

University teachers' thoughts about how critical thinking is a part of their classes

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Abstract— The project “CRITHINKEDU – Critical thinking across higher education curricula”, financed by the European Commission has the purpose to search good practices related to critical thinking integration into higher education curricula. The following article presents a collection of five interviews with higher education professors from Humanities and STEM (science, technology, engineering, Mathematics), in Romania. This is piece of a larger research that aimed to reveal teaching conceptions from all project partners. This paper presents and compares Romanian teachers opinions with those found by the general CRITHINKEDU project and tries to point some directions for teaching techniques improvement.

Key words—Critical Thinking, higher education curriculum, critical thinking dispositions, Humanities, STEM

I. INTRODUCTION

It is important to begin with the presentation of the project from which this paper draws its content and aims. CRITHINKEDU “Critical thinking across the European higher education curricula”, funded by the European Commission under the Erasmus+ Programme, reference number 2016-1PT01-KA203-022808, is a partnership from 9 countries: Belgium, Czech Republic, Greece, Ireland, Italy, Lithuania, Portugal, Romania and Spain. The partnership was constituted by invitations sent to all authors identified by the applicant institution, University Trás-os-Montes e Alto Douro, Portugal. The authors had published papers concerning critical thinking as domain specific and context bounded skill. The countries and institutions represented in this project are those that accepted the challenge to pursue the research and intervention topic proposed in the application (critical thinking and domain specificity). It includes contributions from 11 European Higher Education Institutions (EHEI) and over 59 scholars and experts from different fields (Biomedical Sciences, STEM – Science, Technology, Engineering and Mathematics, Social Sciences, and Humanities). For the second intellectual output of CRITHINKEDU, named “A European review on critical thinking educational practices in higher education institutions” [2], led by the University of Santiago de Compostela (USC), partner institutions had to research for interventions concerning critical thinking (CT) in higher education presented in the literature. After this stage, *partners had to interview teachers*, for a better image of pedagogical and didactical practices in European universities.

II. METHODOLOGY

The methodological design was a common enterprise, all partners from CRITHINKEDU project agreed to have a collection of interviews to find out what teachers are thinking about CT and how they are integrating it into their classes. The general hypothesis of the project is that there are differences among the disciplines concerning CT integration, each discipline having different needs and specific ways of CT embedding. And there is an assumption, which will not be explored: the CT skills and dispositions are better developed embedded and not through stand-alone class. The design has many stages and six outputs. This paper presents the second output, interviews with teachers, and it has the following steps [2]:

A. Design of interviews:

Open-ended questions were formulated, covering a number of CT dimensions inspired by Facione’s framework [2, 4]. The content of the interview protocol was built upon Paul, Elder and Bartell [8] interviews on teacher preparation for instruction in critical thinking. CT concept, intent CT aims, overall approach, type of intervention, teaching strategies, learning materials, assessment, challenges, teacher training/instruction on CT and institutional barriers while promoting CT. These authors conducted interviews with education and subject-matter faculty in private and public colleges and universities, addressing a number of key aspects of teaching practices in CT. Some of these questions were adapted and used in this protocol, as follows: 1. How would you explain to me your concept/idea of CT? 2. What particular aspects of CT do you believe are most important for your students to develop? And why? 3. Could you describe the practices (approaches/strategies/interventions) that you use in your classroom to foster CT? Please, give an example 4. Which learning materials do you use to promote CT in your classroom? 5. Do you assess CT abilities of your students? And how? 6. What challenges do you experience when developing CT in your students? How do you try to address them? 7. What type of instruction (or other) do you think should be provided to your colleagues to support the development of their CT teaching practices? 8. Are there any institutional barriers that limit the promotion of CT education?

B. Sampling design and procedure

CRITINKEDU partners reached to a consensus to select five university teachers from diverse fields, using the categorization: STEM, Humanities, Social Sciences and Bio-medical Sciences.

Participants' characteristics are described in Table 1 (*Romanian Participants to the Interviews*).

TABLE I. ROMANIAN PARTICIPANTS TO THE INTERVIEW

Name (initials)	Domain	Age	Gender	Working experience
A. I.	STEM (Architecture)	51	M	25
M.A.	STEM (Chemistry)	63	M	30
S.C.	Humanities (Philosophy)	45	M	20
D.B.	Humanities (Ethics)	38	M	15
E.A.	Humanities (Archaeology)	62	M	33

C. Data collection

Five protocol interviews were collected. All interviews were audio and video recorded, and then transcribed for analysis.

D. Data analysis

The transcriptions of interviews were submitted to qualitative content analysis. All teachers' responses were analyzed, question-by-question following these 4 stages as in [3]:

a) Decontextualization (Break down the text into smaller meaning units): researchers got familiarized with the data and read through the transcript to obtain the sense of the whole, before it could be broken down into smaller meaning units. By "meaning units" we refer to the constellation of sentences or paragraphs containing aspects related to each other, covering different dimensions of CT addressed in the interview.

b) Recontextualisation: after the meaning units were identified in the transcript, we confirmed whether all aspects of the content had been covered.

c) Coding in pre-established categories: teachers' responses were coded into the main categories and subcategories defined previously. The rubric used for the analysis of the literature reviewed served this goal, although two more dimensions were added: CT instruction in teachers' training and institutional barriers.

d) Description of the results and quotes: results were illustrated with quotes from interviews in order to provide readers with a clear idea about how university teachers promote CT in their classes.

E. Data assessment

Collected data were assessed with the method of content analysis, based on Facione's research tool for CT dispositions [2, 4], which recognizes seven dispositions (truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness and cognitive maturity) and six core CT skills (interpretation, analysis, evaluation, inference, explanation, and self-regulation). In summary, the researchers assessed the

teachers' answers in the light of their CT thinking dispositions, attempting to extract elements that exhibit teachers' dispositions while they were commenting on the fields related to the project.

CT instructional approach is seen as in [5], categorizing the various approaches to CT instruction as general, infusion, immersion, and mixed. In the general approach, CT is taught separately from the presentation of the content of an existing subject-matter.

The infusion approach is a "deep, thoughtful, a well-understood subject matter instruction in which students are encouraged to think critically in the subject" [7: 5]. It attempts to integrate CT instruction in standard subject-matter instruction and makes the general principles of CT explicit to the students. This approach stems from debates concerning whether a generalist or specific method is the most effective way to teach CT in HE.

The immersion approach also tries to incorporate CT within standard subject matter instruction. However, general CT principles and procedures are not made explicit to students.

The mixed approach, named by Sternberg [9], consists of a combination of the general approach with either the infusion or immersion approach. In the mixed approach, there is a separate thread or course aimed at teaching general principles of CT, but students are also involved in subject-specific CT [10]

The type of intervention is modeled after P. C. Abrami, R. M. Bernard, E. Borokhovski, D. I. Waddington, A. Wade and T. Persson [1] categorization of instruction interventions. These authors expanded the analysis beyond a single instructional classification scheme and offered a fine-grained approach, which might explain more of the variability in CT outcomes, and may highlight especially effective instructional approaches.

CT teaching strategies. Ennis [6] describes two basic teaching methods for promoting CT, the Lecture-Discussion Teaching (LDT) and the Problem-Based Learning (PBL), which contrast with each other. LDT is the most common approach to college teaching [6]. There is a lecture (usually accompanied by some reading in a textbook) presenting one or more aspects of the subject-matter, followed by a discussion section (or a discussion at the end of the period in which the lecture was presented). PBL method calls for dealing with a subject-matter issue, usually requiring investigating, developing, testing, and discussing of hypotheses or solutions and possible alternatives.

III. RESULTS AND DISCUSSION

The **conception or definition** of CT revealed by the interviews is substantive: they see CT as a set of skills and as dispositions to reasoning. More skills were mentioned, than dispositions, with a surprising total emphasis of dispositions in S.C. (philosopher) interview, although we can guess the skills embedded in the definition. Some beautiful illustrations are: "*Critical thinking, much like the Orthodox Christian concept of Trezvia (awareness of oneself on one's being in the world at all times, awaken or asleep), assists us, architects or citizens in general, in placing us into the world, while being aware of the process of place-making. I am trying to engage my peers, via*

architectural criticism, in explaining their experience, and my students, via courses and debates” (A.I. - architect). “It is both a mental attitude (to think of everything with your own mind), and a discipline akin to (informal) logic.” (S.C. - philosopher).

And a total understanding of CT as a set of skills, in Chemistry: “I need that my students explain if it works and why or if it doesn’t work and why. So, Chemistry is arguing pro or con some statements” (M.A. – chemist).

The results regarding CT definition are consonant with CRITHINKEDU report, but we can observe that a Humanistic education is aiming to dispositions and less to skills, as we shall observe in the following when we shall talk about what CT aims. “What Archaeology is trying to do is to put facts in order, without any ideology” (E.A. – Archaeology).

The aims, or what CT should do for us, put the professors into position to define what is the purpose of CT into their disciplines. Professor E.A. of Archaeology says that CT aims to demolish students’ overconfidence in textbooks and what they learnt in high school, and in what professors are telling them: “[When talking about the past] a terrible thing is that we all are wrong to some extent” (E.A. – Archaeology).

In Chemistry CT is explanation and interpretation “in all applications, student must explain why something is so”.

The philosophers are the representatives of the **stand-alone class approach**. S.C. and D.B. have similar opinions: “It is important for students to learn to defend their ideas with good arguments, to learn to clearly state and explain their own views, to learn to evaluate others’ opinions and to identify errors in their arguments. Being curious and eager to know are other two things that critical thinking can encourage” (D.B.); “The attitude. It’s the critical thinker stance” (S.C.).

Related to the **overall approach** [5, 6], the preferred method is immersion (incorporate CT within standard subject matter instruction, but general CT principles and procedures are not made explicit to students). Four out of five teachers say that they will challenge their students but will not explain anything related to CT or make students aware of CT tasks: “I am always trying (not always with complete success) to engage my students in debates on any given topic taught in class” (A.I. – architect). One professor supports general, stand-alone approach, philosopher S.C., and that is what he is teaching right now.

The learning outcomes are in line with the general CRITHINKEDU report [3], all teachers mentioned dialogue and authentic situation as specific types of interventions [1], problem solving and discussion (argumentation) as teaching strategies. “I am picking up controversial issues of the day and I am trying to make them develop a more general position on similar aspects of their trade. But debates are the most lively approach to developing CT” (A.I. – architect).

The learning materials category of analysis is poorly populated, only two out of five professors mentioned something: exercises (Chemistry) and textbooks (Philosophy). Also the assessment is in deficit. One professor mentions nothing (Architecture), another says that he do not put CT into the assessment (Chemistry), the evaluation being qualitative, direct, over the semester (“I cannot put CT tasks into an exam. I cannot make the standard (the ready reckoner). But it is not

bad, the exam is only a part of the activity, I can assess them continuously over the semester. But if I put CT on the exam and it is not clear what I want, that is bad” - M.A. – chemist). A much clearer answer is offered by professor S.C., who teaches CT to undergraduate level, and we find out that he assess CT through students class interventions (questions, remarks...etc.), their participation in debates, and a written argumentative final essay. This situation regarding assessment is similar to CRITHINKEDU report [3: 49], most teachers do not specify assessment methods. Or in professor E.A. “I don’t think I have any success, or maybe not just right now. Maybe someday my students will remember what I taught them”.

Teacher training is present: we have a “brown bag day” from Archaeology, where a more skillful peer can mentor young assistant, or an institutionalized solution, an association or a professional organization where teachers can address specific issues connected to CT classes (S.C. - Philosopher).

Challenges and institutional barriers are very diverse, like in the project’s report [3: 49]. But the number of student as challenge doesn’t appear, maybe because the domains don’t have a lot of enrolled students in Romania. But the professors mention mentalities, organizational culture or “**the island effect**”, a single class or a single professor who is doing CT class is not enough to make a valid change: “The main difficulty in developing students’ critical thinking abilities is that other courses that they attend in the university are not helpful to develop their critical thinking abilities, but are rather focused on memorizing information. For this reason, students are not got used to critically tackle the topics” (D.B. – philosopher).

The interviewed teachers showed a deep and substantive conception of CT skills and dispositions, with a clear preference of skills development in Chemistry (STEM) and Architecture. Professors need help in understanding the fact that new pedagogical strategies acquisition will improve their performance and their assessment of CT skills and dispositions.

IV. RESEARCH LIMITATIONS

The research methodology, a qualitative one, cannot make claims of generalizing conclusions, but this inconvenient is overcome by the fact that we have a more vivid image of teaching methods and theories or definitions teachers have. Another limitation is the fact that only male subjects were interviewed.

V. CONCLUSIONS

Most of this paper findings are in line with the main CRITHINKEDU report, the CT definition, aims, overall approach, learning outcomes, assessment. But learning materials and teacher training is not as well represented in Romanian teachers’ interviews, in comparison to the European report. One professor mentions “the island effect”, the fact that CT must be in all subjects in order to make a difference.

So the help that professors need consist of two categories: the one they are aware, presented in challenges and institutional barriers, and the one they are not aware: on learning materials, assessment and teacher training. Interventions should aim

teacher training, but also the educational policy of the universities related to teaching quality assurance, imbedding CT into educational programs design and look for it when evaluating an educational program.

VI. FURTHER RESEARCH

Good news come from this respect. This paper is only the set of interviews from Romanian teachers.

We have two research reports (available here <http://crithinkedu.utad.pt/en/resources/>) on employers' opinion about CT and about European interventions, empirical studies, tackling CT development, and, coming next, a third report about teacher training program developed in Rome. We hope this report will become a seminal work that will inspire other educators in their everyday teaching activities.

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