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Evaluation of the Pilot Studies

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CONTENTS

ACRONYMS

List of abbreviations

FDM	Fertile Design Methodology
CT	Computational Thinking
ER	Educational Robotics
CP	Community Platform
UniWA	University of West Attica, Greece (project coordinator)
URJC	Universidad Rey Juan Carlos, Spain (project partner)
CUB	Comenius University Bratislava, Slovakia (project partner)
CUP	Univerzita Karlova, Czech Republic (project partner)
UVa	Universidad de Valladolid, Spain (project partner)
PTE-trainers	Pilot Training Evaluation Questionnaire for Trainers
PTE-trainees	Pilot Training Evaluation Questionnaire for Trainees

1. Executive Summary

One of the objectives of the FERTILE project (Objective 4) was defined as follows: "To train academic tutors, pre- and in-service teachers in the FERTILE design methodology towards implementing the methodology in their university training on ER or schools and disseminating it to their colleagues aiming to create an educator community that will remain after the project ends." This objective is related to Result 4 of the project, which aims to help educators go beyond classroom learning and face-to-face interaction through the practical use of ER simulators and remote collaboration in a blended context.

To achieve this objective, the training was designed based on the modules and materials developed under Result 3 of the project. The training was piloted by universities in all partner countries (Greece, Slovakia, Spain and the Czech Republic).

This report presents an evaluation of the pilot studies that were carried out. Improvements based on the analysis of the data from the pilot studies and the evaluation of the training materials, as well as the discussion that took place during the 5th Transnational Meeting, are also presented. These are mainly related to the duration of the whole training, the placement of some topics and activities in the training plan and their better explanation, trainees' requests for more involvement in activities with robots, etc.

2. INTRODUCTION

The “FERTILE” project’s Result #4 relates to Objective #4, i.e. to train academic lecturers, pre-service teachers and in-service teachers in the “FERTILE” design methodology so that they can implement it in their university or school training on ER. This result responds to the needs of educators who want to go beyond classroom learning and face-to-face interaction by making practical use of ER simulators and remote collaboration in a blended context towards digital transformation, as implied by the EU Action Plan for Digital Education (2021-2027).

According to the anticipated project Result #3, the consortium designed 4 modules and created relevant training materials (FERTILE project consortium, 2024c) to scaffold educators in designing and implementing Artful ER projects in a blended learning context to cultivate students’ Computational Thinking skills. The materials can also be used for self-study. Still, to familiarise educators with their content and to disseminate the materials efficiently, the project has planned training events. These training events were expected to enable educators to use these materials. Also, during this training, the participants were to familiarise themselves with the “FERTILE” community platform (Result 2 of the FERTILE project), assisting them to collaborate in developing Artful ER projects (FERTILE project consortium, 2023b).

Based on the modules and materials developed in Result #3, a blended training of 20 hours was designed, of which 6 hours would be delivered f2f, 9 hours synchronously online and 5 hours asynchronously online.

The individual sessions cover the modules proposed as follows:

- Module 1: Elaborating on Robotics as an educational tool for cultivating computational thinking: project-based & collaborative learning, computational thinking skills linking ER with Arts, and ER technologies for various educational levels (elementary, secondary, university). Delivery Mode: 3 hours f2f, Duration: 3 hours.
- Module 2: Supporting educators interweave ER with Arts: the Art in the FERTILE project - audiovisual arts (animation, filmmaking, painting), performing arts (dance, theatre, music) and literacy arts (poetry, drama, prose, fiction), triggering the design of artful ER artefacts for cultivating CT, Delivery Mode: blended, Duration: 3 hours f2f & 2 hours asynchronously.
- Module 3: Scaffolding blending f2f with online experience through exemplar artful ER projects: ER simulators, The FERTILE Community Platform, how to share outcomes between f2f & online context. Delivery Mode: Online, Duration: 3 hours synchronously & 1 hour asynchronously.
- Module 4: Promoting the FERTILE design methodology (FDM) through co-designing artful ER projects. Peer review of projects developed according to specific evaluation criteria. Delivery Mode: Online, Duration: 3 hours synchronously & 2 hours asynchronously.

Result 4 includes two tasks:

- T4.1 Implementation and evaluation of pilot studies for educators' training.
- T4.2 Main training events.

Pilot studies for teacher training (academic tutors, pre-service and in-service teachers) are intended to test the training materials, the FERTILE design methodology, the community platform, and the proposed structure of the upcoming training events.

The format of the pilot training was designed to match the materials, which include a variety of resources (text-based learning materials, scholarly articles, PPT presentations, video, web resources, sample artful ER projects, etc.), different types of activities (individual, collaborative, peer review), and can be conducted in different modes (F2F, online synchronously or asynchronously).

The pilot training may be followed by field experiments with students at affiliated schools by teacher trainers. Evaluation data from all these studies will provide feedback on the results, structure and content of training to improve the FERTILE design methodology, materials and also the main training events themselves.

The main training events will then be initiated as multiplier events of the project and complemented with extra sessions for educators to get an in-depth view of the project results. Following an experiential model, they will be organised in a blended learning context, thus supporting the approach of the FERTILE project methodology.

Outcome 4 includes one milestone: M4.1 Evaluation report on FERTILE training in pilot studies.

Another report, a report on the main training events, will be the final deliverable of R4.

This report is organised in the following sections. The section “Structure of the Pilot Training” describes the proposed training structure, particular modules, topics, activities, time allocation and modality of the training. The following section, “Organization of the Pilot Training” presents how the pilot training events were organized in particular countries. In the section "Evaluation of Pilot Studies" the research objectives, research sample, data collection methods as well as data analysis and results per country are presented. Finally, the section “Key Findings and Implications for Training Modifications” describes the overall common results of the data analysis across all participating countries. From these, the “Conclusions” section extracts and outlines recommendations for adapting training in the future.

3. Structure of the Pilot Training Events

In the proposal for the FERTILE project, the modular structure of the training was already proposed, together with an estimate of the duration of the individual modules. In Task T3 of the FERTILE project, the Result 3 deliverables (FERTILE project consortium, 2021) were the materials mentioned in the previous section, which covered the individual topics of the modules. The initial draft of the materials was already designed to specify for each part also its modality, i.e., whether the material will be used in a F2F training session, in a synchronous online session, or whether it is intended for self-study or other asynchronous activities. The proposed materials also included an estimate of the time allotment for each material.

The materials designed for each topic were of different types, so that they could be used for different training modalities and also for self-study. They included text documents, presentations, videos, worksheets, quizzes, discussions, interactive activities and workshops. Most of the learning activities were designed for trainees working collaboratively. Guidelines on how to use the different materials during the training have also been developed to support partners in the planning of the pilot training events and to ensure consistency in the content of the training (FERTILE project consortium, 2023c).

The proposed modules and materials were discussed and refined at several project partner meetings (both online and in-person at the Transnational meeting). Subsequently, the resulting plan of topics and modules was created with the appropriate modalities and time allocations:

Module 1: Robotics as an educational tool for cultivating CT
Duration: 3h F2F and 3h Synchronously

Topics	Modality	Duration
1.1[1] A short overview of the FERTILE idea and training (presentation and exploring trainees' background and expectations)	F2F /Sync	60'
1.2 Teaching ER or with ER (presentation, documents) 1.3 ER technologies - illustrative applications (videos)	F2F /Sync	60'
1.4 Introduction to CT (presentation, tasks) 1.5 CT skills involved in the FERTILE methodology (video)	F2F /Sync	60'
1.6 Workshop on CT skills (presentation, worksheets, quiz)	F2F /Sync	3 h

Module 2: Interweaving ER with Arts
Duration: 3h F2F and 2h Asynchronously

Topics	Modality	Duration
2.1 Art Education combined with ER (collaborative activity - workshop) 2.2 Art forms combined with ER (video)	F2F /Sync	45'

[1] The numbering of the topics follows the numbering of the corresponding training materials

2.3 Examples of interdisciplinary projects combining Art and ER (interactive presentation) 2.4 Interdisciplinary projects analysis (discussion)	Async	60’
	F2F /Sync	45’
2.5 Interdisciplinary project idea generation I. (worksheet)	F2F /Sync	90’
	Async	60’

Module 3: Blending F2F with online experience through exemplary artful ER projects.
Duration: 3h Synchronously and 1h Asynchronously

Topics	**Modality**	**Duration**
3.1 Design ideas for blending teaching with ER (presentation)	Sync	30’
3.2 ER simulators for various educational levels (videos)	Sync	90’
3.3 FERTILE Community Platform Introduction (video)	Async	15’
3.4 Practicing the main functionalities of the FERTILE CP (worksheet, discussion)	Async	45’
	Sync	1h

Module 4: The FERTILE design methodology through co-designing Artful ER projects. Project design presentation and peer evaluation.
Duration: 3h Synchronously and 2h Asynchronously

Topics	**Modality**	**Duration**
4.1 Introducing FERTILE Design Methodology (video) 4.2 Interdisciplinary project idea generation II. (worksheet)	Async	30’
	Sync	30’
4.3 Exemplar Artful ER projects based on the FERTILE Design Methodology (videos) 4.4 Artful ER project analysis (worksheet) 4.5 Artful ER project evaluation rubric (rubric document)	Async	30’
	Sync	30’
4.6 Co-designing a project following the steps of FERTILE Design Methodology (workshop through the CP)	Async	1h
4.7 Project design presentation 4.8 Peer evaluation of project designs	Sync	2h

This proposal became the basis for the training structure, which was to be tested together with the developed materials, the proposed FERTILE methodology and the community platform in a pilot testing at selected partner universities.

4. Organization of the Pilot Training events

The project plan foresaw the evaluation of the FERTILE design methodology (FERTILE project consortium, 2023a), as well as the training materials developed initially (FERTILE project consortium, 2024) to reach their final versions. The consortium had planned to organise this evaluation in the context of pilot studies with about 70 educators. Specifically, the four partner universities (in alphabetical order: CUB, CUP, UniWA, and URJC) were initially planned to organise pilot training events. Eventually, each partner prepared its own plan for a pilot training event according to its educational setting, depending on the trainer's availability and the availability of potential trainees. UVa eventually helped with the piloting and, together with the URJC, organised an additional pilot training event. Thus, five pilot studies were conducted altogether.

This section presents short descriptions and plans of the pilot training events organised by each partner organisation.

4.1 Pilot Training Events Description

4.1.1 CUB

The CUB research team organised a pilot training event at Comenius University in Bratislava with the help of the Erudo Civic Association (https://erudo.sk/), which provides certified in-service teacher training. This institution provided publicity through its website for the training, registration of participants, and management of the recruited participants and materials.

The participants were deliberately chosen so that half of them were Informatics teachers and the other half taught an Arts subject. The number of accepted participants was set at 20.

The F2F session occurred in a computer lab in the Faculty of Mathematics, Physics and Informatics at Comenius University. The online sessions were organised via the Zoom application.

4.1.2 CUP

The CUP research team organised the pilot training event at Charles University with 15 participants. Teachers and student teachers of Computer Science, Art Education and Primary Education participated.

The F2F meetings were organized in the computer labs at the Faculty of Education. All training materials were provided through LMS Moodle, which was also used for communication during the asynchronous sessions.

4.1.3 UniWA

The pilot training involved 9 Master students enrolled in a training on Educational Robotics as part of an inter-institutional postgraduate program on Digital Transformation and Educational Practice at the University of West Attica (UniWA), Greece, during the academic year 2023-2024. The trainees were in-service educators of primary and secondary education.

Through the "Eclass" learning management system provided by the university institution, the asynchronous activities were carried out, and pilot training materials were provided. The training sessions took place in a laboratory class at UniWA, and online sessions were conducted through the institutional MS Teams platform.

4.1.4. URJC

The pilot study involved 22 participants from Universidad Rey Juan Carlos (URJC) and Universidad de Valladolid (UVa) who were current students of Bachelor and Master degrees in teaching education. Two separate pilot studies were carried out: first, the study at URJC and afterwards, the study at UVa were conducted.

The training materials were provided through a GitHub Webpage (https://roboticslaburjc.github.io/estudio-piloto-fertile/), and the F2F sessions were carried out in laboratories with computers both in URJC and UVa. The online sessions took place on Microsoft Teams for the participants from URJC and on the platform Class Collaborate for the participants from UVa.

4.2 The Pilot Training Events Plan

4.2.1 CUB

The training event was conducted from January 20, 2024, to February 12, 2024. It started with a one-day presentation session, during which Module 1 and Module 2 were covered. From January 21 to February 4, participants devoted themselves to self-study - they watched video lectures and presentations mainly from Module 3 and partly from Module 4; they filled in worksheets and familiarised themselves with the platform. The asynchronous distance learning was followed by an online synchronous session on February 5, where participants reviewed their knowledge of blended learning and the platform and familiarised themselves with the basics of Module 4 on the FERTILE methodology. During the following week, the participants were again educated through asynchronous distance learning from the materials we made available to them, completing the worksheets, and finalising the project design in the platform. On February 12, in a synchronous session, participants presented their project designs and peer-evaluated them.

Due to the nature of the pilot training, some minor adjustments were made to the order of the materials compared to the proposed order (e.g. FERTILE Design Methodology was introduced on the first day of the training).

The following table summarises the CUB pilot training plan and indicates the specific materials used in each part of the training.

Dates	training content	F2F	Online sync.	Online async.
January 20, 2024 9:00-12:00	Introduction to the training content, timetable, completion conditions, final project (1.1)[2] Introduction to educational robotics (1.2) and computational thinking (1.4,1.5) CT training activities (1.6) Fertile methodology – short introduction	3h		
Lunch				
January 20, 2024 13:30-16:30	Getting familiar with several robotic toys and their programming environments. Workshop on Arts Education combined with Robotics (2.1) Types of robotic-art projects (2.2, 2.3) Designing your own ER-art project (2.5)	3h		
January 21 - February 4, 2024	Frequently used robotic toys and robots – videos (1.3)			4h
	Completing the design of your own ER-art project (2.5)			
	Creating activities using the Fertile methodology – video (4.1)			
	Blended learning with ER. Simulators (presentation, video tutorials, activity) (3.1, 3.2)			
	Video tutorials on the platform (3.3, 3.4)			
February 5, 2024 15:00-18:00	Fertile methodology – discussion (4.1) Custom robotics project - incorporating simulators (4.2) Platform - discussion, working together (3.4)		3h	
February 6 - February 11, 2024	Custom robotics project - incorporating simulators - completion (4.2)			4h
	ER-art projects with FDM – videos (4.3)			
	Worksheet for Analysing an exemplar (4.4)			
	ER-art project evaluation - rubrics (4.5)			
	Co-designing a project following the steps of FDM (4.6)			
February 12, 2024 13:30-16:30	Project designs presentation (4.7)		3h	
	Project designs peer-evaluation (4.8)			

[2] The numbering follows the numbering of the topics from the previous section

4.2.2 CUP

The pilot study was conducted during the second half of January 2024. The training started with a distance self-study, which focused on introducing the "FERTILE" platform (Module 3) and some materials from Module 1. During the first F2F session, Module 1 and part of Module 2 were covered. Workshop activities were mainly realized during the first F2F session. The second asynchronous part was scheduled before the second F2F session. The participants studied the materials (mostly videos) of Module 2 and Module 3 (worksheets related to the platform). The second F2F session was focused on blended-learning context and working with FDM and the platform. The following week, the participants finished their designed projects and completed the questionnaires. Due to time constraints, some materials and activities have been omitted.

The following table summarises the CUP pilot training plan and indicates the specific materials used in each part of the training.

Dates	training content	F2F	Online sync.	Online async.
January 12 - January 18, 2024	Videos presenting ER technologies (1.3) Video about CT and FDM (1.5, 4.1) Introduction video to the platform (3.3)			2h
January 18, 2024 14:30-18:30	Introduction to the FERTILE training - content, timetable, completion conditions, final project (1.1) Introduction to Educational Robotics (1.2) and Computational Thinking (1.4) Workshop - CT training activities (1.6) Introduction to the FERTILE design methodology	4h		
January 19 - January 25, 2024	Combining ART and ER (2.2, 2.3) Designing own ER-art project (2.5) Worksheets for community platform (3.4) Simulators (presentation, video tutorials, activity) (3.1, 3.2)			4h
January 25, 2024 14:30-18:30	Our project idea (4.2) Video exemplars (4.3) Analysing an exemplars (4.4) Designing the project in platform - working together (4.6)	4h		
January 25 - January 31, 2024	Finalizing the projects (4.6) Questionnaires			3h

4.2.3 UniWA

The training was organised at the period October 27, 2023, to February 16, 202,4 and involved 9 MSc students attending an inter-institutional postgraduate program on Digital Transformation and Educational Practice at UniWA. The piloting was carried out in the context of the regular schedule of the Educational Robotics training. It was considered an appropriate context as in the training curriculum, there were modules related to (a) Various ER technologies and platforms and (b) applications of Educational Robotics in various cognitive subjects, interdisciplinary projects and educational levels.

To maintain the normal flow of the training, some minor modifications had to be made to the order of the material compared to that proposed in the 4 Modules. The philosophy of the dimensions underlying the FERTILE Design Methodology (FDM) was followed, starting with the dimension of Interdisciplinarity (Training materials from Modules 1 and 2), continuing with Computational Thinking (Material from Modules 1 and 2), and finally, Blended Learning (Training materials from Module 3 and 4). The tables below show in detail the organisation of the pilot at UniWA and how the training materials were disseminated.

Dates	training content	F2F	Online sync	Online async
October 27, 2023 - November 11, 2023	Introduction to FERTILE initiative (1.1) Teaching ER or with ER in different educational levels (1.2)		1h	
	ER technologies and indicative applications (1.3)		1h	
	Examples of combining several art forms with ER (2.2) and interdisciplinary projects combining arts and ER (2.3) Interdisciplinary projects' analysis (2.4) Interdisciplinary project idea generation (2.5)			3h
November 24, 2023	Study material for Computational Thinking (CT) (1.4) CT in the FERTILE Design Methodology (1.5)			1h
December 1, 2023	CT training activities (1.6)	3h		
December 8, 2023	Learning design ideas for ER in a blended learning context (3.1) ER simulators and indicative applications (3.2) Introduction to the FERTILE Community Platform. (3.3) Interdisciplinary project idea generation culmination (4.2)	2h		2h

December 15, 2023	Conceptualisation of the FERTILE Design Methodology (4.1) Exemplar artful ER projects based on the FERTILE Design methodology (4.3) Artful ER projects analysis (4.4)	3h		1h

December 22, 2023	Artful ER project design evaluation (4.5)			1h

4.2.4 URJC

The training was scheduled for the period from February 19, 2024, to March 10, 2024, for the study conducted with participants from URJC and from March 11, 2024, to April 7, 2024, for the study conducted with participants from UVa. Both pilots followed the same organisation. During the first days, the students were given the training materials corresponding to Module 1. In addition, they started watching the videos and presentations related to interdisciplinarity from Module 2. During the first F2F session, which lasted 3 hours, 2 hours were devoted to the workshop for computational thinking developed in Module 3 of the training materials, while 1 hour was used to tinker with different educational robotics kits and to prepare a first draft of a project that would combine Educational Robotics and Arts.

After the first face-to-face session, the participants started working asynchronously with the materials of Module 4. Specifically, they worked on videos and presentations about blended learning. They also carried out a synchronous online session where they worked with a state-of-the-art robotics simulator, Kibotics (https://kibotics.org/).

In the last F2F session, the FERTILE Design Methodology (FDM) was presented using the training materials of Module 5. Moreover, they started designing their projects using the "FERTILE" Community Platform, a task carried out asynchronously once they finished the F2F session. At the end of the study, the participants delivered their projects through the platform, completed the worksheets and delivered the different questionnaires we provided (Evaluation of the pilot study, evaluation of the FERTILE Design Methodology, evaluation of the training materials and evaluation of the FERTILE Community Platform).

Dates	training content	F2F	Online sync.	Online async.
First F2F session, 2024 17:00-20:00	Introduction to educational robotics (1.2) and computational thinking (1.4, 1.5) CT training activities (1.6) Tinkering with educational robotics kits (2.1)	3h		
Online synchronous session, 2024 17:00-18:00	Custom robotics project - incorporating simulators (4.2)		1h	
Second F2F session, 2024 17:00-18:00	FERTILE Design Methodology – discussion (4.1) ER-art projects with FDM – videos (4.3) Custom robotics project - incorporating simulators (4.2) Platform - discussion, working together (3.4) Completing the design of your own ER-art project (4.6)	3h		
From the beginning of the training until the end of the training, 2024	Frequently used robotic toys and robots – videos (1.3)			6h
	Completing the design of your own ER-art project (4.6)			
	Creating activities using the Fertile methodology – video (4.1)			
	Blended learning with ER. Simulators (presentation, video tutorials, activity) (3.1, 3.2)			
1 week after the last F2F session, 2024	Projects finalisation (4.6)			7h
	Projects presentation (4.7)			
	Answer questionnaires			

5. Evaluation of the Pilot Studies

In this section, we discuss in detail the methodology we applied to evaluate the pilot studies. We present the research objectives, the research sample and the data collection method. Subsequently, we report the results of the data analysis and provide their interpretation.

5.1 Research Objectives

The evaluation of the pilot studies was to use the findings obtained to improve the structure, organisation, and content of the training so that they can be delivered more effectively and with a broader impact on the community of educators in the future.

Therefore, we posed two research questions:

1. How was the pilot training evaluated by its participants in terms of its structure, content, organization, and outcomes?

2. How was the pilot training evaluated by the trainers in terms of its structure, content, outcomes, and preparation demands?

5.2 Research Sample

As the project's target group is educators at all levels of education teaching ER and the Arts, the pilot studies were intended to focus primarily on them. However, because participants in the pilot training were recruited through convenience sampling, it was impossible to guarantee that all participants in all pilot studies met all the criteria exactly.

A total of 66 teachers participated in all pilot training events. However, some of them did not complete all the required questionnaires, so in the section summarising the participant data, in some cases, we report smaller numbers of participants for a given country than the number of participants attending a particular training.

Next, we present descriptive data for the sample used by each partner.

5.2.1 CUB

The pilot training was attended by 20 participants – teachers from different schools and cities in Slovakia. Most of them (80%) were female participants. Throughout the preparation of the project, the trainees worked in pairs, consisting of one informatics teacher and one arts teacher.

As 1 participant did not fill in the questionnaires, we provided further data only from the 19 teachers who did.

The age composition of the participants included all categories above 30 years of age, with the following distribution: 31-40 years - 21.1%, 41-55 years - 63.2%, and above 55 years - 15.8%. None of the participants were novice teachers. One declared to have 3-5 years of experience, and all the others identified themselves as experts with more than 5 years of experience.

Only two participants (10.5%) were primary teachers. Several of them taught at two or three levels of education: 63.2%, 42.1%, and 5.3% (1 participant) had experience teaching at the lower secondary, upper secondary, and university levels, respectively.

Regarding professional focus, participants were deliberately selected to form Informatics teacher - Art teacher pairs. Therefore, half of them fell into one discipline and the other half into the other discipline. However, some of them taught both informatics and an art subject, or even more subjects. In several cases, pairs of teachers (informatics teacher - art teacher) from the same school have enrolled in the training.

5.2.2 CUP

In the Czech Republic, 15 participants participated in the pilot study. They were primarily future teachers attending a Master program of Charles University, Faculty of Education. Only 12 participants answered all the questionnaires. We will consider only them. Of those participants, 5 were female and 7 were male.

The age of the participants was distributed as follows: 8 were between 20 and 30 years old, 3 were between 40 and 55 years old, and 1 was over 55 years old. Regarding the participants' expertise, 7 categorised themselves as novice teachers, 4 as experts, and one declared 3-5 years of teaching experience.

5 participants were from primary education, 5 were from secondary education, and 2 were university teachers.

6 participants were informatics teachers, or they focused on educational robotics as their main discipline. Arts was the primary discipline of 3 participants and 3 stated the option *Other*. The participants who stated *Other* participated in the pilot study as Art teachers.

5.2.3 UniWA

The UniWA research team organised a pilot training event with 9 Master's students attending an inter-institutional postgraduate program on digital transformation and educational practice (2022-2023) at UniWA, Greece. Throughout the study implementation, the participants were organised into 3 teams of pairs and one team as a triad, with each pair consisting of an ICT teacher and either a primary school teacher or a teacher teaching Greek literature in secondary education.

The nine participants were predominantly female (78%). The age distribution ranged from 20 to 55 years, with a notable representation of those between 30 and 40 years (56%). Two participants taught only at primary education (22.2%). The remaining participants (77.7%) taught in secondary education, with three among them (33.3%) teaching also in primary education.

The participants exhibited varying expertise in educational robotics (ER) and Arts. The majority identified themselves as ER novices (67%), while 33% considered themselves as ER experts.

5.2.4 URJC

22 participants participated in the pilot study. They were in-service and pre-service teachers (currently studying Bachelor and Master degrees in teaching education) from URJC and UVa. Since only 12 participants answered all the questionnaires, we will only consider them. Of those participants, 9 were female and 3 were male.

The age of the participants was distributed as follows: 67% were between 20 and 30 years old, 25% were between 30-40 years old, and 8% were over 55 years old. Regarding the expertise of the participants, 11 of them identified themselves as novice teachers, while one considered themselves as experts.

The primary discipline of the participants was Educational Robotics, since 8 out of 12 focused on that discipline, while 4 out of 12 focused on Arts.

5.2.5 Summary of the research sample descriptive data

The following tables summarise the above data on trainees.

Table 5.1: Distribution of sex across partner countries

Sex	CUB (20)	CUP (12)	UniWA (9)	URJC (12)
Female	16	5	8	9
Male	4	7	1	3

Table 5.2: Distribution of age across partner countries

Age	CUB (19)	CUP (12)	UniWA (10)	URJC (12)
20-30	0	8	8	8
31-40	4	0	2	3
41-55	12	3	0	0
55+	3	1	0	1

Table 5.3: Distribution of years of teaching experience of trainees across partner countries

Teaching Experience	CUB (19)	CUP (12)	UniWA (10)	URJC (12)
0-3	0	7	8	10
3-5	1	1	2	1
5+	18	4	0	1

Table 5.4: Distribution of educational level at which the trainees teach - across partner countries

Educational Level	CUB (20)[3]	CUP (12)	UniWA (9)[3]	URJS (12)
Primary	2	5	5	10
Lower Secondary	12	0	4	1
Upper Secondary	8	5	4	1
Higher education	1	2	0	0

Table 5.5: Distribution of discipline across partner countries

Discipline	CUB (20)[4]	CUP (12)	UniWA (9)	URJS (12)
Educational Robotics	10 (12)	6	3	8
Arts	10 (11)	3	0	4
Other	6	3	6	0

5.3 Data Collection

We carried out data collection through online questionnaires to address the research questions. Following the pilot training events at each partner institution, both trainees and trainers were asked to complete specific questionnaires aimed at obtaining feedback on the training and gaining insights into their experience.

In addition to the introductory part, which collected personal data about the participants, the **Pilot Training Evaluation Questionnaire for Trainees (PTE-trainees)** was divided into three main sections focused on the content, structure, and organization of the training. It contained questions of two types: Likert scale questions and open-ended questions (see Appendix A).

Through questions with a Likert scale, we focused on the evaluation of various aspects of the overall training content (interestingness, usefulness, innovativety, etc.), the difficulty of the individual topics covered, preferences for different teaching modalities, satisfaction with one's own project, as well as the evaluation of various aspects of the training organisation (trainers, environment, schedule, etc.).

In open-ended questions, trainees could express their suggestions for improving the training, e.g. changing the order of topics, higher or lower time allowance for individual topics or activities, etc.

[3] Some of the participants of CUB and UniWA have taught at several levels of education.
[4] Some of the CUB participants have taught both subjects (ER and Arts) and some of them even more subjects.

In the initial part of the **Pilot Training Evaluation Questionnaire for Trainers (PTE-trainers)**, data related to lecturing was collected, e.g. the number of sessions they conducted, how much time it took them to prepare for training and to check trainees' homework, etc. The main part of the questionnaire was again divided into sections focused on the training's content, structure, and outcomes. The questionnaire contained multiple-choice, Likert scale, and open-ended questions (see Appendix B).

The multiple-choice questions were aimed at finding out what percentage of the training materials the trainer planned to teach in the pilot training and how much they actually taught.

By answering questions with a Likert scale, the trainers evaluated various aspects (interestingness, usefulness, innovativety, or problems) of the training content for the participants. In the same way, they evaluated the difficulty of individual topics, the appropriateness of the proposed time allowance and the modalities of particular taught topics, and the quality of various aspects of the trainees' resulting project designs.

Through open-ended questions, the participants were able to suggest changing the structure, order, or time allocation of individual training topics or activities.

5.4 Data Analysis and Findings

66 trainees participated in this study. As 14 of them did not answer the questionnaire, the data analysis was performed only on 52 of them. As this sample was relatively small and there were differences between samples in all participating countries (in terms of the background of the teachers, their years of experience and the educational levels at which they taught), we decided to use primarily descriptive statistics (Agresti, 2012). In most questions, Likert-like scales (Joshi et al., 2015) were used. When analysing the answers to such questions, for each point of scale, we assigned a number, and then we counted the mean of answers. Qualitative analysis was used for open-ended questions, using selective coding of trainees' answers (Merriam and Tisdell, 2015).

Trainees' data was compared to their trainers' data to gain insights into the training events conducted.

5.4.1 CUB

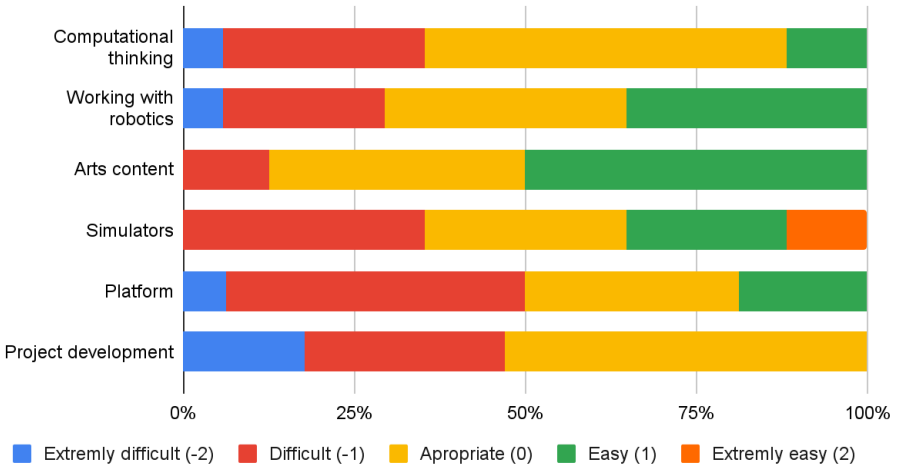
Trainees

Most of the 19 participants who answered the questionnaire had enrolled in the training to find innovative ideas for teaching either Informatics or Arts. They found the training content to be *interesting* (1.84), *innovative* (1.78), and *useful* (1.68) to them on a 4-point scale (where 2 is definitely yes, and -2 is definitely no). The training content was *problematic* for some trainees (-0.64). The percentage distribution can be seen in table 5.6.

Table 5.6: Answers of CUB trainees to the question: "From your point of view, you consider the training content to be…" (n=19)

	Definitely yes (2)	Probably yes (1)	Probably no (-1)	Definitely no (-2)	AVERAGE
Interesting	**84.2%**	15.8%	0.0%	0.0%	1.84
Useful	**68.4%**	31.6%	0.0%	0.0%	1.68
Innovative	**78.9%**	21.1%	0.0%	0.0%	1.79
Problematic	5.3%	21.1%	**36.8%**	26.3%	-0.65

The most difficult topics in the training content were *project development* (-0.65), *platform* (-0.38) and *computational thinking* (-0.29). *Arts content* was the least difficult (0.38) topic. *Simulators* (0.12) and *working with robotics* (0) were mostly appropriate. See Graph 5.1.



Graph 5.1 - CUB trainees' rating of different topics in the training (n=19)

From answers to open-ended questions about time spent on different training topics, there are a few recurring suggestions. On the one hand, 5 trainees would have liked to spend less time on Platform, 3 trainees would have liked to spend less time on Simulators, and 2 of them would have liked to spend less time on Project development. On the other hand, 9 trainees would have appreciated more robotics (mainly hands-on), 6 trainees would have liked to have more time for *project development*, 5 trainees suggested more time on *simulators*, and 2 trainees for *computational thinking*. Some participants suggested including more topics in both questions. Even though *robotics* was appropriate in terms of difficulty, 9 comments asking for more time with robotics suggest that participants would have liked to work with more robotic kits and gain more hands-on experience. Two participants suggested that it would make more sense if the first meeting was online and covered Fertile Design Methodology so that the first in-person meeting would be more focused on working with robots.

Trainees found the training content to be mostly successful in including different topics in their projects (see Table 5.7). *Arts* (1.18), *computational thinking* (1.13), and *robotics* (1.06) were all

assessed positively. The most problematic topics were *simulators* (0.64) - there were 3 trainees (15,8 %) who reported to have only poorly included them in their final project.

Table 5.7: Answers of CUB trainees to the question: "How did you manage to include the following topics in your final project?" (n=19)

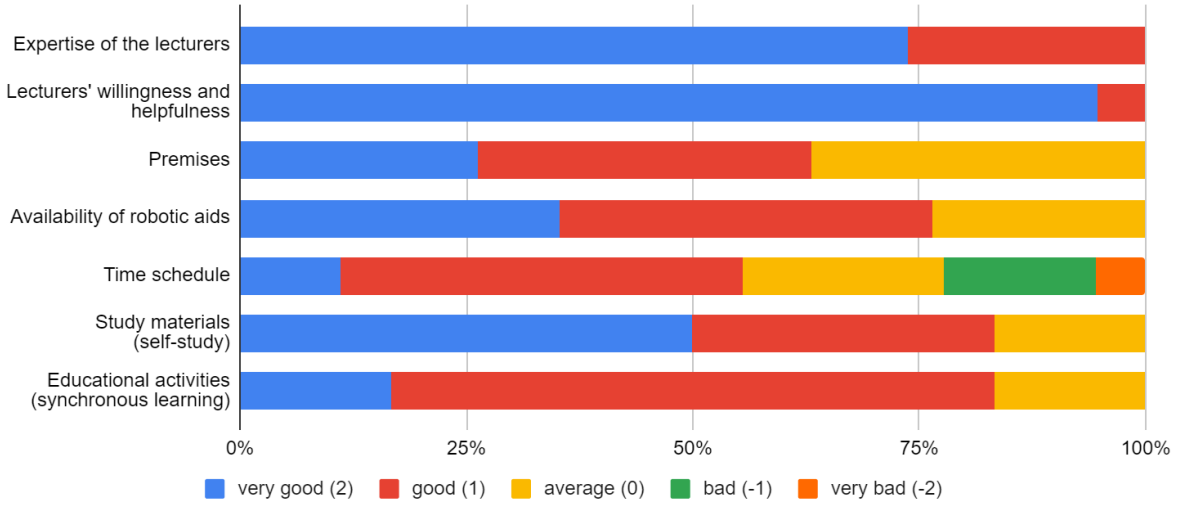
	Inadequately (-2)	Poorly (-1)	Appropriately (0)	Well (1)	Perfectly (2)	AVERAGE
Computational thinking	0.0%	0.0%	15.8%	**42.1%**	26.3%	1.13
Robots involvement	0.0%	0.0%	21.1%	**36.8%**	26.3%	1.06
Arts content	0.0%	0.0%	15.8%	**36.8%**	31.6%	1.19
Simulators	0.0%	15.8%	**26.3%**	21.1%	**26.3%**	0.65

The extent of all learning modalities suited most of the participants (see See Table 5.8) - *synchronous in person* (0.39), *synchronous online* (0.24) and *asynchronous* (0.05).

Table 5.8: Answers of CUB trainees to the question: "How did you find these learning modalities during the training?" (n=19)

	Was very rarely used (2)	Maybe a little more often used (1)	The extent suited me (0)	Maybe a little less often used (-1)	Was very often used (-2)	AVERAGE
Synchronous online	0,0%	26,3%	**57,9%**	5,3%	0,0%	0.24
Synchronous in person	0,0%	36,8%	**57,9%**	0,0%	0,0%	0.39
Asynchronous	0,0%	10,5%	**63,2%**	15,8%	0,0%	-0.06

The participants were mostly satisfied with the training (See Graph 5.2). They were most satisfied with the *lecturers' willingness and helpfulness* (1.94) and their *expertise* (1.74). *Study materials for self-study* (1.33), *availability of robotics aids* (1.12), *training activities in synchronous learning*, and *premises* (0.89) all scored good. Trainees were the least satisfied with the *time schedule* (0.39).



Graph 5.2: CUB trainees' rating of different aspects of the training (n=19)

Trainers

At the pilot study organised by Comenius University in Bratislava, there were 3 trainers, who all taught Modules 1 to 4. One served as a lecturer in 2 pilot testing sessions, the second one in 4 and the third one in 6 testing sessions. All of them used more or less the same percentage of prepared training materials they had been planning to (one used 80-90%, and two used 90-100%). They all mentioned videos as one of the training materials that should be improved. *"The current content of the videos was not very interesting for the participants",* one of the trainers wrote, and two others added that the quality of videos was not good and that it should be improved. They also reported a need for more videos about robots and simulators.

All three trainers suggested that trainees needed more time to do their assignment, as one of them said: *"because Arts teachers and Educational Robotics teachers have distinct requirements, necessitating a harmonious balance of both groups' viewpoints and needs".* Another trainer added: *"There is no need to add scope, but to fill it with useful information, demonstrations, operating instructions, pairing, etc."*

Two trainers agreed that the time scheduled for activity 1.1 was too long and could be shortened. One suggested that part 1.6 could also be shortened. Other suggestions for omitting materials include: low-quality videos, one named 4.3 video about emotions, and one trainer suggested spending less time in sessions about robotics and simulators because: *"in particular schools they have mostly only one technology and the school does not have enough financial support to purchase another technology…"*

Trainers rated the training content to be *interesting*, *useful*, *innovative* and *problematic*, all on the scale where absolutely not is -2 and definitely yes is 2. They considered the training content for the participants to be interesting (1.33), useful (1.33), relatively innovative than not (0.33) and not problematic (-1.33).

From the point of view of the demands on students, trainers rated these topics on a 5-point Likert scale (where extremely difficult is -2 and extremely easy is 2). Computational thinking scored -0.33 (appropriate), working with robotics was appropriate (0), and arts content was involved (0.33). The most difficult topic, based on trainers' responses, was Involving simulators (-1.33), and Working with platform and Project development both scored -0.66, which means rather difficult.

The trainers assigned the time needed for individual modules in 3-point Likert scale (where less time needed is -1 and more time needed is 1). They show the need to have more time for Module 1 (0.67), Module 2 (1) and Module 4 (0.67). Meanwhile, Module 3 had appropriate time allocated (0).

For each module, the trainers recommended a minimum amount of time that is suitable for synchronous (both F2F and online) and asynchronous implementation. They answered on a 5-point scale (0-20%, 21-40%, 41-60%, 61-80%, 81-100%). The results are in table 5.9.

Table 5.9: Answers of CUB trainers to the question: "Based on your experience, please recommend at least what percentage of a particular module is suitable for [synchronous F2F, synchronous online, asynchronous] implementation of Module [1, 2, 3, 4]."

	Synchronous F2F	Synchronous online	Asynchronous
Module 1	41-60% (3)	41-50% (2.67)	41-60% (2.67)
Module 2	41-60% (3.33)	21-40% (2)	21-40% (2)
Module 3	0-20% (1.33)	21-40% (2)	61-80% (3.67)
Module 4	0-20% (1.33)	41-60% (3)	41-60% (3)

Two trainers made only minor changes to the order of activities, e.g., the order of the videos was changed, and they didn't recommend the change of order of activities. The order of the activities used in CUB is shown in section 4.2.1.

Assessing the overall quality of the submitted projects, trainers saw good (0.67) *computational thinking skills*, perfect (2) *robots involvement*, almost perfect (1.67) *arts content* and appropriate (-0.33) *use of simulators*.

Comparison of trainers' and trainees' answers

In the prior subsections, the views of both trainers and trainees were reported and analysed. In order to find out whether trainers and trainees assessed the training in the same way or in a different way, we compared the corresponding answers to some questions in the questionnaires.

The training content was perceived as interesting and useful by both groups, but while trainees found it innovative (1.79), trainers thought it was not so innovative for them (0.33). Trainees found training content not problematic (-0.64), similar to trainers (-1.33), although 26 % of them found it problematic in some way.

In terms of rating individual topics in terms of difficulty (or, in trainers' questionnaire, of the demands on trainees) the answers mostly match. There were only two topics that got different answers: the Simulators and the Platform. While trainees found simulators appropriate (0.11), trainers thought it was rather difficult (-1.33) for students. Working with the platform was appropriate (-0.33) for trainees, but trainers thought it was somewhat difficult (-0.65), even though the difference in absolute values is not so big.

The last group of questions, which we matched answers from trainers and trainees, was the final project. We asked trainers to assess the overall quality of submitted projects and trainees to rate their success in including different topics in their projects. Trainers found robot involvement in trainees' projects as perfect (2), but trainees rated this in their projects as good (1.06). A similar discrepancy goes to arts content - trainers found it perfect (1.67), and trainees found it good (1.19). In computational thinking, there is only a small difference: both were rated as appropriate (0.67 for trainers and 1.13 for trainees). The discrepancy was flipped in using simulators - trainers found it appropriate (-0.33), but trainees thought they included it well (0.65).

5.4.2 CUP

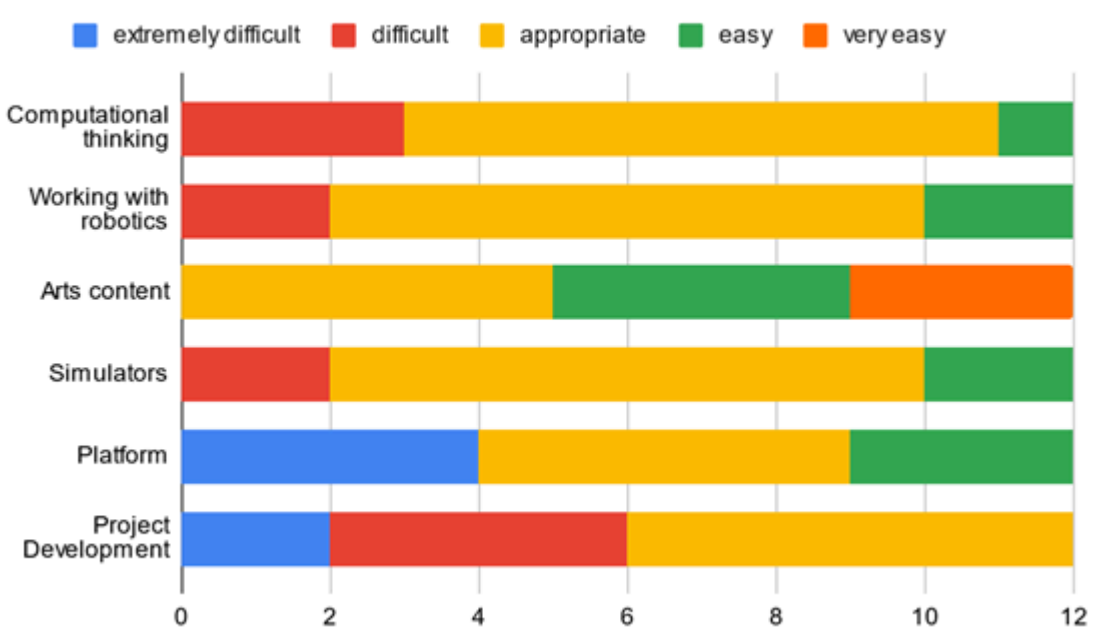
Trainees

Most of the participants had enrolled in the training to find innovative ideas for teaching and because of their *interest* in combining Arts and Educational Robotics. The training content was *interesting* (1.92), *innovative* (1.75), and *useful* (1.75) to them on a 4-point Likert scale (where 2 is definitely yes, and -2 is definitely no). The training content was *problematic* for some trainees (-0.83). Percentage distribution can be seen in the table 5.10.

Table 5.10: Answers of CUP trainees to question: "From your point of view, you consider the training content to be…" (n=12)

	Definitely yes (2)	Probably yes (1)	Probably no (-1)	Definitely no (-2)	WEIGHTED AVERAGE
Interesting	**91.6%**	8,3%	0.0%	0.0%	1.92
Useful	**75.0%**	25.0%	0.0%	0.0%	1.75
Innovative	**75.0%**	25.0%	0.0%	0.0%	1.75
Problematic	0.0%	16.7%	**66.6%**	16.7%	-0.83

The most difficult topics seem to be *project development* (-0.67) and *platform* (-0.42). The topics *simulators* (0), *working with robotics* (0) and *computational thinking* (-0.17) were mostly appropriate. *Arts content* (0.83) was considered as the easiest topic. See Graph 5.3.



Graph 5.3: CUP trainees' rating of different topics in the training (n=12)

Trainees were mostly successful in including different topics in their projects. The most problematic were *simulators* (0.0), where 4 participants were unsuccessful. On the other hand, the *involvement of robots* was the best included topic, see Table 5.11.

Table 5.11: Answers of CUP trainees to question: "How did you manage to include the following topics in your final project?" (n=12)

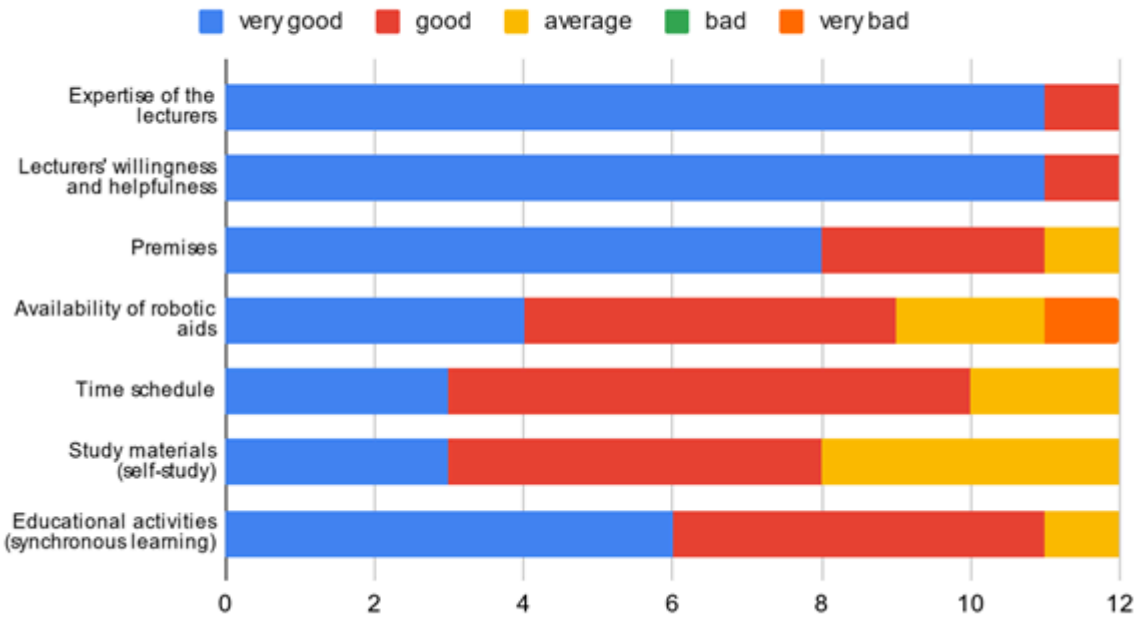
	Inadequately (-2)	Poorly (-1)	Appropriately (0)	Well (1)	Perfectly (2)	AVERAGE
Computational thinking	8.3%	16.7%	16.67%	**33.3%**	25.0%	0.5
Robots involvement	0.0%	0.0%	**50.0%**	33.3%	16.7%	0.67
Arts content	0.0%	25.0%	**41.7%**	25.0%	8.3%	0.17
Simulators	**25.0%**	8.3%	**25.0%**	**25.0%**	16.7%	0.0

The extent of *asynchronous learning* (0.0) was appropriate for participants. In the case of *synchronous sessions*, either online or in person, the participants stated identically (0.42) that they were not so much used. On the matter of the logical structure of the training, only one participant said that the training could have been longer. The others would not change anything. More in Table 5.12.

Table 5.12: The answers of CUP trainees to the question: "How did you find these learning modalities during the training?" (n=9)

	Was very rarely used (2)	Maybe a little more often used (1)	The extent suited me (0)	Maybe a little less often used (-1)	Was very often used (-2)	AVERAGE
Synchronous online	8.3%	25.0%	**66.7 %**	0.0%	0.0%	0.42
Synchronous in person	8.3%	25.0%	**66.7 %**	0.0%	0.0%	0.42
Asynchronous	0.0%	16.7%	**66.7%**	16.7%	0.0%	0.0

Participants were mostly satisfied with the training. Their satisfaction was higher with the *lecturers' willingness and helpfulness* (1.67) and their *expertise* (1.67). *Study materials for self-study* (1.08), *availability of robotics aids* (1.25), *training activities in synchronous learning* (1.08), and *premises* (1.25) all scored good. Trainees were the least satisfied with the *time schedule* (0.75). See Graph 5.4.



Graph 5.4: CUP trainees' rating of different aspects of the training (n=12)

Trainees

There were 2 trainers at Charles University, who all taught Modules 1 to 4. Both of them served as lecturers in the two F2F sessions that took place. In some activities they worked alone, in others they taught together. All of them used more or less the same percentage of prepared training materials they had been planning to (one 70-80%, and the second one 80-90%). One

stated that less time for Module 1 and 2 would be better because of some repetition in materials. Generally, the structure of the materials or the training seems adequate to them. They pointed at the difficulties for trainers, as one of them stated: *"I would perhaps appreciate less preparation for the lecturer themselves, either in printing or further preparation of materials. It's a bit challenging at the beginning to collate it all and make sense of the process."*

Trainers considered the training content to be *interesting* (2), *rather useful* (1), *rather innovative* (1) and *nor yes or not problematic* (0) for the participants (all on the scale where absolutely not is -2 and definitely yes is 2).

From the point of view of the demands on students, trainers rated these topics on a 5-point Likert scale (where extremely difficult is -2 and extremely easy is 2). *Computational thinking* scored 0 (appropriate), *working with robotics* was more or less appropriate (0.5) and while *involving arts content* was stated by one as easy and by the other as difficult. *Working with simulators* and with the *community platform* was considered more or less appropriate (-0.5), while the *project development* itself was considered difficult (1).

The trainers assessed the time needed for individual modules in 3-point Likert scale (where less time needed is -1 and more time needed is 1). One considered that Module 1 needed more time while the other would prefer less time. Modules 2, 3 and 4 were considered more or less appropriate (-0.5, 0, 0.5).

For each module, the trainers recommended a minimum time that is suitable for synchronous (both F2F and online) and asynchronous implementation. They answered on a 5-point scale (0-20%, 21-40%, 41-60%, 61-80%, 81-100%). The results are in table 5.13.

Table 5.13: Answers of CUP trainers to the question: "Based on your experience, please recommend at least what percentage of a particular module is suitable for [synchronous F2F, synchronous online, asynchronous] implementation of Module [1, 2, 3, 4]."

	synchronous F2F	synchronous online	asynchronous
Module 1	61-80% (4.0)	21-40% (2.0)	21-40% (2.0)
Module 2	41-60% (3.0)	21-40% (2.0)	11-30% (1.5)
Module 3	31-50% (2.5)	21-40% (2.0)	21-40% (2.0)
Module 4	61-80% (4.0)	11-30% (1.5)	21-40% (2.0)

Due to the shorter time for the F2F sessions, one of the trainers changed the original order of the activities, so the training started with an asynchronous part.

Comparison of trainers' and trainees' answers

In the prior subsections, the views of both trainers and trainees were reported and analysed. In order to find out whether trainers and trainees assess the training in the same or different way, we compared the corresponding answers to some questions of the questionnaires.

The training content was perceived as interesting by both groups, but trainers underrated usefulness (1 to 1.75 from trainees) and innovativeness (1 to 1.75 from trainees). Trainees found the training content not to be problematic (-0.83) but trainers were not sure (0).

In terms of rating individual topics in terms of difficulty (or, in trainers' questionnaire, of the demands on trainees) the answers mostly match. There is only one topic, which got more than 0.5 difference - this was *involving arts conten*t. While trainees found it rather easy (0.83), trainers thought it was appropriate (0) for students.

The last group of questions, which we can match answers from trainers and trainees, was the final project. We asked trainers to assess the overall quality of submitted projects and trainees to rate how successful they were in including different topics in their projects. Trainees rated all topics as appropriately included, but, on one hand, trainers thought that *computational thinking* was well included (1.5 to 0.5 from trainees). On the other hand, trainers thought that *simulators* were included poorly (-1.00 to 0 from trainees). The differences in *robotics* (1.00 from trainers and 0.67 from trainees) and *arts* (-0.50 from trainers and 0.17 from trainees) weren't that significant.

5.4.3 UNIWA

Trainees

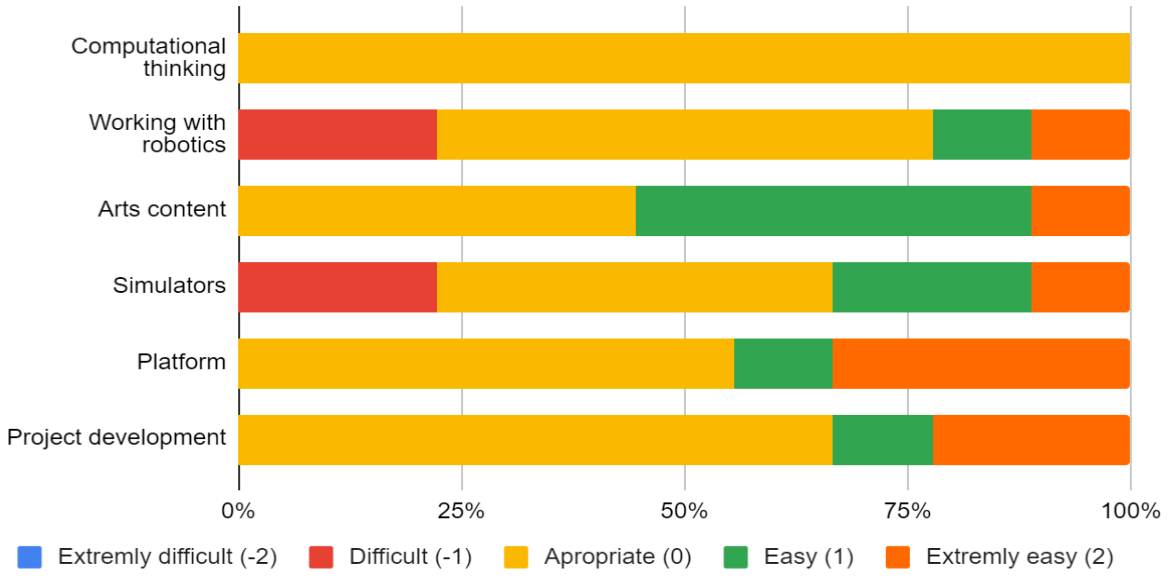
The responses provided by the trainees indicate a predominant interest in learning how to integrate Educational Robotics into their teaching practices. This includes learning how to combine robotics with relevant subjects to enhance student engagement and developing innovative teaching ideas that incorporate robotics. The training content was found to be *interesting* (1.88), *innovative* (2), and *useful* (1.66) to them in 5-point Likert scale (where 2 is definitely yes, and -2 is definitely no).

The training content was not *problematic* for the trainees (-1.22). Percentage distribution can be seen in the table 5.14.

Table 5.14: The answers of UniWA trainees to the question: "From your point of view, you consider the training content to be…" (n=9)

	Definitely yes (2)	Probably yes (1)	Probably not (-1)	Definitely not (-2)	WEIGHTED AVERAGE
Interesting	**88.8%**	11.1%	0.0%	0.0%	1.88
Useful	**100.0%**	0.0%	0.0%	0.0%	2
Innovative	**66.6%**	33.3%	0.0%	0.0%	1.66
Problematic	0.0%	11.1%	**44.4%**	**44.4%**	-1.22

All the topics were found positively appropriate, the most difficult being working with robotics (-0.1) and the easiest being the Community Platform (0.77) See Graph 5.5.



Graph 5.5: UniWA trainees' rating of different topics in the training (n=9)

Trainees were mostly successful in including different topics in their projects. *Arts* (1.33), *computational thinking* (1.11), and *robotics* (1.22) were all well included. Regarding *simulators* (0.7), most trainees used them appropriately (44.4%) and there were no negative ratings. See all numbers in Table 5.15.

Table 5.15: The answers of UniWA trainees to the question: "How did you manage to include the following topics in your final project?" (n=19)

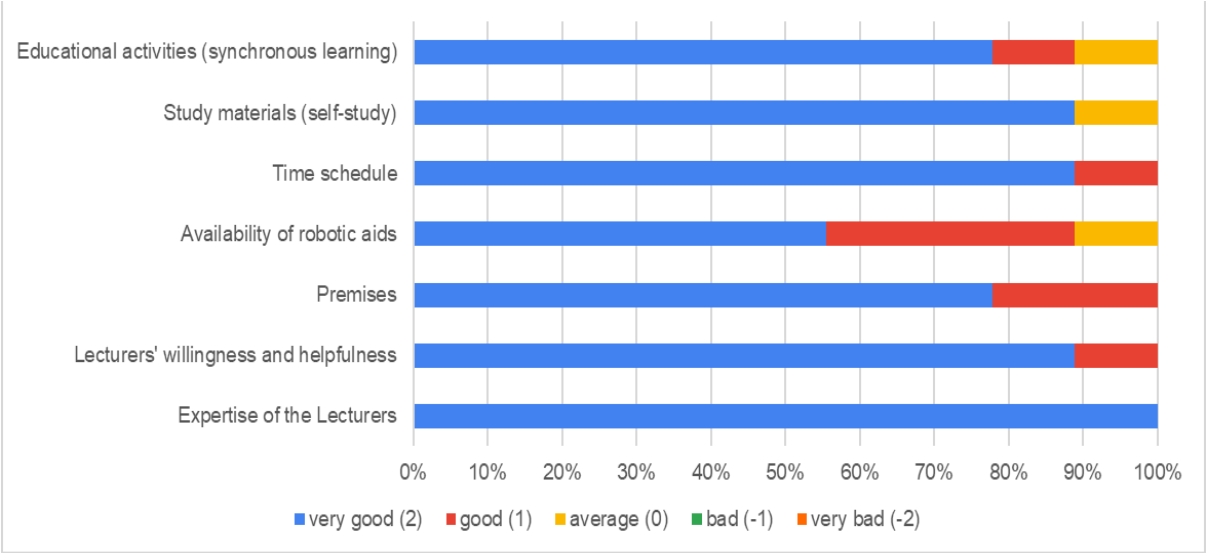
	Inadequately (-2)	Poorly (-1)	Appropriately (0)	Well (1)	Perfectly (2)	AVERAGE
Computational thinking	0.0%	0.0%	11.1%	**66.6%**	22.2%	1.11
Robots involvement	0.0%	11.1%	0.0%	44.4%	44.4%	1.22
Arts content	0.0%	0.0%	22.2%	**22.2%**	55.5%	1.33
Simulators	0.0%	0.0%	44.4%	33.3%	22.2%	0.7

The extent of all learning modalities suited most of the participants - Synchronous in person (0.00), Synchronous online (0.11) and Asynchronous (0.11). See Table 5.16 for details.

Table 5.16: Answers of UNIWA trainees to question: "How did you find these learning modalities during the training?" (n=9)

	Was very rarely used (2)	Maybe a little more often used (1)	The extent suited me (0)	Maybe a little less often used (-1)	Was very often used (-2)	AVERAGE
Synchronous online	0.0%	0.0%	**100.0 %**	0.0%	0.0%	0.00
Synchronous in person	11.1%	11.1%	**66.6%**	0.0%	11.1%	0.11
Asynchronous	11.1%	0.0%	**77.7%**	11.1%	0.0%	0.11

Participants were mostly satisfied with the training. They were most satisfied with the *lecturers' willingness and helpfulness* (2), the *lecturers' expertise* (2), the *time schedule* (1.88) and the *study materials for self-study* (1.77). The *premises* (1.66), *availability of robotic aids* (1.55) and *training activities for synchronous learning* (1.66) all scored high. See Graph 5.6.



Graph 5.6: UniWA trainees' rating of different aspects of the training (n=9)

Trainers

At the University of West Attica, three trainers taught Modules 1 to 4. All of them used more or less the same percentage of prepared training materials they had been planning to (one 90-100%, and two 80-90%).

Two trainers reported that it took more time to implement some activities. One report is related to Module 2 "*2.4 There was not enough time to present in detail all the examples designed by the learners*", and the other is related to the implementation of Module 4 "*more time for analysing an exemplar according to the FDM dimensions, steps and activities*".

These two trainers suggested changes in the order of some training material. Regarding Module 2, they suggested *"Workshop on arts education should move to Module 1"* and "*The workshop focusing on the interdisciplinarity of Arts and ER should move to the beginning of the training*". One also suggested combining activities from Module 3 and Module 4. *"Experience with the FDM should be combined with the CP so that the educators follow the steps through the platform".*

Trainers considered the training content for the participants to be *interesting* (2), *useful* (1.67), *innovative* (1.67), and not *problematic* (-1.33). (All on the scale where absolutely not is -2 and definitely yes is 2).

From the point of view of the demands on students, trainers rated these topics on a 5-point Likert scale (where extremely difficult is -2 and extremely easy is 2). They considered most of them appropriate or easy. *Computational thinking* and *working with robotics* were appropriate (0.33), *Engaging arts content* and *working with the platform* was easy (1), and *involving simulators* and *project development* were relatively easy (0.67).

The trainers assigned the time needed for individual modules in a 3-point Likert scale (where less time needed is -1 and more time needed is 1). They find the time needed appropriate for three of the four Modules (Module 1 (0.33), Module 2 (0), and Module 3 (0)), whereas they show the need for more time for Module 4 (0.67).

For each module, the trainers recommended the shortest possible time that is suitable for synchronous (both F2F and online) and asynchronous implementation. They answered on a 5-point scale (0-20%, 21-40%, 41-60%, 61-80%, 81-100%). The results are in Table 5.17.

Table 5.17: Answers of UNIWA trainers to the question: "Based on your experience, please recommend at least what percentage of a particular module is suitable for [synchronous F2F, synchronous online, asynchronous] implementation of Module [1, 2, 3, 4]."

	synchronous F2F	synchronous online	asynchronous
Module 1	61-80% (3.33)	21-40% (1.67)	0-20% (1.33)
Module 2	21-40% (1.67)	61-80% (3)	21-40% (2.33)
Module 3	0-20% (1.33)	41-60% (2.67)	41-60% (2.67)
Module 4	21-40% (2.33)	41-60% (3.33)	21-40% (1.67)

The trainers assessed the overall quality of the submitted projects, and they found them as almost perfect in terms of all topics. *Computational thinking* skills (1.67), *robots involvement* (2), *arts content*(1.67), and *use of simulators* (1.67).

Comparison of trainees' and trainers' responses

When the trainees' and trainers' answers regarding their opinions on the training content are compared, their views are almost the same. Both groups consider the educational content *interesting* (trainers (2) and trainees (1.88)), *useful* (trainers (1.67) and trainees (1.66)), *innovative* (trainers (2) and trainees (1.67)), and not *problematic* (trainers (-1.33) and trainees (-1.22)).

Regarding the evaluation of topics in terms of difficulty, the opinions of both groups are in agreement since they consider it either appropriate or easy. The biggest differences were in *simulators*, where trainers found this topic easy (-1) and trainees more appropriate (-0.25). In other topics, the differences between trainers and trainees were minimal.

The trainers were asked to assess the overall quality of submitted projects, and trainees were asked to rate their success in including different topics in their projects. The differences were minimal in *computational thinking* (1.67 for trainers and 1.11 for trainees), *robotics* (1.67 for trainers and 1.22 for trainees) and *arts* (1.67 for trainers and 1.33 for trainees). The difference in *simulators* was the most significant - while trainers perceived their inclusion as almost perfect (1.67), trainees found it rather well (0.7).

5.4.4 URJC

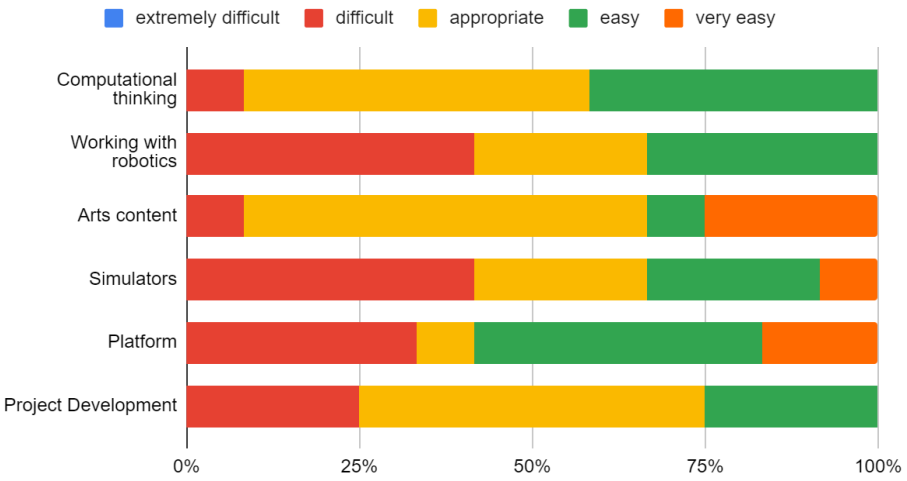
Trainees

Most of the participants had enrolled in the training to find innovative ideas for teaching even in other subjects, not only in informatics and arts. The training content was *interesting* (1.75), *innovative* (1.58), and *useful* (1.58) to them in 5-point Likert scale (where 2 is definitely yes, and -2 is definitely no). Most trainees did not find The training content problematic (-1.25). Percentage distribution can be seen in Table 5.18.

Table 5.18: Answers of URJC trainees to question: "From your point of view, you consider the training content to be…" (n=12)

	Definitely yes (2)	Probably yes (1)	Probably no (-1)	Definitely no (-2)	WEIGHTED AVERAGE
Interesting	**75.0%**	25.0%	0.0%	0.0%	1.75
Useful	**75.0%**	16.7%	8.3%	0.0%	1.58
Innovative	**58.3%%**	41.7%	0.0%	0.0%	1.58
Problematic	0.0%	8.3%	**50.0%**	41.7%	-1.25

The topics *simulators* (0), *working with robotics* (0.08) and *project development* (0) were mostly appropriate. *Arts content* was the least difficult (-0.50) topic. *Computational thinking* (-0.33) and *platform usage* (-0.42) were considered the most easy topics.



Graph 5.7: URJC trainees' rating of different topics in the training (n=12)

Trainees were mostly successful in including different topics in their projects. *Robots involvement* (1.17), *computational thinking* (1.00), and *arts content* (1.00) were all good. The most problematic were *simulators* (0.65), but their score shows that in the worst-case scenario, one participant could appropriately include this topic in the project. See Table 5.19.

Table 5.19: Answers of the URJC trainees to the question: "How did you manage to include the following topics in your final project?" (n=12)

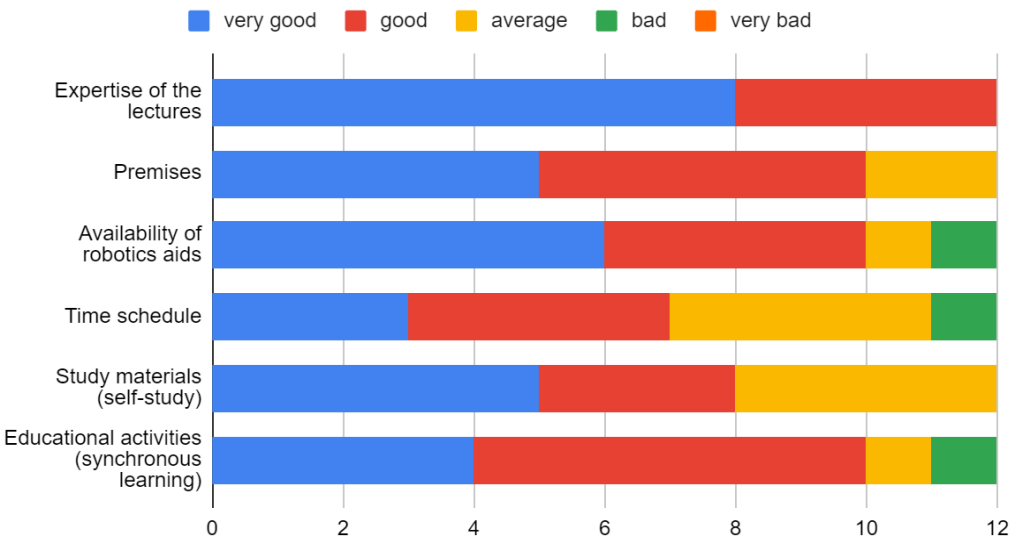
	Inadequately (-2)	Poorly (-1)	Appropriately (0)	Well (1)	Perfectly (2)	AVERAGE
Computational thinking	0.0%	0.0%	33.3%	**33.3%**	33.3%	1.0
Robots involvement	8.3%	0.0%	8.3%	**41.7%**	41.7%	1.17
Arts content	0.0%	0.0%	33.3%	**33.3%**	33.3%	1.0
Simulators	8.3%	0.0%	8.3%	**66.7%**	16.7%	0.65

The extent of *synchronous online* (-0.25) and *asynchronous* (-0.08) modalities suited most of the participants. However, there were some discrepancies regarding *synchronous in person sessions* since 3 of the participants expressed that they would like this kind of session to be shortened. However, 4 participants stated that they would like synchronous sessions to be longer. See Table 5.20.

Table 5.20: Answers of the URJC trainees to the question: "How did you find these learning modalities during the training?" (n=9)

	Was very rarely used (2)	Maybe a little more often used (1)	The extent suited me (0)	Maybe a little less often used (-1)	Was very often used (-2)	AVERAGE
Synchronous online	16.7%	16.7%	**41.6 %**	25.0%	0.0%	-0.25
Synchronous in person	33.3%	16.7%	**25.0%**	25.0%	11.1%	-0.58
Asynchronous	8.3%	0.0%	**83.7%**	8.0%	0.0%	-0.08

The participants were mostly satisfied with the training. They were most satisfied with the *lecturers' willingness and helpfulness* (1.67) and their *expertise* (1.67). *Study materials for self-study* (1.08), *availability of robotics aids* (1.25), *training activities in synchronous learning* (1.08), and *premises* (1.25) all scored well. Trainees were the least satisfied with the *time schedule* (0.75). See Graph 5.8.



Graph 5.8: URJC trainees' rating of different aspects of the training (n=9)

Trainers

In URJC and UVa pilot studies, there were 2 trainers, who all taught Modules 1 to 4. Both of them served as lecturers in the two onsite sessions that took place. All of them used more or less the same percentage of prepared training materials they had been planning to (one 70-80%, and the second one 80-90%). They stated that more F2F time was needed to work on the project and that they needed more time to explain the FDM before working with the community platform.

One of the trainers commented that s/he considered there was a large number of questionnaires that the participants had to fill out, which ultimately limited them in allocating time to the

development of the project itself. Generally speaking, both trainers thought it necessary to have more time to complete the pilot study properly.

Trainers considered the training content for the participants to be *interesting* (2), *useful* (2), rather *innovative* (1.5) and not *problematic* (-2). (All on the scale where absolutely not is -2 and definitely yes is 2).

From the point of view of the demands on students, trainers rated these topics on a 5-point Likert scale (where extremely difficult is -2 and extremely easy is 2). *Computational thinking* scored 0 (appropriate), *working with robotics* was somehow difficult (-0.5). *Involving arts content, working with simulators* and with the *community platform* was all considered appropriate (0), while the *project development* itself was considered somehow difficult (-0.5)

The trainers assigned the time needed for individual modules in 3-point Likert scale (where less time needed is -1 and more time needed is 1). While they considered the time used for modules 1, 2 and 3 appropriate (0) they stated that more time is needed for module 4 (1).

For each module, the trainers recommended a time that is at least suitable for *synchronous* (both F2F and online) and *asynchronous implementation*. They answered on a 5-point scale (0-20%, 21-40%, 41-60%, 61-80%, 81-100%). The results are shown in table 5.21.

Table 5.21: Answers of URJC trainers to the question: "Based on your experience, please recommend at least what percentage of a particular module is suitable for [synchronous F2F, synchronous online, asynchronous] implementation of Module [1, 2, 3, 4]."

	synchronous F2F	synchronous online	asynchronous
Module 1	21-40% (1.5)	21-40% (2.0)	41-60% (3.0)
Module 2	41-60% (2.5)	41-60% (3)	21-40% (2)
Module 3	41-60% (2.5)	21-40% (1.5)	41-60% (2.5)
Module 4	41-60% (2.5)	41-60% (3)	41-60% (2.5)

None of the trainers changed the initial order of the activities, although one of them recommended spending more time explaining the FDM before working with the community platform so that the participants would have more time to reflect and think thoroughly about the FDM.

Comparison of trainers' and trainees' answers

In the prior subsections, the views of both trainers and trainees were reported and analysed. In order to find out whether trainers and trainees assess the training in the same way or in a different way, we compared the corresponding answers to some questions in the questionnaires.

Both groups perceived the training content as *interesting*, *useful,* and *innovative*, but trainers did not align on how *problematic* it was. While some trainees found it somehow problematic (-1.25), trainers rated it as definitely not problematic (-2).

In terms of rating individual topics in terms of difficulty (or, in trainers' questionnaire, of the demands on trainees), the answers of trainers and trainees were mostly different. While trainees rated all topics as mostly appropriate, trainers thought that *computational thinking*, *simulators* and *platform* were difficult for trainees (-1 from trainers) and *working with robotics* and *project development* were easy for them (1 from trainees). Trainers found *arts content* to be appropriate (0 to 0.5 from trainees).

The last group of questions, which we matched answers from trainers and trainees, was the final project. We asked trainers to assess the overall quality of submitted projects and trainees to rate how successful they were in including different topics in their projects. Both groups perceived *computational thinking* (1.00 for both groups), *robotics* (1.00 for trainers and 1.17 for trainees) and *Arts* (1.00 for both groups) as well included. *Simulators* were perceived as more appropriately included (0.5 for trainers and 0.65 for trainees).

6. Key Findings and Implications for Training Modifications

In this section, data from all pilot studies are presented, and their similarities and differencies are outlined. It consists of three subsections. The first presents quantitative data on trainees' percentages from all four countries. In the second one, data from trainers and also data from both trainers and trainees for all partners are discussed. In the third one, qualitative data from trainees, providing further insights into these results, are presented.

Quantitative data from trainees

Data from CUB, CUP, UNIWA and URJC show that trainees who participated in pilot training found the training content interesting, useful and innovative. In all three universities, trainees didn't find the training content problematic. See Table 6.1.

Table 6.1: Answers to question: "From your point of view, you consider the training content to be…" (2 - definitely yes, 1 - probably yes, -1 - probably no, -2 - definitely no)

	CUB	CUP	UNIWA	URJC
Interesting	1.84	1.92	1.88	1.75
Useful	1.68	1.75	2	1.58
Innovative	1.79	1.75	1.66	1.58
Problematic	-0.65	-0.83	-1.22	-1.25
number of participants	19	12	8	12

Trainees rated the training content in terms of difficulty. While working with robotics, simulators and computational thinking were found to be appropriate for all universities; platform and project development were rated differently between them. For participants from UNIWA, all individual topics were appropriate or rather easy, for URJC all topics were mostly appropriate, while for participants from CUB and CUP the project development was rather difficult.

Table 6.2: Trainees' rating of different topics in the training
(-2 - extremely difficult, -1 - difficult, 0 - appropriate, 1 - easy, 2 - extremely easy)

	CUB	CUP	UNIWA	URJC
Computational thinking	0.29	0.17	0	-0.33
Working with robotics	0	0	0	0.08
Arts content	-0.38	-0.83	-0.67	-0.5
Simulators	-0.11	0	-0.22	0
Platform	0.38	0.42	-0.78	-0.42
Project development	0.65	0.67	-0.56	0
Number of participants	19	12	9	12

Regarding managing to include different topics in their final projects, participants in CUB, UNIWA and URJC had more or less the same results. Computational thinking, robots involvement and arts content were all well included, while simulators were included appropriately. In CUP, participants included robots well, all other topics were included appropriately. See Table 6.3.

Table 6.3: Answers to question: "How did you manage to include the following topics in your final project?" (-2 - inadequately, -1 - poorly, 0 - appropriately, 1 - well, 2 - perfectly)

	CUB	CUP	UNIWA	URJC
Computational thinking	1.13	0.5	1.11	1.0
Robots involvement	1.06	0.67	1.22	1.17
Arts content	1.19	0.17	1.33	1.0
Simulators	0.65	0.0	0.7	0.65
Number of participants	19	12	9	12

In CUB, CUP, and UNIWA, the extent of all learning modalities suited most of the participants (values from -0.5 to 0.5), but in URJC, they would like to have slightly less synchronous in-person training sessions. See Table 6.4.

Table 6.4: Answers to the question: "How did you find these learning modalities during the training?" (2 - was very rarely used, 1 - may be a little more often used, 0 - the extent suited me, -1 - may be a little less often used, -2 - was very often used)

	CUB	CUP	UNIWA	URJC
Synchronous online	0.24	0.42	0.00	-0.25
Synchronous in person	0.39	0.42	0.11	-0.58
Asynchronous	-0.06	0.0	0.11	-0.08
number of participants	19	12	9	12

Participants were primarily satisfied with the training organization. In all four countries, they were most satisfied with the Lecturers' willingness, helpfulness, and expertise. Study materials for self-study, Availability of robotics aids and training activities in synchronous learning scored 1 or above in all countries. Premises were perceived as very good in UniWA, but in CUB, CUP and URJC, they were perceived as good. The most significant difference is in perceiving time schedule - while UniWA was second best (1.88), in CUB, CUP and URJC scored the lowest (average in CUB and good in URJC and CUP).

On the one hand, it is promising that trainers' willingness, helpfulness, and expertise are most positively viewed from the trainees' point of view in all countries. On the other hand, the time schedule is a problematic part of training for three partners. This could be influenced by different aspects - as a part of a school/academic year, duration of training and so on. Aside from the time schedule in CUB, all aspects of training were perceived as good or very good.

Table 6.5: Trainees' rating of different aspects of the training (2 - very good, 1 -good, 0 - appropriate, -1 - bad, -2 - very bad)

	CUB	CUP	UNIWA	URJC
Lecturers' willingness and helpfulness	1.94	1.67	2	1.67
Lecturers' expertise	1.74	1.67	2	1.67
Study materials for self-study	1.33	1.08	1.77	1.08
Availability of robotics aids	1.12	1.25	1.55	1.25
training activities in synchronous learning	1	1.08	1.66	1.08
Premises	0.89	1.25	1.66	1.25
Time schedule	0.39	0.75	1.88	0.75
Number of participants	19	12	9	12

Quantitative data from trainers

There were 10 trainers for all partners together. When they rated the difficulty of individual topics of the training, no consensus was reached across the universities. For trainers from UNIWA, most topics were easy, and *computational thinking* and *robotics* were appropriate. For URJC, *computational thinking*, *involving simulators* and *working with the platform* was difficult, and *robotics* and *project development* were easy. In CUP, *project development* was difficult, others were more or less appropriate. In CUB, *involving simulators*, *working with platform* and *project development* were found to be difficult. This discrepancy could stem from different types of trainees involved in pilot training. Some were working mainly with in-service teachers of IT, some worked with Arts teachers, some worked mainly with students. This could influence the way their trainers perceived different topics.

Table 6.6: Answers to the question: "How would you rate the different topics from the point of view of the demands on students?" (-2 - extremely difficult, -1 - difficult, 0 - appropriate, 1 - easy, 2 - extremely easy)

	CUB	CUP	UNIWA	URJC
Computational thinking	-0.33	0	0.33	0
Robotics	0	0.5	0.33	1
Involving arts content	0.33	0	1	0
Involving simulators	-1.33	-0.5	0.67	-1
Working with platform	-0.66	-0.5	1	-1
Project development	-0.66	-1	0.67	1
Number of trainers	3	2	3	2

The trainers assigned the time needed for individual modules in 3-point Likert scale (where less time needed is -1 and more time needed is 1). The results of CUP, UNIWA and URJC are similar, but results from CUB show different tendencies. In CUB, trainers would like to spend more time on *modules 1*, *2* and *3*, and the time allocated for *module 4* is appropriate in their opinion, in UNIWA and URJC, *modules 1*, *2*, and *3* have appropriate duration and more time is needed for

module 4. In CUP, they would allocate less time for *module 2* and more time for *module 4*. The discrepancy regarding *module 4* (aimed at project development) is also shown in table 6.2, where trainees in CUB and CUP rated *project development* as the most difficult whereas in UNIWA and URJC this was seen as appropriate and easy.

Table 6.7: Answer to question "Based on your experience, recommend the time allocation for individual modules compared to the planned one." ((less time needed -1, appropriate 0, more time needed 1)

	CUB	CUP	UNIWA	URJC
Module 1	0.67	0	0.33	0
Module 2	1	-0.5	0	0
Module 3	0.67	0	0	0
Module 4	0	0.5	0.67	1
Number of trainers	3	2	3	2

As answers from trainers differ not only between universities but even among trainers in one university, it is difficult to come to some conclusion. Therefore, we looked at the answers from trainers and trainees from each of the involved universities to compare their points of view. In Table 6.8, we see the differences between trainers and trainees in terms of rating the training content. A positive difference means that trainees agreed more than trainers, and a negative difference means that trainees agreed less than trainers. The differences around 1 point on the scale are shown in bold. As mentioned before, the training is *interesting* for all trainees, and almost all trainers (except for trainers from CUB). Regarding *usefulness*, trainers from CUB, CUP and UNIWA found the training less useful than their trainees. The same goes for *innovativety*. In CUB there is even a big difference - while trainees found the training to be definitely innovative, trainers were not sure. In UNIWA, the differences between trainers and trainees were minimal.

Trainees rated how they thought they included computational thinking, robotics, arts and simulators in their final projects. The same goes for trainers - they rated how these topics were included in trainees projects. Results are shown in table 6.9. Positive difference means that trainees rated their project as better, and negative difference means that trainers rated trainees' project as better. The differences around 1 point on the scale are shown in bold. We see that in CUB, trainers were more satisfied with how trainees included robotics in their project than the trainees themselves. For simulators, the opposite is true. For CUP, the difference between trainers and trainees is high for three out of four topics - trainers didn't think that trainees appropriately included arts and simulators in their project but were more satisfied with their inclusion of computational thinking. For UniWA, the difference is high only for simulators, where trainers thought they were included perfectly, while trainees rated their inclusion as good. For URJC, the trainers and trainees had more or less the same score in all categories.

Table 6.8: Answers from trainees and trainers if they consider the training content to be [interesting, useful, innovative, problematic] (2 - definitely yes, 1 - probably yes, -1 - probably no, -2 - definitely no). A positive difference means that trainees agreed more, and a negative difference means that trainers agreed more.

		Interesting	Useful	Innovative	Problematic
	Trainees (n=19)	1.84	1.68	1.79	-0.65
	Trainers (n=3)	1.33	1.33	0.33	-1.33
CUB	difference	0.51	0.35	**1.46**	0.69
	Trainees (n=12)	1.92	1.75	1.75	-0.83
	Trainers (n=2)	2.00	1.00	1.00	0.00
CUP	difference	-0.08	**0.75**	**0.75**	**-0.83**
	Trainees (n=9)	1.88	2	1.66	-1.22
	Trainers (n=3)	2	1.67	1.67	-1.33
UNIWA	difference	-0.12	0.33	-0.01	0.11
	Trainees (n=12)	1.75	1.58	1.58	-1.25
	Trainers (n=2)	2	2	1.5	-2
URJC	difference	-0.25	-0.42	0.08	**0.75**

Table 6.9: Ratings of how trainees included different topics in their final project. Rated by trainees and trainers (-2 - inadequately, -1 - poorly, 0 - appropriately, 1 - well, 2 - perfectly). Positive difference means that trainees rated their project as better, and negative difference means that trainers rated trainees' project as better.

		Computational thinking	Robotics	Arts	Simulators
	Trainees (n=19)	1.13	1.06	1.19	0.65
	Trainers (n=3)	0.67	2.00	1.67	-0.30
CUB	difference	0.46	**-0.94**	-0.48	**0.95**
	Trainees (n=12)	0.5	0.67	0.17	0
	Trainers (n=2)	1.50	1.00	-0.50	-1.00
CUP	difference	**-1.00**	-0.33	**0.67**	**1.00**
	Trainees (n=9)	1.11	1.22	1.33	0.7
	Trainers (n=3)	1.67	1.67	1.67	1.67
UNIWA	difference	-0.56	-0.45	-0.34	**-0.97**
	Trainees (n=12)	1	1.17	1	0.65
	Trainers (n=2)	1	1	1	0.5
URJC	difference	0	0.17	0	0.15

Trainers from each country could assign how much time they would need for each module in synchronous F2F learning, synchronous online learning and asynchronous learning. The number of trainers was limited, and there was some disagreement in this question between trainers from one university. These differences could be based on trainers' experiences - some like to teach F2F, some may have students who are more comfortable with online learning and so on. However, as many trainers were authors of materials in individual modules, these preferences could also play some role. Therefore, there is no conclusion regarding the allocated time. The results are shown in tables 6.10 to 6.13

Table 6.10: Recommendation of least percentage implementation of different types of learning for Module 1 (0-20% - 1 | 21-40% - 2 | 41-60% - 3 | 61-80% - 4 | 81-100% - 5)

Module 1	CUB	CUP	UNIWA	URJC
synchronous F2F	41-60% (3)	61-80% (4)	61-80% (3.33)	21-40% (1.5)
synchronous online	41-60% (2.67)	21-40% (2)	21-40% (1.67)	21-40% (2.0)
asynchronous	41-60% (2.67)	21-40% (2)	0-20% (1.33)	41-60% (3.0)
number of trainers	3	2	3	2

Table 6.11: Recommendation of least percentage implementation of different types of learning for Module 2 (0-20% - 1 | 21-40% - 2 | 41-60% - 3 | 61-80% - 4 | 81-100% - 5)

Module 2	CUB	CUP	UNIWA	URJC
synchronous F2F	41-60% (3.33)	41-60% (3)	21-40% (1.67)	41-60% (2.5)
synchronous online	21-40% (2)	21-40% (2)	61-80% (3)	41-60% (3)
asynchronous	21-40% (2)	21-40% (1.5)	21-40% (2.33)	21-40% (2)
number of trainers	3	2	3	2

Table 6.12: Recommendation of least percentage implementation of different types of learning for Module 3 (0-20% - 1 | 21-40% - 2 | 41-60% - 3 | 61-80% - 4 | 81-100% - 5)

Module 3	CUB	CUP	UNIWA	URJC
synchronous F2F	0-20% (1.33)	41-60% (2.5)	0-20% (1.33)	41-60% (2.5)
synchronous online	21-40% (2)	21-40% (2)	41-60% (2.67)	21-40% (1.5)
asynchronous	61-80% (3.67)	21-40% (2)	41-60% (2.67)	41-60% (2.5)
number of trainers	3	2	3	2

Table 6.13: Recommendation of least percentage implementation of different types of learning for Module 4 (0-20% - 1 | 21-40% - 2 | 41-60% - 3 | 61-80% - 4 | 81-100% - 5)

Module 4	CUB	CUP	UNIWA	URJC
synchronous F2F	0-20% (1.33)	61-80% (4)	21-40% (2.33)	41-60% (2.5)
synchronous online	41-60% (3)	21-40% (1.5)	41-60% (3.33)	41-60% (3)
asynchronous	41-60% (3)	21-40% (2)	21-40% (1.67)	41-60% (2.5)
number of trainers	3	2	3	2

Qualitative data from trainees

Looking at open-ended questions, we were interested in why participants enrolled in this training. The most common answers were connected with robotics (learning more about Educational Robotics, or working with robots), next, many participants were interested in learning about new inspiration for their work as teachers and how to use interdisciplinarity in their subjects.

Trainees were suggesting areas which they would like to have more covered. In 23 answers, *robotics* was found. Some reasoned in their answers that they would like to have more hands-on experience with different robots or more time to work with them more deeply. Working with *simulators* was the next frequently mentioned - 16 participants would like to spend more time with it, or they thought that they didn't have enough time for this topic, as it was rather innovative for them. More time for *project development* was also a common answer (16) - as many said, they would like to have more time to work on their projects. In 8 answers, *computational thinking* should be more covered, 4 trainees would like to have more time for *art* and 3 for working with the *platform*.

In contrast, 14 trainees thought that working with a *platform* should not take so much time. Most of them didn't write a reason for it, 2 of them wrote that it was easy to work with, 1 answered that it would be easier to explore on their own, and 2 found it unnecessarily difficult and time-consuming. *Simulators* were mentioned 6 times, 2 persons pointed out that they should be left out, as it was not so interesting and beneficial for them. Both *art* and *project development* were mentioned 4 times. *Computational thinking* and *robotics* were mentioned by 1 participant each.

7. Conclusions

The comparison of the pilot studies carried out showed that the pilot training events were very different from country to country. They differed in the way the training was organised, in the overall duration of the training, in the time intervals between individual sessions and in the length of time that participants could devote to designing their projects.

They also varied in the number of participants and their composition, regarding their age, professional focus (Robotics, Arts, Other) and whether they were in- or pre- service teachers. Also, the ratio of participants per trainer varied considerably - e.g. in the training organised by UNIWA, there were three trainers for 9 participants (students). In contrast, in the training organised by CUB, there were three trainers for 20 participants (in-service teachers).

All these factors could and indeed did influence the results obtained. Therefore, it is very difficult to draw any common conclusions.

With regard to the participants, the closest approximation to what future teacher training should look like was the pilot training organised by CUB, which was attended by 20 trainees, all of whom were in-service teachers, 10 of whom were informatics (Educational Robotics) teachers and 10 of whom were Arts teachers. Moreover, this was the most significant sample of participants among all the pilot studies conducted. Therefore, their statements are more relevant. However, this pilot did not have sufficient time allocation, as pointed out by several participants. In terms of the duration of the training, the most reasonable strategy was probably chosen by UNIWA, whose training took place over almost the whole semester so that participants had enough time to study and absorb the different study materials and also to design the project. Trainees from UNIWA were the most satisfied with all parts of the training, see Table 6.5.

The pilot studies were also discussed during the 5th Transnational Meeting of the project partners in May 2024 in Bratislava. Since almost all participants served as trainers in the pilot training, they reported their experiences from them. The order of the training topics, details of its organization, etc., were discussed. From both the data analysis of the pilot studies in this report and the above discussion, several recommendations for organizing future training emerged:

1. **Time allocation**: training should be organised over a more extended period of time, preferably scheduled for 6 weeks or more. Sufficient time should be allowed for the development of the project proposal.
2. **FERTILE Design Methodology** (FDM): from the trainers' observations, there is a need to reorder the sequence of topics slightly. Specifically, the FDM topic needs to be moved closer to the beginning of the training, e.g,. to the end of the first session or to the second session, and introduced to the participants in a synchronous (preferably F2F) way.
3. **FERTILE platform**: Several participants reported problems with the platform being localized in their national languages. Therefore, a review of the translations of the different messages and descriptions on the platform should be done before the upcoming training. Furthermore, the comparison of the trainers' experiences showed that it is highly advisable not to let the trainees work with the platform only in

asynchronous mode, but it is necessary to go through the basic steps in the platform with them in a synchronous session.

4. **Working with robots**: Since many participants really appreciated the robotics workshop and many asked for more activities like this, we recommend reinforcing physical activities with robots and robotic kits in training. We also recommend preparing worksheets for these activities to help participants become more familiar with the different robots, their functions, and how to control them.
5. **Simulators**: Since this topic is crucial for blended learning, which is one of the main topics of the training, we consider it necessary to address this topic in more detail during the training to explain the importance of simulators to the participants and to familiarize them better with working with them.

The data analysis from the pilot studies showed that the participants liked the training and they found it to be interesting and innovative. After adapting it based on the above recommendations, it will be even more attractive and useful for future trainees. The training content has indeed the potential to be adopted in educators' teaching practice.

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APPENDICES

APPENDIX A
THE PILOT TRAINING EVALUATION QUESTIONNAIRE FOR THE TRAINERS (PTE-trainers)

We are asking for brief feedback from you as trainers on the pilot validation of the training materials and training structure. The questionnaire is divided into sections: introduction, content, structure and outcomes. It should take no more than 10 minutes to complete it. Thank you for your honest completion.
BASIC INFO
1. In which country did you organise this pilot testing? Czech Republic Greece Slovakia Spain
2. In how many of the pilot testing sessions have you served as a lecturer? 1 2 3 4 5 6 more than 6
3. On average, how long did it take you to get ready for one meeting with students? less than 2 hours 2-4 hours 4-6 hours more than 6 hours
4. Indicate the modules in which you were present as a lecturer. Module 1 Module 2 Module 3 Module 4
5. How much time did it take you, on average, to check the students' homework after each module? less than 1,5 hours 1,5 - 3 hours more than 3 hours
CONTENT
6. What percentage of prepared training materials were you planning to pilot?

less than 50 %
50-60 %
60-70 %
70-80 %
80-90 %
90-100 %

7. What percentage of the prepared training materials did you actually test during piloting?
less than 50 %
50-60 %
60-70 %
70-80 %
80-90 %
90-100 %

8. Please list the activities that would need to be expanded on the basis of the results of the pilot study. Specify your need. (For example, more time or more assignments, ...)

9. Please list the activities that, based on the verification in the pilot study, you would recommend to be shortened or omitted completely. Specify your need. (For example, they were very difficult for the students, or you did not have time to go over them with the students at all, ...)

10. From your point of view, you consider the training content for the participants to be:
Interesting
Useful
Innovative
Problematic
Rate on the scale: Absolutely not - Probably not - Probably yes - Definitely yes

11. How would you rate the different topics from the point of view of the demands on students?
Computational thinking
Working with robotics
Involving arts content
Involving simulators
Working with platform
Project development
Rate on the scale: Extremely difficult - Difficult - Appropriate - Easy - Extremely easy

STRUCTURE

12. Based on your experience, recommend the time allocation for individual modules compared to the planned one.
Module 1
Module 2
Module 3
Module 4
Rate on the scale: Less time needed - Appropriate - More time needed

13. Based on your experience, please recommend at least what percentage of a particular module is suitable for synchronous (F2F) implementation. Module 1 Module 2 Module 3 Module 4 Use the scale: 0-20% - 21-40% - 41-60% - 61-80% - 81-100%)
14. Based on your experience, please recommend at least what percentage of a particular module is suitable for synchronous (online) implementation. Module 1 Module 2 Module 3 Module 4 Use the scale: 0-20% - 21-40% - 41-60% - 61-80% - 81-100%)
15. Based on your experience, please recommend at most what percentage of a particular module is suitable for asynchronous implementation. Module 1 Module 2 Module 3 Module 4 Use the scale: 0-20% - 21-40% - 41-60% - 61-80% - 81-100%)
16. Did you change the order of some activities in the pilot testing ? Please indicate how.
17. Do you recommend changing the order of some activities for main training events? If yes, please indicate the order of the activities as you recommend.
OUTCOMES
18. How would you assess the overall quality of the submitted projects in terms of the individual topics? Computational thinking Robots involvement Arts content Use of simulators Rate on the scale: Insufficient - Poor - Appropriate - Good - Perfect

APPENDIX B
THE PILOT TRAINING EVALUATION QUESTIONNAIRE FOR THE TRAINEES (PTE-trainees)

This was the first time this training was implemented. We know that you have already completed several questionnaires, but we would like to ask you a few more questions about the organisation and structure of the training. It should not take you more than 10 minutes. Thank you very much in advance and we hope that this will be helpful to other participants.
BASIC INFORMATION
1. Institution
2. Which field do you teach? Informatics Arts (music, painting, drama, ...) Others
3. At what educational level do you teach? Primary Lower secondary Upper secondary Higher education
4. What were your expectations before starting the training?
CONTENT
5. Which topic from the training (computational thinking, robotics, art, simulators, platform, project development, ...) would you assign a larger time allocation? You can also choose more than one area if you need to. Ideally, with a short explanation.
6. Which topic from the training (computational thinking, robotics, art, simulators, platform, project development, ...) would you assign a smaller time allocation? You can also choose more than one area if you need to. Ideally, with a short explanation.
7. From your point of view, you consider the training content to be: Interesting Useful Innovative Problematic Rate on the scale: Absolutely not - Probably not - Probably yes - Definitely yes
8. How would you rate the individual topics in terms of difficulty? Computational thinking Working with robotics Arts content Simulators Platform Project development Rate on the scale: Extremely difficult - Difficult - Appropriate - Easy - Extremely easy

STRUCTURE
9. How did you find these learning modalities during the training? Synchronous online Synchronous in person Asynchronous Rate on the scale: I would prefer much more of it - may be a little more often used - the extent suited me - may be a little less often used - it was extremely often used
10. Would you change the order of some of the activities in the training? Please indicate which ones and how.
OUTCOMES
11. How successful were you in including the following topics in your final project? Computational thinking Robots involvement Arts content Use of simulators Rate on the scale: Insufficient - Poor - Appropriate - Good - Perfect
ORGANIZATION
12. Rate the following aspects of the training: Expertise of the lecturers Lecturers' willingness and helpfulness Premises Availability of robotic aids Time schedule Study materials (self-study) Training activities (synchronous learning) Rate on the scale: Very good - Good - Average - Bad - Very bad