Teaching Tips/Notes NACTA Journal

Using concept map assignments to promote content integration

Introduction

Several studies have supported the notion that active learning activities such as problem-solving cases, simulations and student presentations increase not only understanding but also retention of information (Freeman et al. 2014). Students in their first year of veterinary school often find it hard to apply concepts learned in basic science courses to clinical, real-life scenarios. The abstract nature of these courses makes students less motivated to learn and less engaged in the course material. It is often challenging for students to understand the interconnected and complex nature of a subject like immunology without getting lost in the details.

As with most courses in the veterinary medicine curriculum, the veterinary immunology course is fast paced, and students are expected to learn a large amount of information. Several unfamiliar terms, molecules, cellular mechanisms, and cytokines are discussed. At the end of the semester, students are expected to have a solid understanding of basic immunology and to be able to apply these fundamental concepts to clinically relevant scenarios. This creates the need for the development of teaching strategies that promote student engagement as well as integration and application of course material. In this report, we describe the use of concept map assignments in a veterinary immunology course and the perception of learning by veterinary students.

Procedure

The author implemented concept map assignments in veterinary immunology, a three-credit, 17-week long, core-course in the first year of the veterinary medicine curriculum at the School of Veterinary Medicine at Utah State University. This veterinary immunology course focused on the basic mechanisms of veterinary immunology with an emphasis on protective immunity against infectious diseases and the role of abnormal immune responses in disease. The instructor divided the course into three modules with specific learning outcomes for each module. The first and second modules focused on the components of the immune system and their functions. The third module focused on applying immunological concepts to explain the basis of disorders of the immune system. At the end of each module, students were given a clinical case and were asked to create a concept map to explain the basic immunological mechanisms associated with the given clinical findings. Concept map assignments were posted in Canvas Learning Management System two weeks before they were due. Students worked in groups of three to five members. Concept maps were created on a white board and a photo was taken and was uploaded to Canvas Learning Management System. A rubric directly related

to the learning outcomes of the assignment was used to assess student performance and to provide students with specific feedback. The steps for implementing concept map assignments are listed in Table 1.

Table 1. Steps for developing concept map assignments.

Step	Activity	Description
Step 1	Identify the need	Determine which parts of a course would benefit from assignments that require integration of large amounts of information
Step 2	Determine the timing	Determine when to give this assignment
Step 3	Create the scenario	Identify a real-life scenario which class material could be applied to
Step 4	Set learning outcomes and expectations	Clearly articulate the objectives of the assignment
Step 5	Give instructions	Provide clear instructions of what should be included in the responses and provide examples
Step 6	Use a rubric	Develop a rubric that is directly related to the instructions and the learning outcomes
Step 7	Provide feedback	Provide specific feedback on what was missing, what was incorrect, what was done well, and the organization of information
Step 8	Revise and resubmit	Provide students the opportunity to revise and resubmit their work

Assessment

At the end of the semester, veterinary students completed an anonymous survey via Qualtrics® to assess their perceptions of the usefulness of the concept map assignments and their progress in meeting the course objectives. Three survey questions focused on each student's perception of how helpful the concept map assignments were (or were not) for their understanding of the class material and retrospective pre/post questions about the students' own level of expertise on specific aspects of veterinary immunology. Responses were obtained on a 5 point-Likert scale from "strongly agree" to "strongly disagree".

Results

Fifty-two veterinary students completed the survey. They considered concept maps to be the most helpful learning method used in the course. Approximately 59% of students strongly agreed, 38% of students somewhat agreed and 3% neither agreed nor disagreed with the statement that concept maps were helpful to their learning of the material. In response to the prompt "Before taking this course, I could articulate how the components of innate and adaptive immunity cooperate in response to infection" no students strongly agreed and only 17% of students somewhat agreed with the statement. When responding to the prompt "After taking this course, I can articulate how the components of innate and adaptive immunity

cooperate in response to infection" 75% of students agreed and 25% somewhat agreed with the statement.

Advice to others

Concept map assignments can be modified for use in a variety of courses, especially those that require the assimilation of large amounts of information which can make students lose sight of the big picture concepts and the chronological order of events. In addition, these assignments may be used in courses where content integration is essential for students to understand how the parts of a complex system are connected to each other and how to apply basic science to real-life scenarios. Some examples of these courses include plant physiology, animal physiology, and endocrinology.

References

Freeman S., Eddy S. L., McDonough M., Smith M. K., Okoroafor N., Jordt H., and Wenderoth M. P. 2014. Active learning increases student performance in science, engineering, and mathematics. Proceedings of the National Academy of Sciences 111, 8410–8415.

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