O4 - Report on Implementation and Validation of CEYS Training Activities

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1. Introduction

The Creativity in Early Years Science Education (CEYS) project is an Erasmus+ funded partnership aiming to:

1) Propose concrete training materials that can be used in teacher education for early years and primary teachers in order to foster their use of creative and inquiry-based approaches in science teaching.

2) Involve teachers as co-designers in the iterative phases of development of its interventions, sharing their ownership and thus facilitating their adoption.

3) Implement and validate a number of training activities at national and international levels with the scope to improve early years and primary teachers' knowledge and skills.

4) Develop a systematic evaluation methodology in order to identify the impact of the proposed training process and materials in terms of both effectiveness and efficiency.

This document is reporting on the Phases I and II of the third objective i.e. on national and international training activities and validation events carried out in the four participating countries (UK, Greece, Belgium and Romania) during the first (Sep 2015- Aug 2016) and the second year of the project (Sep 2016-Aug 2017).

The report summarizes the methodology used for the implementation and validation of the CEYS Training Modules and presents its key findings.

2. Implementation and Validation Process

The iterative process of development, implementation and evaluation of the CEYS Training Course is shown in figure 2.1 below.

Figure 2.1: Development of the Training Course in the CEYS project

This report focuses on the key findings from the development, implementation and validation of the 20 Training Modules, of which the course is composed (see Table 2.1). The First 10 Training Modules provide an introduction to key characteristics of creative, inquiry-based approaches to early years science. The Second 10 Training Modules were designed to complement these, by considering in more detail how such approaches might be implemented within a programme of learning experiences over time. The development of the Curriculum Materials, which also form part of the course, and the lessons learned from it are described in the CEYS Curriculum Development Guide (O2-A4).

The development of the training modules, including their implementation and validation in a series of training activities took place in two iterative phases, lasting about a year each. Phase I training activities had as purpose to validate the 10 First Training Modules, while in Phase II the consortium trialled the 10 Second Training Modules, which were produced taking into account Phase I evaluation results. The results from Phase II evaluation resulted in the final version of all the training modules.

In implementing and evaluating the Training Modules CEYS partners explored different scenarios of use involving different participants and time frames in their 4 European countries (Belgium, Greece, Romania and the UK). While the modules provide a timetable and suggested activities for a 3-hour (half-day) training session, these can be modified to meet local needs and circumstances, in line with the principles that informed the design of the training modules. The scenarios of use mostly applied by the partners for the training were: 3-hour (i.e. half day) workshops, shorter versions as part of national and international conferences, and walk-through sessions. In Phase I each partner aimed to organise a

minimum of 2 half-day national training activities, with at least 50 teachers in total, and in Phase II, a minimum of 4-half-day training activities, with at least 100 teachers in tota.. In addition to these, once in every phase of development the consortium organised a 6-day International Teacher Training Summer School, where a number of modules were trialled and evaluated by teachers coming from different European countries, including ones not represented in the consortium.

First set of Training Modules (introducing key features of creative inquiry based approaches)	Second set of Training Modules (supporting issues of implementation within a programme of learning over time)
1 Using questions of teachers and children	11 Linking learning in and outside school
2 Resources and the learning environment	12 Reflection and reasoning
3 Focus on the nature of science	13 ICT to enhance inquiry
4 Focus on inquiry-based science – link with creativity	14 Planning for progression, building on children's ideas/questions
5 Focus on practical investigation which fosters creativity	15 Interpreting policy – opening up opportunities for creativity
6 Collaboration and group work	16 Assessment for learning – variety of strategies
7 Role of play and exploration in inquiry and creativity	17 Involving children in assessment, types of feedback
8 Varied modes of expression and representation	18 Nature of inquiry (different types of inquiry)
9 The role of the teacher	19 Nature of creativity
10 Cross curricular project work	20 Structured and unstructured play and exploration

Table 2.1: CEYS Training Modules

3. Design of the Training Modules

The processes associated with the development, implementation and validation of the Training Modules (as outlined above) informed the design of the Training Modules (see more in the CEYS Training Guide and Scenarios of Use) as shown below in relation to the Curriculum Design Dimensions associated with 'the vulnerable spider web' from van den Akker (2007, p39) (shown in figure 3.1). These different dimensions that frame the curriculum are regarded as vulnerable because they are interconnected and what happens in one dimension affects another.

Figure 3.1: The Vulnerable Spider Web

Rationale – The aims of the CEYS project provided the central rationale for the development of the Training Modules. A more detailed rationale for each module is provided, linked to wider research in the field.

Aims & Objectives and Content – Each module is linked explicitly to the set of Content Design Principles and Teacher Outcomes developed in the EU/FP7 'Creative Little Scientists' project and adopted by CEYS. The programme of 20 modules is designed to ensure each of the principles and outcomes is addressed.

Learning activities – A range of learning activities is included in each module, employing experiences valued by participants and reflecting perspectives from research in teacher education for example:

- Building on current practices - recognising potential in everyday classroom activities
- Sharing experiences across schools/age phases
- Practical activities – viewing them from a child's perspective
- Analysis of classroom examples
- Time for reflection and self assessment
- Consideration of implications for future practice
- Discussion of adaptation/interpretation in local contexts.

Role of facilitator – The following roles for the facilitator are emphasized and inform the design of activities:

- Motivating and displaying enthusiasm
- Building confidence and relationships of trust
- Stimulating questions and reflection.

<u>**Materials and resources**</u> - The modules include use of everyday resources and materials accessible to teachers and familiar to children, and seek to provide and identify links to background teacher resources available online.

<u>**Grouping**</u> – The modules include opportunities for activities in small groups of varied composition, recognizing their value in involving participants and exchanging ideas for example through:

- Facilitating cross phase/school discussion
- Sharing experiences from varied national and international contexts
- Building opportunities for long term collaboration
- Recognising the value of discussion between teachers from the same setting in supporting classroom implementation and progression in children's learning.

<u>**Location**</u> – The modules include opportunities to participate in and reflect on learning in varied locations both indoors and out, formal and informal.

<u>**Time**</u> – The modules are designed to include time for brainstorming, discussion and questioning at different points during the session, alongside practical activity, to enable participants to explore, clarify and reflect on ideas.

<u>**Assessment –**</u> The modules recognize the central role of formative assessment in developing creative, inquiry-based approaches to learning and teaching. Explicit opportunities for assessment are included for example through

- Discussion of classroom examples, examining a variety of evidence of children's learning processes and progress, including their peer and self assessment and the role of the teacher
- Use of recording in varied ways (worksheets, posters, presentation) to support reflection processes
- Participants' discussion of their own views and practices and self-reflection on change and implications as a result of workshop activities.

4. Evaluation and Validation Methodology

The training evaluation methodology sought to cover the evaluation of the training pedagogy, modules and material, as well as the training implementation and at a lesser degree the training impact. The evaluation of the training activities was crucial to the success of the project due its role in the development of the training course, as it provided information that was used to refine the training approach and materials produced by the project. The findings from this evaluation, along with those from the Curriculum Development process, were the key sources of information for the evaluation of the entire project in terms of producing outcomes that would be effective when training teachers to promote creativity in early years science education.

Purposes of evaluation

On the whole, the evaluation of the implementation of the training activities in the CEYS project was seen as performing two purposes:

a) a formative purpose, aimed at identifying both corrective actions during the actual training activity, and changes in the training pedagogy and materials during the development of the activities;

b) a summative purpose, assessing the impact of the training activities after these are concluded.

The formative focus of evaluation was concerned with the strengths and weaknesses of training in its developing stages, for the purpose of revising it to improve its efficiency and appeal. It included all evaluation instances that took place in the training activities of both implementation phases and covered all tasks that are built within the modules, in order to gauge participant reactions to the delivery and materials of the training.

The summative focus of evaluation was on the impact of the training activities on teachers' knowledge, skills and practice and ultimately in their pupils' knowledge and skills. Since, only longer-term training activities are expected to bring about any substantial impact to teachers' practice, CEYS was concerned with this purpose of evaluation only in relation to the 6-day international teacher training summer schools, and to the Curriculum Development Workshops (see Report O2-A2, CEYS Curriculum Development and Evaluation Workshops).

Evaluation instruments

The evaluation instruments used in the CEYS project were intended to provide both qualitative and quantitative data. They were chosen so that they could offer the project valuable information on the satisfaction of participants with the experience, the usability of the approach in different settings and the value of the training materials in order to foster creativity in early years science. They also varied depending on the kinds and timeframe of the training activities organised. For the half-day workshops they consisted of questionnaires for the participants and the facilitators, whereas for the 6-day course they included also a pre-course questionnaire for the participants, an action plan tool and an impact form, meant to be filled in after at least 2 months from the course's completion, so that the participants could reflect on the impact of the knowledge and skill acquired on their pupils. The data collected by these instruments met the validation needs of the project and enabled its improvement.

Foci of evaluation questionnaire

The design of CEYS evaluation questionnaires was informed by Guskey's (2000) suggested evaluation foci. According to him, participants' reactions questions around evaluating the training course and materials can be seen as relating to three broad categories: **content** – **process** – **context**. **Content questions** address the relevance, utility and timeliness of the topics explored through a professional development experience. They focus on the new knowledge, skills and understanding which form the basis for the course. They can also relate to the magnitude, scope, credibility, and practicality of the change required to implement this new knowledge. Participants' comments generally tend to be more favourable when the content addresses specific problems and offers practical, relevant solutions that can be implemented immediately.

Process questions relate to the conduct and organisation of the professional development experience. They ask about how things were done. They generally relate to the structure and format of the activities, and how well those activities facilitated participants' learning. Because participants often have different learning styles or preferred learning modalities, it is wise to include a variety of activities and learning formats. Moreover, planned activities should vary the degree of active engagement for participants, include occasions for collegial sharing, allow for explorations of practical applications and provide ample opportunities for personal planning and reflection.

Context questions generally relate to the setting of the professional development experience. They are designed to provide information on the background and current reality of the environment in which the experience takes place.

Another important but often neglected aspect of context is the participants themselves. Information on their backgrounds, current positions, and previous experiences can be very helpful in interpreting results. These may be collected in pre-course questionnaires.

Corresponding questions may also be asked of the training facilitators, as their view point on the content, process and context, as well as their reflections on what worked or not during a training activity are essential for the adjustment and improvement of the experience.

The CEYS evaluation implemented such questions about content-process-context in its workshop and longer course questionnaires for the participants and facilitators (see Appendix 1 and Appendix 2). In particular, participants' questionnaires included close-ended and open-ended questions about:

- the quality of the training course
- extent to which learning objectives were met
- usability of training approach in their practice
- useful/enjoyable/inspirational/exciting aspects of the training course
- training approaches
- course trainers
- suggestions for improvements
- venue, administration and registration (where appropriate)

Questions about the background of participants were included in the pre-course questionnaire for the 6-day international training course (see Appendix 3).

More about the CEYS evaluation methodology and instruments used can be found in report O4-A1 Training Implementation and Validation Plan: Methodology and Instruments.

Analysis of evaluation data

Each CEYS partner collected and analysed the evaluation data for the training activities they carried out in each implementation and validation phase and presented them in a corresponding National Report. The categories of content-process-context were also used for this analysis and the reporting of its findings. All quantitative questions used a 4-point-Likert scale. A quality indicator of 80% of 'Good' and 'Very Good' answers was set for the question about the overall quality of the training. When this was not met, the partners were invited to provide relevant explanations in the report. All the National Reports for each phase together with the results of the corresponding International Teacher Training Summerschool were assembled in the Reports O4-A2 (National and International Training Activities – Phase I) and O4-A3 (National and International Training Activities – Phase II).

Following these reports, the authors of each Training Module had to suggest, record and implement the appropriate modifications to it.

5. Implementation and Validation of Training Activities (Phases 1 & 2): Summary of results

Tables 5.1 and 5.2 below summarise the training activities implemented and validated during Phases I and II by all CEYS partners and their performance with respect to the project indicators. The activities are presented in a per module basis and the number of participants who attended, those who evaluated and the overall quality reported by them are also presented. As mentioned above, the individual reports for Phase 1 and Phase 2 can be found in the reports for the National and Intenational Training Activities (Phase I and Phase II) (O4-A2 and O4-A3) respectively.

Training Module	Partner	Date	Number of participants	Number of evaluations	Percentage (%) of answers declaring good and very good overall quality of the activity
1 Using questions of teachers and children	OU	10/11/2015 10/03/2016 03/05/2016	23	14	100%
2 Resources and the learning environment	AUC	01/06/2016 07/06/2016	32	29	80%
3 Focus on the nature of science	EA	23/04/2016 28/05/2016	28	14	93%
4 Focus on inquiry-based science – link with creativity	INFLPR	24/03/2016	39	16	100%
	UCL-IOE	06/09/2016	55	37	89%
5 Focus on practical investigation which fosters creativity	UCL-IOE	18/05/2016	27	24	74%
6 Collaboration and group work	EA	27/05/2016	22	18	100%
7 Role of play and exploration in inquiry and creativity	OU	14/04/2016 08/03/2016	30	27	85%
	AUC	07/06/2016 28/10/2016	25	22	95%
8 Varied modes of expression and representation	UCL-IOE	14/03/2016 15/06/2016	8	8	100%
9 The role of the teacher	OU	04/01/2017	16	12	100%
	INFLPR	30/09/2016 29/07/2017	46	34	100%

10 Cross curricular project work	INFLPR	26/03/2016	27	10	100%
11 Linking learning in and outside school	OU	10/02/2017	21	21	100%
	INFLPR	19/05/2017 31/05/2017 30/07/2017	63	46	98%
12 Reflection and reasoning	EA	21/03/2017 22/03/2017	62	49	93%
	OU	20/7/2017	12	11	86%
13 ICT to enhance inquiry	UCL-IoE	28/06/2016	21	21	95%
	INFLPR	07/10/2016	42	39	100%
14 Planning for progression, building on children's ideas/questions	UCL-IoE	24/02/2017 16/03/2017	21	18	100%
15 Interpreting policy – opening up opportunities for creativity	OU	20/07/2017	3	3	100%
16 Assessment for learning, variety of strategies	EA	16/03/2017	22	18	94%
	AUC	29/09/2016 03/10/2016	35	29	80%
17 Involving children in assessment, types of feedback	AUC	29/09/2016 03/10/2016 26/01/2017 09/05/2017 16/05/2017	35	30	96%
	OU	12/12/2016 13/12/2016	48	43	95%
18 Nature of inquiry (different types of inquiry)	UCL-IoE	24/05/2017 01/07/2017	27	26	100%
	INFLPR	19/05/2017 29/07/2017	52	35	100%
19 Nature of Creativity	EA	5/11/2016	20	14	100%
	AUC	26/01/2017	5	5	80%
20 Structured and unstructured play and exploration	EA	22/11/2016	10	10	100%
	AUC	18/10/2016 20/10/2016 16/03/2017 11/05/2017 16/05/2017	59	52	95%
	TOTAL		**936**	**735**	

Table 5.1: The distribution of trialed modules per partner, including participants, those who submitted evaluation and the overall module quality percentage during phases 1&2.

All modules trialed during phase I, with the exception of module 5, have achieved overall quality equal to or higher than 80% according to the participants' evaluations, thus satisfying the relevant project indicator. In the case of module 5, despite the 6% discrepancy with respect to the desired 80% goal, 94% of the participants stated that they would recommend this activity to others. The discrepancy can be attributed to 2 broad factors: context and status of the participants. In terms of context, there was limited budget for refreshments as stated in the relevant national report and as a result 67 % of the participants stated that the

venue and catering was good or very good. In terms of status of the participants, some of the participants were already very experienced and commited concerning the integration of a creative approach in their educational practice. As a result, they declared the workshop and its more introductory nature as satisfactory rather than good or very good.

All modules trialed during phase II have achieved overall quality equal to or higher than 80% according to the participants' evaluations, thus satisfying the relevant project indicator.

Partner	Total number of participants achieved during phase I	Total number of participants achieved during phase II	Total number of participants
AUC	57	134	191
EA	50	114	164
IoE	90	69	159
INFLPR	112	157	269
OU	69	84	153
TOTAL	**378**	**558**	**936**

Table 2.2: The total number of participants achieved per partner during phases 1 & 2

The numbers presented in table 5.2 indicate that all partners achieved the desired goal of a minimum of 50 participants in Phase 1 national activities, but not all the desired goal of a minimum of 100 participants during the Phase 2 national activities. However, the consortium altogether exceeded both the minimum of 250 and 500 participants for the Phase 1 and Phase 2 training activities respectively. Also each partner individually has exceeded the minimum required number of 150 participants.

For more specific information per partner and per module the reader is encouraged to refer to the corresponding reports of Phase 1 and Phase 2.

Regarding the two international CEYS summer schools, aiming at testing a 6-day teacher professional development programme, these were held in July 2016 and July 2017 in Greece with 52 teachers and 18 teacher educators (including those acting also as trainers) from 11 different European countries in total (Table 5.3).

Summer School	Number of countries	Number of teachers	Number of teacher educators
July 2016	6	26	8
July 2017	9	26	10
TOTAL 1	**15** (11 different)	52	18
TOTAL 2		**70**	

Table 5.3 Overview of participating countries, teachers and teacher educators at two CEYS Summer Schools (July 2016 and July 2017)

6. Summary Results from Quantitative Evaluation of Modules

The following tables summarize the participants' quantitative evaluations of the 20 CEYS Training Modules:

Module 1 Using questions of teachers and children

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	3	23	14	0	0	0	14	0	0	0	11	3	0	0	11	3	0	0
		23	100,0%	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	78,6%	21,4%	0,0%	0,0%	78,6%	21,4%	0,0%	0,0%

Would you recommend this activity to others?	
Yes	No
14	0
100,0%	

Table 6.1: Participants' evaluation for Training Module 1

Module 2 Resources and the learning environment

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	2	32	2	2	1	0	9	23	0	0	2	2	1	0	1	3	1	0
		32	40,0%	40,0%	20,0%	0,0%	28,1%	71,9%	0,0%	0,0%	40,0%	40,0%	20,0%	0,0%	20,0%	60,0%	20,0%	0,0%

Would you recommend this activity to others?	
Yes	No
2	0
100,0%	

Table 6.2: Participants' evaluation for Training Module 2

Module 3 Focus on the nature of science

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	2	28	6	7	1	0	8	6	0	0	9	5	0	0	8	6	0	0
		24	42,9%	50,0%	7,1%	0,0%	57,1%	42,9%	0,0%	0,0%	64,3%	35,7%	0,0%	0,0%	57,1%	42,9%	0,0%	0,0%

Would you recommend this activity to others?	
Yes	No
13	1
92,9%	7,1%

Table 6.3: Participants' evaluation for Training Module 3

Module 4 Focus on inquiry-based science – link with creativity

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	3	94	35	14	4	0	39	14	0	0	37	9	7	0	31	18	4	0
		94	66,0%	26,4%	7,5%	0,0%	73,6%	26,4%	0,0%	0,0%	69,8%	17,0%	13,2%	0,0%	58,5%	34,0%	7,5%	0,0%

Would you recommend this activity to others?	
Yes	No
16	0
100,0%	0,0%

Table 6.4: Participants' evaluation for Training Module 4

Module 5 Focus on practical investigation which fosters creativity

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	1	27	8	9	6	0	10	10	3	0	7	8	6	0	6	13	3	2
		27	34,8%	39,1%	26,1%	0,0%	43,5%	43,5%	13,0%	0,0%	33,3%	38,1%	28,6%	0,0%	25,0%	54,2%	12,5%	8,3%

Would you recommend this activity to others?	
Yes	No
0	0
0,0%	0,0%

Table 6.5: Participants' evaluation for Training Module 5

Module 6 Collaboration and group work

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	1	22	13	5	0	0	15	3	0	0	9	9	0	0	14	4	0	0
		22	72,2%	27,8%	0,0%	0,0%	83,3%	16,7%	0,0%	0,0%	50,0%	50,0%	0,0%	0,0%	77,8%	22,2%	0,0%	0,0%

Would you recommend this activity to others?	
Yes	No
18	0
100,0%	0,0%

Table 6.6: Participants' evaluation for Training Module 6

Module 7 Role of play and exploration in inquiry and creativity

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	4	55	15	29	5	0	36	12	1	0	19	23	7	0	15	29	5	0
		55	30,6%	59,2%	10,2%	0,0%	73,5%	24,5%	2,0%	0,0%	38,8%	46,9%	14,3%	0,0%	30,6%	59,2%	10,2%	0,0%

Would you recommend this activity to others?	
Yes	No
18	0
100,0%	0,0%

Table 6.7: Participants' evaluation for Training Module 7

Module 8 Varied modes of expression and representation

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	2	8	7	1	0	0	7	1	0	0	7	1	0	0	7	1	0	0
		8	87.5%	12.5%	0.0%	0.0%	87.5%	12.5%	0.0%	0.0%	87.5%	12.5%	0.0%	0.0%	87,5%	12,5%	0,0%	0,0%

Would you recommend this activity to others?	
Yes	No
0	0
0,0%	0,0%

Table 6.8: Participants' evaluation for Training Module 8

Module 9 The role of the teacher

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	2	62	35	11	0	0	30	16	0	0	35	9	2	0	36	10	0	0
		62	76,1%	23,9%	0,0%	0,0%	65,2%	34,8%	0,0%	0,0%	76,1%	19,6%	4,3%	0,0%	78.3%	21.7%	0.0%	0.0%

Would you recommend this activity to others?	
Yes	No
28	0
100.0%	0.0%

Table 6.9: Participants' evaluation for Training Module 9

Module 10 Cross curricular project work

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	1	27	8	2			8	2			8	1	1		5	5		
		27	80,0%	20,0%	0,0%	0,0%	80,0%	20,0%	0,0%	0,0%	80,0%	10,0%	10,0%	0,0%	50,0%	50,0%	0,0%	0,0%

Would you recommend this activity to others?	
Yes	No
0	0
0.06	0.0%

Table 3.10: Participants' evaluation for Training Module 10

Module 11 Linking learning in and outside school

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	4	84	31	35	1	0	34	31	2	0	33	31	3	0	27	37	3	0
		84	46,3%	52,2%	1,5%	0,0%	50,7%	46,3%	3,0%	0,0%	49,3%	46,3%	4,5%	0,0%	40,3%	55,2%	4,5%	0,0%

Would you recommend this activity to others?	
Yes	No
68	0
100,0%	0,0%

Table 6.11: Participants' evaluation for Training Module 11

Module 12 Reflection and reasoning

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	3	74	31	24	5	0	38	20	1	0	31	27	2	0	31	27	2	0
		74	51,7%	40,0%	8,3%	0,0%	64,4%	33,9%	1,7%	0,0%	51,7%	45,0%	3,3%	0,0%	51,7%	45,0%	3,3%	0,0%

Would you recommend this activity to others?	
Yes	No
55	1
98,2%	1,8%

Table 6.12: Participants' evaluation for Training Module 12

Module 13 ICT to enhance inquiry

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	3	63	42	17	1	0	39	17	3	0	38	17	4	0	38	16	6	0
		63	70,0%	28,3%	1,7%	0,0%	66,1%	28,8%	5,1%	0,0%	64,4%	28,8%	6,8%	0,0%	63,3%	26,7%	10,0%	0,0%

Would you recommend this activity to others?	
Yes	No
32	1
97,0%	3,0%

Table 6.13: Participants' evaluation for Training Module 13

Module 14 Planning for progression, building on children's ideas/questions

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	2	21	7	11	0	0	13	5	0	0	14	4	0	0	11	5	0	0
		21	38,9%	61,1%	0,0%	0,0%	72,2%	27,8%	0,0%	0,0%	77,8%	22,2%	0,0%	0,0%	68,8%	31,3%	0,0%	0,0%

Would you recommend this activity to others?	
Yes	No
0	0
0,0%	0,0%

Table 6.14: Participants' evaluation for Training Module 14

Module 15 Interpreting policy – opening up opportunities for creativity

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Goo d	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
1	1	3	3	0	0	0	3	0	0	0	3	0	0	0	3	0	0	0
		3	100,0%	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%

Would you recommend this activity to others?	
Yes	No
3	0
100,0%	0,0%

Table 6.15: Participants' evaluation for Training Module 15

Module 16 Assessment for learning, variety of strategies

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	3	57	18	26	2	1	13	26	8	0	17	24	6	0	24	19	4	0
		57	38,3%	55,3%	4,3%	2,1%	27,7%	55,3%	17,0%	0,0%	36,2%	51,1%	12,8%	0,0%	51,1%	40,4%	8,5%	0,0%

Would you recommend this activity to others?	
Yes	No
41	0
100,0%	0,0%

Table 6.16: Participants' evaluation for Training Module 16

Module 17 Involving children in assessment, types of feedback

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	5	83	18	52	3	0	26	44	1	0	31	29	11	0	18	41	12	0
		83	24,7%	71,2%	4,1%	0,0%	36,6%	62,0%	1,4%	0,0%	43,7%	40,8%	15,5%	0,0%	25,4%	57,7%	16,9%	0,0%

Would you recommend this activity to others?	
Yes	No
26	1
96,3%	3,7%

Table 6.17: Participants' evaluation for Training Module 17

Module 18 Nature of inquiry (different types of inquiry)

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	4	79	51	10	0	0	49	12	0	0	50	10	1	0	50	10	1	0
		79	83,6%	16,4%	0,0%	0,0%	80,3%	19,7%	0,0%	0,0%	82,0%	16,4%	1,6%	0,0%	82,0%	16,4%	1,6%	0,0%

Would you recommend this activity to others?	
Yes	No
35	0
100,0%	0,0%

Table 6.18: Participants' evaluation for Training Module 18

Module 19 Nature of Creativity

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	2	25	11	2	1	4	10	4	3	1	10	3	1	4	13	2	3	0
		25	61,1%	11,1%	5,6%	22,2%	55,6%	22,2%	16,7%	5,6%	55,6%	16,7%	5,6%	22,2%	72,2%	11,1%	16,7%	0,0%

Would you recommend this activity to others?	
Yes	No
12	4
75,0%	25,0%

Table 6.19: Participants' evaluation for Training Module 19

Module 20 Structured and unstructured play and exploration

Trialled		Atten ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
Part ners	Tim es		Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
2	6	69	32	29	1	0	24	35	2	0	29	23	5	0	37	23	2	0
		69	51,6%	46,8%	1,6%	0,0%	39,3%	57,4%	3,3%	0,0%	50,9%	40,4%	8,8%	0,0%	59,7%	37,1%	3,2%	0,0%

Would you recommend this activity to others?	
Yes	No
57	1
98,3%	1,7%

Table 6.20: Participants' evaluation for Training Module 20

SummerSchool 2016

Atten Ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
	Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
24	18	6	0	0	20	4	0	0	24	0	0	0	23	1	0	0
24	75,0%%	25,0%	0,0%	0,0%	83,3%	16,7%	0,0%	0,0%	100,0%	0,0%	0,0%	0,0%	95,8%	4,2%	3,2%	0,0%

Would you recommend this activity to others?	
Yes	No
24	0
100,0%	0,0%

Table 6.21: Participants' evaluation for SummerSchool 2016

SummerSchool 2017

Atten Ded	Overall Quality				Objectives Met				Usefulness to practice				Personal Interest/Enjoyment			
	Very Good	Good	Satisfa ctory	Poor	Fully	Mostly	Partia lly	Not at All	Very Good	Good	Satisfa ctory	Poor	Very Good	Good	Satisfa ctory	Poor
26	23	3	0	0	15	8	2	0	16	7	1	0	22	4	0	0
26	88,5%	11,5%	0,6%	0,0%	60,0%	32,0%	8,0%	0,0%	66,7%	29,2%	4,1%	0,0%	84,6%	15,4%	0,0%	0,0%

Would you recommend this activity to others?	
Yes	No
19	7
73,1%	26,9%

Table 6.21: Participants' evaluation for SummerSchool 2016

Some general comments about the above findings:

- On the whole they are very positive.
- The Phase 2 results seem to be higher than the Phase 1, which can be explained since the feedback from Phase 1 was taken into account in Phase 2. Whereas the content of the Second set of Training Modules, which were trialled in Phase 2, was new, the overall training approaches were similar to those of Phase 1 and thus one could stipulate that the partners were also better at using them in Phase 2.
- The Second set of Training Modules make use of the Curriculum Materials. The evaluation of these modules contributed also to the validation of the Curriculum Materials and their usability.
- The finalization of the Training Modules has taken these evaluation findings into account.
- Some Training Modules which appear to have been trialled by only a small number of participants have also been trialled in one or both the Summer Schools. For example Module 15 was one of the last to be developed and was mainly trialled in the Summerschool 2017 as part of the course.

7. Summary Results from Qualitative Evaluation of Modules

The qualitative feedback provided interesting information about what participants valued in the content and structure of the modules, for instance:

- strong conceptual framework underpinning each module;

- the practical and interactive nature of the activities (in particular the hands-on activities);

- the opportunities they had for discussion in groups with their peers and tutor(s);

- exploring the role of the teacher in different activities;

- experiencing some activities from a child's perspective;

- examining in depth examples from practice - the use of classroom-based episodes of learning and teaching were identified as very valuable across all training activities

- the time given for reflection on their own practice and on how to change it following what they learned.

On the other hand, challenges identified by the participants of the training included:

- language / terminology used – especially a challenge for teachers who are non-native English speakers;

- heavy conceptual framework;

- time spent to content input versus time spent on practical activities and/or focused group discussions and reflections;

- heterogeneity in background of participants;

- presentation of background information for examples of classroom practice; and

- access of materials and handouts.

8. **Overall Lessons Learned**

In this section, an overview of the lessons learned during the Phase I and II as well as the summer school implementation of the CEYS modules is presented. The contents of this section derive from the individual lessons learned per module trial which were formed taking into account both the trainees' feedback as well as the different trainers' observations and considerations. Overall, the participants were very satisfied by the workshops in terms of achieving their learning goals, being engaging and useful for their practice. The participants were evaluated by the facilitators as enthusiastic and willing to adopt the CEYS methodology and examples in their everyday practice.

The overall lessons learned can be grouped in the following categories.

Training development process

- In developing training, it is important to include an explicit conceptualisation of teacher education pedagogy. In CEYS this was made explicit both in module design and implementation.
- The value of the iterative processes of production, implementation, evaluation and revision in refining and enriching the training materials.
- The processes of implementation and validation provided important opportunities for sharing varied experiences and expertise across the partnership. They played key roles in developing common understandings and use of terminology related to characteristics of creativity and inquiry in early years science learning and teaching. The development and evaluation of the modules required partners to make their pedagogical strategies explicit.
- In designing modules and associated classroom materials there needs to be scope for local interpretation in the very different local and national contexts. For this purpose, it was significant that the modules were trialled in different national settings and at the international summer schools. This helped increase partners' awareness of the influence of different background contexts and assumptions and offered insights into policy and practice in a range of countries across Europe. This informed consideration of ways in which modules might need to be adapted for particular audiences. Finally, the shared experiences of teaching and discussion at the Summer Schools was particularly valuable in refining organizational strategies and clarifying teaching points associated with particular modules.
- It is important to explore varied modes of presentation and participation (face to face, mixed mode, online) to allow access to participants in a wide range of contexts.

Training content and pedagogy

- The collaborative approach, the dialogue, the exchange of ideas, the applicability in the classroom through real life examples, the inquiry method and the experiential approach were valued very highly by the participants.
- Participants very much also appreciated the diversity of activities during the workshop: discussion, reflection, practical activities
- It is important to avoid the typical trap of 'packing too much' into a workshop as too extended content input could hinder experiential processes of the module.
- The role of Curriculum Materials and other classroom examples was significant for supporting articulation and reflection on practice, drawing on range of evidence and

highlighting the potential in everyday activities and children's capabilities in varied contexts.

- It was important to integrate approaches to assessment and evaluation into all module elements to support both learning and teaching processes, and further development of module activities.

- The facilitators need to build on participants' prior experiences and make connections to practice across the module.

- The revisiting of links to the CEYS conceptual framework throughout the workshop is necessary, e.g. by providing a handout of definitions of creativity and characteristics of creative inquiry-based approaces for reference during module activities.

- The value of feedback loops across the module is high, e.g. by providing opportunities for participants to look back at their initial ideas and practices, reflect on how their ideas had changed and implications for future teaching.

- The need for tutor scaffolding of both practical and discussion activities, for example through modelling, questioning and frameworks for recording. This has a key role in clarifying intentions with a varied audience, and in focusing attention on factors that contribute to creativity and inquiry in learning and teaching and implications for practice.

Time Management

- Trainees had limited time to handle all aspects in-depth during the majority of workshops.

- The workshops should allow greater time for reflection, action planning and evaluation.

- Teachers are very positive about opportunities to have discussions with peers and tutors and are willing to share their experiences. Giving them enough time to discuss proved to be a useful strategy of the workshop.

- An optimization of the percentage of time dedicated to theory compared to the time used for more experiential activities should be considered. A potential increase in experimental activities and provision of training materials prior to participants prior to the workshops could help in using the time within the workshop more efficiently.

Prior Knowledge and language issues

- A brief introduction to the CEYS conceptual framework about inquiry and creativity in early years science should be included at the beginning of every module. This helps the understanding of the module content and its contribution to the promotion of inquiry and creativity.

- The targeted audience should be identified more clearly with respect to their background.

- Spending time with participants clarifying key concepts and terminology associated with the conceptual framework adopted by CEYS is very important. A number of terms do not translate easily from English into different languages, and workshop participants also may have different interpretations of terms involved.

Collaboration, Followup and Exchange of Practices

- The participants showed great interest in reading and analysing other teachers' practices, a procedure which was considered inspiring by them as well as useful

because they felt safe by seeing methods and examples that can work in situ at school.

- Teachers are very interested to know how science teaching is performed in other European countries, so the classroom examples were for them not only the modalities to learn the content about the children's agency and role of the teacher, but also to understand the approach teachers from other countries have to inquiry activities.

- The participants valued highly the collaborative approach of the workshops and the possibility to exchange ideas and practices with their fellow trainees as well as the trainers.

- Participants shared their concerns about potential obstacles for implementation of the acquired knowledge in the form of lack of support from their colleagues/schools combined with constraints posed by national/school curriculum, time and their own beliefs and attitudes.

- International training activities should offer to the participants the potential for job shadowing across Europe, opportunities for Ambassadors, building networks.

9. <u>References</u>

Guskey, T.R, (2000) Evaluating Professional Development. Thousand Oaks, CA: Corwin Press.

10.APPENDICES

Appendix 1: Evaluation questionnaire (participants' questionnaire)

Creativity through Early Years Science Education
TRAINING ACTIVITY

END EVALUATION

NAME OF PARTICIPANT

E-MAIL OF PARTICIPANT

OVERALL QUALITY OF THE TRAINING ACTIVITY

☐ VERY GOOD   ☐ SATISFACTORY

☐ GOOD   ☐ POOR

EXTENT TO WHICH THE TRAINING ACTIVITY LEARNING OBJECTIVES WERE MET

☐ FULLY   ☐ PARTIALLY

☐ MOSTLY   ☐ NOT AT ALL

USEFULNESS OF TRAINING ACTIVITY TO YOUR PRACTICE

☐ VERY GOOD   ☐ SATISFACTORY

☐ GOOD   ☐ POOR

PERSONAL INTEREST/ENJOYMENT

☐ VERY GOOD   ☐ SATISFACTORY

☐ GOOD   ☐ POOR

WHICH WAS THE MOST USEFUL/ENJOYABLE/INSPIRATIONAL/EXCITING ASPECT OF THE TRAINING ACTIVITY AND WHY?

_____

_____

_____

PLEASE IDENTIFY WHICH OF THE TRAINING APPROACHES THAT YOU EXPERIENCED IN THIS TRAINING ACTIVITY ENABLED YOUR LEARNING

_____

_____

_____

PLEASE IDENTIFY EXAMPLES OF EVIDENCE WHICH ACCORDING TO YOU WOULD SHOW THAT YOU HAVE MET YOUR LEARNING OBJECTIVES IN RELATION TO THE TRAINING ACTIVITY

_____

_____

_____

HOW COULD THE TRAINING ACTIVITY AS A WHOLE BE IMPROVED?

_____

_____

_____

ANY COMMENTS ABOUT THE KNOWLEDGE/COMMUNICATION/RESPONSIVENESS OF THE PRESENTER(S)?

_____

_____

_____

VENUE AND CATERING

☐ VERY GOOD   ☐ SATISFACTORY

☐ GOOD   ☐ POOR

REGISTRATION AND ADMINISTRATION

☐ VERY GOOD   ☐ SATISFACTORY

☐ GOOD   ☐ POOR

WOULD YOU RECOMMEND THIS TRAINING ACTIVITY TO OTHERS?

☐ YES   ☐ NO

ANY FURTHER COMMENTS/CONCERNS/APPRECIATIONS REGARDING THE WHOLE ORGANISATION OF THE TRAINING ACTIVITY

_____

_____

_____

☐ *PLEASE TICK THIS BOX IF YOU DO NOT WISH THIS INFORMATION TO BE USED IN REPORTS OR RESEARCH. ANY INFORMATION THAT IS USED WILL BE ANONYMISED.*

Thank you for completing this questionnaire. The Organisers

Appendix 2: Training facilitators' reflective evaluation sheet

Date: _____   Training facilitator: _____

About the course

1. To what extent did the course overall meet its aims, objectives and learning outcomes?

Fully ❑   Mostly ❑   Partly ❑   Not at all ❑

2. Please write a few lines explaining why you answered the previous question as you did.

....

....

....

....

3. Did any unexpected problems / issues arise during the course?

Yes ❑   No ❑

If yes, please describe them and explain how you dealt with them.

....

....

....

....

4. Which parts of the course did you consider especially important and why?

....

....

....

....

5. Which parts of the course did you consider as the least important? Why?

....

....

....

....

6. If you were giving this course again, what would you change (if anything) and why.

………

………

………

7. How good were the Administrative Arrangements (room, refreshments, etc) relating to the course?

Very❑ Mostly ❑ Partly ❑ Not at all❑

8. How could the course as a whole be improved?

………
………
………

Looking into the future

9. Please identify examples of evidence which according to you would show that the participants have met the learning objectives in relation to the course.

………
………
………

10. What follow-up training activity would be most helpful to the participants in your opinion?

………
………
………

11. Please feel free to make any further specific comments on other aspects of the course.

………
………
………

Appendix 3: Creativity in Early Years Science Education Training Course - pre-course questionnaire for participants

PLEASE MAKE SURE YOU COMPLETE **ALL 3 PAGES** OF THE FORM AND PRESS **SUBMIT** AT THE END.[1]

PERSONAL DETAILS

1. Surname*
2. Name*
3. Gender*
4. Your educational institution *
5. Your position *
6. Age range of your pupils or students *
7. You are currently teaching in *
8. By the end of this school / academic year, how long will you have been working as a teacher or teacher trainer? *
9. Address of your Educational Institution
10. Website of your Educational Institution

CONTACT DETAILS

11. Street / Street Number
12. City / Town
13. Area Code
14. Country*
15. E-mail address*
16. Telephone number
17. Mobile Phone*
18. Fax

BACKGROUND AND MOTIVATION

19. Please explain your motivation for attending this course and indicate up to 6 things you might expect to gain from it*
20. Short CV*
21. Will you bring your own laptop? *
22. Day of arrival*
23. Day of departure*
24. Other travel details (e.g. please mention whether you will be accompanied by any extra person(s))
    Please tell us where you have heard about th

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[1] Fields marked with * are mandatory