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Armélinda Agnello and Jean-François Focant

Session title (10-word limit)
Enhancing critical thinking and problem-solving skills through active-learning strategies

Session Abstract
Critical thinking, data analysis and problem-solving are highly valuable analytical skills for academic and professional purposes, especially in the healthcare sector. These skills are a key focus of the organic chemistry course for first-year undergraduate students in veterinary science. There are clear analogies between diagnostic process and the molecule identification based on the analysis of spectroscopic data. Both tasks involve gathering relevant information, developing causal hypotheses and testing them. Statistical data show that chemistry problem-solving tasks involving interactive digital technologies contribute to enhancing students' analytical skills and motivation. Face-to-face, distance and blended learning approaches will be shared.

Detailed Description
Developing soft skills, such as analytical thinking, helps students to succeed in their studies and reach their professional goals. These skills are particularly important for students intending to pursue a career in the healthcare sector, especially when it comes to establishing a diagnosis, which involves gathering information and constructing causal hypotheses based on the correct interpretation of signs (symptoms) and evidence (blood tests, electrocardiograms, etc.) in a specific clinical context. We would like to share our experience in fostering critical thinking, data analysis and problem-solving skills among first-year undergraduate students in veterinary science taking an organic chemistry course. These challenging problem-solving tasks are based on molecular structural analysis combined with interactive digital technologies. In brief, this involves identifying an unknown molecule from clues in spectroscopic data obtained from the interaction of a sample with an electron beam or electromagnetic radiation. Data are displayed as Cartesian graphs (which can be analogized to an electrocardiogram, for example). The students have to extract relevant information, analyze and organize it to find out an evidence-based chemical structure. Student engagement in argumentation in this context is analogous to the dialogic process of establishing a diagnosis through the critical analysis of patient anamnesis. The interactivity of digital technologies enables students to be more active in searching for clues and to practice the entire reflective approach. These technologies promote asynchronous home training with a wide range of exercises improving students' flexibility.
Statistical data collected over ten academic years provide evidence that this blended approach combining on-campus tutorial session with a complementary home-based training program effectively contributes to improving students' exam performance relying

on analytical skills. Moreover, during the COVID-19 pandemic, the entire pedagogical scenario was easily converted to full distance-learning with either online or on-campus exams.

Learning Outcomes

We would like to share four learning outcomes:

(1) ***Increasing student motivation and autonomy.*** First-year undergraduate students in veterinary science are a challenging population in the context of a chemistry course, as many of them barely perceive the added value or concrete usefulness of this subject in their curriculum. To overcome this negative perception, the course is usually designed to highlight the links between chemistry and veterinary medicine, usually using relevant examples, which is certainly a motivating factor for these students. In addition, a focus on the skills that are directly transferable to future healthcare professionals boosts student motivation. In a survey, most of our students expressed a positive perception of this innovative approach to problem-solving integrating new technologies. Interactivity improves students' autonomy and prompts them to engage further in challenging problems and to work in a beneficial play-learning mode.

(2) ***Fostering skills such as critical thinking, data analysis and problem-solving skills.*** Molecular structural analysis is an interesting topic for developing these skills, particularly when it is combined with digital technologies. These technologies are an efficient alternative to the previously used textbooks. Indeed, interactivity overcomes the disadvantages of fixed-image data and the necessity to highlight some clues for legibility. Student can then concentrate on the entire reflexive process.

(3) ***Enhancing exam performance.*** We would like to share statistical data based on problem-solving questions collected over ten academic years in order to compare several learning approaches (face-to-face, distance and blended learning) and to emphasize the positive effects of digital tools.

(4) ***Diversifying learning strategies and assessment methods.*** This blended learning approach can easily be converted into a full distance-based learning scenario. Ideas on assessment methods will also be discussed.