Come ThinkAgain

Certification based Education Training System

D.3.1 - Plan for experimental pilots' validation set-ups and evaluation concept

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EXECUTIVE SUMMARY

This deliverable establishes the piloting and validation plan for the Erasmus+ project ComeThinkAgain (COMputational and Entrepreneurship THINKing And Green Agenda INnovations). ComeThinkAgain develops cross-sectoral, standardised training and certification (so called 'micro-Certification based Education Training System' - ComeThinkAgainCETS) that improves the teaching of key cross-sectoral skills in the pillars Computational Thinking (CT), Entrepreneurship (EE) and Social Responsibility & Green Skills (GS). This deliverable is focused on project validation, but it should be noted that another related aspect is the design of a certification framework that will be delivered in project deliverable D4.3 - Concept for assessment and certification (M18). Given the relation between the two frameworks, some aspects related to certification (like certification testing) are touched upon in this deliverable, but are not elaborated on beyond the scope needed to specify the piloting and validation.

The plan presented in this deliverable has been prepared based on the knowledge available during the first phase of the project. However, new information may become available that requires changes to the piloting and evaluation approach. Monitoring for and communication of potential changes are part of the piloting and evaluation task and will be addressed accordingly.

Section 1.1 of this deliverable introduces the general piloting and validation plan, starting with the definition of the validation goals. The project has two core validation goals, to **(1)** validate the learning content and learning methods (didactical and pedagogical concepts) developed and applied in the project, and **(2)** to validate the certification scheme developed during the project. To achieve this, a set of validation criteria to validate against has been defined (Interactivity, Collaboration, Pedagogy, Content, Technology, Usability, Motivation, Assessment and Support for Learners). Furthermore, the key stakeholders to be addressed for validation have been identified to be **(1)** the learners participating in pilot interventions (Trainers/Teachers on primary, secondary and vocational levels) and **(2)** Project stakeholders (Project partners, Pilot organisations, Project advisory board, Community of practice).

As the core concept for validation, an iterative **participatory evaluation** approach[1] has been chosen that utilises project stakeholders to iteratively assess and interpret the outcomes and results of validation activities, based on **qualitative and quantitative data** that is collected during validation events from learners. Participatory evaluation has been chosen over purely data-driven and statistical validation because of inherent characteristics that would limit the significance of statistical analysis. The type of research performed in the project, as well as the real-world characteristics in teacher education mandate that results can be piloted only with an indicative number of pilot studies, each performed on an indicative group of participants from the relevant target group. The number of data samples collected during piloting will allow experts to perform assessments and draw conclusions during validation, but will not be large enough to justify validation based on purely data-driven or statistics-based analysis methods. However, data from piloting activities will be analysed using relevant quantitative, statistical, and qualitative methods to ensure a solid, data-driven foundation for a consensus-based outcome in participatory evaluation.

Section 1.2 lists the core validation events to test project developments and collect qualitative and quantitative feedback from the learners. The events are organised as interventions in which learning content and methods are used to train teachers/trainers.

[1] Guijt, I. (2014, September). Participatory Approaches. UNICEF OFFICE OF RESEARCH. https://www.betterevaluation.org/sites/default/files/Participatory_Approaches_ENG.pdf

This is planned iteratively in 2 cycles with feedback analysed in between cycles and the results integrated in project developments for cycle 2. The piloting organisations are relevant teacher and trainer education organisations for primary, secondary and vocational training (VET) (either project partners or external collaborators). The piloting organisations are:

Table 1: ComeThinkAgain piloting organisations

	Short name	Country	Target group
Pädagogische Hochschule Steiermark	PHST	Austria	Primary and secondary teachers
Tartu Unikool	UT	Estonia	secondary teachers
Pädagogische Hochschule Zürich	PHZH	Switzerland	primary teachers
Mercantec	Mercantec	Denmark	VET trainers
Deutscher Volkshochschul-Verband	VHS Verband	Germany	VET trainers
Industrielle Berufslehren Schweiz	Libs	Switzerland	VET trainers
Die Wiener Volkshochschulen	VHS Vienna	Austria	VET trainers

Stakeholder engagement (project partners, pilot organisation, project advisory board and community of practice) are planned at key points in the project to discuss and evaluate the data collected in pilot interventions, and draw conclusions leading to iterative improvements and final results, following the iterative participatory evaluation outlined in Section 1.3.

Section 2 details the means of data collection during pilot interventions. This includes **pre-, post- and certification tests** (qualitative) to assess knowledge, skill and attitude gain, **questionnaires** (combined qualitative and quantitative) to assess learning experience and certification scheme as well as **interviews** (qualitative) to assess learning experience and certification scheme. Additionally, an **intervention report** (qualitative) by the trainers conducting the intervention will be prepared to assess impressions about learning experience and certification scheme from the perspective of the teachers/trainers conducting the interventions.

Section 3 details the means of data preparation that can be used to pre-process raw data and help experts to interpret the data. Those methods include **paired samples t tests, visual representation** of data (for quantitative data in tests and questionnaires) and **text coding** as well as **qualitative content analysis** (for qualitative questionnaire and interview data).

Section 4 discusses how data can be prepared and presented to the different stakeholders in different phases of the project. This includes the presentation of outcomes to project partners, pilot organisations, advisory board and community of practice in different key phases of the project. Main forms of presentation will be **pre-processed data** (according to the methods introduced above), **presentations** and **reports**. Further target groups relevant for dissemination of project results are the scientific community and the general public. The scientific community will be addressed through **scientific publications** based on the results presented in the relevant project reports. The general public can be engaged through the usual means of communication and dissemination (e.g., newsletters, social media), providing **high-level abstractions and visualisations of key results**, and references to more detailed project reporting for the interested audience.

This deliverable contains several Annexes that provide additional material to help design various piloting and validation activities. Annex A contains a visualisation of the piloting framework and timeline that helps to better understand the requirements for the different phases of piloting. Annex B contains a draft schedule for organising a piloting intervention to give piloting organisations a rough overview of the different elements that are expected to be included in an intervention, especially those activities needed for validation. Annex C contains a template for informed consent to collect anonymised data from participants during interventions. Annex D contains a first draft for a questionnaire to collect feedback during pilot interventions, and Annex E contains draft interview guidelines to assist in conducting interviews during pilot interventions.

Future work will focus on monitoring the implementation of the piloting plan specified in this document, and to make sure that the relevant outcomes and results are made available in the different project phases according to the piloting plan. Furthermore, any potential changes to the piloting plan that may be necessary after gaining a better understanding of the requirements in later project phases will be monitored and communicated to the relevant stakeholders.

1. Piloting and Evaluation Concept - Overview and Timeline

The evaluation of the project has been split into 5 phases, briefly outlined in this Section. A visual outline of the validation plan including time line can be found in Annex A of this deliverable.

1.1. Phase 1 - Project validation plan development (between M1 and M12 of the project)

This phase deals with the development of the project's validation plan which in its final iteration is published thorough this deliverable. The major outcomes of this phase are the definition of validation goals (Table 2) and validation criteria (Table 3) for the project and the identification of the stakeholder groups (Table 4) considered by the validation.

Table 2: ComeThinkAgain validation goals

Validation goals	
Validation goal 1: Validate learning content and methods developed during the project	The goal is to develop a validation framework that allows to evaluate the relevance and quality of the learning content and methods (including proposed pedagogical and didactical concepts) with relevant stakeholder groups.
Validation goal 2: Validate the certification scheme developed during the project	The validity of the certification scheme developed in the project is to be validated. The validation goal is to assess the effectiveness for certifying the learned skills this project focuses on. The developed validation framework is to be able to assess the relevance and quality of the proposed certification scheme in this context.

Table 3: ComeThinkAgain validation criteria

Validation criteria	
Interactivity	Engagement and active participation required from learners throughout the interventions (including, for instance, interactive elements, hands-on activities and exercises as part of the developed learning content)
Collaboration	Opportunities for learners to work together and learn from each other (e.g., including group projects and exercises or discussion forums)
Pedagogy	Learning methods applied, comprising a well-balanced combination of didactical and pedagogical concepts, ensuring that the course design aligns with established learning theories and best practices in education (i.e. constructionism, self-regulated learning, cooperative learning, E-learning)
Content	Encompasses the subject matter, materials, and resources provided, i.e., high-quality, inclusive, and connected learning content, embedded in a state-of-the-art learning management system; accurate, relevant, and up-to-date content that aligns with the defined learning objectives
Technology	Learning tools and the learning management system used to deliver training and certification (i.e., appropriate technologies that support the learning objectives and enhance learning)
Usability	Mainly relates to the ease of use and navigation of the used learning management system (i.e., an intuitive and user-friendly interface that minimizes cognitive load)
Motivation	Engage and inspire learners to actively participate (i.e., incorporating motivational elements such as gamification, real-world relevance or storytelling)
Assessment/Certification	Mainly focuses on the certification scheme and the certification process but also includes aspects like learner self-assessment and learning progress
Support for Learners	Encompasses the resources and assistance available to help learners succeed; this includes mechanisms such as tutorials, FAQs, or access to trainers in the online learning phases

Table 4: ComeThinkAgain validation stakeholders

Stakeholder groups relevant for validation	
Learners participating in pilot interventions (Trainers/Teachers on primary, secondary and vocational levels)	The learners to participate in pilot interventions, testing the project developments, have been identified and narrowed to include trainers/teachers on primary, secondary and vocational levels. The project has adopted a train-the-trainer approach, which should assess if the learning content and certification framework developed during the project will give the trainers/teachers the necessary skills as

	educators in order to pass on the knowledge to their students and trainees.
Project stakeholders (Project partners, Pilot organisations, Project advisory board, Community of practice)	The validation framework needs to include measures to collect feedback from the relevant stakeholder groups in each key project phase. This will ensure that the input from stakeholder groups can be considered in project validation and help to shape project developments.

Based on this, a draft validation plan that allows to validate the project's developments with the identified stakeholder groups has been designed. Several iterations of improvement have been integrated based on the feedback of relevant stakeholders, including the project partners as well as the project's advisory board through the scheduled advisory board workshop for which the outcomes are reported in the first intermediary version of project deliverable D3.2.

At the time of writing of this deliverable, Phase 1 has been concluded with the final outcome being this deliverable D3.1 detailing the project's validation plan.

1.2. Phase 2 and Phase 4 – First and second cycle of pilot interventions (M19-M25 and M28-M34 of the project)

The validation plan includes two cycles which have been designed to pilot the project's developments, in a first iteration in **cycle 1 (M19-M25)** and in a second iteration in **cycle 2 (M28-M34)**. The piloting in each cycle addresses the learning content and learning methods developed in the project, as well as the certification process. Each piloting event in both cycle 1 and cycle 2 includes a variety of data collection for validation purposes, which will be further specified in Section 2 of this deliverable (methods for data collection). This section focuses on planning how and when project developments will be piloted with the relevant learners by the organisations tasked with piloting. Table 5 summarises the piloting plan.

Table 5: ComeThinkAgain piloting plan

Piloting organisation	Country	Piloting Cycles			
		Cycle #	Time line	Expected # of participants	Target group
PHST	Austria	Cycle 1	10/2025 - 04/2026	15-23	Primary and secondary teachers
		Cycle 2	09/2026 - 01/2027	15-23	Primary and secondary teachers
UT	Estonia	Cycle 1	10/2025 - 04/2026	15-25	Secondary teachers

		Cycle 2	09/2026 - 01/2027	15-25	Secondary teachers
PHZH	Switzerland	Cycle 1	10/2025 - 04/2026	15-25	Primary teachers
		Cycle 2	09/2026 - 01/2027	15-25	Primary teachers
Mercantec	Denmark	Cycle 1	10/2025 - 04/2026	10-15	VET trainers
		Cycle 2	07/2026 - 01/2027	10-15	VET trainers
VHS Verband	Germany	Cycle 1	10/2025 - 04/2026	10	VET trainers
		Cycle 2	07/2026 - 01/2027	10	VET trainers
Libs	Switzerland	Cycle 1	10/2025 - 04/2026	5-10	VET trainers
		Cycle 2	07/2026 - 01/2027	5-10	VET trainers
VHS Vienna	Austria	Cycle 1	10/2025 - 04/2026	7-15	VET trainers
		Cycle 2	07/2026 - 01/2027	0-8	VET trainers

In cooperation with WP2 (development of the learning content and learning methods), a list of content micro-modules to be developed for each target group has been identified. This is summarised in Table 6. An overview of the content modules to be piloted in each cycle is visualised in

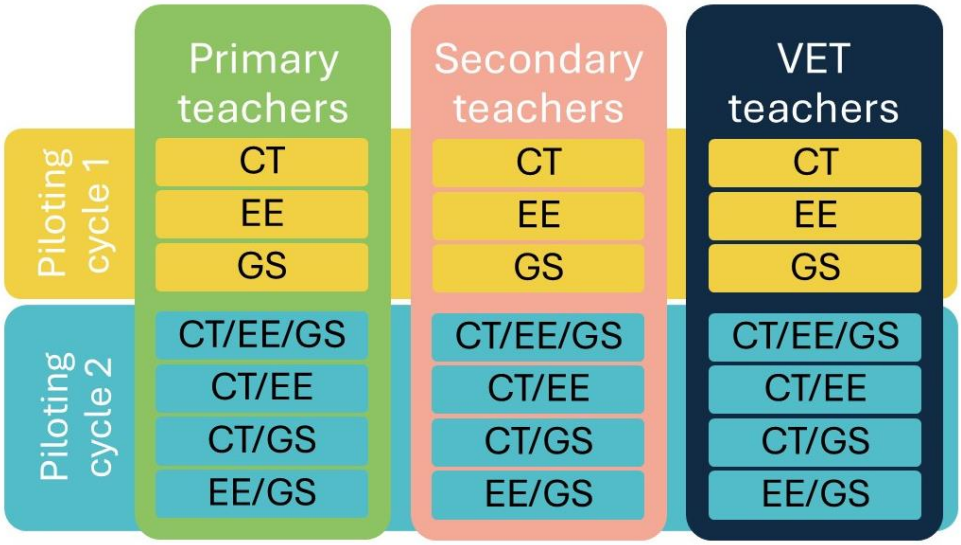


Figure 1.

It was decided through discussion with the project partners and the project's advisory board that modules developed to be piloted in cycle 1 include a 1 ECTS content module for each of the content pillars computational thinking, entrepreneurship and social responsibility & green skills (CT, EE, GS) for each of the three pilot target groups

(primary teachers, secondary teachers and VET trainers). This results in 9 ECTS worth of content modules all together. Following the pilot plan laid out in Table 6, each content module will be piloted at least once.

For cycle 2, the content focus of micro-modules will shift to content areas at the intersections of either two or all three content pillars (CT, EE, GS). 9 ECTS of content modules at the intersection of 2 pillars, and 3 ECTS of content modules at the intersection of 3 pillars will be developed. Which piloting organisation is to pilot which content module for cycle 2 will be fixed at a later stage in the project, when more experience from cycle 1 is available. It will be ensured that each module developed for cycle 2 is piloted at least once.

Table 6: ComeThinkAgain micro-modules to be piloted

Micro-module ID	Content Pillar/ Intersection	# ECTS	Pilot cycle	Target group	Piloting organisation
1	CT	1	Cycle 1	Primary teachers	PHZH
2	CT	1	Cycle 1	Secondary teachers	PHST, UT
3	CT	1	Cycle 1	VET trainers	VHS Verband, VHS Vienna
4	EE	1	Cycle 1	Primary teachers	PHZH
5	EE	1	Cycle 1	Secondary teachers	UT
6	EE	1	Cycle 1	VET trainers	VHS Vienna
7	GS	1	Cycle 1	Primary teachers	PHST
8	GS	1	Cycle 1	Secondary teachers	PHST
9	GS	1	Cycle 1	VET trainers	Mercantec, Libs
10	CT/EE/GS	1	Cycle 2	Primary teachers	TBD[2]
11	CT/EE/GS	1	Cycle 2	Secondary teachers	TBD

[2] The piloting organisations for each module developed for cycle 2 will be defined after insights from evaluation of cycle 1 are available. It will be ensured that each module will be piloted at least once.

12	CT/EE/GS	1	Cycle 2	VET trainers	TBD
13	CT/EE	1	Cycle 2	Primary teachers	TBD
14	CT/GS	1	Cycle 2	Primary teachers	TBD
15	EE/GS	1	Cycle 2	Primary teachers	TBD
16	CT/EE	1	Cycle 2	Secondary teachers	TBD
17	CT/GS	1	Cycle 2	Secondary teachers	TBD
18	EE/GS	1	Cycle 2	Secondary teachers	TBD
19	CT/EE	1	Cycle 2	VET trainers	TBD
20	CT/GS	1	Cycle 2	VET trainers	TBD
21	EE/GS	1	Cycle 2	VET trainers	TBD

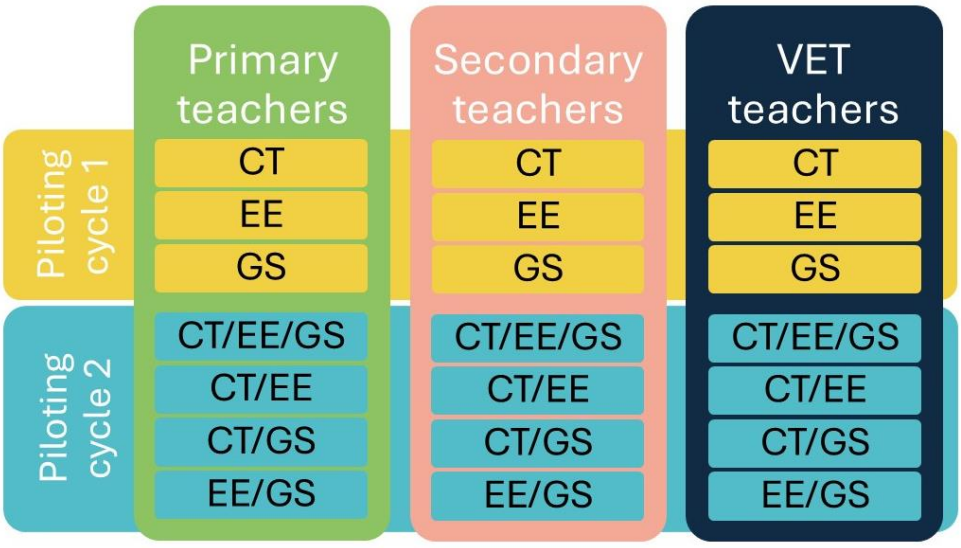


Figure 1: Overview of content modules to pilot in cycle 1 and cycle 2

Each piloting session has been planned as an intervention that includes all the necessary elements for teaching, certification and validation data collection. The elements contained in such a session are highlighted in Table 7, and a draft schedule template to organise such an intervention is provided in Annex B. This draft schedule is intended to guide each piloting organisation to prepare individual piloting sessions and adapt them to their needs. Aside from the teaching which is of course the main focus, each session should

include a pre-test to assess the knowledge, skill and attitude of the participants before a session, as well as a post-test to validate learning outcome in those areas. A separate certification test is to be scheduled to certify and proof that participants achieved the learning objectives of the respective micro-module according to the developed certification scheme (project deliverable D4.3). Additional data collection for validation purposes includes a questionnaire issued to all participants at the end of the event, as well as the conducting of interviews with selected participants and an intervention report compiled by the trainers/teachers conducting the intervention. The individual sessions can be in presence, virtual, or a hybrid event across the different days of the intervention – the piloting organisation is free to choose the best suitable format for their individual context.

Table 7: ComeThinkAgain building blocks for pilot interventions

Intervention building blocks	
Introduction	Introduction of not only the educational goals, but also the special context of the intervention also being used for scientific evaluation of project outcomes. Introduction of the procedures of how the intervention is conducted, including introduction (and signing) of the informed consent form for anonymised data collection.
Pre-test	Test to assess prior knowledge, skills and attitude in order to be able to assess and validate the learning outcomes. Guidelines about how the testing should be conducted can be found in Section 2.1 of this deliverable.
Learning sessions	The main focus of each intervention are of course the learning sessions in which the learning content is presented according to the learning methods proposed by the project.
Post-test	A test to assess the knowledge, skills and attitude after the learning sessions. This test has to be the same as the pre-test in order to evaluate learning success. Guidelines about how the testing should be conducted can be found in Section 2.1 of this deliverable.
Certification test	An additional test that, on success, will grant the learner a certificate according to the certification framework developed by the project. This test needs to be different from the pre- and post-tests in order to not influence the testing criteria for certification. Certification testing will be discussed in more detail in the relevant project deliverable D4.3 - Concept for assessment and certification.
Questionnaire	A questionnaire to help the project assess **(1)** the learning experience (learning contents and methods) **(2)** the certification scheme developed by the project Guidelines about how the questionnaire should be conducted can be found in Section 2.2 of this deliverable.
Interviews with selected participants	In addition to the questionnaire, an additional element of data collection are interviews with selected participants, again to help the project assess **(1)** the learning experience (learning contents and methods)

	(2) the certification scheme developed by the project Guidelines about how such interviews could be conducted can be found in Section 2.3 of this deliverable.
Intervention report	To collect feedback from not only the learners participating the intervention, but also from the teachers/trainers conducting the intervention, a report according to guidelines as laid out in Section 2.4 needs to be prepared after each intervention.

The main outcome of both Phase 2 and Phase 4 in the context of validation is the data collected for the purposes of validation using tests, questionnaires and interviews (as detailed in Section 2), which is to be processed in Phases 3 and 5 to assess the validation outcomes.

1.3. Phases 3 and 5 – Qualitative and quantitative evaluation of the first and second cycle of pilot interventions (M26-M28 and M23-M36 of the project)

After data collection from the pilot interventions in cycle 1 and cycle 2 is completed, the collected data will be analysed and conclusions will be drawn based on the results. In M26-M28, the data from piloting cycle 1, and in M23-M36 the data from piloting cycles 1 and 2 will be considered. The methodologies as to how the data will be analysed will be further specified in Section 3 of this deliverable, and the methodologies used to prepare and present the results are discussed in Section 4 of this deliverable.

In phase 3, the main objective is to derive outcomes from the first piloting cycle that will help to shape and improve the project developments towards the second piloting cycle. Analysis is based on the qualitative (questionnaires, interviews, intervention reports) and quantitative (pre-test, post-test and certification test) data collected during the individual pilot interventions, using the methods for data analysis (Section 3) and data preparation/presentation (Section 4).

A draft validation report will be compiled that assesses the achievement of the validation goals based on the available data. The draft validation report will be subjected to the feedback from relevant project stakeholders (project partners, piloting organisations, advisory board, community of practice) before making a revised validation report available to the project to help guide the project developments towards the second piloting cycle.

Similarly, for phase 5 the main objective is to derive outcomes from the second piloting cycle that will allow to report the final project validation outcomes. Analysis is based on the qualitative (questionnaires, interviews, intervention reports) and quantitative (pre-test, post-test and certification test) data collected during the individual pilot interventions, using the methods for data analysis (Section 3) and data preparation/presentation (Section 4). Like for phase 3, in phase 5 a draft validation report is planned that will be subjected to the feedback of relevant project stakeholders (project partners, piloting organisations, advisory board, community of practice). This will be the basis for the two deliverables reporting on the validation outcome of the project: D3.3 (Pilot findings and evaluation results, M36) and D3.4 (Audit guideline, M36).

2. Methods for data collection

In this Section we briefly describe the methods of data collection identified to be relevant for project validation, and how they are intended to be used in different project activities. The main methods of data collection identified are tests (pre- and post-tests to be able to assess learning outcomes, and certification tests), questionnaires to be able to collect quantitative feedback from participants, and interviews as a less structured way to collect feedback from participants. Feedback from the trainers/teachers conducting the intervention is collected through intervention reports. We provide guidelines and, where relevant, templates for data collection. The effectiveness of the data collection methods will be assessed as part of the validation after the first piloting cycle, and will be adapted if necessary for the second piloting cycle.

With the exception of the certification test, all data collection will be achieved in anonymised form. For this, each participant will be handed a printed paper with a random code that has to be noted on the pre-test, the post-test, the questionnaire and for the interview. The participants should be asked to discard the paper with the random code at the end of the intervention. This way, data collected through each instrument can be uniquely classified through the code, but the project has no means of uniquely identifying the individual behind the code.

At the beginning of each intervention, the participants will be informed about the methods of anonymised data collection, and are asked to sign an informed consent. A draft consent form can be found in Annex C of this deliverable.

2.1. Testing

The testing instrument is used for 2 main purposes in the context of the ComeThinkAgain pilot interventions:

1. To be able to assess learning outcomes of participants, knowledge, skill and attitude prior to and after a learning session is assessed through testing. For this, participants need to complete the same test twice, and any improvement of test scores after the sessions indicates positive learning outcome. Pre- and post-tests can contain 2 elements: **(a)** questions regarding content, which requires knowledge of the topic area in order to be answered correctly; **(b)** an element of self-assessment that asks how a participant perceives their knowledge, skills and attitude in the topic area without questioning concrete knowledge aspects.
2. To be able to assess knowledge, skill and attitude for certification, and subsequently the validity of the certification process, each intervention needs to conduct a certification test that is independent from the pre- and post-test in order to not influence the validity of the certification outcome. The certification framework will be specified in D4.3.

Tests are to be performed by the organisers/trainers of interventions, based on testing templates provided by the project. To ensure that test material is available for the interventions that fulfils the criteria of the project, we provide guidelines for each content micro-module developed in the project to provide a set of test questions to be used for pre- and post-tests as well as certification tests. We acknowledge that different content areas may require different testing approaches in order to ensure the best possible learning outcome, and that there may be micro-modules for which a different testing strategy would be more suitable. However, in the project we not only need to ensure the best possible testing experience, but also comparable test results across micro-modules to enable wider project validation. Therefore, it is important for each micro-module to follow those guidelines.

We derive our testing guidelines from the well-established ICDL (International Certification of Digital Literacy[3]), a certification scheme in which some of the project partners are actively involved in. ICDL is a globally recognised certification programme that verifies an individual's proficiency in essential computer skills. ICDL was established in 1997 and has provided over 17 million certificates for participants improving their digital literacy skills, in more than 100 territories world-wide. Each ICDL module is supported by at least 2 independent testing streams, each comprised of a set of questions. As a general rule, each knowledge item addressed in a content module is to be covered by at least one test question in each testing stream[4]. In this context, a guideline document ('CTT – Characterisation Test Template') outlining the rules for certification and test question development is provided to ICDL operators.

We think that the procedures of the ICDL certification scheme are an ideal basis for the ComeThinkAgain certification scheme, given the maturity and long-term success of ICDL over the years. However, since validation of the certification scheme is one the key goals of the project, potential short-comings of this approach will be assessed with project stakeholders and during piloting, and an alternative will be proposed in case something more suitable emerges. Table 8 summarises the testing scheme proposed for ComeThinkAgain. Those guidelines may be further developed before the deliverable D4.3 - Concept for assessment and certification (M18) is delivered.

Table 8: ComeThinkAgain test development guidelines (based on ICDL guidelines)

Learning goals to test	The syllabus of an ICDL module provides learning goals, test questions are created on the basis of the syllabus
Number of testing streams	At least 2 (1 demo stream + 1 testing stream)
Duration of test	45 Minutes for trainers and 60 minutes for trainees
Number of questions per stream	No fixed number, but there should be at least 1 question per knowledge item (as a minimum requirement, 75% of the knowledge items should be covered by questions)
Type of questions	Single-choice, multiple-choice, in-application testing; the type of testing instrument and questions relies on testing providers, in concert with national operators and the ICDL foundation
Testing procedure	Tests are conducted in controlled environments offered by testing providers, on dedicated testing hardware.

2.2. Questionnaire

The questionnaire instrument is used for the purpose of collecting data regarding the learning and certification experience of learners. Each participant in an intervention is

[3] https://icdl.org/about-us/

[4] As an additional option, it is possible to assign different priorities to different knowledge items. It is legitimate to have lower priority items represented only in one testing stream.

asked to fill in a brief questionnaire after both the learning sessions (including pre- and post-test) and the certification test are completed. The questionnaire is designed to assess project developments according to the validation criteria of the project (assess Interactivity, Collaboration, Pedagogy, Content, Technology, Usability, Motivation, Assessment and Support for Learners). To achieve this, 4 major categories to assess project developments have been identified, listed in Table 9.

Table 9: ComeThinkAgain questionnaire categories

Content areas	Assess aspects related to learning content and content areas (validation criteria: Interactivity, Collaboration, Content, Technology, Usability)
Pedagogical concepts	Assess aspects related to the learning methods used to deliver the learning content (validation criteria: Interactivity, Collaboration, Pedagogy, Motivation, Support for Learners)
Certification	Assess aspects relating to the certification scheme (validation criteria: Technology, Usability, Assessment)
General impressions	Assess the broader implications of the ComeThinkAgain project outcomes with learners that are not yet covered by the more restrictive validation frame of the previous three categories.

A draft questionnaire addressing those aspects that has been designed with the input of the relevant project stakeholders (project partners, piloting organisations) is attached in Annex D of this deliverable. This draft may still evolve before the start of piloting cycle 1 based on the progress of the project to that point, and may also be adapted before the start of piloting cycle 2 based on the insights and validation outcomes from cycle 1.

2.3. Interviews

The interview instrument is, similar to the questionnaire instrument, used for the purpose of collecting data regarding the learning and certification experience of learners. The difference being that with interviews, a different atmosphere is created that allows for collecting boarder feedback from selected participants based on the experiences and impressions of the sessions. Compared to the questionnaires, an interview is more open and allows the interviewer to engage with the interviewee in a more spontaneous way and to direct the interview based on the answers received from the interviewee.

The interview method we propose is to conduct **qualitative, semi-structured interviews**, which are structured along guiding questions. The guiding questions might be similar to the open-ended questions in the questionnaire. The main goal is to capture qualitative feedback through the interview that may not have been anticipated through the questionnaire. A representative number of participants should be interviewed and, if possible, the interviews should be concluded directly after the sessions. The number of interviews depends on the study's goals, participant diversity, and available resources. The focus should be on the depth and quality of analysis rather than a fixed number of interviews. Therefore, as a good practice, we recommend that around 10% of participants should be interviewed per intervention[5]. The interviews should be directed by

[5] National Centre for Research Methods Review Paper. (Accessed: 2025, March) How many qualitative interviews is enough?. https://eprints.ncrm.ac.uk/id/eprint/2273/4/how_many_interviews.pdf

the interviewer in the way they perceive it to be most valuable, but the project can provide guiding principles to help the interviewer conduct the interview in a fruitful way.

As a good practice, the interviewer should be prepared to make an audio recording of the interview, which will simplify later transcription of the interview. Interviewers should be appointed by the organiser of the intervention. Transcription should be provided in English language. Audio recordings are to be deleted after transcription. Any parts that contain information that allows to personally identify the interviewee should be removed from the transcript before it is provided to the project.

Table 10 provides a check-list that should be covered during the interview. Annex E contains a set of guiding questions that can be used during the interview to foster the conversation.

Table 10: ComeThinkAgain interview check-list

Interview check-list	
Before the interview	• Thank the interviewee for their time, and introduce yourself • Introduce the context of the interview • Assure that the interviewee has already signed the informed consent, and re-assure that the collected information is strictly anonymous • Ask if the interview can be recorded so that it is easier to transcribe • The interview should not take longer than 30 minutes
During the interview	• Note the start time of the interview • Announce that recording starts before pressing the record button (if the interviewee has allowed recording) • Before starting the interview ask the interviewee to state the anonymisation code for later identification • Conduct the interview
After the interview	• State the end of the interview before stopping the recording • Note the end time of the interview • Thank the interviewee again for their time before they leave • Prepare written notes of the interview that include the interviewers' key impressions and findings

2.4. Intervention Report

As opposed to the test, questionnaire and interview instruments which are designed to collect feedback from intervention participants, the intervention report is designed to provide an additional source of feedback that is not covered by the other instruments: The impressions of the trainers/teachers conducting the intervention. It is designed to be qualitative in nature, but is expected to be a streamlined and structured report as the trainers/teachers writing the report are part of the project and are aware of the type of insights the project is interested in. To achieve this, a structured template will be provided structuring the feedback. Aside from more formal/administrative aspects of reporting (e.g., agenda and minutes of the event, number of participants), the template will also focus on collecting impressions according to the project's evaluation criteria in the areas the related to core project developments. Similar to the guidelines for the questionnaire, this will include the aspects listed in Table 11.

Table 11: ComeThinkAgain intervention report categories

Content areas	Observations relating to learning content and content areas (validation criteria: Interactivity, Collaboration, Content, Technology Usability)
Pedagogical concepts	Observations relating to the learning methods used to deliver the learning content (validation criteria: Interactivity, Collaboration, Pedagogy, Motivation, Support for Learners)
Certification	Observations relating to the certification scheme (validation criteria: Technology, Usability, Assessment)
General impressions	Other observations that are not yet covered by the more restrictive validation frame presented for the previous three categories.

3. Methods for data analysis

The ComeThinkAgain validation approach is rooted in **iterative participatory evaluation** rather than data-driven/statistics-based validation. The project has planned the measures to follow this approach both in the partner set-up as well as in the work plan. Regarding the partner set-up, a diverse project consortium with expertise in all relevant aspects of the subject matter has been selected. Additionally, an external advisory board with complementary expertise as well as the establishment of a community of practice to bundle this expertise in the long-term have been assembled. The work plan includes appropriate measures to derive consensus-based outcomes with input from relevant project experts, the advisory board (task T3.2), and the community of practice (task T5.4). The various measures have been highlighted in the project piloting and validation plan in described in Section 1 and visualised in Annex A of this deliverable.

What we want to achieve in the validation of this project is that experts will get the best possible basis for reaching a consensus on how outcomes of validation activities are to be interpreted. For this, raw data collected during validation activities is to be presented in an unbiased way to the experts in order to allow them to draw conclusions. The raw qualitative and quantitative data collected from the study subjects (as described in Section 2 of this deliverable) will be pre-processed according to common methods, depending on the nature of the data collected. The most relevant data pre-processing methods for each individual data source are presented in Table 12. While we assume that those are the most relevant data pre-processing methods, this is not an exhaustive list and subject to change once the piloting efforts of the project progress.

Table 12: ComeThinkAgain data analysis methods

Pre- and post-test	A common method to process pre- and post-test results is the **paired samples t test** method, allowing check for a statistically relevant difference between paired observations with e.g. an intervention in between the two times. For the paired samples t test, there is no requirement for minimum sample size so it is applicable to the characteristics of the ComeThinkAgain pilots, but a concern with low sample sizes is low statistical power. This needs to be considered in data analysis.

	Visual representation of pre- and post-tests results is also a good way to help visualise the gains in knowledge, skill and attitude. Two good ways to visually represent gains is per questions (visualise the average number/percentage of correct answers for each question before and after the intervention) or per participant (average number/percentage of correct questions per participant before and after the intervention).
Questionnaire	The Questionnaire designed for ComeThinkAgain piloting will contain a mixture of quantitative data (Likert scale questions) and qualitative data (free-form responses to questions). Both types will be pre-processed to form a basis for expert analysis. For Likert scale questions, the raw data will be pre-processed to provide a **visualisation** of the number/percentage of responses for each point on the scale. Free-form answers are more difficult to process, but methods like **text coding** allows to structure answers into relevant categories that make it easier for experts to draw conclusions from the free-form data collected. **Qualitative content analysis** (see Interviews below) may be applicable as well, but is likely not required for the type of open-ended questions asked for in the questionnaire.
Interviews	Interview data can be challenging to analyse due to its free-form and open-ended nature. Qualitative content analysis[6] is a common method for processing interview data. It is an interpretative approach that aims to systematically analyse text data to identify themes, patterns, and meanings.
Intervention report	The intervention report captures the impressions and experiences of the individuals/organisation conducting the intervention. It will already be provided in a structured form by project partners/experts familiar with the ComeThinkAgain project and its goals. We expect the intervention reports to be used for project validation without further pre-processing, other than grouping the feedback in the individual categories from each report together for easier comparison.

4. Data preparation and presentation of results

To ensure a solid basis for project collaboration and iterative participatory evaluation, as well as effective dissemination of project results, it is important that validation outcomes are made available in the different stages of the project. This Section summarises the

[6] https://qualitative-content-analysis.org/

key points in the project where results or partial results need to be available to be able to engage with relevant stakeholder groups, as listed in Table 13.

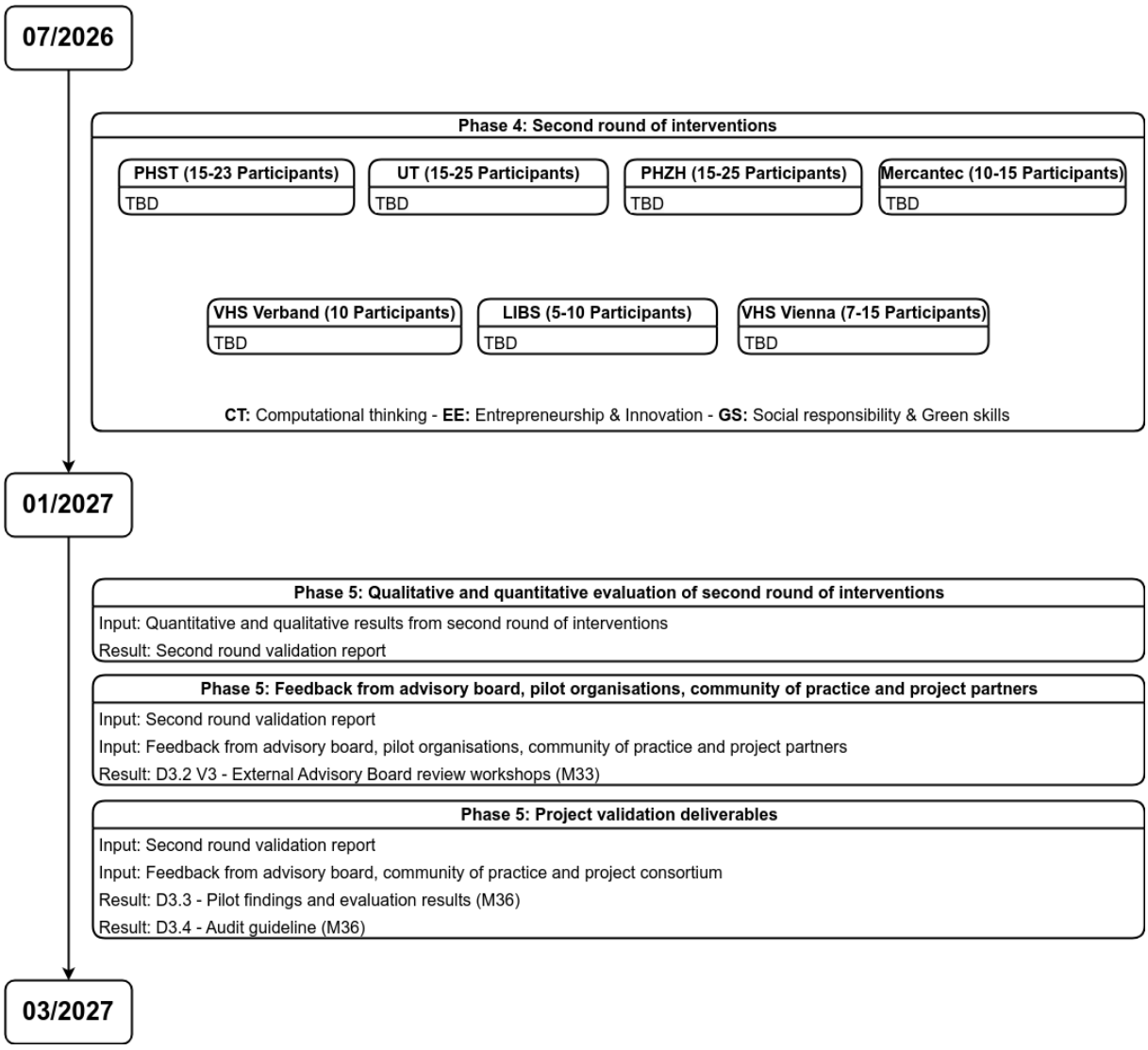
Table 13: ComeThinkAgain data preparation and presentation summary

Project partners	Project partners are an integral part of the collaborative and iterative participatory evaluation of results. To ensure effective collaboration, pre-processed data according to the data analysis methods presented in Section 3 need to be made available. The analysis takes place in piloting phase 3 for the first cycle (between 04/2026 and 07/2026) and piloting phase 5 for the second cycle (between 01/2027 and 03/2027). The approach is to first provide the pre-processed and visualised data of the individual data sources collected, as presented in Section 3. **Work sessions between the project partners** will be performed according to the project plan, assessing the data and allowing to iteratively form a first draft of the participatory evaluation outcome. This will be reported and presented in internal project reports – **First round validation report** (for phase 3) and **Second round validation report** (for phase 5).
Pilot organisations/ Advisory Board/ Community of Practice	Other core stakeholders that are part of the iterative participatory evaluation are piloting organisations, the advisory board and the community of practice. To ensure effective collaboration with those stakeholders that are not as closely associated to the project as the project partners are, it is important that they are approached with a clear analysis of the situation, based on the results achieved in the relevant phase of the project in order for the stakeholders to be an effective part of participatory evaluation. The relevant interactions with those stakeholders are to take place in piloting phase 3 for the first circle (between 04/2026 and 07/2026) and piloting phase 5 for the second circle (between 01/2027 and 03/2027). The approach is to engage the stakeholders in the relevant stakeholder activities that are part of the project plan (e.g. **advisory board meetings, community of practice meetings**). The shareholders are to be approached by presenting the core outcomes of the in each project phase, utilising **presentation slides** prepared from the

	outcomes presented in the validation reports. Additional material like the **validation reports** and **pre-processed data** collected in cycle 1 and cycle 2 will be made available. The final outcome and results of the validation will be presented in **D3.3 - Pilot findings and evaluation results** (M36 of the project).
Scientific community	The scientific community is not a core target group for project validation, but the dissemination of project results is a key part of the project plan – this includes the dissemination of validation outcomes. In this context, presentation of results will be achieved in the context of scientific publications utilising the project reporting in the different phases as a basis.
General public	The general public is not a core target group for validation, but communication of results to the general public is a key part of the project plan, including the communication of validation outcomes. In this context, communication will be achieved through the usual channels (newsletters, social media, …) using the most accessible validation results (core results, visualisations, …) with links to further material (project reports, scientific publications, …) for the interested audience. Activities will be coordinated with dissemination WP5.

Annex A – Visualisation of the piloting and validation timeline


04/2024
Phase 1: Project pilot and validation plan development
Validation goal 1: Validate learning material and pedagogic concepts developed during the project
Validation goal 2: Validate the certification scheme developed during the project
Target audience: Learners participating pilot interventions (Teachers/Trainers on primary, secondary and vocational levels), Stakeholders (Project partners, Pilot organisations, Advisory board, Community of practice)
Result: Piloting and validation plan concept
Phase 1: Feedback from advisory board, pilot organisations, community of practice and project partners
Input: Piloting and validation plan concept
Output: D3.2 V1 - External Advisory Board review workshops (M12)
Phase 1: Project piloting and validation plan
Input: Piloting and validation plan concept
Input: Feedback from advisory board, pilot organisations, community of practice and project partners
Output: D3.1 - Plan for experimental pilots' validation set-ups and evaluation concept (M12)
10/2025
Phase 2: First round of interventions
PHST (15-23 Participants)
MM2: CT (secondary
MM7: GS (primary teachers)
MM8: GS (secondary
UT (15-25 Participants)
MM2: CT (secondary
MM5 EE (secondary teachers)
PHZH (15-25 Participants)
MM1: CT (Primary teachers)
MM4: EE (Primary teachers)
Mercantec (10-15 Participants)
MM9: GS (VET trainers)
VHS Verband (10 Participants)
MM3: CT (VET trainers)
LIBS (5-10 Participants)
MM9: GS (VET trainers)
VHS Vienna (7-15 Participants)
MM3: CT (VET trainers)
MM6: EE (VET trainers)
CT: Computational thinking - EE: Entrepreneurship & Innovation - GS: Social responsibility & Green skills
04/2026
Phase 3: Qualitative and quantitative evaluation of first round of interventions
Input: Quantitative and qualitative results from first round of interventions
Result: First round validation report
Phase 3: Feedback from advisory board, pilot organisations, community of practice and project partners
Input: First round validation report
Result: D3.2 V2 - External Advisory Board review workshops (M23)
Phase 3: Intermediary reporting
Input: First round validation report
Input: Feedback from advisory board, pilot organisations, community of practice and project partners
Output: Revised first round validation report
07/2026


07/2026
Phase 4: Second round of interventions
PHST (15-23 Participants)
TBD
UT (15-25 Participants)
TBD
PHZH (15-25 Participants)
TBD
Mercantec (10-15 Participants)
TBD
VHS Verband (10 Participants)
TBD
LIBS (5-10 Participants)
TBD
VHS Vienna (7-15 Participants)
TBD
CT: Computational thinking - EE: Entrepreneurship & Innovation - GS: Social responsibility & Green skills
01/2027
Phase 5: Qualitative and quantitative evaluation of second round of interventions
Input: Quantitative and qualitative results from second round of interventions
Result: Second round validation report
Phase 5: Feedback from advisory board, pilot organisations, community of practice and project partners
Input: Second round validation report
Input: Feedback from advisory board, pilot organisations, community of practice and project partners
Result: D3.2 V3 - External Advisory Board review workshops (M33)
Phase 5: Project validation deliverables
Input: Second round validation report
Input: Feedback from advisory board, community of practice and project consortium
Result: D3.3 - Pilot findings and evaluation results (M36)
Result: D3.4 - Audit guideline (M36)
03/2027

Annex B – Draft schedule for pilot intervention workshops

This draft agenda should be seen as a guideline for the pilot organisations to organise their interventions and should ensure that all the building blocks of an intervention are considered. However, the pilot organisations should feel free to adapt the schedule to their individual needs.

Day 1

09:00-09:45	Introduction
09:45-10:30	Pre-test for project evaluation
10:30-11:00	Break
11:00-12:30	Learning/teaching session 1
12:30-13:30	Lunch
13:30-15:00	Learning/teaching session 2
15:00-15:30	Break
15:30-17:00	Learning/teaching session 3

Day 2 - X

09:00-10:30	Learning/teaching session 1
10:30-11:00	Break
11:00-12:30	Learning/teaching session 2
12:30-13:30	Lunch
13:30-15:00	Learning/teaching session 3
15:00-15:30	Break
15:30-17:00	Learning/teaching session 4

Final day

09:00-10:30	Learning/teaching session 1
10:30-11:00	Break
10:30-11:15	Post-test for project evaluation
11:15-12:30	Questionnaire
12:30-13:30	Lunch
13:30-15:30	Certification test
15:30-	Interviews with selected participants
After the event	Teachers/trainers conducting the intervention compile intervention report

Annex C - Informed Consent for anonymised data collection

Thank you for your willingness to not only participate in this training session of the ComeThinkAgain project that will increase your skills, but also to allow us to collect anonymised data that will allow us to assess the effectiveness of our work. ComeThinkAgain is a European Erasmus+ education project investigating the challenges and intersections of three project pillars: Computational Thinking Skills (C1), Entrepreneurship & Innovation Skills (C2) as well as Social Responsibility & Green Skills (C3). The project is striving to develop education content and establish education practices that foster independent, reflective, and cooperative competence acquisition. The project aims at developing a cross-sectoral, standardised training and certification system based on the three project pillars.

Our core mission is to increase your skills in selected topics relating to the project's content pillars. Aside from that, we do also have the responsibility as a research project to assess how good we are in fulfilling that mission. For this, we will collect data during this session that will allow us to assess your learning progress and learning experience. We will:

Conduct pre- and post-tests: This will help us to assess your learning progress, and allow us to identify where we need to improve the learning content.

Ask you to fill a questionnaire: This will help us to assess your learning experience, and allow us to identify where we can improve the learning environment.

Select some of you to conduct an interview at the end of the session: A different way of assessing your learning experience in order to help us improve the learning environment. It will last approximately 30 minutes.

All data collected will be strictly anonymous. We will not be able at a later point to identify the individual providing the data.

Please note that we also conduct a **certification test**. But that one is for you, not for us. It will not be used for validation purposes, only to be able to assess your skills and issue you a certificate accordingly. The certification test will not be anonymous in order to be able to issue you a certificate. Data will be retained in the certification system according to the procedures of the certification scheme.

Anonymisation procedure

We will issue you a random code at the beginning of the session. For the pre- and post-tests, the questionnaire and the interview you will be asked to provide this random code to be able to link them during analysis. It is important that you provide the same random code for all testing sessions. Please discard the paper copy of your random code after the session. Use of a random code discarded after the session will ensure that no individual can be linked to the data collected, ensuring the collected data is fully anonymised.

No personally identifiable information will be asked during the pre- and post-tests, the questionnaire or the interview. Please make sure that you do not provide any personally identifiable information during data collection.

Audio records

This is only relevant for the interview part. If you are selected for an interview, you will be asked explicitly for your consent to audio record the interview. If you indicate "yes", you are of course allowed to tell us to turn the recording off at any time and we can also stop the interview at any time if you want to. If you indicate "no", we will just take notes

of your answers. The audio recording will be used for the sole purpose of transcribing the interview. The audio will be deleted after transcription. The transcript will be anonymous (identified by the random code indicated above as the identifier). If information is shared during the interview that can be used to personally identify you, it will be removed from the transcript before storage.

Data Storage and Usage

The collected data will be stored securely on the project's server located within the EU, and will only be used in the context of the Erasmus+ research project ComeThinkAgain (Project ID 101139845). The purpose of data usage is to support the evaluation and validation of ComeThinkAgain project results with the intended target user group. Outcomes and findings based on the validation of the interview data will be part of project deliverables and (scientific) publications. Any results derived from the data are strictly anonymous.

Revocation of consent

You have the right to revoke consent to the use of your interview data at any time on request during the training session. But be advised that after the end of the training session, and once you have discarded the random identifier code, the project has no mean of identifying the information you provided. Therefore, any anonymised data collected as well as any published results and outcomes derived from the data you provided cannot be altered retrospectively. For any additional questions please send a formless email to info@comethinkagain.eu.

Consent

I hereby consent to the use of the information collected during the training session (pre- and post-tests, questionnaire, interview) for the purposes of ComeThinkAgain project evaluation and validation. I have understood that the collected information is to be fully anonymous and no personal identifiable information should be shared. I have understood that I can revoke my consent at any time during the training session, but that fully anonymised data collected cannot be deleted retrospectively.

Date, Name and signature

Annex D – Draft questionnaire for pilot intervention workshops

Content areas	**Basic questions**	
	How do you rate the content areas addressed in this course/module (1-5)	
	Did you identify any content areas that were missing and should be addressed in future?	
	Do you have any suggestions for future improvement of the content areas addressed in this course/module?	
	Specific questions	
	To what extent has the course/module improved your understanding of CT/EE/GS	
	Are there any topics or real-world examples you would have liked to see included?	
	Do you see opportunities to implement the content directly with your learners (students/trainees)?	
	If no: What additional content/knowledge would be necessary?	If yes: What was particularly helpful?
Pedagogic concepts	**Basic questions**	
	How do you rate the teaching methods used in this program (1-5)	
	Are there any aspects relating to the teaching methods that you specifically liked?	
	Do you have any suggestions to improve the teaching methods in future?	
	Specific questions	
	Which aspects of the module most positively influenced your motivation?	
	How effective were the teaching and training methods used in helping you understand and engage with the course content?	
	Was the balance between theory and practice appropriate for you? [1-5]	
	How helpful were the provided materials (videos, texts, exercises)? [1-5]	
	How engaging was the learning environment? [1-5]	

	Has this course/module changed your perspective on CT, EE, or GS? If so, how?
	How relevant and applicable are the teaching methods applied in this course/module to your teaching or training practice?
Assessment / Certification	**Basic questions**
	How do you rate the certification process [1-5]
	Do you think the certificate you obtained will be useful in your future activities? Please briefly explain.
	Do you have any suggestions to improve the certification process in future?
	Did you find the test appropriate in relation to the learning goals? [1-5]
	Was the difficulty level of the test appropriate for your target group (students, trainees, ..) later on? [1-5]
	Did you find the certification method appropriate? [1-5]
	Do you have suggestions to improve the certification method?
	Specific questions
	To what extent does the certification reflect the knowledge and skills gained during the workshop?
Usability[7]	**Basic questions**
	How intuitive was the learning platform to use? [1-5]
	Were there any technical problems or barriers to using the learning platform?
	Specific questions
	Which additional features or functions in the learning platform would you like to see?
	Which collaborative formats (e.g., group work, peer feedback, discussions, etc.) did you find most beneficial?
	Did the learning platform provide sufficient support features (e.g., help guides, error messages) to assist you in completing tasks efficiently?
General Impressions	**Basic questions**
	Now that you have completed the course/module how would you rate it overall? [1-5]
	Would you recommend the program to a colleague? (yes/no)
	Specific questions

[7] Optional: Also include usability questions regarding the learning platform

	The course is designed for approximately x hours of effort. How would you describe your actual time investment? (significantly/slightly more/less than x hours; about x hours)
	What are your personal key takeaways from this course/module?
	How would you rate the integration of online and face-to-face sessions? [1-5]
	How would you rate overall structure of the course/module (i.e. its synchronous and asynchronous combination)? [1-5]
	How well can you apply what you have learned to your own practice/work? [1-5]
	Do you have any further comments or suggestions?

Annex E – Draft interview guidelines for pilot intervention workshops

General

- In which area are you teaching (primary, secondary, VET)?
- Which subject(s) do you teach?
- What is your teaching experience / how many years of experience?
- What is your educational background?
- What factors motivated you to enrol in the module?
- How familiar were you with the topics covered in the module before participating?
- How do you currently encourage your students/trainees to develop skills in Computational Thinking/Entrepreneurship & Innovation/Social and "Green" Responsibility?

Content areas

- Did you acquire new competencies as a result of the module? If so, which ones?
- Was the level of complexity appropriate for your expertise? If not, what adjustments would you suggest?
- Were the learning materials and tasks well-structured and easy to understand?
- Were there any topics that you found especially valuable or that should be explored in greater depth?

Interactivity

- Which interactive components (e.g., quizzes, exercises, discussion forums) did you find particularly effective?
- Were there any interactive features that you felt were missing or could be improved?
- How would you assess the balance between passive and active learning activities?

Collaboration

- Which collaborative formats (e.g., group work, peer feedback, discussions, etc.) did you find most beneficial?
- What recommendations do you have for enhancing collaboration in future modules?

Motivation (of the learner/participants)

- Which aspects of the module most positively influenced your motivation?
- Were there any moments or aspects of the course where your motivation declined? If so, why?

- Did the course enhance your long-term interest in the subject matter?

Pedagogic concepts

- Were you able to extract concrete teaching methods applicable to your own classroom setting?
- Do you foresee integrating the content directly into your own teaching practice?
- How effective were the teaching and training methods used in helping you understand and engage with the course content?
- How do you plan to apply what you learned in your teaching practice?

Assessment/Certification

- How effective were the certification/assessment methods in validating your understanding and skills gained during the course?
- Were the certification/assessment methods (e.g., quizzes, reflection tasks) fair, relevant, and supportive of your learning?
- Would you prefer alternative or additional certification/assessment formats? If yes, please explain.
- Do you feel the certification/assessment methods used are applicable or transferable to your own professional context?

Support/Guidance

- How well-supported did you feel throughout the course/module?
- Were there moments when you felt additional support was needed? If so, in which areas?
- What additional support structures could improve the learning experience?

Usability

- How intuitive and user-friendly did you find the navigation and interface of the learning platform?
- Did you experience any moments of confusion or difficulty while using the learning platform?
- How effectively does the learning platform facilitate the integration of online and face-to-face sessions?
- Did the learning platform provide adequate tools to support interaction and collaboration across both online and face-to-face modalities?

General impressions

- What are your personal key takeaways from this course/module?
- Would you recommend this course/module to a colleague? Why (or why not)?
- Are there any aspects that you feel need urgent revision or improvement?
- What additional topics would you like to see covered in future courses/modules?

- To what extent did the course/module meet your expectations?
- Would you enrol in another course module from the ComeThinkAgain program? Why (or why not)?
- Do you have any further comments or suggestions?