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Co-design creation of critical thinking embedded activities in clinical courses

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Introduction

The existence of a skills' gap in graduates at day 1 compared to the needs of the labour market is often mentioned. Typically, those gaps revolve around communication, collaboration and teamwork, problem-solving, and critical thinking (CrT) (Vista 2020; Thornhill-Miller et al. 2023). In the workplace context, CrT is essential for problem-solving, decision-making, and

innovation. In the field of health sciences, CrT is interconnected with clinical reasoning (CR) (Payan-Carreira et al. 2019). Previous focus groups held with educators, students and labor representatives in Veterinary Medicine revealed conceptual differences among labor market stakeholders (Dumitru et al, 2023), sustaining that most valued and perceived CrT-related skills and dispositions as lacking in newly-graduates.

The Think4Jobs ERASMUS+ project proposed to strengthen the cooperation between Universities and the Labour Market (LM) by designing, developing, implementing, and evaluating CrT blended curricula. The project linked/associated LM representatives and Universities to produce tailored learning activities with the intention to minimize the identified mismatches in CrT skills and dispositions (Rebelo et al. 2023). To secure attractive and effective learning interventions, the participatory co-design approach was selected to leverage CrT and CR in Veterinary Medicine students. The participatory co-design contributed with opportunities to translate scientific knowledge into work-based situations. The participatory co-design implied engaging the stakeholders of the product (in this case, day-1 veterinary graduates) in the formative process, adding to the exchange of perspectives between the Academia and LM representatives. Moreover, by bringing the profession-learning into the class, it was expected to also foster students' engagement with more active learning styles.

In this presentation we describe the methodology used to create real-case problems to be developed in the blended veterinary curricula using a participatory co-design approach. The goals were to enhance the students' CrT (skills and dispositions) acquisition and ultimately to trigger them to decide on the solutions to specific, real-life problems. Of Scandinavian origin, the term participatory design refers to a user-centred design model involving users and designers in the process of technological development (Asaro, 2000). Co-design hints at the participation of designers (herein, the educators) and other stakeholders in the development process, assuming that everyone may contribute with their experiential and conceptual knowledge (Sanders & Stappers, 2008).

Herein, we detail the construction of student-centred CrT-blended activities to be implemented in courses with a clinical dimension, specifically, in the Veterinary Medicine Integrated Master offered at University of Évora.

Design of Activities

The implementation of focus groups in an earlier step of Think4Jobs project identified putative educational CrT skills/dispositions mismatches. It revealed that LM representatives expect newly graduates to demonstrate confidence and proficiency in interacting with clients, to exhibit effective decision-making skills and the ability to implement actions in practice. Proactivity, autonomy, systematic approach, analytical thinking, self-confidence, as well as metacognition and self-correction, are among the sought-after skills and traits during the LM hiring process. Consequently, it was decided to design learning activities simulating real-world/real-life scenarios encountered by practicing veterinarians, targeting the development of clinical skills, particularly using ill-structured problems within case-based learning approach for the clinical courses in Veterinary Medicine programs. The particulars of the clinical situation to be used in the interventions were retrieved from the archives of a *Veterinary Hospital*, by an educator and the LM partner in the project. The interventions design followed an adapted "*think aloud*" approach to deconstruct clinical reasoning into multiple interwoven small steps around the evaluation of a clinical case and aiming at deciding on the most adequate solution for the problem. The number of steps and the amount of information to provide at each step was agreed between the LM and the educators, aiming to match the natural clinical reasoning by a professional. For each activity, a document should be produced, conveying the rationale behind the clinical analysis and proposed solutions. The documents would be assessed for the factual and conceptual understanding related to the course content, and the strength of students' reasoning, including the ability to substantiate procedural and metacognitive dimensions of knowledge with evidence. The activities would be implemented with students in randomly created groups of 4 to 5 elements.

A framework has been developed for clinical courses in the program (table 1). This framework can be adjusted in terms of content, duration, and complexity based on the desired training level. Additionally, it can also be integrated with the training of technical skills during in-house internships.

TABLE 1: Framework to be used in the case-based activities developed for courses in a clinical theme

Activity step by step			CT skills	CT dispositions
General action		Specific action		
Step 1	Present the patient´s problem	Depict the patient's initial story, question, complaint, or evident symptoms before history taking.	Interpretation Inference	Systematicity Cognitive maturity
		Identify the focus of the problem [Why the animal was brought to the consultation]		
		Provide all the hypothesis that may be associated with the problem [I: likely, II: less likely, III: not very likely]		
Step 2	Choose the questions to pose to discriminate between the most relevant hypotheses	Query differential diagnoses Assess the quality of the information collected	Inference Evaluation Communication	Autonomy Evaluation Inquisitiveness Open-mindedness
Step 3	Provide the patient's clinical history information	Revise how the information influence the differential diagnosis	Analysis Interpretation Evaluation	Cognitive maturity Analyticity Systematicity
		Consider of the focus of the clinical problem has changed		
		Rank the most important information according to the value to raise the differential diagnostic list		
		Contrast the diagnostic approaches		

(*Continued*)

(*Continued*)

Step 4	Deliver additional information on request	Ponder if additional parts of the clinical exam are now required in order to exclude some unlikely, but important hypotheses	Analysis Interpretation	Systematicity Analyticity Communication True-seeking
		Discuss how the findings contributed to redefine the diagnostic list (if it changed)	Interpretation Evaluation	
		Discuss the additional exams necessary to confirm the most likely hypothesis and to discriminate between others	Analysis Interpretation Evaluation	Analyticity
		Interpret the findings from the diagnostic Tests	Evaluation Inference	
		Identify the discarded hypotheses on the bases of the additional information provided. Present your diagnosis	Interpretation Inference	

Activity step by step (cont.)			CT skills	CT dispositions
General action		**Specific action**		
Step 5	Therapeutic options	Discuss the therapy that is now indicated, given this diagnosis and patient circumstances	Analysis Evaluation Interpretation Explanation	Communication
		Select the most suitable treatment for a particular situation (consider the animal background, animal problem, co-related health issues, etc.) Identify arguments to support the selected therapeutic options using a SWOT matrix		

(*Continued*)

(*Continued*)

Step 6	Schedule the follow-up	Present your prognosis Discuss it with the teacher/trainer	Inference Explanation	Systematicity Analyticity
		Provide a timeframe for when you expect to see the results of the treatment		
		Describe the changes expected and the timeline for those changes		
		Schedule the moments when the animal should be observed for the condition improvement [either for ambulatory or non-discharged animals in hospital care]		
Step 7	Metacognition	Revise your reasoning: verify your diagnosis	Inference Self-regulation Metacognition	Analyticity Open-Mindedness
		Suppose that the animal fails to show health improvements or presents additional complications. Detect what could have been wrong		
		Anticipate the critical point(s) in the animal´ tutor compliance [time in treatment; effort; costs of treatment; failed expectations for the animal value]. Propose a mitigation plan for them		

One week before each session, students are to receive a document (referred to as the Activity-Plan) through Moodle. This document will outline expectations for preparation before, participation during, and follow-up after the lesson. It will specify the content scope, learning objectives, suggested self-learning activities, desired self-learning outcomes, and estimated time required for preparation and completion of the activity. Additionally, assessment rubrics, focusing on evaluating key reasoning skills, will be provided in advance for both preparatory self-learning tasks and in-class activities. The Activity-Plan also clarifies the expected final output and submission deadline. Recommended references are accessible to students through Moodle, and they will be encouraged to seek additional resources online.

The proposed framework allows to integrate other pedagogical tools and resources, such as a SWOT analysis for the proposed therapeutic approach, or a concept map for the discussion of the differential diagnosis.

Discussion and Conclusion

Incorporating daily clinical cases into the classroom settings offers several advantages. It fosters a direct connection between classroom activities and the real-world/real-life tasks performed by Veterinary doctors, thereby enhancing student engagement and motivation. Moreover, it facilitates cognitive learning and equips students with essential workplace skills and attitudes. Additionally, involving representatives from relevant LM organizations in designing and adjusting these activities further enriches the learning experience by bringing work-based learning opportunities into the academic environment. The positive rewards are perceived by all of those involved, still piloting of these activities will bring further insights in the real value of the framework to mitigate skills mismatch between the academy and the labour market.

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