The CRITHINKEDU European course on critical thinking education for university teachers: from conception to delivery

CRITHINKEDU
Critical Thinking Across the European Higher Education Curricula

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Executive summary and key findings

Within the scope of the CRITHINKEDU project[1], this intellectual output (Output 3) reports the experience of conceiving and delivering a European training course on Critical Thinking (CT) education for university teachers. It draws on the proposal of the "European inventory of critical thinking skills and dispositions for the 21st century" and the "Preliminary guidelines for quality in critical thinking education" - both presented in the two previous intellectual outputs of the project (Dominguez, 2018a, 2018b). This report is targeted to each leading partner institution or to any Higher Education (HE) institution which desire to later replicate this training course at the local level, to faculty staff interested in the

This report describes the experience of designing and conceiving a European training course on Critical Thinking (CT) education for university teachers

implementation of CT teaching practices and learning activities in their classroom. Deployments within the CRITHINKEDU project will be carried-out as part of the fourth and following intellectual output (Output 4).

The course herein described includes training sessions to promote and support quality teaching on CT. It provides educational resources and practical training activities within different key topics, such as learning design, teaching methods and CT assessment. By engaging teachers with effective instructional design principles, teaching strategies, and assessment criteria for CT, they were encouraged to integrate them in the daily teaching practice.

The first CRITHINKEDU course was open to a limited number of participants: each partner contacted an average of 4 university teachers for a total number of 65 participants (counting also the coaches) from 9 different European countries (Belgium, Czech Republic, Greece, Ireland, Italy, Lithuania, Portugal, Romania and Spain). The course took place in Rome (Italy) from the 29th of January 2018 to the 4th of February 2018.

Considered as a pilot experience, this course was more than a simple opportunity for group work and exchange of experiences among higher education teachers interested in CT education. Based on a post-course questionnaire, all the participants witnessed a high degree of satisfaction: 93% of the respondents appreciated the plenary sessions held during the course. The course proved useful to the professional practice of more than 80% of the participants. The participants evaluated the course as a useful way to significantly improve the following skills: Collaboration, Communication, Critical Thinking and, mainly, Instructional Design. More than 86% of respondents intend to use what they have learnt in the CRITHINKEDU course once back in their institution, and more than 74% of them would recommend this course to other colleagues.

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[1]For more information, please visit http://crithinkedu.utad.pt/en/crithinkedu/

The CRITHINKEDU course mainly confirmed the importance and utility of the "Preliminary proposal of guidelines for quality in CT education" according to the key points already highlighted in previous outputs (namely Output 1 and Output 2), as reported in the results of the post-course questionnaire submitted to all the participants. Namely, the results obtained showed a strong need to provide more teaching resources and practical examples to support the integration of CT educational practices at the course level. Moreover, participants were particularly concerned with the way of assessing students' CT in their curricular units, requesting more examples and practical tools to assess the level of students' CT.

Among future interventions, the CRITHINKEDU course is expected to be replicated in the participants' countries (adapted to local needs). Thus, it will be possible to analyse in more depth its impact on teachers' professional development. Also, teachers will be invited to participate in different deployment scenarios, supporting the development of the "European guidelines for critical thinking education in Higher Education Institutions" (which will be delivered in Output 4).

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1. Introduction, goals and structure of the report

As described by Schoefer and Meyer (2005), since the early 1960s, the rapid worldwide expansion of higher educational enrollments over the twentieth century has massified the HE systems in European countries. At the same time, the institutionalized vision of a society which sought higher qualifications providing much better career prospects (Li, Morgan, & Ding, 2008; Altbach, Reisberg, & Rumbley, 2009) has been causing unintended social effects going from graduate unemployment and underemployment to social mobility stagnation (McCowan, 2007; Pursiainen, 2012; Robertson & Dale, 2013). This new paradigm has generalized and affects the society as a whole. In education, we are facing a dangerous levelling which generates a view of education as depending on common sense and, all too often, certain solutions are accepted as new, whereas they have already been experienced (Poce, 2012, 2015, 2017). This seems to lead to an immobilization of the system.

This situation calls for innovation and for a need to sustain the development of new skills, as reminded earlier by the European Commission (2010)[2]. The development of CT skills is therefore pivotal in contemporary society to generate self-aware and active citizens. A "critical attitude" and facilitating the understanding and use of CT becomes more and more necessary to promote an innovative and democratic society, keeping in mind the structural issues and the definition of new knowledge (European Commission, 2010).

As some might think, the problems identified by the European Union in the above mentioned document cannot be solved with interventions based on the mere use of technologically advanced tools. The culture of technology lacks depth, being characterized by the speed at which the various technical solutions follow each other on the market.

The ability to enhance, self-assess and assess CT skills is therefore crucial to face the urgent need for renewal and innovation, especially in education, and for establishing policies aimed at increasing not only the higher education students' potentials but the social welfare as a whole. As Paul and Elder (2002, p. 230) state:

> *"[…] everyone thinks; it is our nature to do so. But much of our thinking, left to itself, is biased, distorted, partial, uninformed or downright prejudiced. Yet the quality of our life and that of what we produce, make, or build depends precisely on the quality of our thought."*

CT skills are fundamental requirements for setting HE students up for success. These skills are needed to use the acquired knowledge and to generate a new one (Davies & Barnett, 2015). Undoubtedly, the context, where the young generations of the Western countries live, highlights inadequate attention to cultural resources that represent the backbone to implement innovation and progress in any sector. As Harold

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[2]Available at https://bit.ly/2rTn2MV

Bloom reminds us, European history was built upon the cultural canons of the West. In an interview given to Domenica del Sole 24 Ore[3], Bloom states:

> *"[…] we live in a world dominated by the visual media. But culture cannot be dominated by the vision and remain related to Dante, Shakespeare and Cervantes, who were instead influenced by Taddeo di Bartolo, Michelangelo, Caravaggio […]. Today that canon is possible, but only for an ever-smaller elite. I cannot say, however, if this elite will be able to connect with a society dominated by low and popular visual models. Yale remains one of the last places where it is possible to educate the elite. But elsewhere?"*

The issue raised by Bloom is real and must be faced with vigor. To counter the tendency to be addicted to the system, interventions are to be promoted and validated through dedicated actions, aimed at compensating for the lack of structures helpful to build the cultural repertoire of the young generations.

From previous research, it is clear that improvement in students' CT skills and dispositions cannot be a matter of implicit expectations (Marin & Halpern, 2011; Tiruneh, Verburgh & Elen, 2014; Dominguez, 2018b). Educators must make CT objectives explicit and include them in training and faculty development (Abrami et al., 2008). Factors that seem to be related to the effectiveness of CT instruction include the teaching strategies and CT instructional approaches; the student's year level and prior academic performance; and the type of CT measures adopted (Tiruneh et al., 2014; Dominguez, 2018b).

Students' CT skills and dispositions should not be a matter of implicit expectations

Embedding CT instruction within specific subject matter domains, rather than teaching it in separate courses, is being considered as a more promising route to help students become critical thinkers (Tiruneh et al., 2014; Dominguez, 2018b). However, a closer analysis reveals a need for clarification of essential design principles suitable for the development of CT (the components of CT to be targeted, kind of tasks that are designed, the role of students, type of feedback and coaching given by instructors).

Within the scope of the CRITHINKEDU project 'Critical Thinking Across the European Higher Education Curricula', reference number 2016-1-PT01-KA203-022808, funded by the European Commission under the Erasmus+ Programme, the current report - Output 3 - describes the CRITHINKEDU course experience. It arises from the need to improve the quality of CT teaching and learning in universities across the curricula. It is divided in five main sections: the CRITHINKEDU course - fundamentals and objectives (section 2); the CRITHINKEDU course - conception and development (section 3); the participants (section 4); the results and impact (section 5); and the conclusions and future work (section 6).

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[3] "Intervista a Harold Bloom", November, 21st, 2009, Domenica del Sole 24 Ore. Retrieved from: http://menteallegra.blogspot.it/2009/11/anticipo-di-post-intervista-ad-harold.html

We believe that the training and learning activities held in Rome added value either in terms of compliance to and achievement of the expected intellectual outputs of the CRITHINKEDU project, and also enabled the pursuit of subsequent project activities, including the deployment of educational scenarios in the partners' institutions during the fourth intellectual output (Output 4).

Key findings from the reported course experience can be integrated for the improvement of future course replications at local levels. It will allow to collect/share/discuss data and results of the different deployment scenarios, implemented by the teachers who attended the CRITHINKEDU course and by other teachers after the course replication at the local level. It will also provide and consolidate elements to enrich the preliminary guidelines described in CRITHINKEDU's second intellectual output (Dominguez, 2018b), transferring them into the "European guidelines for critical thinking education in Higher Education Institutions".

This report intends to identify the key findings experienced in the CRITHINKEDU course and its possible integration into future local replications

As a direct benefit, HE institutions will increase the professional development of their teachers, specifically in CT instruction. Indirectly this course will enhance the capacity of future graduates to involve themselves more "critically" in their professions, but also as participatory citizens in a shared system of economic and political norms, moral values, and interdependent activities.

2. The CRITHINKEDU course - fundamentals and objectives

The CRITHINKEDU training course for university teachers, held in Rome from the 29th of January 2018 to the 4th of February, was designed and delivered based on the "Preliminary proposal of guidelines for quality in CT education" (Dominguez, 2018b, p. 57; Table 1) and the "Gaps between the labour market needs and CT educational practices in EHEI" (Dominguez, 2018b, pp. 54-55; Table 2).

The research team tried to efficiently link the main perceptions from the interviewed professionals (Output 1) with the findings from the literature review and teachers' interviews on CT teaching practices in HE (Output 2), to provide the course participants with the latest and more useful resources and experiences in CT education. The course aimed to promote and support teachers' pedagogical knowledge on CT educational design, teaching and assessment at course level, considering specific fields of study (Biomedicine, STEM, and Social Sciences).

The CRITHINKEDU course was designed upon the "Preliminary proposal of guidelines for quality in CT education"

All the levels of the "preliminary proposal of guidelines for quality in CT education" (Table 1) and the different "gaps between labour market needs and CT educational practices in European Higher Education Institutions" (Table 2) were taken into account during the design and conception of the CRITHINKEDU course experience. However, particular attention was given to the course level in order to fulfil each guideline with practical experiences and examples.

The course was implemented bearing in mind the following aspects:

- Participants should be introduced in more general/transversal elements of CT;

- Participants should be able to discuss and apply CT in their discipline/field;

- Participants should be encouraged to redesign their courses aiming at the strengthening/embedding the 'teaching CT' aspects;

- Participants should have the opportunity to discuss field/discipline specific instances of teaching CT.

Particular attention was paid to conclusions drawn from the two previous intellectual outputs (Output 1 and Output 2):

- CT skills and dispositions are both important to be developed in HE students, the dispositions being especially valued within a long-term perspective;

- The CT conceptual definition and practical understanding is crucial to integrate CT teaching practices in a "traditional" course;

- The immersive CT approach (with implicit CT instruction) is reported in the literature as being much more used than mixed/infusion approach (with explicit CT instruction), but the last seems to be more effective in CT development;

- The need to use effective instructional design principles and teaching strategies for CT instruction (the type of intervention and teaching strategy more used by European Higher Education teachers are Lecture-Discussion Teaching (LDT) and Problem-Based Learning (PBL), respectively, suggesting that active and cooperative learning approaches are more suitable to develop CT in students);

- The learning materials and resources can present diverse formats (case studies, videos, controversial questions and pictures, etc.), being of crucial importance the use of real-world situations and/or workplace-based scenarios;

- The assessment of CT should be systematically integrated;

- and finally, time management should be closely monitored, as well as the size of classes and the challenges of CT education in an era of (digital) information overload and complex settings.

Table 1. A preliminary proposal of guidelines for quality in CT education (Dominguez, 2018b, p.57)

1. Organizational Level

Foster an Organizational Culture for CT Education and Research

1.1. Define CT as an integral part of teaching and learning activities;
1.2. Incorporate into existing review process systems how CT is embedded in the programmes;
1.3. Value research on CT education;
1.4. Promote professional development for teachers to support CT in students;
1.5. Encourage the creation of communities of practice and dissemination events on CT education with different stakeholders, such as teachers, institutional staff, students, professionals, etc.;
1.6. Encourage provision of institutional teams and resources to support teachers' engagement with CT practices;
1.7. Engage teachers in self and peer-assessment, exchanging perceptions, needs and expectations related to CT.

2. Programme level

Support CT education reforms across the curriculum

2.1. Provide different and progressively complex activities and opportunities to foster CT throughout the curriculum, ensuring students can transfer what is learnt in one part of the curriculum to other areas;
2.2. Involve relevant stakeholders in the design of the curriculum and in the reflection on the suitability of learning outcomes, attending to different CT skills and dispositions in professional fields;
2.3. Value CT assessment and monitorization at the curriculum level;
2.4. When designing CT teaching and learning activities, be aware that CT encompasses personal and interpersonal skills and dispositions, such as proactiveness, adaptability creativity, emotional maturity, communication and teamwork

3. Course level

Engage with effective instructional practices to design, deliver and assess CT development in the classroom

3.1. Define the course objectives with explicit description of the expected learning goals and outcomes in terms of CT;
3.2. Evaluate students' CT needs using different methods such as diagnosis/assessment (according to academic level and previous background; labour market needs);
3.3. Align the CT course objectives with the programme/curriculum objectives;
3.4. Design a set of engaging learning activities that attend to the defined CT learning goals and outcomes;
3.5. Provide CT learning activities as opportunities to transfer different skills or dispositions in a variety of situations and/or subjects;
3.6. Provide CT learning resources that relate to the future professional needs of students;
3.7. Promote students' self-regulation through learning-activities, formative assessment and opportunities of self-evaluation;
3.8. Present to students, at the beginning of the course, explicit guidelines on how assessment of CT will take place;
3.9. Put in place adequate CT assessment instruments according to previous defined learning goals and outcomes;
3.10. Integrate CT assessment in the assessment of the course outcomes

A very key point to be emphasized relates to the necessity to overcome the difficulty in assessing CT progression and monitor long-term effects of CT promotion, particularly its transferability to the workplace and everyday life. These difficulties are present at three different levels: pedagogical, methodological, and organizational. Therefore, the course had the purpose of reflecting on the adequacy of structural settings and policies to nurture teachers and students in active learning and consistent, durable CT development.

Table 2. Gaps between labour market needs and CT educational practices in European Higher
Education Institutions (Dominguez, 2018b, pp. 54-55).

Identified GAP	Professionals	University teachers
CT Aims	High emphasis on CT dispositions (key point to reinforce CT skills); It requires long-term goals and interventions across the curricula.	CT dispositions are not the focus of the teaching practice; Interventions are punctual and short-term.
Most important CT skills and dispositions	Self-regulation and Analyticity.	Analysis and Evaluation.
Scope of CT development	CT relates with other social skills and dispositions, as proactivity, adaptability, emotional maturity, communication and teamwork.	Other social skills and dispositions that can have potential relation with CT need to be emphasized.
CT approach	CT skills and dispositions are considered of utmost importance for the successful transition of graduate students to the labour market, calling for explicit approaches to CT.	CT principles are not made explicit to students.

The experience was understood as an opportunity to support teachers on how to introduce effective teaching and evaluation practices to promote CT within their own courses ('train-the-teacher'). Participants at the end of the course experience were expected to:

The experience aimed to support university teachers on how to introduce effective teaching and evaluation practices to promote CT within their own courses

- Redesign their courses to include CT educational practices, considering the effective instructional design principles, and the results from the first and second intellectual outputs (Dominguez, 2018a, 2018b), in particular the "Preliminary proposal of guidelines for quality in CT education" (Table 1);

- Get highly inspired by different approaches, methods, criteria and tools to support CT teaching and assessment in their courses;

- Discuss how they may encourage their colleagues and institutions to engage in CT education.

3. The CRITHINKEDU course - conception and development

This section provides information on how the course was conceived and then developed, creating an interactive training experience. The primary objective of the course, as previously presented, was to give the opportunity to participants (university teachers) to upgrade their teaching skills on how to enhance and foster CT in their courses. Also, it was expected to inspire and enable these teachers to act as ambassadors of the effective adoption of CT teaching practices at their institutions, stimulating them to replicate the course to other faculty members.

Table 3 shows the different activities planned in common agreement between the CRITHINKEDU partners for the conception and delivery of the third CRITHINKEDU intellectual output (Output 3).

Table 3. Main activities of the third CRITHINKEDU intellectual output.

Activity	Description
1	Define the goals, outcomes and assessment criteria for the training course.
2	Develop the course subjects and design the training activities/tasks to be held.
3	Identify and catalogue the existing learning resources (such as slidecasts, videos, podcasts, interactive quizzes, etc.), which will support the training activities during the course.
4	Identify the new basic learning resources to be developed.
5	Develop the newly identified learning resources.
6	Develop the training course (including the assessment tool), integrating all the previous elements.
7	Delivery of the training course by the leading and the participating organizations. The course will be delivered to members of the other partners, who will replicate the course to faculty members from their institutions.

For the CRITHINKEDU course, the training sessions and resources were designed independently of the field of study, leaving up to every participant to adapt them according to their own domain-specific courses. Also, particular attention was given to:

- Clear course structure – different type of learning topics, goals, sessions, activities and resources per day;

- Reasonable balance in the number of training activities and materials provided per day;

- Provision of practical elements and scenarios for CT instruction, including design principles, teaching resources and methods, assessment criteria and tools;

- Creation of a team with Responsible Partners (RP) and coaches from the partnership for designing and delivery the course.

The following aspects were taken into consideration to achieve the course objectives: successful courses require careful planning, including good definition of goals, strategies and activities; the collection of feedback from HE teachers who took the course is crucial to improve future replications of the experience.

For this course design, several steps were accomplished: define course goals, determine learning resources, develop teaching and evaluation methods and tools (assignments and criteria), and check the availability of the required hardware/ software (when needed). As a continuous process, course planning went through all the mentioned steps in an interconnected way and underwent continuous revision.

The entire process of the course conception was managed in online sessions of brainstorming and discussion between the Responsible Partners (RP) and coaches

At the planning stage, the team of RP and coaches (from the partnership) established what and how participants would be learning regarding the content, including the expectations for cognitive and personal development, as well as strategies to monitor and assess them. After several online sessions of brainstorming and discussion, the team created different course materials (presentations, practical assignments and questions, etc.). All of this shared process was managed at distance, using the e-mail, collaborative writing and videoconference tools. The course was open to a limited number of participants: each partner contacted in average 4 university for a total number of 65 participants (counting also the coaches) from 9 different countries (Belgium, Czech Republic, Greece, Ireland, Italy, Lithuania, Portugal, Romania and Spain).

To create a favorable climate for learning and just-in-time adjustments, HE teachers have been asked to provide insights, ideas, discussions and other useful feedback to help improve the experience as the course was ongoing.

After the end of the course, a dissemination phase of the results obtained was planned. During this phase, the outcomes will be shared with teachers, stakeholders, relevant institutions and organizations. Dissemination methods include social networks, newsletters, press releases, course brochures, research papers, conference presentations, posters, workshops, online discussion lists, journal articles, reports and other documents.

3.1. The pre-introductory sessions

Local pre-introductory sessions were implemented to get a common understanding on CT before the course in Rome

Before the attendance of the training sessions in Rome, the majority of the partners involved in the project held a pre-introductory session (following a common structure) at their institutions, to the potential participants of the CRITHINKEDU course.

In line with the other outputs of the project, the Facione's framework of CT skills and dispositions (Facione, 1990)[4] was presented to participants and discussed to achieve a common understanding on CT. Also, the local teams shared theoretical assumptions on CT education, the results of the previous CRITHINKEDU outputs, and debated current or former experiences in CT learning and teaching within their courses. In order to all the course participants have a common knowledge base, short local meetings were set up (with no more than 2 hours) (Figure 1) to introduce the participants from all institutions among themselves and to guarantee them complete and satisfactory fruition of the CRITHINKEDU course. The main aims of these short introductory local meetings were the following: present the CRITHINKEDU project; know each other; ask to participants what they know about CT and what their expectations were for the CRITHINKEDU course; present some useful material (mainly the Facione's Framework; Facione, 1990); present the proposal for a "European inventory of CT skills and dispositions for the 21st century" (Dominguez, 2018a, pp. 57-58); present the "preliminary proposal of guidelines for quality in CT education" (Dominguez, 2018b, p. 56); ask for participant's personal course experiences on CT education (pro and cons); share common definitions of CT skills and dispositions; and ask for participant's motivation to bring their own course materials to be redesign during the CRITHINKED course in Rome.

At the pre-introductory sessions, after a short presentation of the CRITHINKEDU project and course, each partner was asked to clarify the expectations of the participants during the course of Rome. Each partner chose how to manage the introductory meeting locally: for example, it was possible to use technological tools (e.g., padlet) to make the participants interact more easily during the meeting.

All participants were asked to bring a series of materials related to their curricular unit to serve for the work during the course, such as the ECTS, study material, concept maps, examples of student work, etc. A guide for internal use was prepared by KU Leuven partner with a detailed description of the activities to be carried out, allowing for greater harmonization and homogenization of meetings at the local level.

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[4]Facione. P. A. (1990). *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction.* Research Findings and Recommendations. Mellbrae, CA: The California Academic Press. Available as ERIC Doc. No.: ED 315 423.

Before the session, the Facione's (1990) paper was sent to the participants for them to read it and reflect according to the following guiding questions:

- Why are you interested in promoting students' CT in your course?

- What specific CT aspects can and/or need to be promoted in your course(s)?

- How can these CT aspects contribute to the expected course outcomes?

Figure 1. Introductory local meeting in Belgium (KU Leuven and UCLL)

In the pre-introductory session, the first activity called "Meet each other & discuss Facione's framework", a plenary session of 60 minutes was conducted with these guiding questions:

- Why do you want to join the course in Rome? Why do you want to change your curricular unit?

- What is the biggest difference & similarity between what you understand from Facione's article and your initial understanding of CT?

- Discuss Facione's framework:

  o Clear or not? (the coach prepares some questions to check whether the article is really clear to the participants or not);

  o What was new for you? Some thoughts or observations?

The CRITHINKEDU project was also presented (second activity) in the plenary session, in 25 minutes, which was organized as follows:

- Presentation of the CRITHINKEDU project;

- Presentation of the CRITHINKEDU outputs;

- Presentation of the CRITHINKEDU course (goals, structure and expectations):
    - Why do we want to organize the CRITHINKEDU course?
    - What will be the structure?
    - What will be the third CRITHINKEDU output?
    - What can you expect?

The third activity, named "Expectations and practical preparation for Rome", was also conducted in a plenary session of 20 minutes, using a multimedia presentation and other technological tools. It was organized as follow:

- What do you expect?

- How would you evaluate if the CRITHINKEDU course is a success for you? (fill in the Padlet). Knowing the expectations of the CRITHINKEDU course, how can you prepare yourself?

Homework was expected as preparation for the first "Meet and greet" CRITHINKEDU course activity (1st day in Rome):

- Select one of your curricular units and think on the materials to bring to Rome to redesign the curricular unit (also include evaluation/assessment of students, rubrics or criteria you use, exam questions, evaluated tasks/papers, etc.);

- Prepare a short "Pecha Kucha"/talk/ a visual presentation (only images) (max.5 minutes) on your curricular unit, to share with other participants (present on your laptop). The purpose of the presentation is to let others understand the background of your course. Hence, we suggest to include the following info:
    - What is the position of the course in the program? Select one of the courses you teach;
    - What key tasks are students expected to perform at the end of the course? i.e. describe the expected performance outcomes. What should they be able to do, with what they have learnt at the end of the course? Think of concrete actions, in general, not specifically focused on critical thinking;
    - What kind of support is provided to students to achieve the expected outcomes? e.g. what learning activities do students go through to achieve the expected outcomes. What teaching methods, study material, guidance, … & feedback is provided to students?
    - How are/were students evaluated? Give an example;
    - Any other essential info you think will help others understand your course (target group background, time, available resources, etc.).

The following activities can be suggested to the participants (optional tips):

- Reading: Perkins et al. (2000)[5] and Bailin and Battersby (2015)[6];

- Thinking: prepare your answers to the following questions:

  o Why are you interested in promoting students' CT in your course? Compare the situation you have observed regarding the students' CT level and your identified ideal level. Can you describe the gaps/ key issues you would like to address? Try to be as concrete as possible.

  o How will you know/measure whether your students developed the CT aspects you mentioned before (possible indicators)?

  o Have you tried anything before to stimulate the CT aspects you have mentioned just now? What worked? What not? Why?

  o Do you have an idea of the student's critical thinking abilities before entering your course? What is their starting level?

  o Are there barriers for you to promote CT in your course? If yes, what are they? Do you anticipate/identify any barriers linked to the general environment, students' profile, course-related aspects and others?

  o How do you feel about the current situation? What possible resources you can use for the development of CT in your course?

  o Do you think the desired CT performance level you just thought of can be achieved solely within your course? If not, what would be needed to be regularly practiced and promoted in other courses (in the same program)?

The last part of the meeting was devoted to sharing logistic information like phone numbers, time of arrival, etc. (15 minutes).

Once the introductory meetings were held, a welcome message was sent to all course participants (Figure 2). In this message, in addition to logistical information, the access to a shared folder (Figure 3; Supplementary document 1[7]) on the Internet was provided in order to minimize printed materials. In this folder, day by day, all the updated materials regarding the training program, resources and activities were uploaded.

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[5]Perkins, D., Tishman, S., Ritchhart, R., Donis, K., & Andrade, A. (2000). Intelligence in the Wild: A Dispositional View of Intellectual Traits. *Educational Psychology Review*, *12*(3), 269-298.
[6]Bailin, S., & Battersby, M. (2015). Teaching Critical Thinming as Inquiry. In M. Davies & R. Barnett (Eds.), *The Palgrave Handbook of Critical Thinking in Higher Education.* New York: Palgrave Macmillan, 123-138.
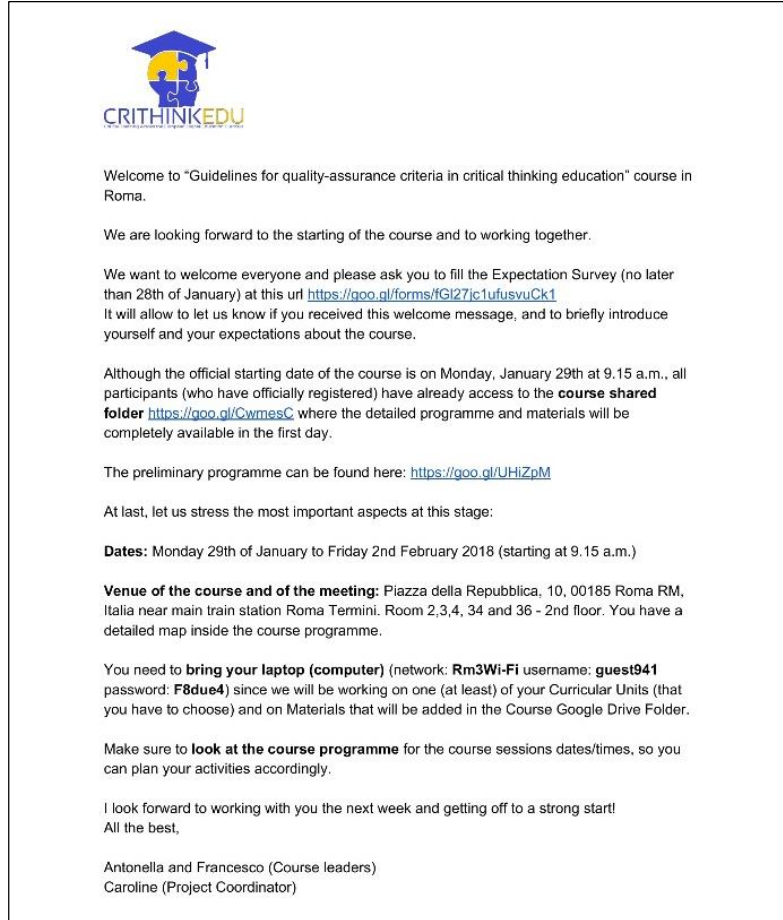[7]For more information, please see http://bit.ly/Supplementary1-O3

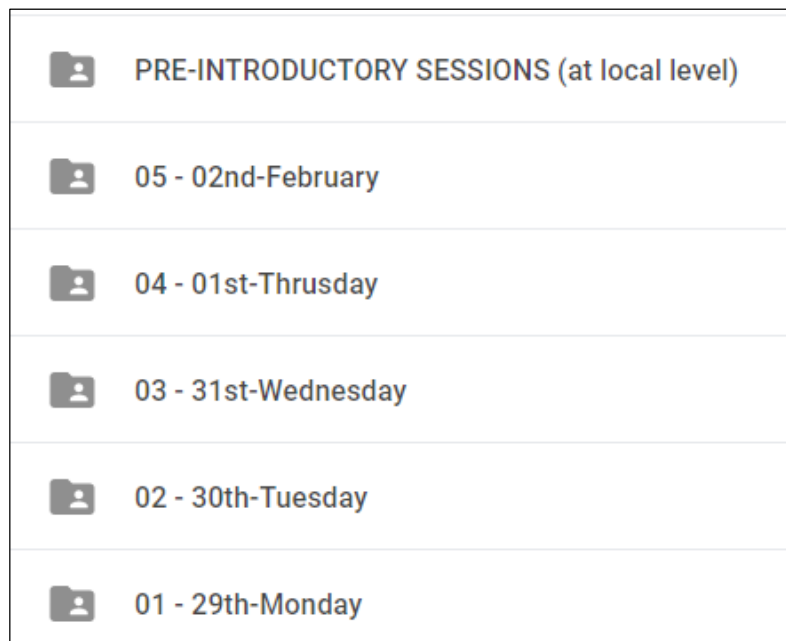Figure 2. Welcome message sent to the course participants

Figure 3. Folder shared with course participants

3.2. The organization process: shared leadership and agile management

The implementation of the CRITHINKEDU course with high quality combined the elements of distributed leadership (Harris, 2009) and agile project management (Highsmith, 2009). These two approaches directly derive from the project management and development of complex systems fields, generally related to technological innovation. We tried to adapt these two approaches to the needs of both course team and participants.

The implementation of the CRITHINKEDU course combined elements of distributed leadership and agile project management

Distributed Leadership approach aims at sharing the work of leadership in complex structures: in this one-week course, each day of the course has been assigned to the responsibility of one or a maximum two Responsible Partners (RP) for the day. Table 4 shows on a daily basis the learning topics presented to the participants and the partners responsible for each topic. Rather than to focus on a single leader, distributed leadership provides guidelines on how multiple leaders individually and jointly engage in common tasks. Distributed leadership helps understanding project activities as situated and social processes at the intersection of leaders, followers and the situation. At the level of the days of the course, each partner takes the roles of RP in the day he/she leads, and of Coaches in days led by others.

The distributed leadership model grants all partners a space and autonomy for crafting the course as leaders, at the same time they do this in-line with the project objectives and in consultation with all partners, bearing in mind that the course is a complex task which can only be successfully approached together. Distributed leadership is a shift in focus from "individual leaders" (as promoted within traditional models) to a more systemic perspective, whereby "leadership" is conceived as a collective social process emerging through the interactions of multiple actors.

There are six different key principles of Distributed Leadership adopted in the development of the CRITHINKEDU course in Rome:

1. Every project partner acts as an RP and as a Coach at the same time depending on the day of the course;

2. The objectives of the course can be achieved only as a joint effort;

3. Everyone has space for creative ideas, but they all have to be fine-tuned to the objectives of the course and the project;

4. The success of the course can only be achieved through the commitment of everyone to deliver on time and high quality;

5. Close cooperation is needed, and actions of one partner have effects on the progress of the other partners;

6. Empowering and motivating each partner by providing mutual support and recognizing each other's achievements.

Agile Course Management starts out with the expectation that the requirements will evolve and change during the designing and the planning of the course. On the other hand, the traditional approach to face-to-face course management starts by defining exactly how the "end product" should be like, freezing requirements and specifications before the course is delivered. The problem with this approach is that change and adjustments are inevitable, and face-to-face courses must have a strategy built in to handle this change. Without the strategy to deal with change (coming both internally from inside the course teacher and externally from course students), the course cannot progress and deliver value.

The approach applied in developing and delivering this course focuses both on assigning tasks to every project partner and delivering it on time while ensuring the necessary flexibility in adjusting activities and processes in the project, based on the results of the previous day.

For this purpose, coaches' meetings were held at the end of each day of the course. Thus, they could make a report of the current day, analyzing the problems encountered and the solutions proposed, and consequently, the next day's topic could be discussed with the RP to clarify what would be presented the following day.

Some of the key principles of original agile project management approach were used, namely:

- Welcoming changing requirements in the development process and regular adaptation to end-user needs;

- Measuring progress and providing conceptual, pedagogical and technical excellence, ensured by the ongoing support of the coaches;

- Frequent communication to share information and ensure everyone is in the picture.

Each coach was in charge of managing a small group of participants in the course (ranging from 4 to 9). More details about the role of the coaches and the RP will be provided below, during the next section.

Table 4. Course days, topics and Responsible Partners (RP)

Course days	Topic of the day	RP
Day 1 Monday 29th of January	What do we want to achieve in our Curricular Unit? (goal: identify and clarify CT learning goals and outcomes) At the end of the day, each participant should have: identified the main learning outcomes of his/her course, with explicit expectation in terms of critical thinking; nailed down the aspects of CT that students may have problem with - a concrete problem list is produced to clarify the redesign focus(es); and identified the strength of the existing course (what positive results were achieved until now).	KU Leuven & UCLL
Day 2 Tuesday 30th of January	What do students have to do? (goal: design CT learning activities and tasks) At the end of the day, each participant should have: individually created a visual representation of the task analysis results (task tree); and designed a series of concrete learning activities (at least 3 "whole" learning tasks) that explicitly focus on the aspect(s) of critical thinking and in-line with design principles for CT education.	USC & UCLL
Day 3 Wednesday 31st of January	How can we support students in CT development? (goal: experience CT teaching methods and strategies) At the end of the day, participants should be able to: understand how to structure a CT-oriented lesson; to identify strategies to foster CT in the classroom, focused on questioning and dialogue; and know how to apply cooperative learning techniques helpful for CT development. Moreover, participants should be able to: plan, use and monitor strategies for problem solving, use relevant information for solving problems; correlate PBL to creative thinking and visual literacy and attain the transfer of CT skills and dispositions within PBL situations. Furthermore, they should be also able to design a prototypical VaKE[8] in their courses to enhance CT skills in their students and to construct a dilemma for VaKE use.	UOWM & UTAD
Day 4 Thursday 1st of February	How can we measure the achievement? (goal: identify criteria and tools for CT assessment) At the end of the day, each participant should identify at least the main CT students' performance considering the main performance task of their course identified on Day 2. Each participant should be able to: identify the correct timing to assess students' performance; identify the exact CT assessment activity they want to use in the identified main task; and identify the criteria to assess the task in a measurable way, writing it into detail, ready to be used.	UNIROMA3
Day 5 Friday 2nd of February	Are we all ready to go? (goal: present the main outcomes of the course) This is the final course day: each participant presents his/her work in a presentation showing how to start implementing changes in his/her Curricular Unit once at home.	UNIROMA3 & UTAD

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[8]For more information, please see http://www.vake.eu/

3.3. The structure of the course

The choice was made to use a modular structure that could be managed and dynamically organized independently for each day, although coherently during the whole week.

For each day, the topic under discussion focused on the activities to be driven on three main pillars:

1. Planning (needs analysis, objectives definition and so on);
2. Executing (training and learning activities);
3. Evaluating (assessment, monitoring and improvement).

The results of the activities carried out within the small groups on each session were shared between coaches and RP at the end of every day. On the fifth and final day, summaries and reports of the work from the whole week were discussed and conveyed in the current report, guiding the improvement of the CRITHINKEDU course experience to be replicated at a local level.

Concerning the roles of the course team members, three categories were defined:

- Responsible Partner(s) (RP) - in the number of one or two per day, provided by the project partners (see after), they actes as a supervisor(s), who were responsible for the management of daily activities:
  - o To track time usage in all sessions;
  - o To organize the whole day considering the topic of the day;
  - o To speak in plenary session (unless otherwise specified);
  - o To organize the coaches for each activity session.

- Coach - one per group of participants, who was responsible of tracking the activities of the working group. He or she could ask clarification to the RP regarding the group work to guarantee the same level of achievements for each participant. To ensure this goal, a document with general guidelines was provided (Figure 4). The coach would also track time usage for working group sessions.

The course structure modules were then defined as follows:

1. The Expectation session - it is a plenary session. There is only one expectation session each day to clarify the main goals and activities; it is held in the morning, before the activities and/or hint session(s), and it lasts for 30 minutes max.

2. The Plenary session (Figure 5), where Responsible Partners (RP) introduce the topic of the day to all the participants (address to Table 4). It also includes a Hint session (Table 5), which consists in an oral presentation by the supervisor

or by an invited expert and lasts 20 minutes in total (a max. 10 minutes' presentation of the "hint", followed by 10 minutes of plenary discussion). In the plenary session, the supervisor also provides one example or shares one experience grounded in the research or evidence related to the activity to be developed in the following session. Each supervisor decides how to present this session (split it between two activities sessions or before or after an activity session) and determine the number of hint sessions of that day, according to the topic to be addressed.

3. For the Activity session (Table 6 to Table 10), for the first four days (from Monday to Thursday), the participants were divided into groups, organized according to the field of study while in the last day (Friday) they were mixed regardless of their field study to share their work with other groups. Each group was constituted of around 6/7 participants (up to 9 at maximum) (Figure 6).

4. An Achievement session took place at the end of the day (maximum one hour long); In the first 30 minutes, participants discussed and consolidated the day thoughts in group while in the second 30 minutes two groups presented their achievements of the day (plenary session, one speaker per group, 15 minutes each).
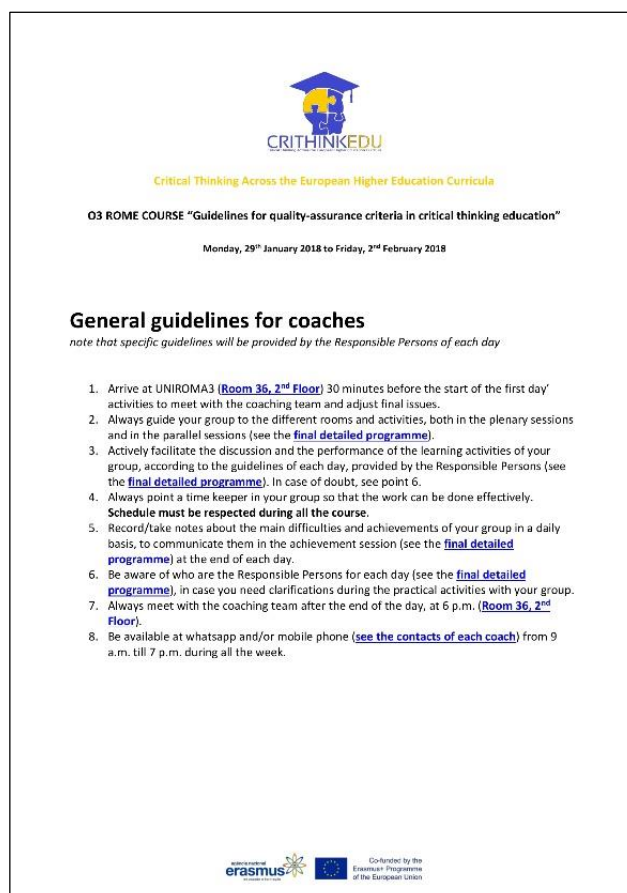

Figure 4. General guidelines for coaches

Figure 5. Plenary sessions of the CRITHINKEDU course

Figure 6. Activity sessions of the CRITHINKEDU course

Table 5. Hints sessions per day

Course Days	Hints/Topic of the day	RP
Day 1 Monday 29th of January	Hint session 1.1 - An introduction on the 4C/ID model	KU Leuven & UCLL
	Hint session 1.2 - Heuristic bias and CT	
	Hint session 1.2 - Characterization of Critical Thinking: a proposal	
Day 2 Tuesday 30th of January	Hint session 2.1 - Task analysis	USC & UCLL
	Hint session 2.2 - The design of teaching sequences integrating Critical Thinking	
	Hint session 2.3 - Tips for designing supportive & procedural information to deal with intuitive mental model	
Day 3 Wednesday 31st of January	Hint session 3.1 - CT Teaching Methods and Strategies - CT Lesson Planning; Classroom environment and questioning; Cooperative Learning Techniques	UOWM & UTAD
	Hint session 3.2 - Problem-Based Learning (PBL) methodology - Methods and strategies of PBL supporting CT development, creative thinking and visual literacy	
	Hint session 3.3 - Using Values and Knowledge Education (VaKE) for Enhancing Critical Thinking	
Day 4 Thursday 1st of February	Hint session 4.1 - Tools to assess CT levels of your students	UNIROMA3
	Plenary session with Sharon Bailin and Mark Battersby[9]	
Day 5 Friday 2nd of February	Plenary session: What are the expectations after the CRITHINKEDU course?	UNIROMA3 & UTAD

On the following tables (Table 6 to Table 10), a detailed account of the activities developed daily during the course in Rome is provided.

In the shared folder (Supplementary document 1) detailed information on the schedules, logistical information and materials for each course day and other important resources shared with participants can be found.

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[9]We want to thank Sharon Bailin and Mark Battersby for their online presence, support and enthusiasm in this plenary session.

Table 6. Detailed activity sessions of Day 1

TOPIC OF THE DAY

What do we want to achieve in our Curricular Unit?

(goal: identify and clarify CT learning goals and outcomes)

Activity 1.1 - Identify and clarify learning outcomes

Step 1: Outline of the activity- tutor purposes questions and briefly introduces the process and expected outcomes of this session.

Step 2: Identify gaps, strengths and opportunities for clarifying desired learning outcomes.

- participants individually reflect on own courses guided by the reflection questions

- in pair share own thoughts

- in group exchange ideas and doubts for clarifications

Expected outcomes: at the end of the session, each participant 1) identifies main learning outcomes of his/her course with clear expectation regarding the critical thinking; 2) nails down the aspects of CT that students have a problem with. A concrete problem list is produced to clarify the redesigned focus(es); and 3) identifies the strength of the existing course (has worked effectively).

Activity 1.2 - Assessment needs

Step 1: Tutor proposes the questions, clarify the expected outcomes of this session.

Step 2: Participant individually thinks about them.

Step 3: One-to-one /in a pair, share each other's thoughts.

Step 4: At least an example is shared in the group.

Step 5: Individual reviews his/her own analysis.

Expected outcomes: based on the clarified problems and desired learning outcomes, each participant identifies relevant factors and resources (e.g. students' pre-knowledge, time available, existing materials, etc.) of each target task. Be aware when and how these factors need to be considered during the design of the learning tasks (be prepared for Day 2).

Table 7. Detailed activity sessions of Day 2

TOPIC OF THE DAY

What do students have to do?

(goal: design CT learning activities and tasks)

Activity 2.1 –Task analysis

Step 1: Reflect individually: Is the task identified on Day 1 an essential one for the course. Why this task? What specific aspects of CT are connected to the task?

Step 2: Discuss and finalize the description of the main performance task of the course in a few lines (explicit about CT requirement). Analyze/list sub-tasks (JIT).

Step 3: List the specific subject-related knowledge, sub-skills and attitudes that are important for this (complex) performance task. Explicitly articulate the requirements of cognitive and behavioral requirements of CT and highlight the bottleneck problems that students may likely experience (use the inputs from activity 1.2 from the Day 1).

Step 4: Share with the group one or two task trees from participants to give feedback and encourage clarification and discussion.

Expected outcomes: individually create a visual representation of the task analysis results (task tree).

Activity 2.2 –Design learning activities

Step 1: Design one learning activity. Additional supportive information will be provided on how to use the results of task analysis in design learning tasks that consist of task description, supportive information, just-in-time information and part-task.

Step 2: Design other two learning activities.

Step 3: Design 1 or 2 practice (part-task practice) if relevant.

Expected outcomes: by the end of the day, each participant designs a series of concrete learning activities (at least 3 "whole" learning tasks) that explicitly focus on aspect(s) of critical thinking and in line with design principles for CT education. Such activities fulfil the following requirements: the designed learning activities are the "whole task"; for each designed learning activity, supportive information and just-in-time information are identified; activities evolve from simple to complex by varying the amount of support and guidance embedded in the tasks) (JIT) – (also reflect on method and various forms of task: individual, group-work, field-work, role-play etc.).

Table 8. Detailed activity sessions of Day 3

TOPIC OF THE DAY

How can we support students in CT development?

(goal: experience CT teaching methods and strategies)

Activity 3.1 – Design CT-oriented lesson plans with the integration of questioning and cooperative learning strategies

Step 1: Create at least one CT-oriented lesson plan using the work previously developed on Days 1 and 2.

Step 2: Integrate a moment for questioning and cooperative learning.

Step 3: Exchange and share the activities developed between the groups within a domain for stimulating inspirations.

Expected outcomes: understand how to structure a CT-oriented lesson plan; identify strategies to foster CT in the classroom focused on questioning and dialogue; and know how to apply cooperative learning techniques that can help the development of CT dispositions.

Activity 3.2 – Problem-based learning (PBL) and CT development

Step 1: The participants will be invited to analyse some problem situations and give answers related to CT, creative thinking and visual literacy, supportive information, just-in-time information and part-task.

Expected outcomes: by the end of the activity, participants will be able to 1) plan, use and monitor strategies for problem-solving; 2) use relevant information for solving problems; 3) correlate PBL to creative thinking and visual literacy; and 4) attain transfer of CT skills and dispositions within PBL situations.

Activity 3.3 – Experience the VaKE method

Step 1: Experiment a dilemma discussion and analysis, passing through the steps

- argumentation in favor of or against

- viability check

- reflection – beliefs?

- need for information

- information search (in groups)

- second round of argumentation

- viability check

- thinking on the argumentation

- fallacies

Step 2: Construct dilemmas in groups and present them to the audience.

Expected outcomes: by the end of the activity, participants will be able to 1) design prototypical VaKE for their courses for enhancing CT skills to their students; 2) construct a dilemma for VaKE use; and 3) reflect critically on the values that support different arguments.

Table 9. Detailed activity sessions of Day 4

TOPIC OF THE DAY

How can we measure the achievement?

(goal: identify criteria and tools for CT assessment)

Activity 4.1 – Deploy your assessment plan and detail at least one CT assessment task

Step 1: Reflect individually on how to:

- assess the aspects of CT that are connected to the main task of Day 2?

- define the criteria identified in the morning, during the hint session, in a measurable, scale-like way.

- choose an activity to assess CT levels (short essay, multiple choice, oral presentation, etc.)

Step 2: Individually, write down the CT assessment activity in a short paragraph (with performance, conditions and criteria).

Step 3: Share within the group one or two assessment tool/criteria to give feedback and encourage clarification and discussion (rubric, 5-multiple choice questions, etc.).

Step 4: Individually, design the assessment activity for a particular task in detail. Ready to be used in a real course. Be explicit about assessment criteria (for example write down a rubric to assess CT in short essays).

Step 5: Individually, work on the whole course or in a part of it to develop an assessment plan (formative and summative) and at least one detailed assessment activity (more if possible).

Step 6: Share one or two examples of detailed assessment activity, first in pairs and then open it to the group discussion.

Step 7: Share one of the activities in the group and organize discussion and feedback.

Step 8: Individually, revise your activity; tutors provide one-to-one feedback.

Expected outcomes: each participant identifies what is the correct timing to assess the CT performance and how to do it. By the end of the day each participant will have a full assessment plan.

Activity 4.2 – Assessment principles applied to CT

Step 1: Use think-pair-share method cycling through the guiding questions of each principle (see daily materials for further details).

Expect outcomes: revise and improve the CT assessment plan started in the activity 4.1.

Table 10. Detailed activity sessions of Day 5

TOPIC OF THE DAY

Are we all ready to go?

(goal: presentation of the main outcomes of the course)

Final Activity – How to start implementing changes in your Curricular Unit?

Step 1: Individually, and based on the work developed during the training experience, some participants present to different groups their redesigned courses to promote students' CT and ask for feedback to improve.

Expected outcomes: each participant will be able to identify specifically the strengths and weaknesses of their redesigned courses, and in general of the training experience.

4. The participants

A pre-course questionnaire was prepared (Supplementary document 2[10]) and sent to participants to gather background information on them and their expectations. The results from this questionnaire (Supplementary document 3[11]), were used to construct the current section that describes the main characteristics of the CRITHINKEDU course participant's, taking into account their own experiences and perceptions on the course topic. We then deepened the analysis towards their expectations about the course, seeking to identify and characterize the main tendencies, similarities and differences between them.

4.1. Participants' profile

Most of the participants were female (30 out of 42 responses; 71,4%), aged between 31 and 40 years (35,7% of the respondents), who have been teaching for more than 11 years but less than 20 years (17 out of 42 responses; 40,5%) and participated at the pre-introductory sessions at local level (31 out of 42 responses; 73,8%). About half of them were rather familiar with the teaching of critical thinking (20 out of 42 responses; 47,6%), taught between 3 and 5 curriculum units in the last academic year (23 out of 42 responses; 54,8%), and wanted to re-design a curriculum unit inserted in the Social Sciences macro field (24 out of 40 responses; 60%).

About a quarter of the participants wanted to re-design a curriculum unit of the second year (11 responses out of 42; 26,1%) or of the third year of the course degree (10 responses out of 42; 23,8%). More than half of participants believed that he/she has a high level of collaboration (26 responses out of 42; 61,9%) and communication skills (23 responses out of 42; 54,8%), but only 38,1% (16 responses out of 42) reported it in relation to critical thinking and 43,9% (18 responses out of 42) regarding creativity.

Table 11 summarizes the information on the curriculum units chosen to be redesign integrating CT teaching practices, according to the fields adopted in the previous intellectual outputs (Dominguez, 2018a, 2018b), built upon different international classifications (e.g., ISCED-F 2013; United Nations Educational, Scientific and Cultural Organization [UNESCO], 2013), comprehending several economic activities (Directorate-General of the European Commission [Eurostat], 2008): Biomedicine, STEM, Social Sciences, and the Humanities.

As shown in Table 11, there was uneven representativeness of both the Economic Activities and the Macro Fields of the participant's curriculum units. The most indicated Macro field belonged to Social Sciences (62,5%). Concerning the Economic activities, the most registered category was Education (27,5%) and Engineering (20%).

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[10]For more information, please see http://bit.ly/Supplementary2_O3
[11]For more information, please see http://bit.ly/Supplementary3-O3

Table 11. Pre-questionnaire - Teaching fields classified by Economic activities and Macro fields
(n=40)

Teaching field	Economic activities (EUROSTAT, 2008)	Macro fields
Diagnostic Nursing (n=1) Mental Health Nursing (n=1) Clinical Thinking (n=1) Pseudoscience: homeopathy (n=1)	Health (n=4)	BIOMEDICINE (n=5)
Animal Reproduction (n=1)	Agronomics and Animal Science (n=1)	
Linear Algebra (n=1) Statistical Methods (n=1) Analysis of Structures (n=1) Wood Technology (n=1) Hydraulic (n=1) Industrial Management (n=1) Mass and Heat: balances and transfer (n=1) Environment Protection (n=1)	Engineering (n=8)	STEM (n=8)
Project Management Tools and Techniques (n=1) Organizational Behavior (n=1) Leadership (n=1) Managerial Psychology (n=1)	Human Resources (n=4)	SOCIAL SCIENCES (n=25)
Pedagogy (n=2) Development of Critical Thinking (n=1) Technologies of Psycho Pedagogical Education (n=1) Adult Education (n=1) Critical Literacy (n=1) Introduction to Social Sciences (n=1) Service-learning in China (n=1) Civic Education (n=1) Open Inquiry Learning Environments in Science Education (n=1) Design Learning Environments (n=1)	Education (n=11)	
Social Assistance, Team Formation and Management (n=1) Socio-Educational Projects and Programs (n=1) Wellbeing, Welfare and Society (n=1)	Social Work (n=3)	
Social Activity Ethics (n=1) Social Responsible Business (n=1)	Social Aid and Charity (n=2)	
Business Ethics (n=1) Teaching Economics (n=2) Economic Epistemology (n=1) Contemporary Economic Doctrines (n=1)	Financial Services (n=5)	
English Literature (n=1)	Arts and Culture (n=1)	HUMANITIES (n=1)
A module in group design (n=1)	Undefined (n=1)	UNDEFINED (n=1)

Figure 7 shows the categorization of the participants' answers to the qualitative open question "What is your main reason for taking this course?". The most indicated reasons to take the course were related to acquiring knowledge and understanding on how to foster and develop students' CT (both with 26% of the responses). Some statements of the participants are given below:

> *"A deeper understanding of critical thinking methods that could be applied while teaching economics, and, in particular, economic doctrines."* (P5)

> *"Getting inspired and learn how to foster critical thinking."* (P24)

> *"Try to develop in students the analysis, evaluation, criticism and argumentation."* (P40)
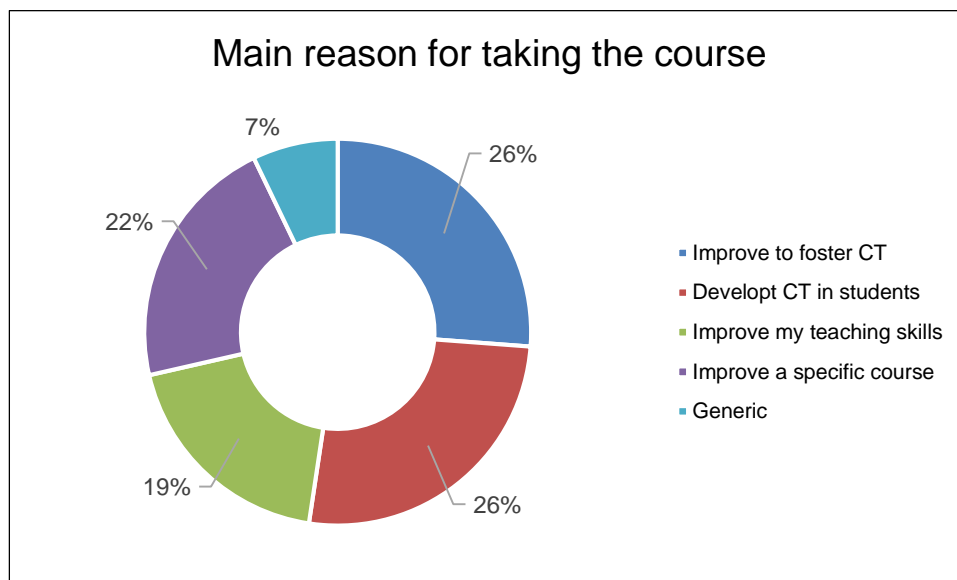

Figure 7. Main reasons of participants for taking the course (n=42)

On Figure 8 the categorization of the participants' answers to the qualitative/open question "Why are you interested in promoting students' critical thinking in your course?" is shown. Most of the participants said to be interested in fostering CT because CT is important in social and work life (43%), and not only because it is linked to one or more field of study (31%), as stated by different participants:

> *"Because I think it is absolutely essential to take better decisions in this always changing world."* (P27)

> *"In order to help them become independent learners, good teachers as well as democratic citizens."* (P11)
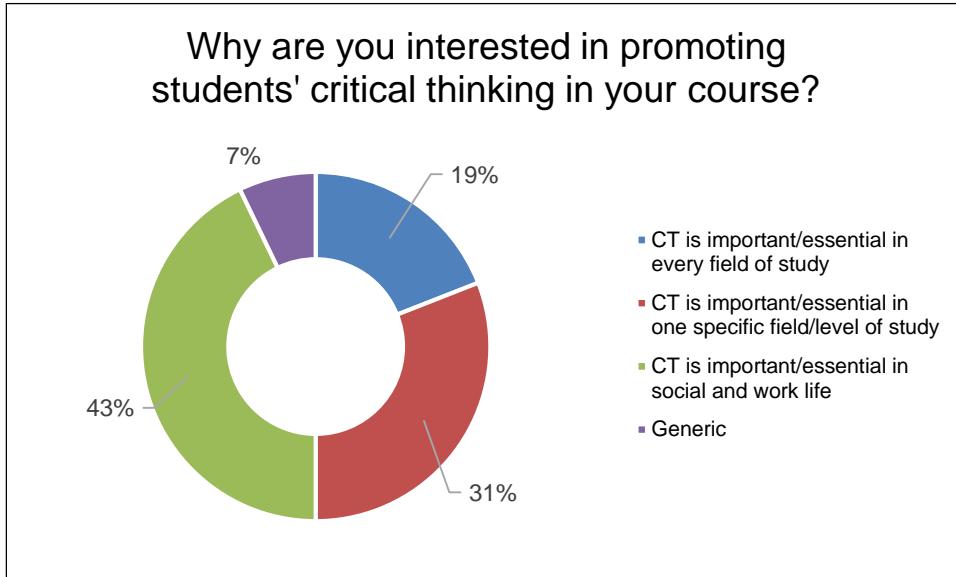
Figure 8. Reported interests in promote students' critical thinking (n=42)

4.2 Participants' expectations

The same questionnaire included questions on the participants' expectations on the course and its usefulness in their teaching work. Specifically, two open-answer questions consisting in a series of four sentences on which the participants were requested to express their agreement or disagreement on a 5-point Likert scale were included.

The first open question reads as follows "What results do you expect from this course?". A summary of participants answers is presented in Figure 9, grouped in categories that emerged from the analysis.
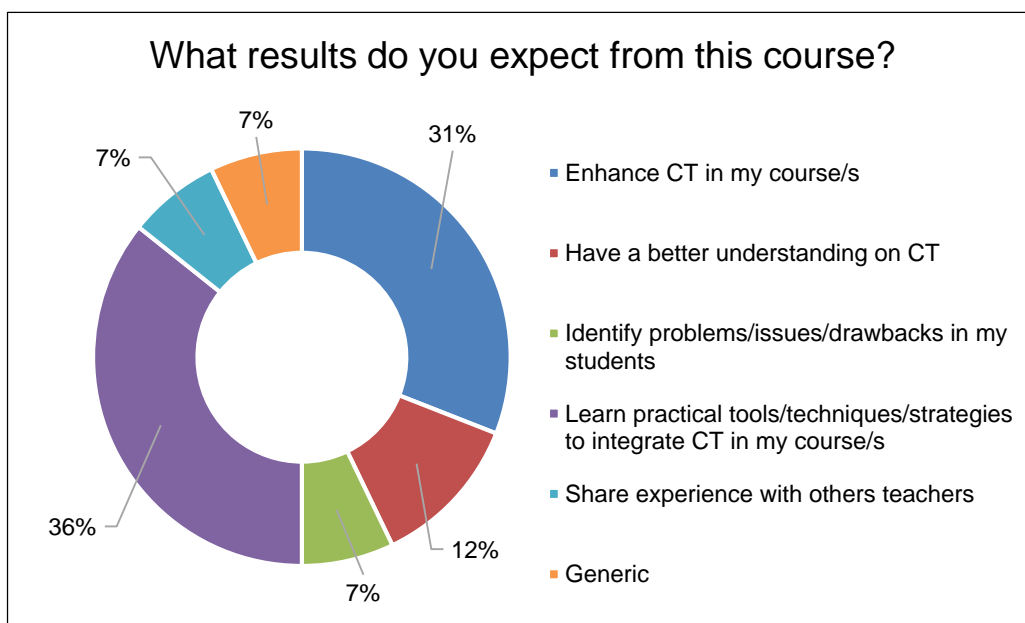

Figure 9. Participant's expectations from the CRITHINKEDU course (n=42)

One example regarding the participants' expectations from the course was the following:

"Get more concrete examples on how learning activities can be organized. Get insights on what specific issues of CT education needs to pay special attention to." (P3)

The last two open questions were related to the participants themselves: "What elements of the course will you expect to be most difficult to master?" and "What suggestions do you have for overcoming these difficulties?". In fact, the first one asks which parts of the course are anticipated as the most difficult and the second requests the participants to propose possible to overcome these difficulties. Figure 10 presents

Participants had high initial expectations for the course, particularly regarding 'CT assessment' and 'CT learning design' topics

the categorization of the participants' answers to the first question. The critical thinking assessment was the most difficult aspect identified by participants (43%). The capacity to design and plan learning activities embedding critical thinking in a particular curricular unit was the second one (21%), as exemplified in the following statement:

"Evaluating the arguments/making judgment and making a case & strategies for ensuring assessment transparency." (P18)
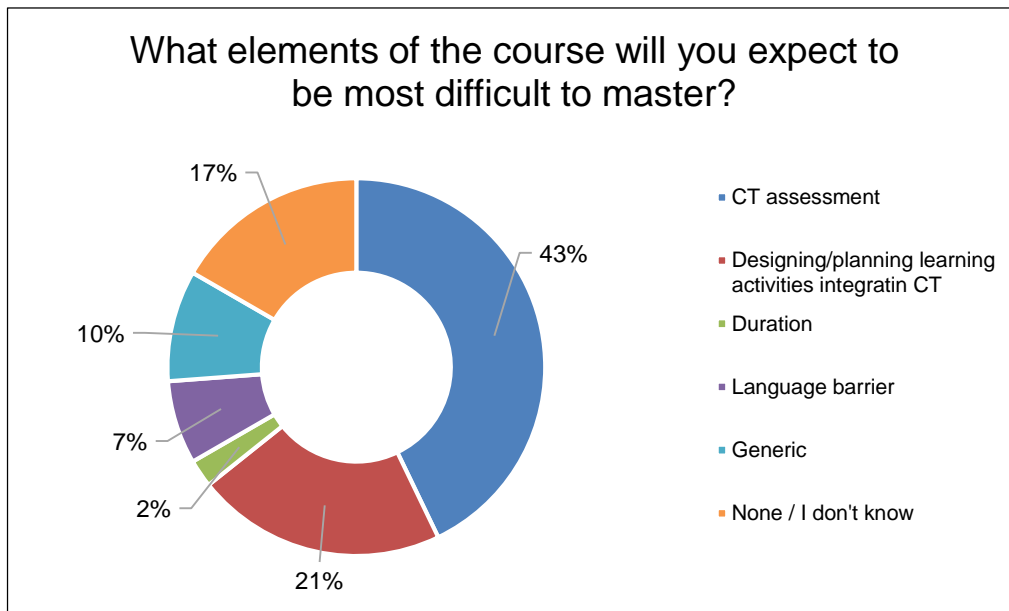

Figure 10. Difficulties foreseen in the course (n=42)

Figure 11 presents the categorization of the answers given by the participants to the second question: "What suggestions do you have for overcoming these difficulties?". If we consider the participants' suggestions in a general way, it seems that the most suitable solution is to "work in groups and share experiences with other colleagues" and/or "use different learning methods" (both with 31% of the responses). But if we

aggregate the data for analysis by the type of difficulties encountered, the use of examples and practical tools is more recommended for difficulties regarding CT assessment than group work, while a reversed situation is found if we consider the planning of the activities (Figures 11 to 13, and Table 12).
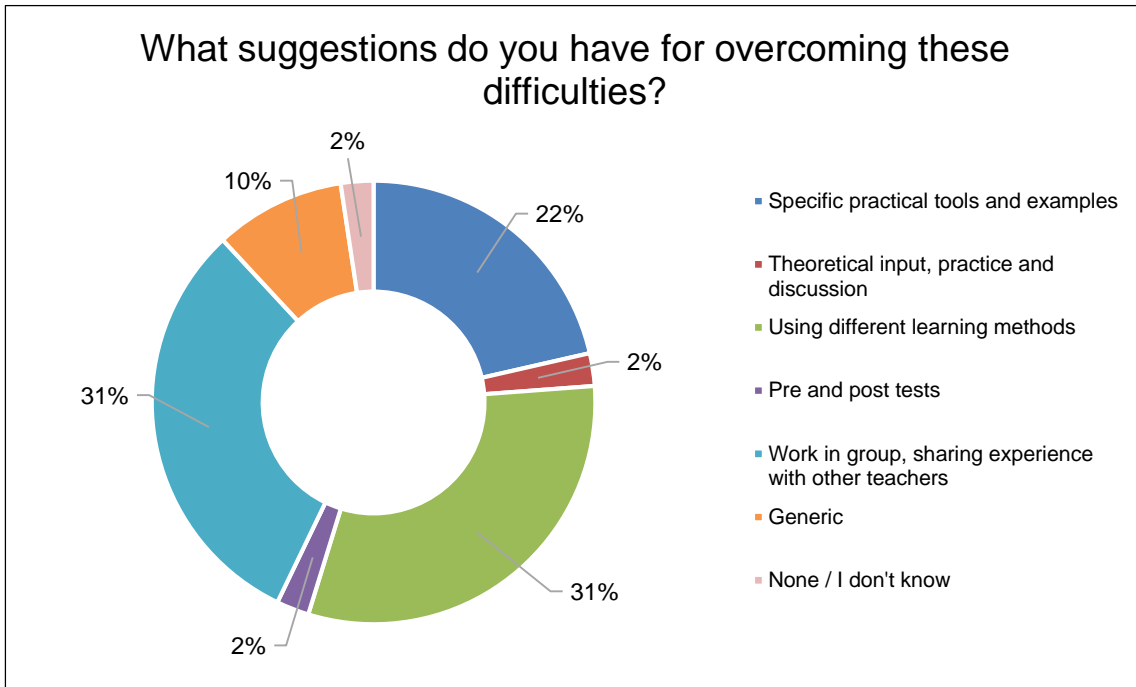

Figure 11. Suggestions to overcome difficulties in the course (n=42)
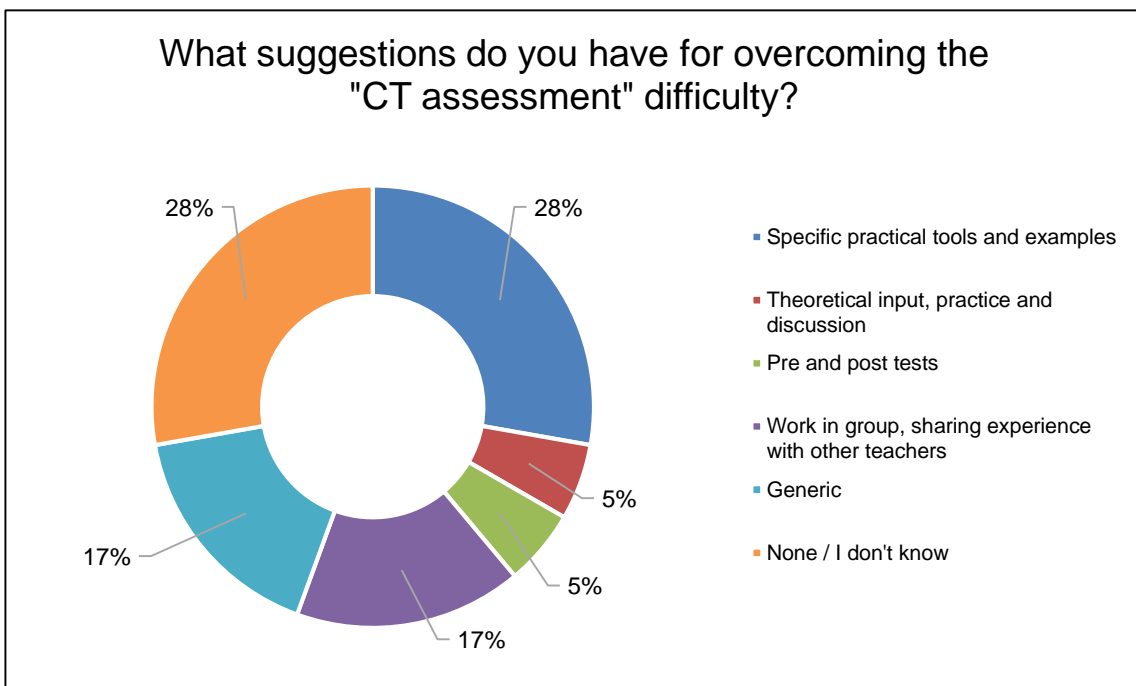

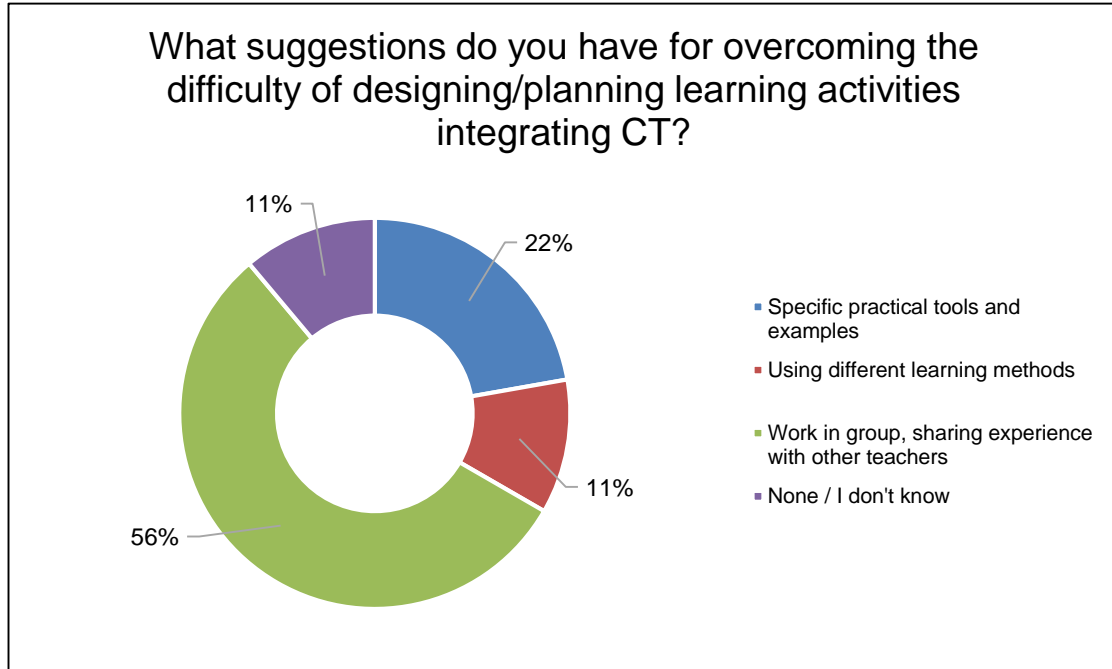Figure 12. Suggestions to overcome "CT assessment" difficulties (n=18)

Figure 13. Suggestions to overcome difficulty of design learning activities integrating CT (n=9)

Table 12. Participants' suggestions aggregated by difficulty (n=42)

	DIFFICULTY						
SUGGESTION	CT assessment	designing/ planning learning activities integrating CT	duration	generic	language barrier	none / I don't know	Total
generic	3			1			4
none / I don't know	5	1	1	1		5	13
pre and post tests	1						1
Specific practical tools and examples	5	2		1		1	9
Theoretical input, practice and discussion	1						1
using different learning methods		1					1
work in group sharing experiences with other teachers	3	5		1	3	1	13
Total	18	9	1	4	3	7	42

The last question concerning the expectations of the participants was constituted of four sentences requesting the participants to express the level of agreement on a five-point Likert scale (Figure 14).

The question was worded as follows: "Regarding your expectations, indicate the level of agreement/disagreement with the following statements":

- "This training will meet my needs." (S1);

- "This training will be useful to my daily teaching activities/work in my institution." (S2);

- "I will use the course information and the ideas provided at my institution." (S3);

- "I will enlarge my professional network (share experience and make contacts)." (S4).

None of the respondents expressed a very negative opinion (Strongly Disagree) on each of the statements. More than 90% of respondents (38 out of 42) agreed or strongly agreed on statement S1. Almost the 90% (37 out of 42) of the participants agreed or strongly agreed on statement S2. More than 64% (27 answers) of the respondents strongly agreed on statement S3, and 26% (11) agreed on it, for a total of 90% of respondents. Almost the 90% (37 out of 42) of the participants agreed or strongly agreed on statement S4. Figure 14 shows the agreement level for each statement.
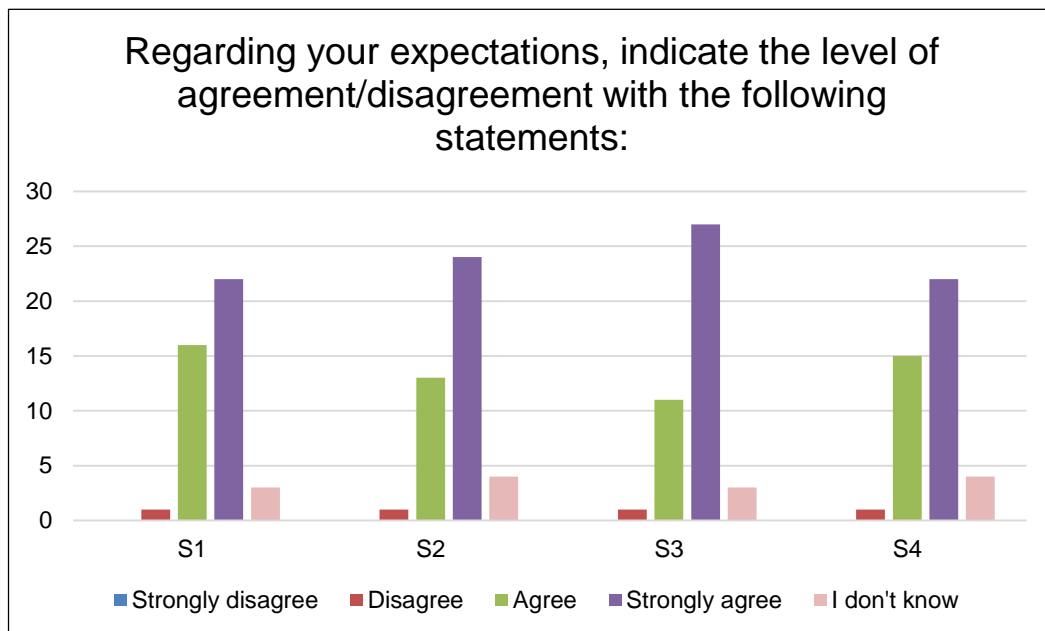

Figure 14. Participants' expectations regarding different statements (n=42)

In conclusion, it is clear that there were strong expectations in relation to the results of this course and that guidelines for CT education are crucial for the participants involved. However, some considerations on the results must be stressed: statistically, it is not possible to generalize the results since participants have expressed their wish to participate on a voluntary basis. Moreover, not all course participants completed the entry questionnaire. However, it is clear that participants attached great importance to

group work and to the possibility of using different examples and case studies during
the CRITHINKEDU course.

5. Results and impact

As already mentioned, at the end of the course a post-questionnaire was provided to
assess the satisfaction of the participants and to detect any shortcomings or problems
of the course (Supplementary document 4[12]). Also, efforts were made to assess
whether participants met their initial expectations and would be able to replicate the
course in their institutions. Although the completion of this final questionnaire was
requested several times, it was not possible to obtain answers from all the participants
(39 out of 42).

The coaches of the partners' institutions of the CRITHINKEDU project were also given
the opportunity to reply to the questionnaire. To this end, an initial question was asked
to identify how many coaches and participants responded to the questionnaire. As the
number of coaches (n=6) was significantly lower than the number of respondents
(n=39), it was decided to analyze the responses to the questionnaire as a single group.
The results of this questionnaire are provided in detail in Supplementary document
5[13].

In general, the overall participants were satisfied with the CRITHINKEDU course
experience (Figure 15). Only two respondents out of 45 (4%) stated that they did not
like the CRITHINKEDU course. Almost 70% (31 respondents) liked it, and 12
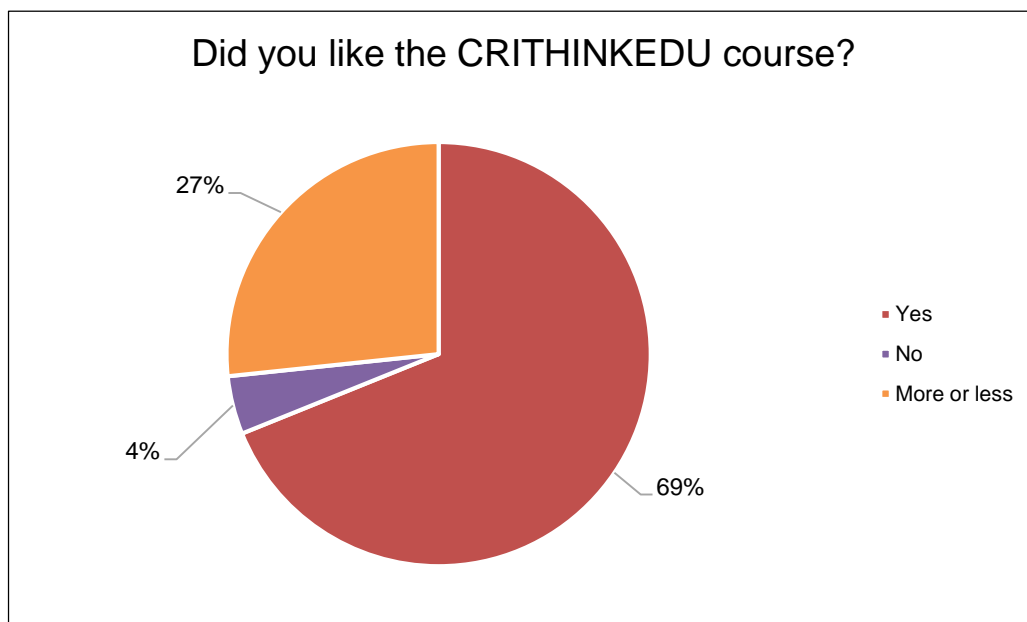respondents (27%) answered "more or less".

Figure 15. CRITHINKEDU course satisfaction (n=45)

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[12]For more information, please see http://bit.ly/Supplementary4-O3
[13]For more information, please see http://bit.ly/Supplementary5-O3

Table 13 shows that the majority of the respondents teach their main course in Social Sciences fields (mainly Education), representing 71,1% of the participants, followed by STEM (17,8%), and Biomedicine (11,1%).

Table 13. Post-questionnaire - Teaching fields classified by Economic activities and Macro fields (n=45)

Teaching field	Economic Activities (EUROSTAT, 2008)	Macro field
Veterinary Medicine (n=1)	Agronomics and Animal Sciences (n=1)	BIOMEDICINE (n=5)
Health Sciences (n=2) Mental Health (n=1) Nursing (n=1)	Health (n=4)	
Civil Engineering (n=3) Wood Technology (n=1) Statistics (n=1) Mathematics (n=2) Engineering (n=1)	Engineering (n=8)	STEM (n=8)
Social Work / Sociology (n=1)	Social Work (n=1)	SOCIAL SCIENCES (n=31)
Education (n=6) Science Education (n=2) Language didactics / linguistics (n=1) Early childhood teacher's education (n=1) Psychology (n=1) Educational development (n=1) Teaching Methodology (n=1) Educational Science (n=3) Teaching didactics (n=1) Chinese Studies (n=1) Linguistics (n=1) Languages (n=1) Applied Linguistics (n=1)	Education (n=21)	
Economics (n=2) Economics and ICT (n=1) Responsible Business (n=1) Didactics of Economics (n=1) Business ethics (n=1) Business administration (n=2) Business (n=1)	Financial Services (n=9)	

Only the respondents entering the "no" or "more or less" answers (n=14) were asked to further specify why they were not fully satisfied. In addition to the pre-set response options, a free field to enter a more detailed answer was also provided. The main issues highlighted by respondents' responses are (it was possible to select more than one option) (Figure 16):

- Not enough case studies/examples (n=7);

- Course Content (n=5);

- Coach Style (n=4);

- Training Room Condition (n=4);

- Quality of plenary speakers (n=3);

- It was not easy to work in the group (n=2);

- Materials (not enough/ too many/ not relevant) (n=2);

- The course was too long (n=2);

- Concepts that apply to my job not explained thoroughly (n=1);

- More time should have been spent on my own case studies/examples(n=1);
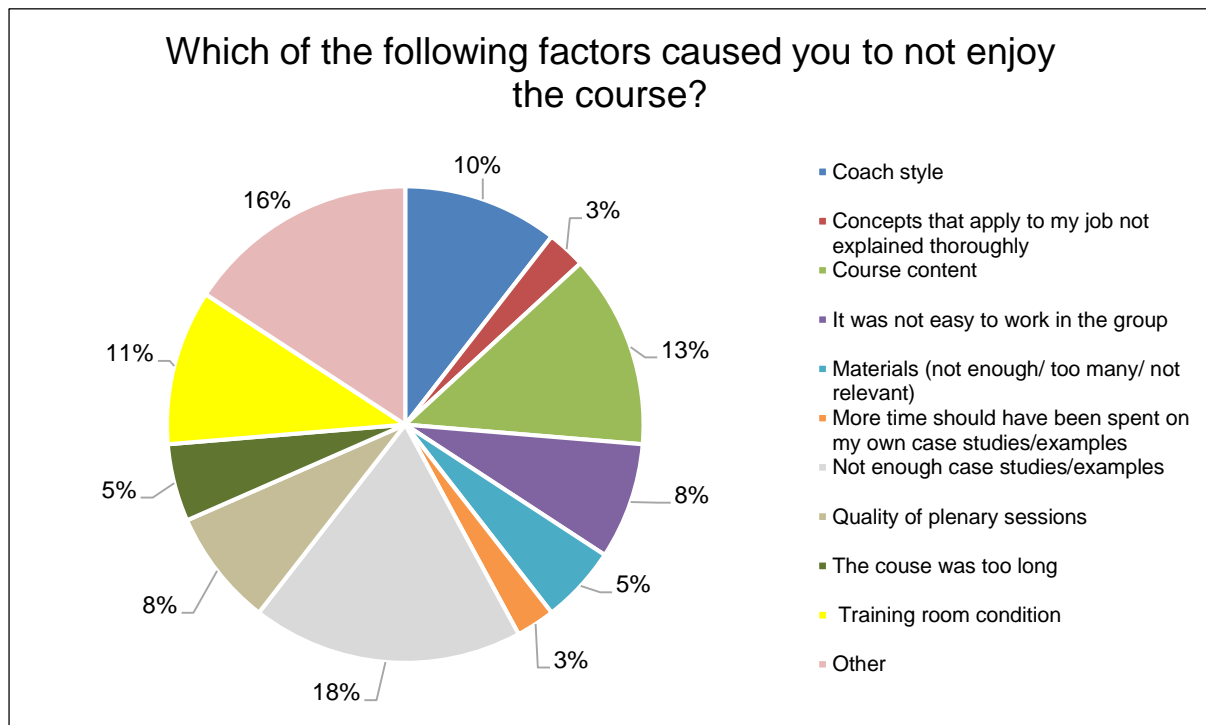
- Other (n=7).

Figure 16. Factors that caused participants to not enjoy the course (n=14)

From these answers, it results that the major expectation (learning using case studies and examples) of these participants was not satisfied. Other course problems were claimed by the participants in more detailed answers left in the open question, such as the role of the coach, the time management of the training activities, the course structure, and the group work:

"I felt that the role of a coach was not fully explained to me in advance and I was underprepared for what I had to do." (P19)

"Frequent interruption of group process/activity." (P14)

"Timing should have been followed more correctly." (P24)

"Too much individual work was not clear." (P5)

"Some sessions were too general, not very focused on critical thinking." (P32)

"Not a very collaborative atmosphere in the group." (P37)

"The participants were tired at the end of the day and especially at the end of the week. Time management." (P22)

"Course structure - hint sessions quite general, afterwards asking specific results (application)." (P2)

The following question regarding the course experience was asked to the respondents, worded as "Regarding your course experience, indicate the level of agreement/disagreement with the following statements". It was composed of 19 statements to which participants had to express the level of agreement on a five-point Likert scale (Figure 17 to 21, and Table 14).
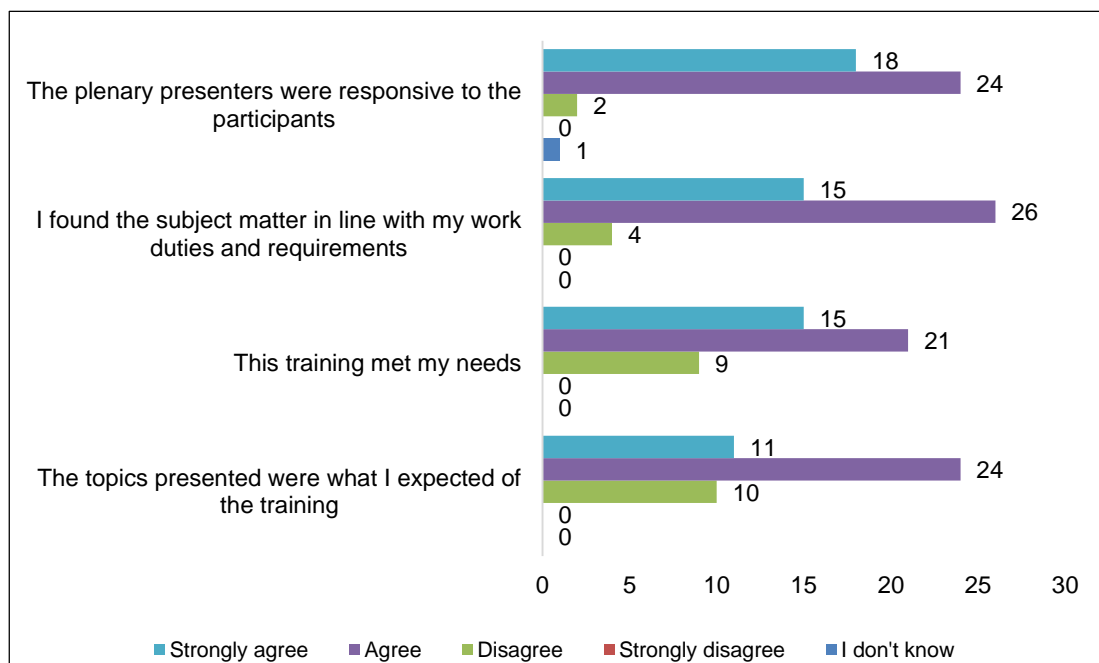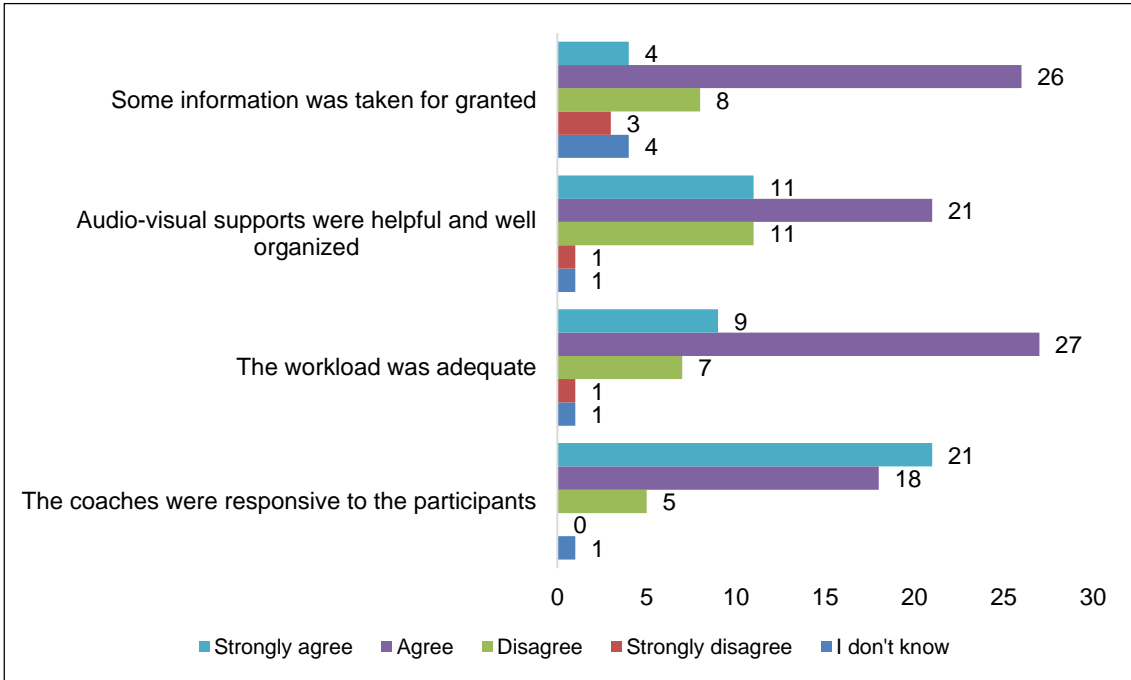

Figure 17. Course experience 1 (n=45)

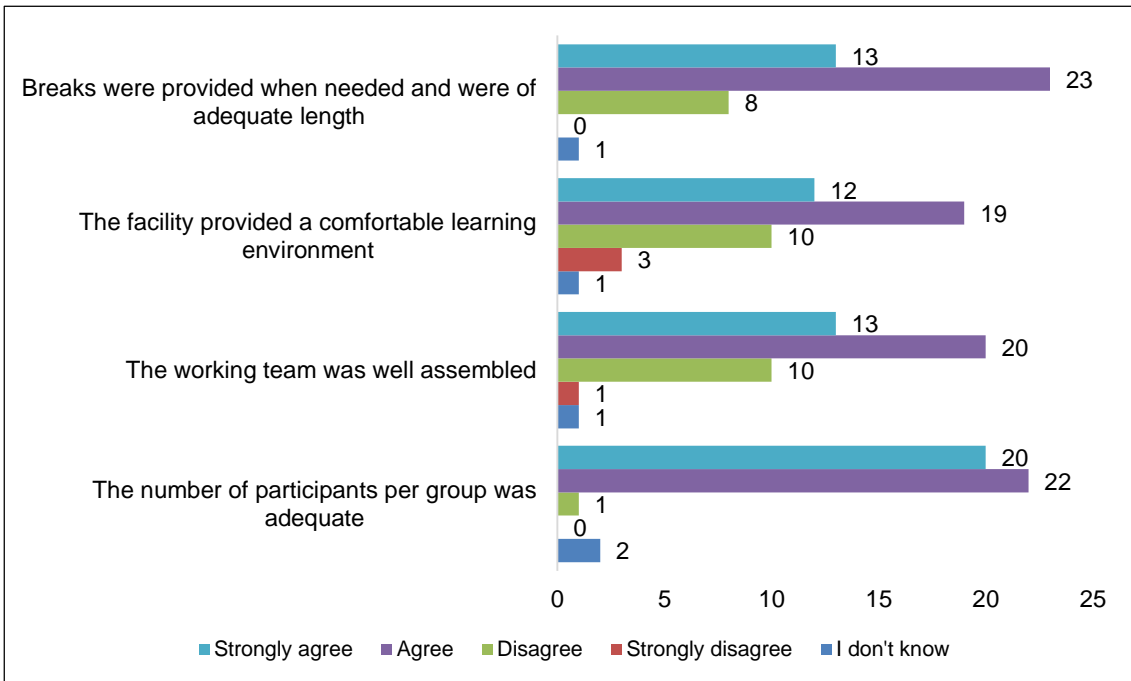Figure 18. Course experience 2 (n=45)
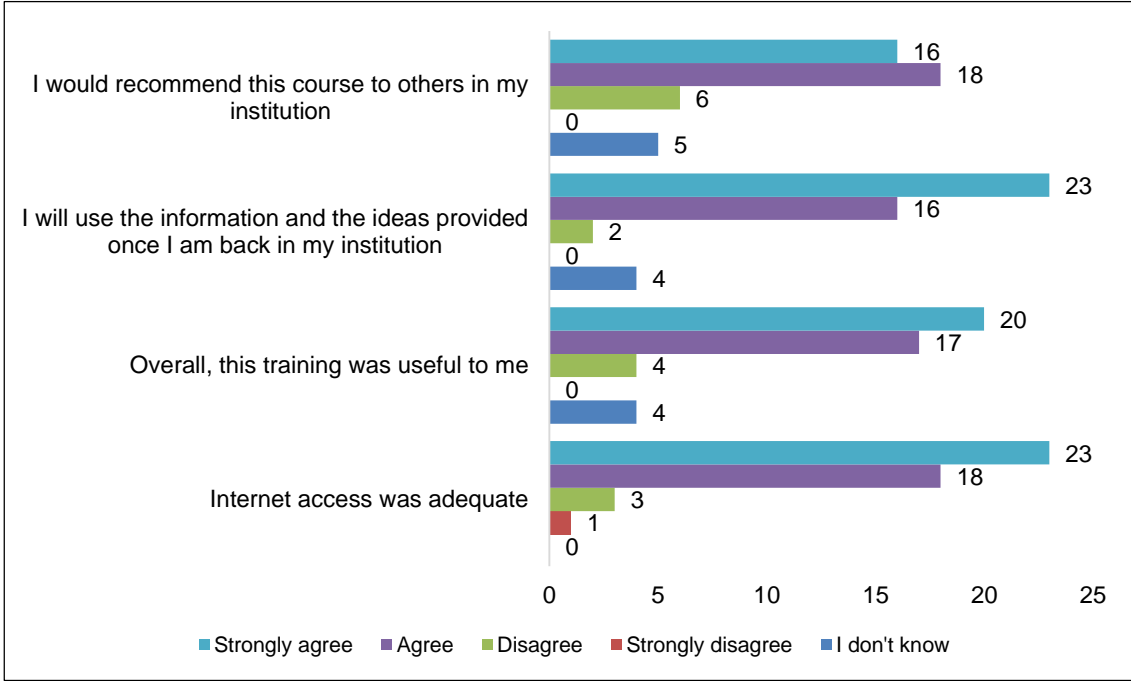

Figure 19. Course experience 3 (n=45)

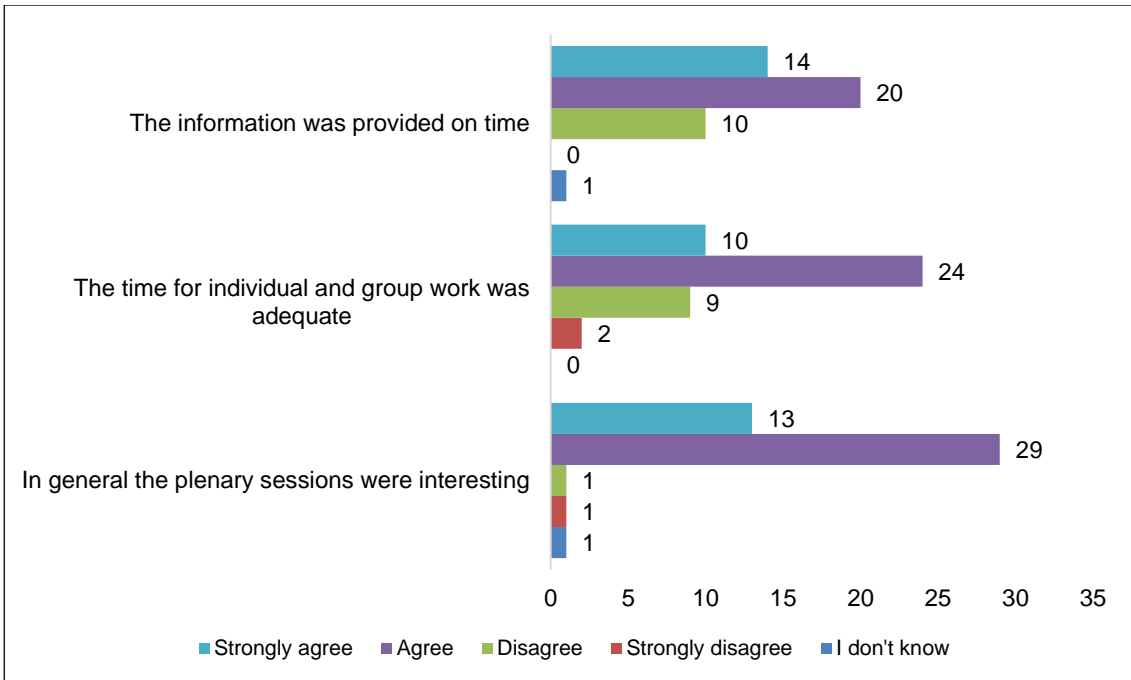Figure 20. Course experience 4 (n=45)

Figure 21. Course experience 5 (n=45)

Table 14. Summary of the positive and negative aspects of the course experience (n=45)

Positive aspects

The number of participants per group was adequate (93% of respondents agreed or strongly agreed with this statement).

In general, the plenary sessions were interesting (93% of respondents agreed or strongly agreed with this statement).

The plenary presenters were responsive to participants (93% of respondents agreed or strongly agreed with this statement).

I found the subject matter in line with my work duties and requirements (more than 90% of respondents agreed or strongly agreed with this statement).

Internet access was adequate(more than 90% of respondents agreed or strongly agreed with this statement).

I will use the information and the ideas provided once I am back in my institution(more than 86% of respondents agreed or strongly agreed with this statement).

The coaches were responsive to the participants (around 86% of respondents agreed or strongly agreed with this statement).

Overall, this training was useful to me (82% of respondents agreed or strongly agreed with this statement).

Breaks were provided when needed and were of adequate length (80% of respondents agreed or strongly agreed with this statement).

The workload was adequate (80% of respondents agreed or strongly agreed with this statement).

This training met my needs (80% of respondents agreed or strongly agreed with this statement).

The topics presented were what I expected of the training (more than 80% of respondents agreed or strongly agreed with this statement).

I would recommend this course to others in my institution(more than 75% of respondents agreed or strongly agreed with this statement).

The time for individual and group work was adequate (more than 75% of respondents agreed or strongly agreed with this statement).

Negative aspects

Some information was taken for granted (participants wanted more basic information and resources on CT) (66% of respondents agreed or strongly agreed with this statement).

Respondents were then asked to evaluate the quality of the course through a multiple question, whose answer options could range from 1 to 5, where 1 meant a very low quality and 5 a very high quality (Figure 22).
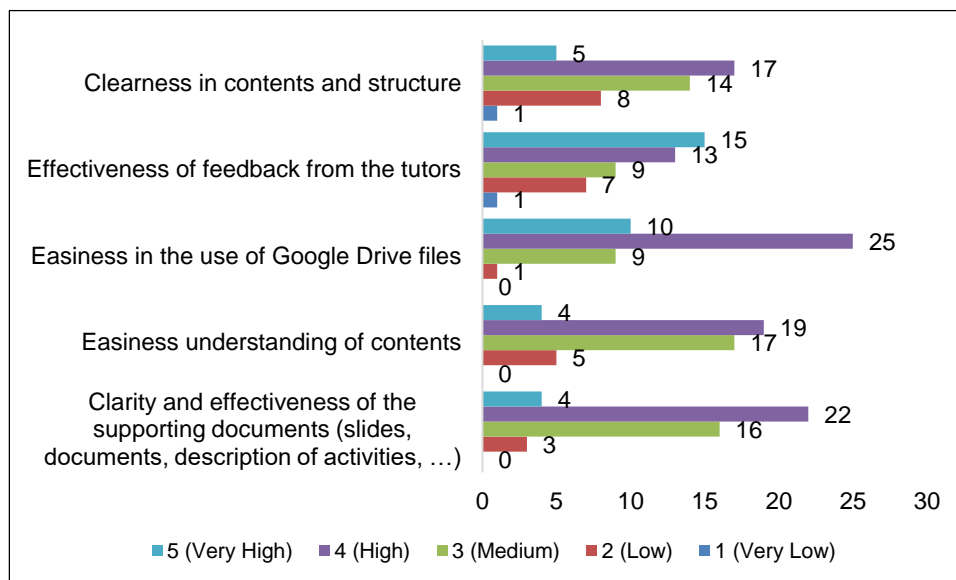
Figure 22. Course content quality (n=45)

The question was formulated as "Assess the quality of content of the course in terms of". The following responses were obtained:

- Clarity and effectiveness of the supporting documents (slides, documents, description of activities, …) (around 57% of the respondents gave a high or very high grade);

- Easiness understanding of contents (more than 50% of the respondents gave a high or very high grade, and 37% gave a medium score);

- Easiness in the use of Google Drive files (more than 77% of the respondent gave a high or very high score);

- Effectiveness of feedback from the tutors (more than 62% of respondents gave a high or very high score);

- Clearness in contents and structure (more than 50% of the respondents gave a high or very high grade, around the 31% gave a medium score).

After the quality of the course content, respondents were asked to self-evaluate themselves in terms of the level of their competences – after the course - on a scale of 1 to 5, where 1 means very low and 5 very high. The aggregate results by level are shown in Table 15. Except for the digital skills and leadership skills, all competencies of respondents were perceived as having undergone a high or very high improvement. The competence indicated as the most enhanced by the course was Instructional Design, followed by Critical Thinking, Communication and Collaboration.

Table 15. Level of participants' competences after the CRITHINKEDU course (n=45)

COMPETENCE	1 (VeryLow)	2 (Low)	3 (Medium)	4 (High)	5 (Very High)
			GRADE		
Collaboration	0	1	19	20	5
Communication	0	2	18	20	5
Critical Thinking	0	3	14	20	8
Creativity	1	5	18	17	4
Problem-solving	1	4	18	16	6
Digital skills	4	12	17	10	2
Instructional design	0	4	9	25	7
Curriculum planning	1	4	17	18	5
Teaching methods	1	4	15	17	8
Learning assessment	0	3	19	17	6
Leadership	1	11	16	14	3
Groupwork	0	5	17	16	7

At the end of the questionnaire, four open questions were asked to collect feedback and impressions of the course from respondents. The questions were as follows:

- "If anything, what would you change about the course, and why?";

- "What did you like best from the course?";

- "What did you like least from the course?";

- "Please provide any additional comments you feel would help with the evaluation of the course.".

You can find complete answers of the respondents in [Supplementary document 5](). Unfortunately, the answers are too heterogeneous impairing the creation of categories that would not neglect the differences or the composition of adequate categories and answers.

Regarding the answers to the question "If anything, what would you change about the course, and why?", participants mainly claimed the following aspects: a better preparation of the coaches, the inclusion of more practical examples for CT teaching and assessment, more work in mixed groups and more time for the individual work. Some of the illustrative answers are presented in here:

> *"Include more "tools" (like value line, etc.) to use in class. Also, go into greater details of these tools, specifically how one applies them in class, what are the pitfalls, strengths, etc.*

However, I understand now that this was not the goal of the course, and these things can/should be known or looked up afterwards." (P8)

"Groups should have been divided per subject of interest. Changing the groups would have been better. The Coach should have been more familiar with the CT subject and models used." (P35)

"*Include more examples about how explicitly one can assess critical thinking skills.*" (P22)

In respect to the question "What did you like best from the course?", participants especially emphasized: the engagement in group work, the coaches and their role in guiding the work during the activity sessions, some of the hint sessions, and the exchanging of experiences between different fields and disciplines. Some illustrative answers are here presented:

"*The exchange between different institutes and disciplines.*" (P2)

"*The coaching of the different participants and discuss their design.*" (P41)

"*Information and resources from hints.*" (P18)

Finally, and taking into account the question "What did you like least from the course?", participants identified the following negative aspects: the lack of some supporting materials and the low engagement of some coaches, the few opportunities to work in mixed groups, some of the hints sessions and the large amount of the participants´ expected work. Once again, the full data with all answers from the participants can be found in Supplementary document 5.

6. Conclusions and Future Work

This report described the experience of a European training course on CT education for university teachers based on the "Preliminary proposal of guidelines for quality in CT education" (Dominguez, 2018b, p. 56) and from the "Gaps between labour market needs and CT educational practices in European Higher Education Institutions" (Dominguez, 2018b, pp. 54-55).

More than fifteen years ago, Halpern (2001) pointed out that American universities and colleges acknowledged the need to include CT teaching in their institutional programs at every level. And although some American students entering the university have already enjoyed some critical thinking teaching, they also claim that they still need more advanced teaching (Jacobson & Mark, 2000). Paul, Elder, and Barlett's (1994)[14] revealed that while the 89% of faculty members "claimed critical thinking to be a primary objective of their instruction", only 19% could "give a clear explanation of what critical thinking is". Moreover, only 9% of the respondents were "clearly teaching for critical thinking on a typical day in class". Though 78% of respondents "claimed that their students lacked appropriate intellectual standards", only 8% "could

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[14]In "Study of 38 Public Universities and 28 Private Universities to Determine Faculty Emphasis on Critical Thinking Instruction". Retrieved from https://bit.ly/2jShX3X on 28/01/2018.

enumerate any intellectual criteria or standards they required of students or could give an intelligible explanation of what those criteria and standards were". Furthermore, only 8% of HE teachers "were able to provide a clear conception of the critical thinking skills they thought were most important for their students to develop" (Paul, Elder & Barlett, 1997). Also, apart from academic settings, many scholars agree that critical thinking skills are useful for everyone throughout their lives (O'Keefe, 1986, 1995; Browne & Stuart, 2004), including in the transition to their professional lives (Dominguez, 2018a).

The question at issue is: how can we transform instruction and learning so that HE students acquire different intellectual habits, dispositions, and traits? How can we teach CT skills and dispositions in ways that are lasting, comprehensive, and substantive?

In the European Community, the CRITHINKEDU course is the first answer to these questions, which have been disregarded. While there is room for improvement, the CRITHINKEDU course was an opportunity for group work and exchange of experiences among HE teachers for too long. The results obtained from the pilot course in Rome show a high degree of satisfaction from the participants with the group work. Almost all participants (93%) appreciated the plenary sessions held during the course. More than 80% of respondents found the course useful for their work and for their curriculum requirements. The participants' expectations were very much aligned with a practical way of thinking: participants expected to learn practical tools/techniques/strategies to integrate CT in their curricular units, and they were particularly concerned with assessing the achievement of CT in their students. Finally, the four more enhanced skills by the course were the following: Collaboration, Communication, Critical Thinking and Instructional Design.

Constructing a course to integrate the CT in HE teaching on guidelines such as those proposed in second CRITHINKEDU intellectual output (Dominguez, 2018b) was both a challenge and a first verification of the need for the guidelines themselves. Regarding the first two levels of the guidelines, the organizational and programme levels, the CRITHINKEDU course confirmed the validity of the guidelines and was reflected in the shared experiences of the participants during the activity and plenary sessions in Rome. The need for an organizational culture for CT education and of its support across the curricula is somehow reflected in the results from this experience.

Particular attention must be paid to the third level, the course level. It has emerged from the pilot experience of the CRITHINKEDU course that guidelines such as the 3.5 "Provide CT learning activities as opportunities to transfer different skills or dispositions in a variety of situations and/or subjects" (Dominguez, 2018b, p. 56) may be difficult to implement, particularly in a context limited in time and resources such as that of a single course, with large classes and not along the whole curriculum. Also, the crucial point is to provide examples and case studies to demonstrate how CT skills or dispositions can be transferred to different fields of study.

Another critical issue that emerged from the pilot experience of the CRITHINKEDU course is CT evaluation, being a challenge for the generality of the teachers. It is necessary to provide valid examples of specific evaluation of critical thinking and not of all other skills or competences. Thus, the guideline 3.9 "Put in place adequate CT assessment instruments according to the previously defined learning goals and outcomes" (Dominguez, 2018b, p. 56), may remain an empty shell if examples of the tools to be used in relation to critical thinking development goals are not provided.

To conclude, more than 86% of respondents agreed or strongly agreed that they would use the information and the ideas provided in the CRITHINKEDU course once back in their institution and more than 74% of them would recommend this course to others in their institution. The next step will be to adjust and replicate the CRITHINKEDU course in all the countries of the participants in Rome. Participants and other HE teachers who will attend similar training could, in turn, carry-out deployment scenarios (put into practice what they learnt) in the scope of the fourth intellectual output (Output 4). Data from these deployment scenarios will

Local deployment scenarios of the CRITHINKEDU course will be organised with the university teachers, to support the elaboration of the "European guidelines for critical thinking education in Higher Education Institutions"

be collected, and more in-depth analysis will be made for the validation of the proposed preliminary guidelines, to elaborate the "European guidelines for critical thinking education in Higher Education Institutions", based on empirical data collected from those CT educational interventions with university students in different fields.

7. List of references

Abrami, P. C., Bernard, R. M., Borokhovski, E., Wade, A., Surkes, M. A., Ramim, R., & Zhang, D. (2008). Instructional Interventions Affecting Critical Thinking Skills and Dispositions: A Stage 1 Meta-Analysis. *Review of Educational Research*, *78*(4), 1102-1134. https://doi.org/10.3102/0034654308326084

Altbach, P. G., Reisberg, L., & Rumbley, L. E. (2009). Trends in Global Higher Education: Tracking an Academic Revolution. Paris: UNESCO. Available at https://bit.ly/2ITxcrG

Bailin, S., & Battersby, M. (2015). Teaching Critical Thinming as Inquiry. In M. Davies & R. Barnett (Eds.), *The Palgrave Handbook of Critical Thinking in Higher Education*. New York: Palgrave Macmillan, 123-138. ISBN: 978-1-137-37803-3

Browne, M. N., & Stuart, M. K. (2004). *Asking the right questions: A guide to critical thinking (7th ed.).* Upper Saddle River, NJ: Pearson-Prentice Hall.

Dominguez, Caroline (coord.). (2018a). A European collection of the Critical Thinking skills and dispositions needed in different professional fields for the 21st century. Vila Real: UTAD. ISBN: 978-989-704-256-0. Available at https://bit.ly/2KCtKPl

Dominguez, Caroline (coord.). (2018b). *A European review on Critical Thinking educational practices in higher education institutions*. Vila Real: UTAD. ISBN: 978-989-704-258-4. Available at https://bit.ly/2k8MKtz

Davies, M., & Barnett, R. (Eds.). (2015). *The Palgrave Handbook of Critical Thinking in Higher Education*. New York: Palgrave Macmillan. ISBN: 978-1-137-37803-3

European Commission (2010). *New Skills for New Jobs*. Brussels: Education, Audiovisual and Culture Executive Agency (EACEA P9 Eurydice). Available at https://bit.ly/2rTn2MV

Eurostat (2008). *NACE Rev. 2: Statistical Classification of Economic Activities in the European Community*. Luxembourg: Office for Official Publications of the European Communities. Available at https://bit.ly/1EKGS03

Facione. P. A. (1990). *Critical Thinking: A Statement of Expert Consensus for Purposes of Educational Assessment and Instruction*. Mellbrae, CA: The California Academic Press. Available as ERIC Doc. No.: ED 315 423.

Halpern, D. F. (2001). Assessing effectiveness of critical thinking instruction. *Journal of General Education*, *50*(4), 270-286. https://doi.org/10.1353/jge.2001.0024

Harris, A. (2009). *Distributed Leadership – Different Perspectives*. Netherlands: Springer. ISBN: 978-1-4020-9737-9

Highsmith, J. (2009). *Agile Project Management: Creating Innovative Products*. New Jersey: Pearson Education. ISBN: 978-0321658395

Jacobson, T. E., & Mark, B. L. (2000). Separating wheat from chaff: Helping first-year students become information savvy. *Journal of General Education*, *49*(4), 256-278. https://doi.org/10.1353/jge.2001.0025

Li, F., Morgan, W. J., & Ding, X. (2008). The Expansion of Higher Education, Employment and Over-Education in China. *International Journal of Educational Development*, *28*(6), 687–697. https://doi.org/10.1016/j.ijedudev.2007.10.002

Marin, L. M., & Halpern, D. F. (2011). Pedagogy for developing critical thinking in adolescents: Explicit instruction produces greatest gains. *Thinking Skills and Creativity*, *6*(1), 1-13. https://doi.org/10.1016/j.tsc.2010.08.002

McCowan, T. (2007). Expansion without equity: An analysis of current Policy on access to higher education in Brazil. *Higher Education*, *53*(5), 579–598. https://doi.org/10.1007/s10734-005-0097-4

O'Keefe, V P. (1986). *Affecting critical thinking through speech*. Annandale, VA: ERIC Clearinghouse on Reading and Communication Skills. (ERIC Document Reproduction Service No. ED 267 476). ISBN: 9789997865120

O'Keefe, V P. (1995). *Speaking to think, thinking to speak: The importance of talk in the learning process*. Portsmouth, NH: Boynton/Cook Publishers. ISBN: 978-0867093582

Paul, R. W., Elder, L., & Bartell, T. (1997). California teacher preparation for instruction in critical thinking: Research findings and policy recommendations. Sacramento: California Commission on Teacher Credentialing.

Paul, R. W., & Elder, L. (2002). *Critical Thinking: Tools for Taking Charge of Your Professional and Personal Life*. New Jersey: Prentice Hall. ISBN: 0-13-064760-8

Perkins, D., Tishman, S., Ritchhart, R., Donis, K., & Andrade, A. (2000). Intelligence in the Wild: A Dispositional View of Intellectual Traits. *Educational Psychology Review*, *12*(3), 269-298. https://doi.org/10.1023/A:1009031605464

Poce, A. (2012). Contributions to the definition of a critical technology. An assessment study. Milano: Franco Angeli. ISBN: 9788820410063

Poce, A. (2015). *Tecnologia critica, Creatività e Didattica della Scienza*. Milano: Franco Angeli. ISBN: 9788891725332

Poce, A. (Ed.). (2017). Verba Sequentur. Pensiero e scrittura per uno sviluppo critico delle competenze nella scuola secondaria. Milano: Franco Angeli. ISBN: 9788891752321

Pursiainen, C. (2012). *At the Crossroads of Post-Communist Modernisation*. Hampshire: Palgrave Macmillan. ISBN: 978-1-137-28413-6

Robertson, S., & R. Dale. (2013). The social justice implications of privatisation in education governance frameworks: a relational account. *Oxford Review of Education*, *39*(4), 426–445. https://doi.org/10.1080/03054985.2013.820465

Schofer, E., & Meyer, J. W. (2005). The Worldwide Expansion of Higher Education in the Twentieth Century. *American Sociological Review*, *70*(6), 898-920. https://doi.org/10.1177/000312240507000602

Tiruneh, D. T., Verburgh, A., & Elen, J. (2014). Effectiveness of Critical Thinking Instruction in Higher Education: A Systematic Review of Intervention Studies. *Higher Education Studies*, *4*(1), 1-17. http://dx.doi.org/10.5539/hes.v4n1p1

UNESCO (2015). *International Standard Classification of Education (ISCED-F 2013)*. Canada: UNESCO Institute for Statistics. ISBN: 978-92-9189-179-5. Available at http://unesdoc.unesco.org/images/0023/002350/235049e.pdf

8. Funding and acknowledgments

9. Supplementary documents

Supplementary1. Course shared folder: http://bit.ly/Supplementary1-O3

Supplementary2. Pre-course questionnaire (form): http://bit.ly/Supplementary2_O3

Supplementary3. Pre-course questionnaire (results): http://bit.ly/Supplementary3-O3

Supplementary4. Post-course questionnaire (form): http://bit.ly/Supplementary4-O3

Supplementary5. Post-course questionnaire (results): http://bit.ly/Supplementary5-O3