that the delivery methods used were suitable to the workshop content and participant needs;
- 96% of the participants agreed or strongly agreed that the content of the workshops was interesting and engaging;
- 89% of the participants agreed or strongly agreed that as a result of completing the workshops they have increased their confidence in the delivery of the STEAM subjects;

- 93% of the participants agreed or strongly agreed that participating in the workshops provided an opportunity to develop new ideas, share best practices and increase their professional competence.

The participating teachers were then asked to provide any additional feedback, comments or suggestions regarding the workshops they had undertaken, a selection of the responses is provided below:

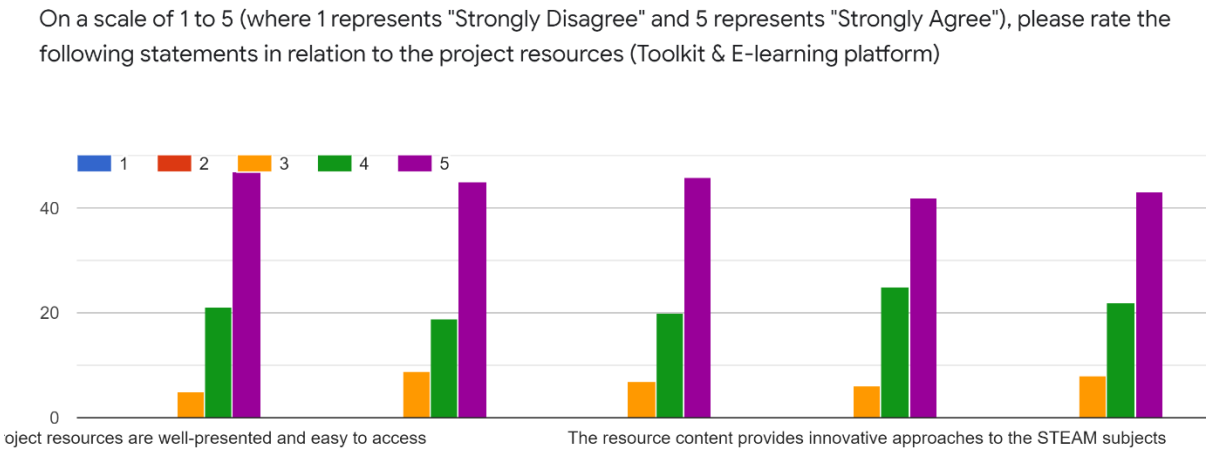
- *"I really enjoyed the workshops and found them really helpful. I liked being able to work with other teachers from other schools and share our ideas";*
- *"Great team with fresh ideas for the teachers. Great facilitators as well!";*
- *"The workshops were fun and interesting, it was useful to have someone guide me through all the content of the toolkit and the platform";*
- *"The workshops were well-organised and ran according to the agenda and timescales. The project was presented and explained clearly. The activities the group undertook were interesting and engaging. It was helpful to be shown how to use all the different resources and logon to the e-learning platform. Working through the e-learning platform at my own pace was good as it enabled me to explore things in detail. Overall, the workshops were enjoyable and it was interesting to speak with other teachers from other schools";*
- *"The workshop format worked well despite having to be held virtually. The host was helpful and supportive. The agenda was clear and we followed it accurately and in line with the outlined timings. They were helpful in guiding the teachers through the project rationale, aims & objectives and resources";*
- *"The workshops were interesting and engaging. The practical activities and guidance from the trainer were excellent. The opportunity to discuss and share our experiences with other teachers was really valuable";*
- *"The virtual workshops were fun and it was helpful to be guided through the content of the website and platform";*

- *"The workshops were interesting and well-delivered. It was helpful to be guided through the resources and to have someone to ask questions of";*
- *"I enjoyed the 3 workshops and the time working through the e-learning platform. I still have a lot of content to go through on the platform as there was a lot of things to go through. It was nice to speak with other teachers and share our experiences, especially after such a long time dealing with the pandemic";*
- *"I enjoyed the workshops and self-directed learning through the platform. I was nice to speak with other teachers from other schools and to see that we are all facing the same issues and have a shared experience";*
- *"I enjoyed the workshops, worked well virtually but would have loved to have done it in person. Nice to meet teachers from other schools and discuss things. Helped my build my confidence and learn from others";*
- *"The virtual workshops were fun and it was interesting to hear the different approaches to the STEAM subjects. It was also useful to understand how teachers who specialise in the different fields experience their classes and engage with their learners";*
- *"The biology teacher who delivered the session had some interesting insights about getting students out into nature for real learning. It was a refreshing approach";*
- *"The workshops were engaging and informative. It was a good opportunity to discuss strategies and share experiences with other teachers".*

From this feedback, we can see that the teacher training workshops were well-received by the participating teachers and that the learning content was suitable for the required purposes. Obviously, we would have preferred to hold all the workshops physically as they would have been even more impactful, but all of the partner organisations adapted their plans effectively to deal with the issues caused by the pandemic in each country.

STEAMitUP Project Resources

Table 5.9: *Participant Ratings of the STEAMitUP Educational Resources*



- 93% of the participating teachers agreed or strongly agreed that the project resources are well-presented and easy to access;
- 88% of the participating teachers agreed or strongly agreed that the resource content is suitable for the target audiences;
- 90% of the participating teachers agreed or strongly agreed that the resource content supports the delivery of the STEAM subjects;
- 92% of the participating teachers agreed or strongly agreed that the resource content provides innovative approaches to the STEAM subjects;
- 89% of the participating teachers agreed or strongly agreed that they found the content useful and that they will utilise aspects of the toolkit & e-learning platform in their lessons.

The participating teachers were then asked to provide any additional feedback, comments or suggestions regarding the STEAMitUP project resources they had used, a selection of the responses is provided below:

- *"I was happy to be included in these workshops and think the project has made some fantastic resources";*

- *"I only teach the Science subjects; therefore, the Arts/Engineering/Math and Technology aspects were useful for me. I found the resources well-made and presented in an effective and professional manner";*
- *"All the resources I used were excellent and I love the visual elements, branding, colour scheme of the project in general. The toolkit was useful especially in providing ideas for interdisciplinary lessons. I found the content of the learning platform informative and extremely helpful in supporting me to think of new ways of approaching some of the subjects I am not as familiar with or confident teaching";*
- *"The toolkit is great and so is the platform. It would be helpful to have the link to the platform on the website rather than having to be sent it but I think the trainer said this would be added later. Everything is professional looking and the project logo and theme is great";*
- *"The toolkit and e-learning platform are both excellent resources. They seem to complement each other very well. They provide a teacher with a good selection of useable materials as well as the necessary information, advice and guidance to use them effectively";*
- *"I found everything great. The website, toolkit and platform all look great and have a consistent theme and style. All the content I used was well-made and useful in the classroom";*
- *"All the resources look good and provide useful content. I like the project colour scheme on the website and platform. Everything is user friendly and easy to use in the classroom";*
- *"I found all of the resources to be professionally presented and useful for lesson preparation or classroom activities";*
- *"All the resources were good and useful for some teachers, especially teachers who have to deliver multiple lessons across all STEAM fields. If you are already experienced in one of the STEAM areas then you may find that area less useful than the others";*

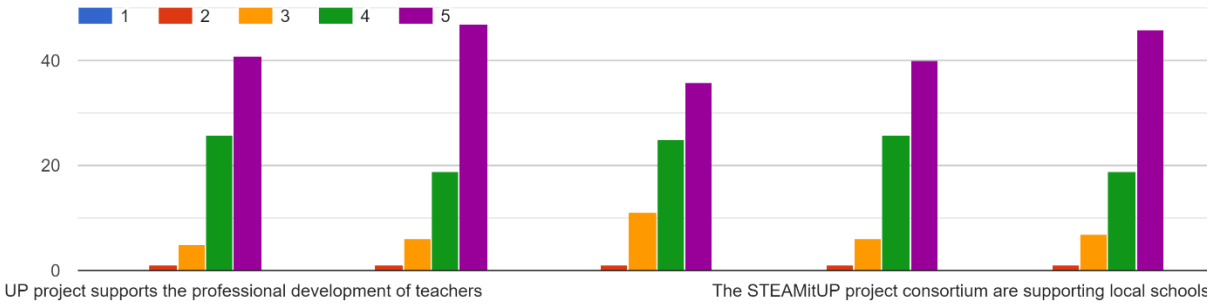
- *"I found all the resources to be well-presented on the website and platform. The content is well-structured and covers a lot of STEAM topics across all the subject areas. My only issue is that content aimed at Primary and Secondary teachers/learners is all mixed together so it can be difficult to sift through to find the content specifically suitable to you and your learners";*
- *"The toolkit and platform contents are really good for both classroom delivery and general CPD for teachers. There are lots of practical activities and suggestions for ways to improve how the STEAM subjects are delivered. There are some excellent and varied content and signposting links that provide a wide range of extended resources that I have found useful as I am a relatively inexperienced teacher";*
- *"The resources are all excellently presented and user friendly. The toolkit and platform provide teachers with a great suite of materials across the STEAM fields. The only problem I found was that some of the resources are specifically aimed at either Primary or Secondary school teachers but it is not clearly identifiable without accessing the resources directly";*
- *"The project resources are all presented in a really effective way and look great on the website and platform. There is some really good content provided that will be very useful especially to inexperienced teachers or teachers who are required to teacher any of the STEAM areas that they are not comfortable teaching";*
- *"I am very satisfied with the ideas of STEAMitUP because it develops the basic skills of the 21st century (creativity, problem solving, self-regulation and cooperation)".*

The feedback provided in this section supports our findings from the previous workshop surveys. They show that the project consortium has developed a wide-ranging, well-presented and user-friendly suite of OERs that support teachers to implement STEAM activities, lessons and workshops.

STEAMitUP Project Impact

Table 5.10: *Participant Ratings of the STEAMitUP Project Impact*

On a scale of 1 to 5 (where 1 represents "Strongly Disagree" and 5 represents "Strongly Agree"), please rate the following statements in relation to the project impacts from your experience.



- 91% of the participating teachers agreed or strongly agreed that the STEAMitUP project supports the professional development of teachers;
- 90% of the participating teachers agreed or strongly agreed that the STEAMitUP project provides quality resources to support the delivery of the STEAM subjects;
- 84% of the participating teachers agreed or strongly agreed that the STEAMitUP project supports the increased participation of students in the STEAM subjects;
- 90% of the participating teachers agreed or strongly agreed that the STEAMitUP project supports school communities to engage in new innovative approaches to the STEAM subjects;
- 89% of the participating teachers agreed or strongly agreed that the STEAMitUP project consortium are supporting local schools to improve their STEAM provision.

The participating teachers were then asked to provide any additional feedback, comments or suggestions regarding the STEAMitUP project impact from their experience, a selection of the responses is provided below:

- *"The workshops, website and resources are all very interesting and provide teachers with a lot of information, advice and guidance";*

- *"From the above questions I think the project is having a positive impact of the areas outlined. However, some of those issues require a much larger effort that is well above the capabilities of your project";*
- *"As a result of participating in the workshops I learnt a lot about this project and what you are trying to achieve. I think the project is interesting and has really positive aims";*
- *"The project resources are all excellent and look really professional. My experience of the workshops and conversations with the other teachers was overwhelmingly positive";*
- *"After completing the workshops and working through the resources I think that the project is making a solid effort to support the delivery of the STEAM subjects. There is a lot of good work the project has done and everything is presented in an impressive way";*
- *"From my experience in the workshops I can see that this project is making positive steps towards supporting the delivery of the STEAM subjects. As a teacher who does not specialise in any of the STEAM fields, I found the resources provided very useful and I will use them in my classroom where appropriate. Being involved has had a positive impact on my approach to the STEAM subjects (especially Mathematics) and I think it will help me improve my delivery of some of my lessons";*
- *"The project has had a positive impact on my view of delivering STEAM related lessons. I teach an early year's class, so I do not go into depth with any of the STEAM areas but I feel more confident in my ability to deliver some of my required subjects now";*
- *"The workshops and resources have had a positive effect on my approach to delivering the STEAM subjects. As a Language specialist I sometimes struggle when delivering some of the content under the STEAM areas and after completing the workshops I feel more confident in my abilities";*

- *"This project is clearly making a positive impact on STEAM education. Supporting teachers to increase their competences in delivering the STEAM subjects is vital to ensuring students enjoy the lessons. If you are not a specialist in any of the STEAM subjects then it can be daunting to teacher them at a competent level. The project resources I used are interesting and provide useful content for classroom activities and professional development";*
- *"From my interactions with LMC and the STEAMitUP project, I can see you are trying to make a real impact on how the STEAM subjects are seen and taught. With the website, toolkit and platform you have created a fantastic set of resources for students, teachers and school leaders to use";*
- *"The aim of the project is clear and the resources support those objectives. I found everything well-presented and professionally made, from the website through to the platform content. I think the project motives are excellent and the more teachers get to use the resources the better. It has been difficult as a teacher since the pandemic began so any support is very welcome and this project seems to really empower teachers to see the STEAM subjects in a different light";*
- *"As a result of completing these workshops I can see that the project schools are working hard to support teachers and students with the STEAM subjects";*
- *"The project appears to be making good efforts to engage with schools, teachers and students with a view to promoting the STEAM subjects. Providing a wide-ranging suite of resources for both students and teachers is very useful in this aim. It is very difficult to increase student participation in the STEAM subjects as individual decisions are made over to course of a student's educational journey that effect their career choices. I only teach students who have chosen to study the Sciences and they have generally followed a path toward a certain career or because the genuinely enjoy Science. All teachers can do is ensure that they teach their specific subject in a positive manner to ensure their students enjoy what they are being taught and increase their thirst for more knowledge";*

- *"After the workshops, I had a positive view on delivering the STEAM subjects and could not wait to try out some new activities in my class. I think the project had a positive impact on my approach so it should on others too".*

The participating teachers were asked to suggest some practical recommendations that would support the implementation of STEAMitUP project related activities, a selection of responses is provided below:

- *"All the project resources are good so just share them with as many schools/teachers as possible";*
- *"It is very difficult at the moment as the continuing impact of the pandemic will restrict what you can do. It is still very difficult to get out into schools so if you are relying on virtual activities it will be difficult to have a real impact. After nearly 2 years of working under these circumstances many people have reached their limit in relation to virtual activities and they are no-longer having the impact they did at the beginning of the pandemic";*
- *"You need the school leaders and decision makers involved. Teachers time is very limited so try to make sure you support them rather than just give them some resources to look at";*
- *"Run more practical workshops with teachers and even students if possible";*
- *"More guidance on how to achieve cross-curricular collaboration in practice in schools";*
- *"The workshops were helpful so try to run more of them with teachers where possible. I think the Robotics and Coding activities are really engaging and fun for learners of all ages and an excellent way to get young children interested in the STEAM areas";*
- *"Run more workshops with teachers. Hold regular STEAM themed activities maybe to coincide with certain national/global events. Run practical activities with students as much as possible";*
- *Getting out into classrooms is helpful but will be difficult due to COVID-19";*

- *"It is very difficult at this time as the pandemic is still effecting our daily actions and you are limited in what you can do. Maybe some interactions between students of different ages using the resources provided would be useful or bringing together different schools to be able to share their experiences and successes in initiating STEAM related activities";*
- *"This is dependent on many variable factors including educational level, resources available and teacher/learner capability. There are so many initiatives you can implement from regular STEAM days in school to get all students involved, to extra-curricular activities where interested students can come along for workshops, practical experiments or just extra learning opportunities";*
- *"Try to run more workshops with teachers and students too. Have STEAM days where you go to schools and get classes involved in activities and experiments";*
- *"Try to run workshops in schools if possible, both for teachers and students. If you can go and offer professional support to teachers and STEAM subject related activities in Primary and Secondary schools then you will be able to reach a really wide audience";*
- *"This is difficult due to the pandemic, our school like many others, is not really allowing external visitors or even parents on site. Therefore, it is hard to reach you target audience as you would probably want to. Running regular virtual STEAM workshops could be good idea to provide more teachers with the project resources and share the project with a bigger audience";*
- *"Run regular activities in schools or local communities. Align activities with big events or dates like Science Week or the upcoming COP26 event";*
- *"You could run STEAM themed after-school workshops to bring together all the disciplines and show how they are interlinked";*
- *"Due to the pandemic it is very difficult to have the impact you would want, you need to be going into schools and running activities or events".*

The Participating teachers were asked to provide any ideas or suggestions that they may have that could improve the delivery of the STEAM subjects in schools, a selection of the responses is provided below:

- *"I am a newly qualified teacher so I am still learning, I found the workshops and resources helpful the implementation of my lessons in general";*
- *"Each subject has its own challenges, but they all need practical activities to make them more engaging for learners. Mathematics can be difficult as many students have a kind of psychological barrier when it comes to Maths, they either enjoy it or hate it and many students seem to think that they are 'not very good at Math' even if they are perfectly competent"*
- *"Outings, debates, talks with scientific professionals";*
- *"I only teach in Primary school so I cannot speak for Secondary schools, from my experience younger children are generally really engaged with the STEAM subjects, especially when the lessons are practically focussed. Children love experiments, arts & crafts and building things in general, anything that is hands-on. So, keep the delivery practical and active as possible";*
- *"Ensure lessons contain as many hands-on practical activities as possible";*
- *"Each teacher has their own style and way of delivering different subjects. The STEAM subjects cover a vast array of different topics and years of teaching time. I try to make my lessons fun, interactive and as practical as possible but this is not always possible. Each lesson or subject comes with their own challenges as do different students or classes";*
- *"Schools need to encourage more practical workshops and interdisciplinary lessons to shoe how subjects interact outside of educational settings. Schools also need to encourage representatives of the STEAM industries to visit schools to explain potential career avenues and link this to careers information, advice and guidance. Maybe inviting industry professionals into classrooms to run workshops or even support teachers to deliver lessons could be interesting";*

- *"Interdisciplinary lessons and activities are a great way to deliver STEAM content and provide you with a chance to show learners how the fields are linked";*
- *"From my experience in Primary school, I find that the majority of children enjoy practical activities and getting 'hands-on' with the subject matter";*
- *"Keep it fun and engaging at all times. Make sure the lesson has obvious practical links or implications on the student's everyday lives, this way they build a deeper understanding and can relate to what is being taught";*
- *"I think that teachers usually do all they can to make their lessons as engaging and fun as possible, each of the STEAM subject is very different and all have their own challenges. I find the Arts the easiest to deliver as they are solely about creativity and self-expression, there are not always 'right' and 'wrong' answers like the other subjects. Many students seem to have a natural affinity or capacity for a certain type of subject and this is often linked to their personality. The key is to make all subjects enjoyable, rewarding and positively challenging without putting younger students off with complexity or difficulty";*
- *"Each teacher has their own strategies and delivery methods, this comes from a combination of your personality and experience. Above all you need to keep the students engaged by whatever means you can. Try to show how subjects often interact together and do not exist in isolation";*
- *"Put theory into practice. Younger students learn best by getting stuck in and doing things. Experiments and practical activities work the best. I guess it becomes more difficult as the students get older and have to learn under the increased pressure of exams and coursework deadlines";*
- *"I only teach the Arts so I can only comment on this area. I like the Arts related content you have included in the resources, it provides some solid theoretical context and includes some interesting practical activities. Art is about personal expression, so give as many opportunities for expression as possible";*

- *"I am a relatively inexperienced teacher and I only teach Biology at GCSE level to all Secondary school aged students so I wouldn't feel capable of advising others how to teach the wider STEAM subjects effectively. I my limited experience, if you keep your lessons engaging, practically focused and fun then the majority of the students will enjoy the lessons. Group work and adding elements of competition are also really effective ways of ensuring students engage with the lesson content";*
- *"Right now, this is difficult due to the pandemic. You would have to hold virtual events, workshops or activities with teachers or students. Hopefully, once you can go back into schools on a regular basis you can run some fun STEAM related activities";*
- *"I strive to make my Science lessons fun and as practical as possible. Hands on practical activities are far more educational than simple theory, putting the learning content into a 'real world' context is vital".*

The participating teachers were asked to provide any additional ideas or suggestions that could increase female participation in the STEAM subjects at all educational levels, a selection of the responses is provided below:

- *"I am not sure how you can address this, having more recognisable female role models in the STEAM fields would help";*
- *"This issue is bigger than the educational system, although teachers and educators can have an impact. Female students can be inadvertently put off the STEM subjects in particular as they are seen as more 'technical' or male subjects. This will not affect those female students who have a passion for any of the STEM fields, but it may discourage those female students who could potentially succeed in those fields but do not continue their studies due to social pressures. The key is to enthuse and empower female students at all levels and show them that STEM careers are just as accessible to female as to male students. The Arts seem a bit more balanced in relation to the gender distribution of students as the arts include a wide range of areas from Music to Performing Arts";*

- *"Messages, posters, announcements in schools in which the protagonists are also women, in order to motivate and arouse curiosity";*
- *"I do not see a huge difference between the ability or participation between boys and girls in Primary school. All children have to take the same lessons and share the same experiences in class. I think the issue happens later in their educational journey when they have to make decisions about their future. It is still seen as more feminine to study the Arts and masculine to study more 'technical' subjects such as Math, Engineering or Technology. The Sciences are a little more complex as you can see differences between the gender's participation in Biology, Chemistry and Physics respectively. I think these issues are a product of social forces and gender stereotypes but the situation does seem to have improved in recent years especially compared to when I was in school";*
- *"This is a far too deep and complex issue to discuss via this mechanism in my opinion. There are so many factors at play";*
- *"In my experience male and female students do not necessarily differ in terms of ability at the level I teach. Some students have a more 'natural' propensity for mathematical thinking than others but this isn't as a result of gender in my experience. The issue seems to be when students are older and are required to make decisions concerning their education and career. I think that more female students are choosing to study the STEM subjects than in previous generations and this appears to be the same for careers in these fields also. The Arts are different as I do not think that female participation in these fields has been an issue. I think that female students should be encouraged to follow the study or career paths that interest them the same as with male students";*
- *"At the level I teach all the class do the exact same lessons and activities. We do a lot of learning through play and provide children with opportunities to explore and investigate. I do not see a difference between boys and girls at this age but I am aware that female participation in some subjects is disproportionally low";*

- *"I only teach IT so I am not fully aware of the situation for the broader STEAM subjects, in my experience IT is definitely a more male dominated subject and industry although this has begun to change in recent years as more female students chose to study IT related subjects at A-level or at University. From my understanding around 80% of IT roles in the UK are filled by men so it is clearly an issue that needs to be investigated further as this will have a disproportionate effect on the future career opportunities for women in an increasingly digital focused employment landscape";*
- *"I think this issue needs to be addressed on a societal level to change how the STEM subjects in particular are viewed. Female participation in these subjects seems to have increased in recent years, both in education and industry but it is still clearly an issue that more females do not choose to follow a career in the STEM subjects. As teachers, all we can do is encourage those who are competent and enjoy the subjects to follow them as far as they want to achieve their potential";*
- *"This is not an issue I see in Primary school; all the students do the same lessons and generally show an interest in all the things we do. I can see how parents can 'push' their children towards certain subjects over others for different reasons";*
- *"Provide examples of important women in history. Also, to disprove the idea that because they are women they are not as valid as men in some areas";*
- *"This is a difficult one, at a younger age it seems that girls are generally just as interested in the subjects as boys. However, as they get older girls generally move toward the Arts more and shy away from the STEM subjects, not always but generally. I think this is a societal issue and it would be interesting to see if it is different in different countries or cultures. I am not sure how fix it other than to encourage more girls to follow STEM education and career paths and empower them to push back against societal pressures. I think this is already happening and things have improved over recent years but there is still a lot to be done";*

- *"I teach primary school students so they all complete the same lessons regardless of gender. At the age I teach I do not see a huge difference between the abilities or preferences of male or female students in relation to any of the subjects. If the students are having fun and exploring, they are generally engaged and happy. I think that as they get older and their education starts to increasingly focus on academic performance and passing examinations students of either gender can be put off from certain subjects. I think there are also social elements at play as Science, Engineering and Math are seen as more male dominated fields and the Arts as generally more female dominated or at least more effeminate in nature. I think positive female role models are essential and there seems to have been a move in this direction but many female students seem to either be dissuaded from following the STEM fields or actively choose not to study them past a certain level";*
- *"This is too complex an issue to cover in a simple sentence or paragraph. There are so many factors that influence this, from societal issues around gender roles, to subtle differences in how some teachers approach the STEAM subjects with their male and female students. Parents and peer groups also play a role as they can both influence how the subjects are seen by female students";*
- *"At Primary level I do not see much difference between boys and girls in relation to their interest in the subjects. There are subtle differences in what activities boys and girls engage with more but in general at the age I teach all students enjoy anything practical. Again, this may change as they get older and have to make decisions about their future studies and careers";*
- *I only teach at Primary level so I cannot comment on secondary education or higher. In Primary education I do not see this as an issue as we do not cover a great deal of advanced Engineering, Technology or Science content, and in the Arts and Mathematics all the students complete the same activities regardless of gender";*
- *"STEAMitUP could be implemented at a younger age to give children and especially girls the opportunity to learn more about this innovative learning environment";*

- *"There are many factors that influence female participation in the STEAM fields. In the UK, up to the age of 13 all students study the same subjects, they then have to choose which subjects they want to take on to full GCSE level and beyond. I do not see an issue in the Arts, although there are actually usually fewer male than female students taking the art disciplines in my experience. The key is to encourage more female students to choose to study the STEM subjects with a view to a viable education and career path";*
- *"In my experience of teaching Biology at a secondary school level I find a pretty even male / female distribution. All the lessons I teach are mandatory for the students as the Sciences are a required subject for all students to undertake at GCSE level. I do however see some differences in the subjects that students chose to take at further and higher education levels, the Sciences seem relatively popular with both male and female students but it would be interesting to see if there are any noticeable differences between the difference Sciences and male/female participation";*
- *"I am aware of this issue in relation to the STEM fields but I do not find this to be an issue in any of the Arts. This issue is heavily influence by societal trends and from my understanding, female participation has been increasing in the STEM fields in recent years both in education and industry";*
- *"In the UK, both male and female students usually have the same lessons until they make their GCSE subject choices at age 13 or 14. After this point they study some mandatory subjects but others are as a result of their choices. Maybe all the STEAM subjects should be mandatory to all students to ensure they at least study them until 16 years old and hopefully secure a qualification. At 13 /14 years old, many students are not sure what they want to do longer term so maybe some female students do not see the subjects as possible career options and thus do not choose to continue studying them, then it is extremely difficult to return to studying them post GCSE exams. Female students need to be given the same motivations and guidance as boys in relation to studying and potential careers in the STEAM fields";*

- *"I can only speak from my experience and my Science classes are generally male dominated with a ratio of about 70/30 male to female. This also seems to vary between Biology, Physics and Chemistry too with Biology being more popular with female students than the other two. I think that this has improved in recent years as more female students have taken the up the Sciences at further or higher education level, although it is still a male dominated area at all levels. Encouraging and empowering girls at a young age is key to ensuring they see the same value in the STEAM subjects as boys do or by ensuring they do not see the more technical subjects as for boys and not girls. I think our societal views of male and female roles do not help either but this is something that I have seen change for the better over my career and we are moving in the right direction, albeit very slowly".*

The participating teachers were asked to provide any additional ideas or suggestions that could increase the impact of the STEAMitUP project on the key target audiences, a selection of the responses is provided below:

- *"Get as many teachers and students to try out your resources as you can and also gather more best practices from the teachers you work with to share with others";*
- *"Simply reach a larger audience if possible, the more schools you work with the better";*
- *"Try to get as many teachers to use the resources in their classrooms as possible";*
- *"I have had limited interact with the project but from what I have seen it is having a positive impact so just keep working with more schools and teachers across the countries";*
- *"Keep adding more lesson plans and platform content where possible, the project could be a very useful long-term resource for teachers if the resources are constantly updated. You could try to add an element of user generated content by letting teachers upload their own innovative lesson plans or links to other useful resources they are aware of";*

- *"Run regular workshops for the professional development of teachers and try to run STEAM days in schools regularly. This needs to be a consistent and ongoing endeavour";*
- *"Reach as many students and teachers as you can. Once you are able, go out to schools and offer STEAMitUP themed activity days or workshops. Put the resources you have developed into action and show schools how to use the toolkit and platform";*
- *"I think you are doing a really good job under difficult circumstances. The more schools, teachers and students you can share the project with the better";*
- *"Reach as many students and teachers as possible and get the buy-in of school leaders";*
- *"Just engage with more teachers and students. Try to get into schools when possible. Obviously, the situation with COVID-19 will limit what you can achieve right now";*
- *"Share the project with as many primary and secondary schools as possible. Keep updating the resources to provide teachers with an ongoing resource to keep returning to for support in delivering interesting and challenging STEAM lessons";*
- *"Try to run more teacher workshops and activities in schools if possible. Share the project website as widely as possible and try to make links with wider regional or national bodies to support your work";*
- *"Your target audiences seem quite broad - all primary and secondary school teachers and students. The range of ages and competences across these target audiences is very wide as is the curricula that they engage with. To make an impact I think you need to focus on the enjoyment of learning and discovery rather than focusing on the specifics of the STEAM fields";*
- *"I think a problem you have is trying to do a bit too much, you are aiming your project at all schools, students and teachers. This is a positive objective but very difficult to achieve as you can over-stretch yourselves. Maybe streamline your target audience slightly to enable the project to have more of a definitive impact";*

- *"Simply share the project and resources with as many teachers as possible. Teachers love free, easy to use resources".*

The final open-ended question asked the participating teachers to provide their overall thoughts on the STEAMitUP project as a result of their experiences working with the relevant partner, a selection of the responses is provided below:

- *"I enjoyed the workshops and found all the project resources to be excellent. I am in my first year of teaching so this is all very new for me at the moment, I feel that I have gained a lot from being involved with the project";*
- *"I enjoyed the workshops and I think the resources developed are well made. The website is great and the platform is easy to use";*
- *"Everything was good, the workshops, website, lesson plans and platform were all excellent";*
- *"From the workshops and working with LMC, I have found the project really interesting and helpful. The resources are great and I will use the lessons plans, workshop resources as well as some of the platform content in my lessons";*
- *"After completing the workshops and working through the majority of the project resources, I found this project both interesting and ambitious in its scope. I found the project brand to be very effective and all the resources you have developed to be consistent in terms of quality, presentation and usability";*
- *"As a result of completing the workshops and looking through the resources, I think that this project is excellent. I like the approach you have taken and think that you are making great efforts to promote the STEAM subjects";*
- *"The STEAMitUP project seems to be really helpful for teachers and students. Any free-to-use educational resources are always helpful for teachers. The project theme is very strong and all the resources are really well branded and have a strong identity. The website and platform look excellent and are really easy to use. Well done!";*
- *Overall, I found it very innovative and beneficial for the education of pupils";*

- *"From my experience in the workshops and looking through all the resources I found the project to be taking really positive steps towards supporting teachers to deliver the STEAM subjects. If you do not specialise in any of these fields it can be daunting to be asked to teach them at any level so any initiative to support teachers is welcome. I like how there is an international dynamic to the project and that teachers from all the countries are sharing their expertise";*
- *"I enjoyed the workshops and found all the resources useful to a point. I teach different subjects at all secondary school levels but my specialisms are the History and Economics so I found guidance on how to improve my delivery of the STEAM subjects helpful. Some of the resources were aimed at Primary level so they were not useful for my students but I can see how they would help primary level teachers";*
- *"The project seems to be very well run and I really like the international dynamic of having different countries working together for a shared goal. It is interesting to see how different teachers in different countries work and deliver similar educational content.";*
- *"From everything I have seen the project has created some great resources. The website looks amazing and I love the presentation of everything. The toolkit has a lot of different kinds of resources to use in the classroom and the platform has some great ideas and support materials for teachers. I enjoyed working through everything and it has had a positive impact on my approach to the STEAM subjects and I will try out some new approaches with my students";*
- *"Everything I have seen has been excellent, the website, resources and workshops were all great and really helped build my confidence and provide me with some fresh ideas. As a relatively inexperienced teacher I the project has had a positive impact on my confidence. I feel that I can use the resources to add some new elements to my teaching";*
- *"Great project, good aims and objectives. I really like the resources and think everything is great";*

- *"Everything I have seen has been professionally presented and well-developed. The useable resources are good, although there was not a great deal of content I could use with my learners. The website and project branding is excellent and consistent throughout all the resources";*
- *"I found the workshops and project resources to be very professional and a useful educational resource. As far as I can tell the project is having an impact in the different countries and I think the fact that schools in different countries are working together for a shared goal is fantastic";*
- *"I found the experience really interesting and helpful in developing new approaches to delivering lessons. As an inexperienced teacher I found the opportunity to speak with more experienced teachers from other schools to be invaluable";*
- *"From the workshops and resources I used, I can see that the project is trying to make a positive impact on how the STEAM subjects are taught and experienced in schools. I think that the project website, teaching resources and platform are really good and support teachers to try new approaches to teaching";*
- *"Everything seemed great. If you can get lots of teachers to use the website and platform then the impact will come as a result. It would be interesting to see how everything is working or being used in the different countries";*
- *"My experience with the workshops and project resources has been positive and enjoyable. The project seems to be well-managed and is striving to achieve the stated goals. The resources are good and the project is very well branded throughout. From what I can tell the project is having a positive impact on how you promote the STEAM subjects and engage with schools to support the implementation of the resources you have developed";*
- *"Everything I have seen and been involved in has been excellent. I think the project aims and objectives are really important. All the project resources look really good and are easy to use with minimal support".*

From this detailed and extensive feedback concerning the project impact, we can see that that from the participating teacher's perspective STEAMitUP has achieved the main aims and objectives outlined at the outset of the project. The STEAMitUP consortium and supporting schools have developed an effective suite of open educational resources that support the implementation and delivery of interdisciplinary STEAM lessons.

The vast majority of the participants stated that from their experience, the STEAMitUP project was having a positive impact on those who had engaged with the website, OERs and general project activities. They provided overwhelmingly positive feedback on all elements of the project impact along with a selection of useful suggestions for ways in which we can further increase our impact on the key target groups.

We also received some fantastic ideas and suggestions from the participants in relation to the planning, implementation and delivery of STEAM activities, lessons and project related actions that can be used for future initiatives. A selection of these are outlined in greater detail in the following practice recommendations chapter.

Some of the most interesting feedback we received was in relation to the question regarding efforts to increase female participation in the STEAM subjects. Many of the participating teachers identified a decrease in female participation as they progress upward through the different educational levels, although this is more evident in the STEM fields than the Arts. The responses gathered outline this as a deeply complex issue with no simple solution. The teachers pointed out the influences of gender stereotypes, societal pressures as well as a lack of attention given to past and present female role models within the STEAM fields as factors that passively discourage or actively restrict female participation at all levels of STEAM education and careers. On a positive note, many teachers stated that they had seen positive improvements in relation to this issue in recent years as attitude's towards 'traditional' gender roles have changed.

Practice Recommendations

As a result of implementing the national impact assessment workshops and analysing our findings, the STEAMitUP project consortium have developed the following practice recommendations to support implementation of STEAM related educational initiatives and activities:

1. **Increase interdisciplinary lessons and activities** – a key recommendation running through the majority of the teacher feedback was to ensure that, wherever possible, an interdisciplinary approach should be used across the STEAM fields. This is vital to educate students in the fact that all these fields are interlinked and compliment each other on many levels. This is an issue that can be difficult to overcome when working within the limitations of strict curriculum requirements. However, if implemented correctly this can empower and enthuse students to overcome any fears or hesitations they have regarding individual subjects and instead understand and appreciate the interconnectedness of these diverse fields;
2. **Encourage practical and experiential learning** – another key recommendation raised by the majority of teachers was to utilise practical activities, experiments and 'hands-on' involvement at all times when delivering STEAM related content. This has obvious benefits and is already widely practiced; however, limited funding, equipment and time can restrict its effectiveness at all levels of education. The key is to instil an active desire to learn, facilitate practical engagement and encourage both literal and hypothetical experimentation at all levels of STEAM education;
3. **Facilitate extra-curricular activities** – this recommendation can include elements of all the others covered in this section. Providing additional structured and focused STEAM related activities outside of the 'traditional' classroom setting can be extremely useful in boosting engagement and overcoming barriers to participation. STEAM clubs, after-school workshops, themed days or events can all be utilised to promote the fields and offer the freedom for teachers and students to explore new activities outside of the often-rigid hour-long lesson format;

4. **Run female-focused STEAM initiatives** – again this recommendation can run alongside and compliment all others. Female-focused or female-only STEAM initiatives can encourage increased participation as this can negate some of the barriers and social influences outlined in previous sections. This ideally should also involve the inclusion of information regarding relevant female role-models from within the STEAM fields, both historically and from the present day. This could be in the form of case studies and/or guest speakers to show what is possible if you follow a STEAM career. Providing female students with a 'safe space' to investigate, experiment and develop can empower them to discover new aspirations and explore alternative career options that they may not have previously considered or thought plausible;
5. **Involve industry and representatives of the STEAM fields** – providing a 'real-world' context to the STEAM fields is vital to dispelling some of the apprehensions students may have towards studying them at a higher level. Showing students how the STEAM fields are key to many aspects of our lives and how they can open up endless career opportunities can be a powerful mechanism to increase participation at all levels. Encouraging an understanding of the practical applications of the STEAM fields can be achieved through industrial visits, educational trips and by welcoming representatives of STEAM industries into schools to share their passion and experience with students.

These are just some of the potential actions a school or teacher can take in order to further promote the STEAM fields and encourage increased student participation at all levels. Every school will have their own strategies gained through experience but the STEAMitUP team encourage all schools to implement a combination of these recommendations to embed an effective and sustainable STEAM culture into their existing provision.

Conclusion

The STEAMitUP Impact Assessment Study has provided the project consortium with a fantastic opportunity to engage with a diverse range of primary and secondary educators from across the partner countries. From the implementation of the various teacher training workshops we gained a great deal of information regarding the quality, usability and impact of all elements of the STEAMitUP project. From this experience the project team are satisfied that our efforts have been well-received and had the desired impact on the key target audiences.

As we move toward the completion of the project, the partner organisations and participating schools will continue our activities to promote STEAM education and encourage increased participation at all levels of education. This impact survey, and complimentary policy recommendation paper, provide theoretical backing to the key project objectives and support the educational resources already developed and piloted. This collective suite of OERs will continue to be freely accessible via the STEAMitUP website while elements of the project can be implemented by any school that desires to do so.

The STEAMitUP project team would like to thank all of those teachers and schools that have supported our work and been involved in this impact assessment study. The process has been vital in our efforts to gain a deeper understanding of the issues faced in STEAM education and how schools can implement relatively simple initiatives to overcome some of the barriers to participation.

Annexes

STEAMitUP Toolkit Evaluation Complete Survey Results -
https://docs.google.com/forms/d/1qxuOZYbyormYhgC-LWbvmCkTAUI607vHuFPlTRhD628/edit#responses

STEAMitUP E-learning Platform Impact Complete Survey Results -
https://docs.google.com/forms/d/1fkERs-9YALAiHiNLtSQZCrlb37vCpxk1NeeGrOeffDc/edit#responses

STEAMitUP Workshop Impact Assessment Complete Survey Results -
https://docs.google.com/forms/d/1F-yY63Hs0tvlMg1dJR-QddsYLg9-QO5znzSoXZlf0pw/edit#responses

Impact assessment workshop resources provided for implementation:

- Workshop 1 – session plan & presentation slides
- Workshop 2 – session plan & presentation slides
- Workshop 3 – session plan, presentation slides and lesson plan template

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Project Number: 2019-1-UK01-KA201-061990

STEAMitUP

IO3 Impact Assessment Study

Workshop Implementation Guidelines

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Project Number: 2019-1-UK01-KA201-061990

Overview

This guide is aimed at supporting the implementation of the practical workshops that form part of the IO3 Impact Assessment Study & Practice Recommendations. It includes guidance for the different phases of this process and the reporting requirements that will support LMC to create the final Impact Assessment and Practice Recommendation document.

Implementation Outline

Phase A – A total of 20 hours of blended learning and training, delivered to 20 teachers in each partner country *(please use participant list provided to record participant details)*

Completed as 3 separate activities;

1. 4 hour workshop to introduce the STEAMitUP project rationale, key aims and an overview of the content of IO1 & 2 *(using Workshop Plan 1 and resources provided)*

2. 12 hours of online engagement with the IO2 e-learning platform – trainer led with some self-directed learning completed by the teachers *(using Workshop Plan 2 and resources provided)*

3. A final 4 hour workshop for the teachers to work in small groups to assess the content of IO1 & 2 and create an action plan of how they can implement the resources in their teaching practices. Each group is also tasked with creating a brief STEAMitUP lesson plan *(using Workshop Plan 3 and resources provided)*

Phase B – 2 teachers from Phase A will take what they have learned and developed and implement it in 2 classes of students. They will run national implementations of selected parts of the IO1 Toolkit and IO2 e-learning platform with students. This process will be undertaken by the 2 teachers with the support of the project partner in each country. The teachers are free to use a methodology that best suits their needs *(the 2 Teachers in each partner country will be given the freedom to implement this phase as they deem necessary)*.

Partner reporting requirements – each partner will produce a short report upon completion of Phases A & B. This should include the methodology used, evidence of activities and an analysis of what was gained from the process (from a project, teacher and student perspective). From this each partner should identify a selection of practice recommendations as part of their conclusion *(please use report template provided)*.

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Phase C – This will involve each teacher from the previous phases completing a brief electronic impact survey based on the training, IOs and potential impacts of the project objectives.

Partner reporting requirements – All participants from previous phases will complete an electronic impact survey, those who participate in both phases will be asked to complete an additional section on the survey to represent their experiences in phase B. Each partner should have 20 responses, with 2 of those responses including the completion of the additional section covering phase B *(using electronic survey link provided)*.

Workshop 1 (4 hours)
Introduction to the STEAMitUP project, Toolkit and E-Learning Platform

Activity	Resources	Time Assigned
1.1 Introduction to the STEAMitUP project Overview of STEAMitUP project Introduction to STEAMitUP consortium Outline of project resources Introduction to STEAMitUP website	Presentation 1.1 Project website link - steamitup.eu/en/	30 minutes
1.2 How to access and utilise the STEAMitUP Toolkit (IO1) Overview of Toolkit via project website Review and navigation of Best Practices, Lesson Plans and Additional Resources Practical activity using Toolkit content – 3 group activities Participant feedback on the Toolkit using QA survey link provided	Presentation 1.2 Link to Toolkit - steamitup.eu/en/toolkit Separate participants into groups of 4 for the activities (physically in a classroom or virtually in 'breakout rooms') Participants will require access to a computer and the internet in order to access the project website Link to IO1 Toolkit QA survey to be completed by all participants – https://forms.gle/xKwQN5jxLp7T1X6y7	3 hours total (2 hours dedicated to the practical group activities)

1.3 Introduction to the STEAMitUP E-learning platform (IO2) Account creation and brief overview of the platform content (simply the introduce 6 module titles)	Presentation 1.3 Link to E-learning platform - steamitup.eu/en/e-learning or https://steamitup.4eclass.net/ Participants will require access to a computer and the internet in order to access the project website, e-learning platform and to create an account	30 minutes
End of workshop 1		

Workshop 1 *(4 hours)*

- 1.1 Introduction to the STEAMitUP project *(30 minutes)*
- 1.2 How to access and utilise the STEAMitUP toolkit *(3 hours)*
- 1.3 Introduction to the STEAMitUP e-learning platform *(30 minutes)*

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[Project number: 2019-1-UK01-KA201-061990]

Objectives of Workshop 1

On completion of this workshop we hope that participants will be able to:

- Understand the rationale and key aims of the STEAMitUP project
- Access and utilise the open educational resources developed by the project consortium
- Provide constructive feedback on the STEAMitUP toolkit
- Create an account and access the STEAMitUP e-learning platform
- Navigate and access the module content of the STEAMitUP e-learning platform

1.1 Overview of the STEAMitUP Project

Project Rationale:

- Draw attention to the need for increased participation in the STEAM fields.
- Develop an interdisciplinary STEAM program to empower students, school leaders, school staff and school communities to apply STEAM activities, robotics and digital tools.
- Support the promotion of digital technologies in creative, collaborative and efficient ways.
- Actively engage teachers and students with digital technologies e.g., robotics kits, gamified learning modules, and digital resources.
- Develop an innovative learning environment and the STEAMitUP Toolkit which will offer online blended gamified modules, lesson plans, and material for experiential workshops on STEAM education and on the use of digital technologies.

Project Objectives:

- Encourage and motivate students to be engaged in the fields of STEAM.
- Build the capacity of educators, school leaders, and school staff to organise and implement STEAM activities in schools with the use of digital tools and non-digital tools.
- Develop digital skills, creativity, problem solving, self-esteem and collaboration in students through STEAM education, activities and resources.
- To develop a suite of OERs to support the above aims.

1.1 Project Consortium

The project consortium consist of 6 organisations from across the EU
They represent a selection of School, Colleges, Universities and Research Organisations

Lancaster and Morecambe College, UK (Coordinator)

Siglo22, Spain

Future in Perspective Limited, Ireland

Doukas School, Greece

CARDET, Cyprus

University of Groningen, Netherlands

1.1 Project Outcomes and Developed Resources

Intellectual Outputs:

IO1 – STEAMitUP Toolkit

- A practical and innovative toolkit that supports Teachers to develop, design and implement effective activities for enhancing basic skills of students within STEAM education.

IO2 – STEAMitUP E-Learning Platform and Blended Learning Modules

- An interactive e-learning environment to support the professional development of Teachers in relation to delivery of the STEAM subjects.

IO3 – Impact Assessment Study and Practice Recommendations

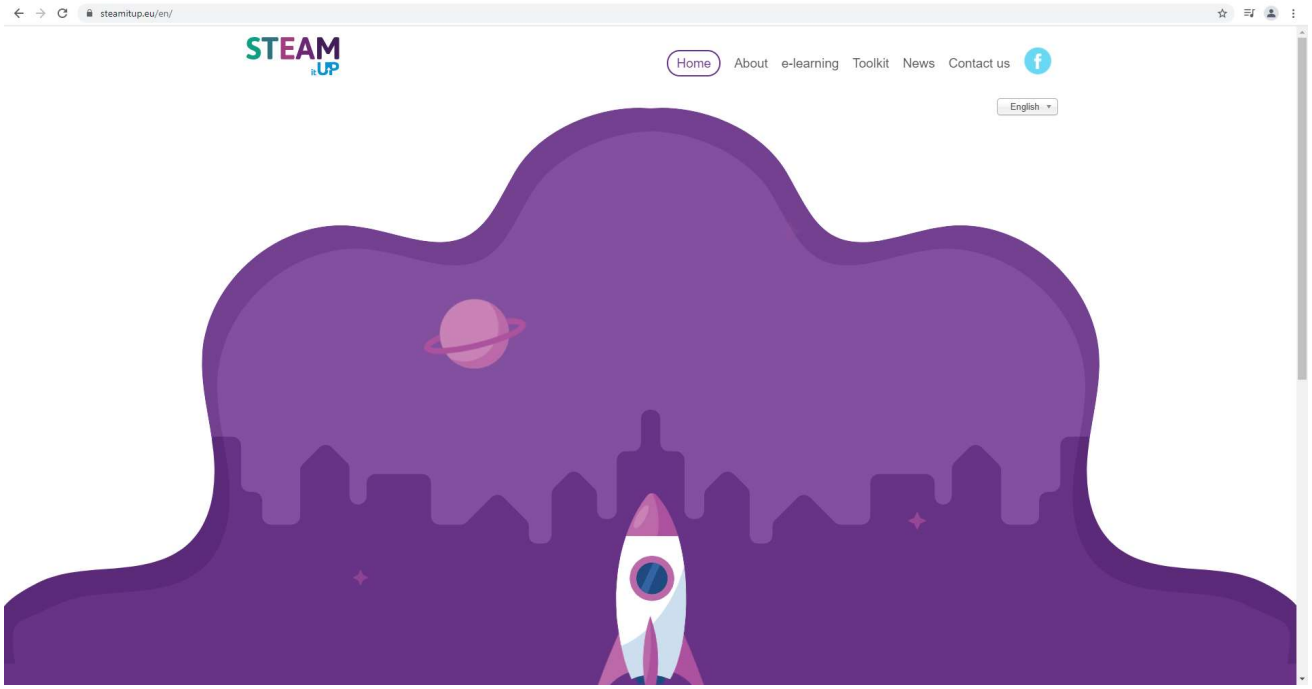
- An impact assessment study to measure the effectiveness of the project, including pilot testing, implementation guidelines and practical recommendations.

IO4 – Policy Recommendations Report

- A policy recommendation report to support Teachers, school leaders and decision makers in the implementation of STEAM related initiatives.

1.1 Project Website

- Access the project website via the following link – steamitup.eu/en/
- This is the main access point for the STEAMitUP project.
- From here you can find out more about the project consortium, activities and events.
- You can access all of the project open educational resources.



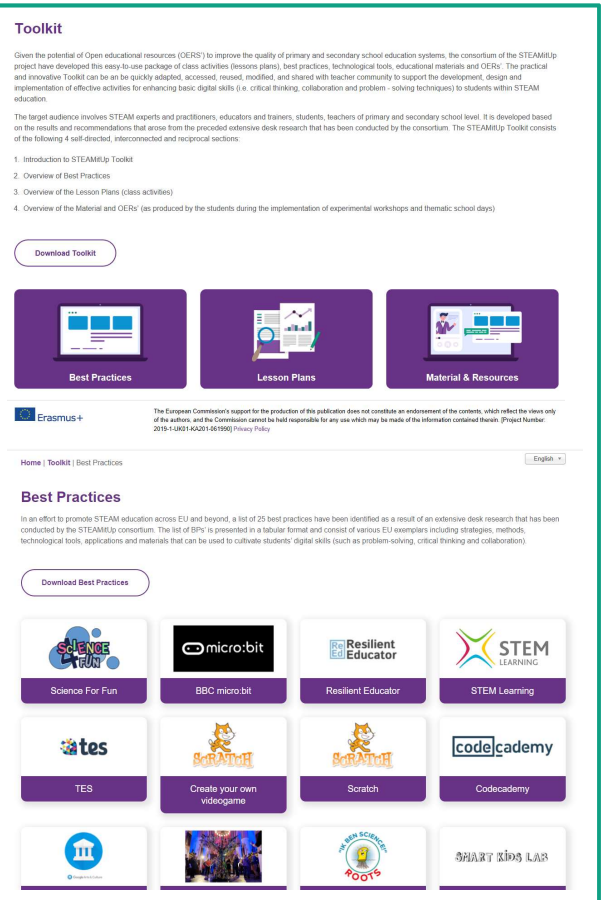
1.2 STEAMitUP Toolkit

STEAMitUP Toolkit:

- A practical and innovative toolkit that supports Teachers to develop, design and implement effective activities for enhancing basic skills of students within STEAM education.
- Consists of a selection of educational tools including lesson plans, best practices and additional materials & resources.
- Accessible via - https://steamitup.eu/en/toolkit
- Also downloadable in pdf. format.

Best Practices:

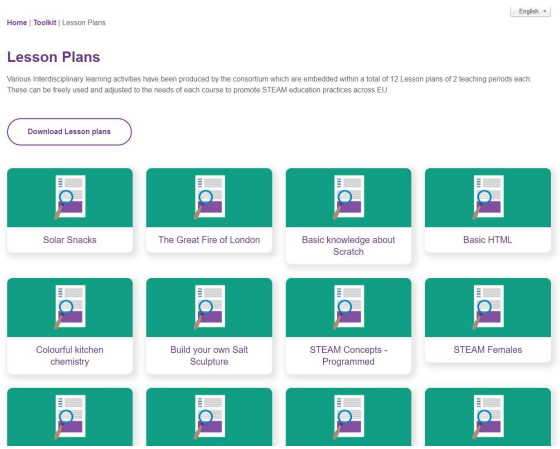
- A selection of best practice examples from across the partner countries.
- These include supplementary projects, websites, initiatives and resources focussing on the STEAM subjects.
- They are aimed at providing Teachers with additional ideas activities and resources to utilise or implement.



1.2 STEAMitUP Toolkit

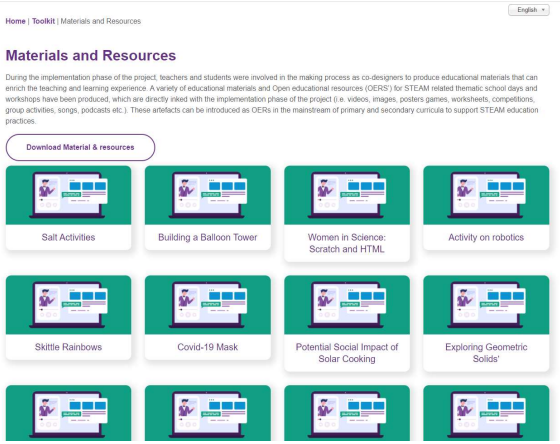
Lessons Plans:

- A selection of practical lesson plans to be implemented in the classroom.
- 12 multidisciplinary lessons to provide Teachers with some ideas to incorporate STEAM activities.
- Aimed at various levels of Primary and Secondary Education
- Each lesson plan contains all the necessary information for the planning and implementation of each activity.



Materials & Resources:

- A selection of additional material and resources that supplement the lessons plans.
- Aimed at extending the impact and potential of the lessons and toolkit.
- Consists of workshop plans, presentations and evidence of activities undertaken in an earlier implementation phase of the project.



1.2 STEAMitUP Toolkit

Using the STEAMitUP Toolkit:

Activity 1: Using the best practices *(30 minutes)*

- In groups we will spend some time looking through the STEAMitUP best practices
- Each group will explore a selection of the 25 best practices
- Identify the best practice example your group have found to be the most useful
- Each group will then provide a short explanation of their choice to the entire group

Activity 2: Using the lesson plans *(45 minutes)*

- In groups we will now take a more detailed look at the STEAMitUP lessons plans
- Each group will explore a selection of the 12 lesson plans
- Identify the lesson your group have found to be the most interesting
- Each group will then provide a short explanation of their choice to the entire group

Activity 3: Using the additional materials and resources *(45 minutes)*

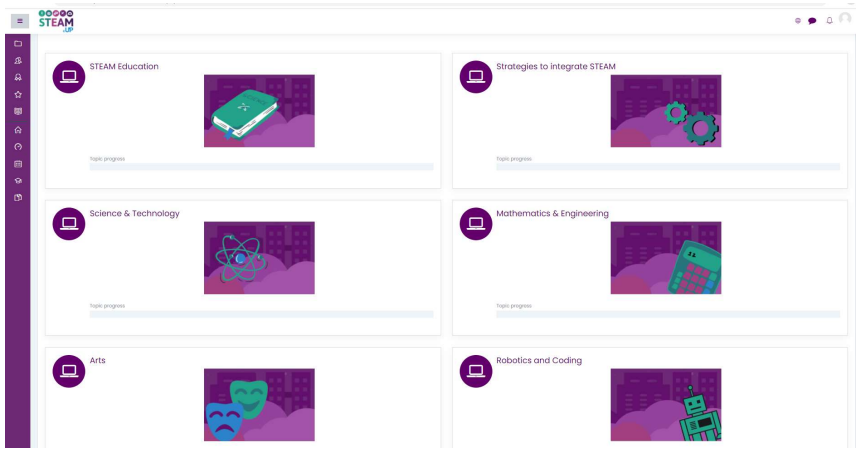
- In groups we will now take a more detailed look at the STEAMitUP materials and resources
- Each group will explore a selection of the 12 sets of resources
- Identify the resource your group have found to be the most interesting
- Each group will then provide a short explanation of their choice to the entire group

Please take the time to provide some constructive feedback on the STEAMitUP Toolkit using the following link - https://forms.gle/xKwQN5jxLp7T1X6y7

1.3 STEAMitUP E-Learning Platform Introduction

Introduction:

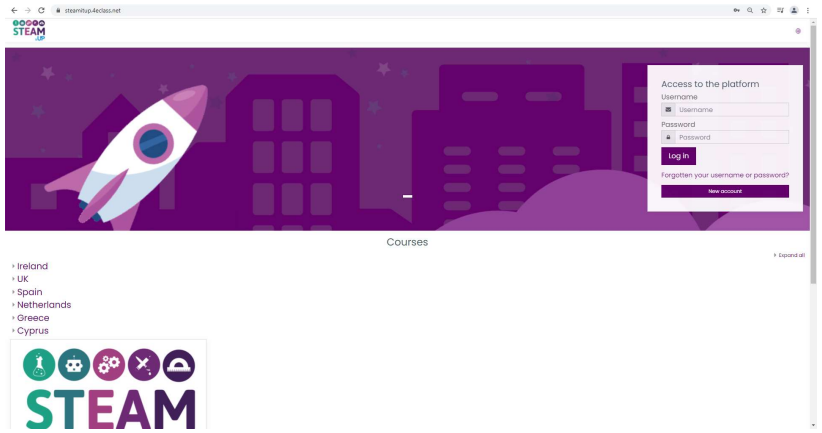
- Aimed at supporting the professional development of Teachers
- Provides information, advice and guidance for Teachers to support the delivery of the STEAM subjects
- Separated in to 6 modules with sub-units in each module
- Around 8 hours of learning content per main module (Science & Technology / Arts / Engineering & Math)
- 3 additional smaller modules (STEAM Education, Strategies to Integrate STEAM, Robotics & Coding)
- Includes gamified elements and practical applications for the classroom

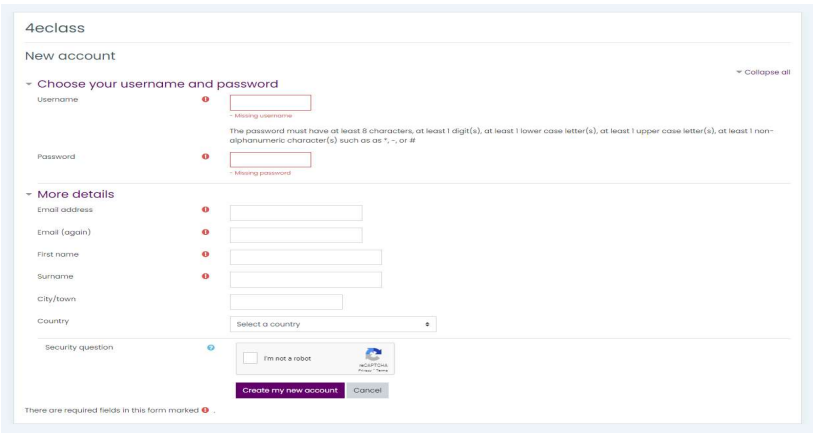


1.3 STEAMitUP E-Learning Platform Introduction

Account Creation:

- Platform accessible via project website or https://steamitup.4eclass.net/.
- To access the platform content you must first create an account.
- Click the *'New account'* tab on the right hand side of the screen.
- Complete the user details page and click *'Create my new account'* tab.
- You will then receive a *'verify email address and account'* email.
- Follow the instruction in this email to finalise the process and you will then have access to the e-learning platform content via you newly created account.
- We will take an in-depth look at the platform content in workshop 2.





Thank you for your participation!

Please join us for workshop 2

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Workshop 2 (12 hours) ***Online Engagement with the STEAMitUP E-Learning Platform***		
Activity	**Resources**	**Time Assigned**
2.1 Introduction to the STEAMitUP E-Learning Platform (IO2) Login using accounts created in workshop 1 Present and introduce the 6 module titles and show participants who to navigate the platform including different language areas	Presentation 2.1 Link to E-learning platform – steamitup.eu/en/e-learning or https://steamitup.4eclass.net/ Participants will require access to a computer and the internet throughout this workshop in order to access the project website and e-learning platform	10 minutes
2.2 Modules 1 & 2 – STEAM Education and Strategies to Integrate STEAM modules Working through the complete content of the 2 introductory modules as a group, led and guided by the trainer	Presentation 2.2 The content of the 'STEAM Education' and 'Strategies to integrate STEAM' e-learning modules	30 minutes
2.3 Overview of STEAM modules Inc. Robotics and Coding Take some time to investigate the content of the Science & Technology, Mathematics & Engineering, Arts, Robotics & Coding modules	Presentation 2.3 The content of the 'Science & Technology', 'Mathematics & Engineering', 'Arts', 'Robotics & Coding' modules	1 hour 20 minutes

Begin this process guided by the trainer but then allow participants some freedom to explore the module that interests them the most		
2.3 Self-directed learning - Individual exploration of e-learning platform content Individual learners will be required to access the platform and work through the modules themselves after the 2 hours of classroom delivery	Each participant will be required to access the platform and login into their accounts The content of the 'Science & Technology', 'Mathematics & Engineering', 'Arts', 'Robotics & Coding' modules	10 hours of self-directed learning outside of workshop
End of workshop 2		

Workshop 2 *(2 hours delivery + 10 hours SDL)*

- 2.1 Introduction to the STEAMitUP platform *(10 minutes)*
- 2.2 STEAM education and strategies to integrate STEAM modules *(30 minutes)*
- 2.3 Overview and navigation of the platform content *(1 hour 20 minutes in workshop & 10 hours self-directed learning)*

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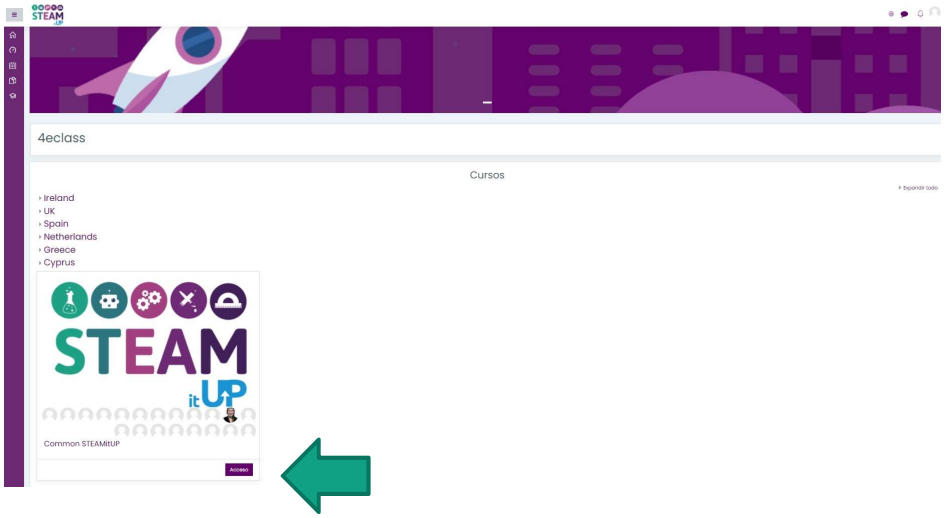
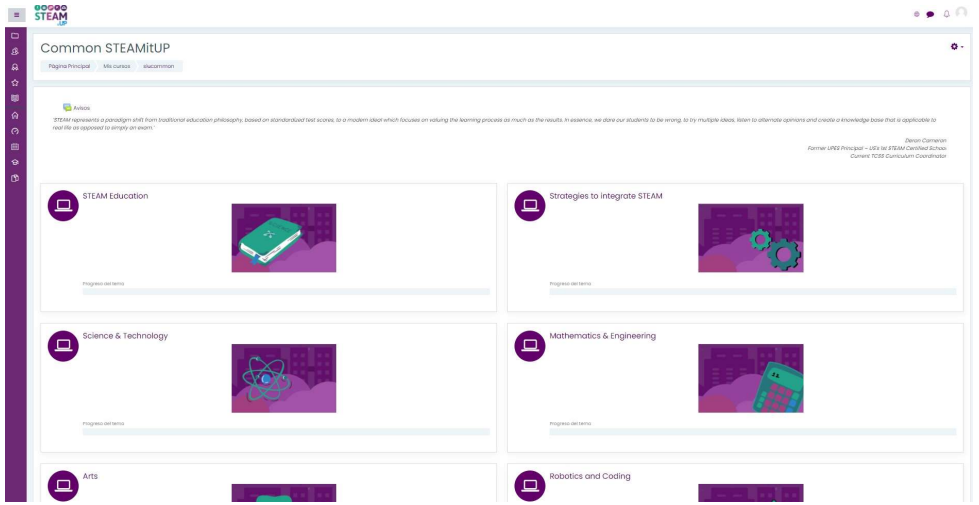
Objectives of Workshop 2

On completion of this workshop we hope that participants will be able to:

- Navigate and access the module content of the STEAMitUP e-learning platform
- Access the 6 modules within the e-learning platform
- Gain a basic understanding of the module and sub-unit content
- Complete a selection of the module content as self-directed learning
- Utilise the e-learning platform content to support your professional development

2.1 Introduction to the Common STEAMitUP area



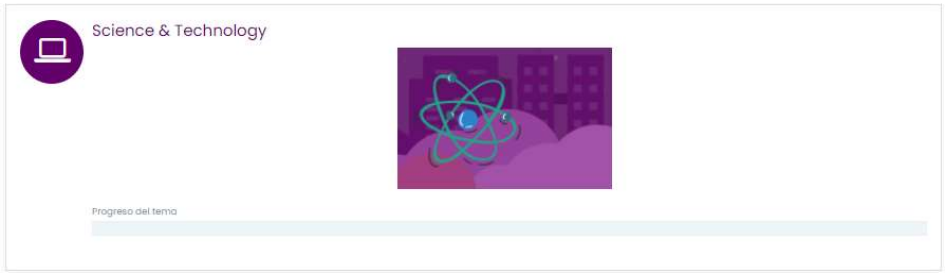


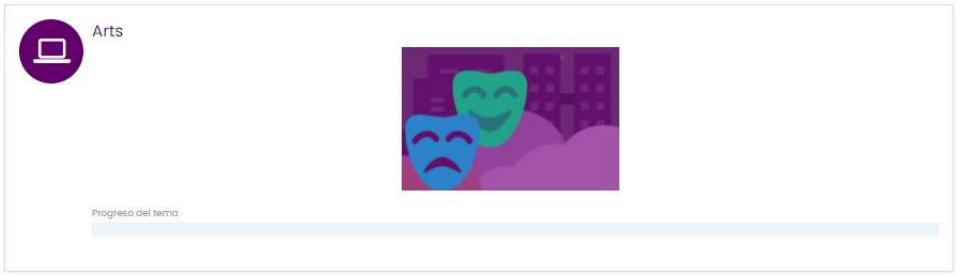
Please log into the STEAMitUP e-learning platform using the account details you set up in workshop 1.

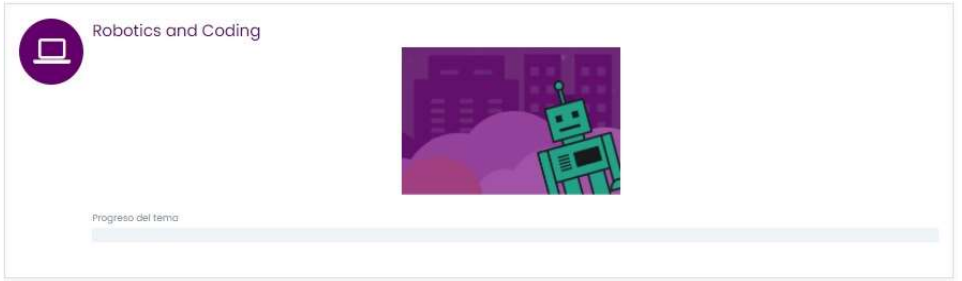
To access to the STEAMitUP e-learning platform content you will first need to enter the Common STEAMitUP area clicking the window or the access button in the main screen. Pay attention to do it in the window that is in your country language.

Once you access the course you will find two introductory modules, ‘STEAM Education’ and ‘Strategies to Integrate STEAM’ in your lessons. Then the main content is organised into four different modules: ‘Science & Technology’, ‘Mathematics & Engineering’, ‘Arts’ and ‘Robotics & Coding’.

2.1 Introduction to the Common STEAMitUP area







Clicking on any of these windows will give you access to the different modules in which you will find theoretical content as well as different activities and quizzes to test your knowledge through the different sub-units.

2.2 The STEAM Education & Strategies to Integrate STEAM Modules

Please click on the 'STEAM Education' window to access the content of this introductory module

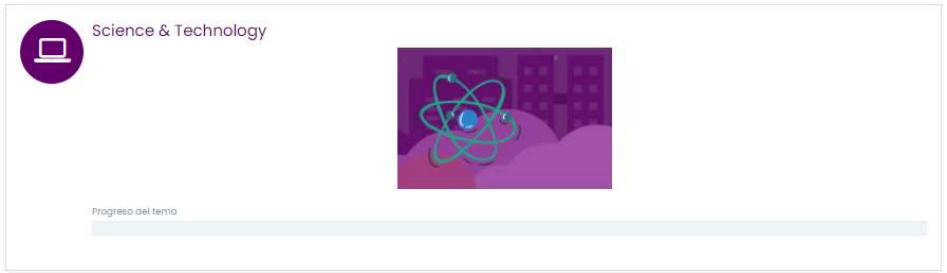
1. Watch the video "What is STEAM Education" and reflect about any other objectives for including STEAM in education rather than the one that has been given (innovation)
Link to the video: https://steamitup.4eclass.net/course/view.php?id=446&section=1
2. Using the Padlet embedded into the STEAM Education module think about at least three different benefits that including STEAM subjects could have for your lessons
3. WOMEN IN STEAM: Think about at least two ideas to create a more equal environment to develop STEAM subjects in your lessons.

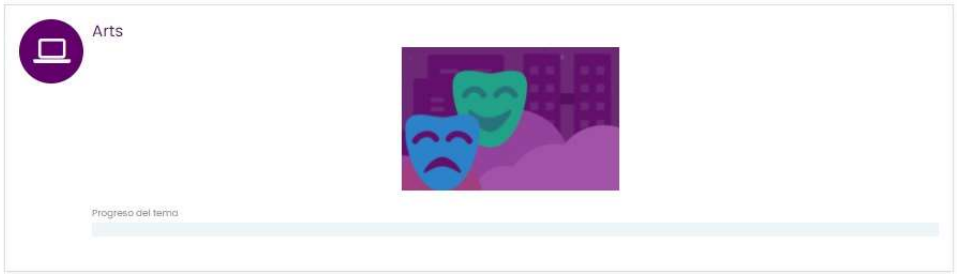
2.2 The STEAM Education & Strategies to Integrate STEAM Modules

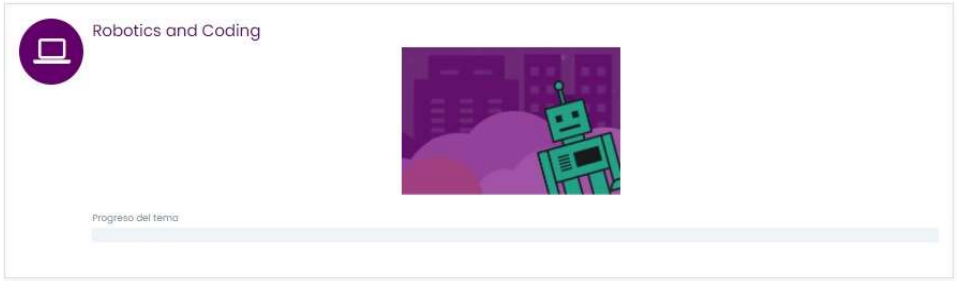
Please click on the 'Strategies to Integrate STEAM' window to access the module content.

1. For each one of the words listed in the picture try to think of at least two different strategies that you would implement in your STEAM lesson to potentiate and strengthen these skills.
2. Watch the video "STEAM Education Experience" and think about two different activities related to the STEAM subjects that you could implement in your lessons.
Link to the video: https://youtu.be/0tkAvWWhKf4

2.3. Self-directed work through the platform content

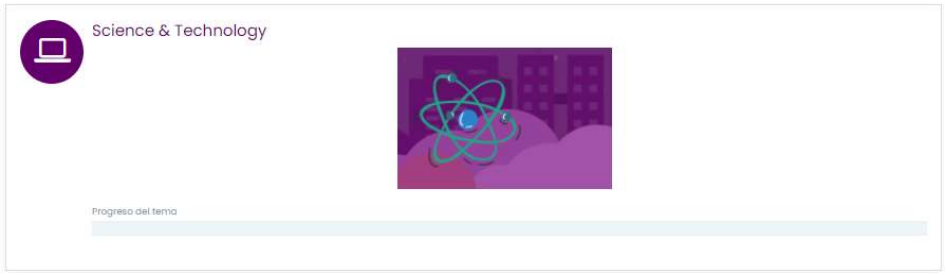


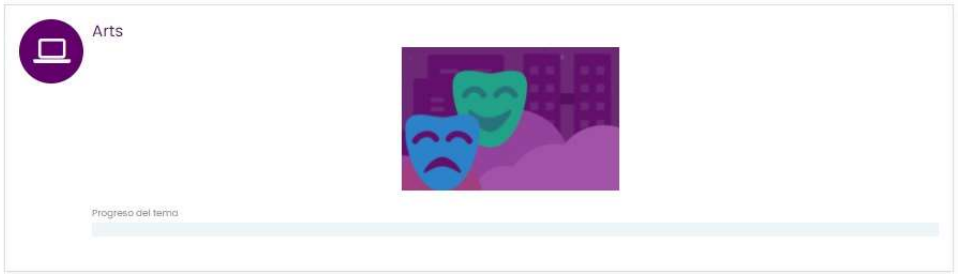


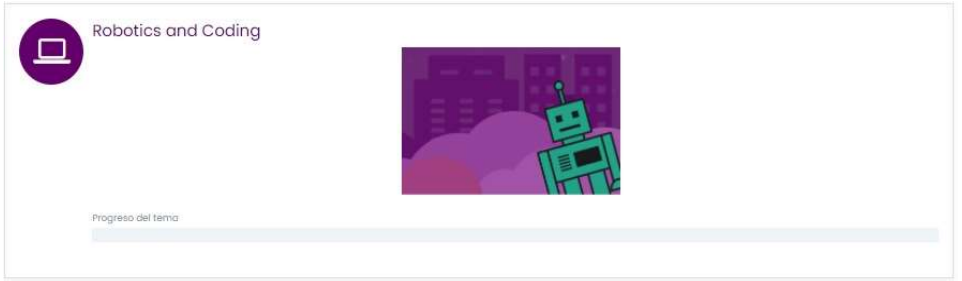


Now it is time for you to have a look at the content of the modules.
Begin by choosing the educational area that interests you the most and spend an hour working through the module content with the guidance and support of the trainer.

2.3. Self-directed work through the platform content







The remainder of this workshop is to be conducted as self-directed learning.
Each participant is tasked with spending 10 hours investigating and working through some of the content of each of the main modules before we return for workshop 3.
You will all then be asked to provide constructive feedback on different element of the platform in workshop 3.

Thank you for your participation!

Please join us for workshop 3

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Workshop 3 (4 hours) *Debrief, Assessment, Feedback and Action Planning*		
Activity	**Resources**	**Time Assigned**
3.1 Group discussion and feedback on e-learning platform structure, content and usability Begin with the Padlet exercise then progress onto a group discussion based on the padlet responses Participant feedback on the e-learning platform and module content using QA survey provided	Presentation 3.1 Padlet link - https://padlet.com/pvera15/4sgdtu0n35cm69k0 Link to IO2 e-learning platform QA survey to be completed by all participants – https://forms.gle/7rCv7dmHBpFhLcbX6	30 minutes
3.2 Implementing the STEAMitUP resources into the classroom – group activities Activity 1: Brainstorming and action planning (1 hour planning & 30 minutes presentation time) Activity 2: Lesson plan creation (1 hour planning & 30 minutes presentation time)	Presentation 3.2 Separate participants into groups of 4 / 5 either physically in the classroom or virtually using 'breakout rooms' STEAMitUP Workshop 3 Lesson Plan Template	3 hours total (1 hour 30 minutes for activity 1) (1 hour 30 minutes for activity 2)
3.3 Final debrief discussion and feedback on workshops, resources and the project overall	Presentation 3.3 Link to final workshop QA and Impact assessment	30 minutes

Participant feedback on the overall workshop and project impact using survey link provided	survey to be completed by all participants – https://forms.gle/xQSQg14TxyGJbSZ76	

End of workshop 3

Additional implementation of STEAMitUP resources with a minimum of 2 teachers in each country

Upon competition of the three workshops and total of twenty hours of training, two of the twenty participating teachers will progress onto an additional implementation phase.

This phase will involve those selected teachers using the resources included in the STEAMitUP toolkit, e-learning platform and action plans developed in workshop 3 in their classes with students.

The selection of the teachers to progress to this classroom implementation will be done between the trainer / project representative and the participants. The two teachers may openly choose to go forward or the trainer may have to ask the participants who would like to undertake this additional activity.

The selected teachers will be given the freedom to implement the resources and action plans as they deem suitable for their needs and class requirements. Each teacher will be asked to complete an additional QA and Impact survey upon completion of this implementation phase. These findings will then be added to the final IO3 Impact Assessment Study findings and final comparative report.

Workshop 3 *(4 hours)*

- 3.1 Group discussion and feedback on the e-learning platform structure and content *(30 minutes)*
- 3.2 Implementing the STEAMitUP resources in the classroom – group activities *(3 hours)*
- 3.3 Final debrief discussion and feedback *(30 minutes)*

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Objectives of Workshop 3

On completion of this workshop we hope that participants will be able to:

- Provide constructive feedback on the e-learning platform content
- Access and utilise the STEAMitUP suite of resources as part of your teaching practices
- Share your own best practice examples of STEAM implementation
- Develop an action plan or strategy to implement the STEAMitUP resources into the classroom
- Contribute to the development of an additional lesson plan that can be delivered in the classroom
- Provide feedback on the overall impact of the STEAMitUP project and practice recommendations

3.1 Group discussion and feedback on the e-learning platform structure and content

- This workshop will begin with a brief discussion regarding the e-learning platform
- You should all have spent around a total of 12 hours engaging with the platform content
- The STEAMitUP consortium would welcome your thoughts, impressions and suggestions in relation to the following aspects of the e-learning platform:

  Accessibility
  Presentation
  Usability and navigation
  Coherence of content
  Quality of learning content
  Inclusion of innovative educational approaches
  Usefulness as a professional development resource

- Please complete the following *padlet* and then we will share our thoughts in a group discussion https://padlet.com/pvera15/4sgdtu0n35cm69k0

Please provide some feedback on the e-learning platform via the following survey - https://forms.gle/7rCv7dmHBpFhLcbX6

3.2 Implementing the STEAMitUP resources in the classroom

- Let us now focus on potential strategies to implement the STEAMitUP resources into the classroom
- We would welcome your professional opinion and experience to help develop some action plans to support teachers to utilise the project resources
- We would also like to give you the opportunity to develop your own STEAM focused lesson plan that could be included in the project resources to support other teachers in each partner country
- To facilitate this process you will undertake some group activities to allow you to share your experiences and best practice examples with each other

- We will now separate you in to groups (either physically in the classroom or virtually via digital breakout rooms)

3.2 Implementing the STEAMitUP resources in the classroom

Activity 1: Brainstorming and action planning

- Working together in your groups you are tasked with developing an action plan to support the implementation of the STEAMitUP resources into a classroom setting
- You can use any of the resources included within the Toolkit (best practices, lesson plans and the additional resources) and any of the learning content included within the e-learning platform
- Try to focus on how you could utilise different elements of the STEAMitUP resources and combine them together in practice
- Try to think about how these resources could be utilised alongside existing STEAM materials or how they can compliment your existing STEAM subject curricula
- You have 1 hour to complete this activity
- We will then share our ideas and action plans in a 30 minute group discussion

3.2 Implementing the STEAMitUP resources in the classroom

Activity 2: Create you own STEAM lesson plan

- Using the template provided each group is tasked with creating their own STEAM lesson plan
- Work together to combine your knowledge and experience and develop an innovative multi-disciplinary lesson
- Try to utilise a range of different resources or educational tools
- Try to incorporate some of the resources you have used from with the STEAMitUP toolkit and e-learning platform
- You have 1 hour to complete this activity
- We will then present our lesson plan ideas with the entire group

Course:	
Lesson Title:	
STEAM Area:	
Grade / Level:	Timeframe:
Lesson overview:	
Learning objectives: Upon completion of this lesson students will be able to:	
Material or resources required:	
Lesson activities:	
Instructions for teachers:	
Other comments or considerations:	

3.3 Final Debrief Discussion and Feedback

- We will now provide you with the opportunity to share your thoughts on your experience during these workshops
- This will take the form of a group discussion based around the following talking points:
    1. The length, format and content of the workshops
    2. The STEAMitUP toolkit resources
    3. The STEAMitUP e-learning platform
    4. The STEAMitUP project in general
    5. Ways in which the project can improve or actions that can increase the potential impact
    6. Any additional thoughts or suggestions

- Now we would welcome your final thoughts and feedback on the STEAMitUP workshops, resources and project as a whole as a result of your experience by completing a final survey - https://forms.gle/xQSQg14TxyGJbSZ76

Thank you for your participation!

We hope you enjoyed the workshops

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Lesson Plan Template

Course:	
Lesson Title:	
STEAM Area:	
Grade / Level:	Timeframe:
Lesson overview:	
Learning objectives: Upon completion of this lesson students will be able to:	
Material or resources required:	
Lesson activities:	
Instructions for teachers:	
Other comments or considerations:	

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