

Student-led collaborative learning enhances engagement in veterinary neurophysiology lectures

David Kilroy and Arun HS Kumar*

ABSTRACT

Student engagement is essential for effective learning. Although several approaches to improve student engagement are reported in the educational literature, specific studies focusing on veterinary preclinical subjects are lacking. In this study we aimed to test the utility of a student-led collaborative learning approach in order to increase their engagement with the learning process in veterinary neurobiology lectures. The students were asked to identify real world/clinical cases as part of their collaborative learning. These cases were further discussed in the lecture sessions to correlate them with the basic neuroscience principles covered in the veterinary neurobiology curriculum. This exercise led to improved student engagement, which was objectively assessed. We conclude that using examples of real world/clinical cases and correlating them with basic science concepts improves student engagement and hence should be considered in pre-clinical curriculum design.

Key words: Neuroscience, Student engagement, Collaborative learning, Preclinical veterinary subjects, Curriculum design.

BACKGROUND

Learning is a process of bringing continuous and persistent change in one's performance^{1, 2}. Various theories on learning^{3, 4} suggest that the process of learning is multi-dimensional⁵⁻⁸ and hence the teaching practices must meet the needs of these different learning approaches. This is especially true in classroom-based teaching, where the student cohort are in the same degree course but their learning and comprehension styles will be very diverse and this necessitates inclusive teaching strategies.^{5, 9, 10} While it is feasible to include different teaching-learning resources to meet the needs of these diverse groups, adopting approaches to enhance student engagement can better facilitate this process. This approach will be an appropriate means to encourage student self-reflection, thus introducing "for the learners-by the learners" philosophy of learning. Moreover, students' reflection on subject knowledge is vital to their future self-directed learning and subsequent professional success. Several studies addressing strategies to improve student learning^{7, 11-13} have indicated that improving student engagement in the learning process leads to improved learning outcomes and thus better professional success (Figure 1). Importantly, enhancing student engagement facilitates diversity in understanding, which is an essential and practical step towards the innovation process and also creates a wide range of intellectual and practical skills among students.¹⁰ Further, improving student engagement can augment the transition from surface learning to deep learning^{11, 14} (figure 2), which is also key to innovation and to professional success.

A keen interest in subject discussion is one of the important skills expected from students of veterinary medicine. Teachers should facilitate this process by adopting teaching philosophies which enhance students' learning. However teaching styles should also encourage students to develop their own views about the various topics being taught and discussed. This involves giving students considerable latitude in their written assignments and encouraging active discussion/debate both inside (formally) and outside (informally) teaching time. Stimulating discussion and debate is a challenging task especially in undergraduate classes, as students' active engagement is often minimal. We have specifically quantified the level of student engagement in one of the neurobiology modules delivered as part of our Veterinary Medicine programme at University College Dublin. We have developed a matrix based on the number of questions asked in a class (Table 1), to objectively assess the level of student engagement in each of the 50-minute lecture session.

Lack of engagement can have direct consequences on students' learning as it always leads to superficial rather than deep learning.¹⁴⁻¹⁸ Several approaches have been reported to improve student engagement in lecture sessions.¹⁴⁻¹⁸, among which were teacher qualities⁶ (Figure 3) and student factors,¹² (Figure 4). A majority of the literature on improving student engagement recommends activities and teaching styles focused on exposure to real world events^{19, 20}; for example, encouraging students to relate their lecture content to specific clinical conditions.^{6, 9, 21} This can be further augmented by facilitating collabora-

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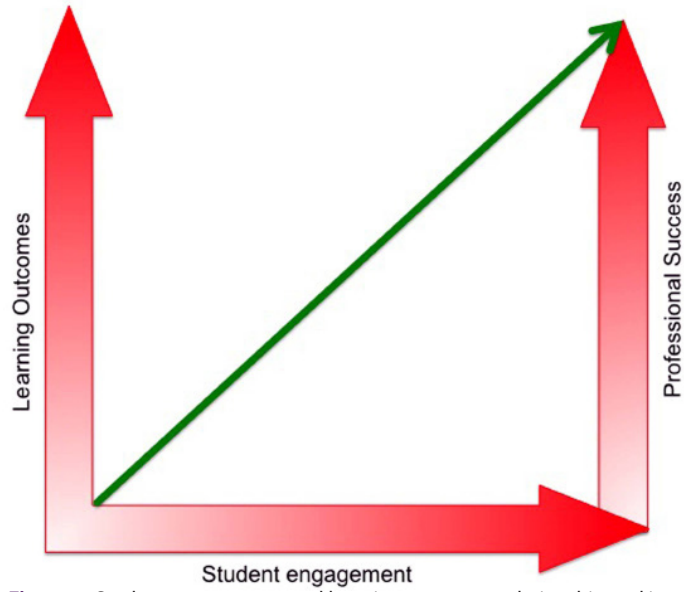


Figure 1: Student engagement and learning outcomes relationship and its impact on professional success.

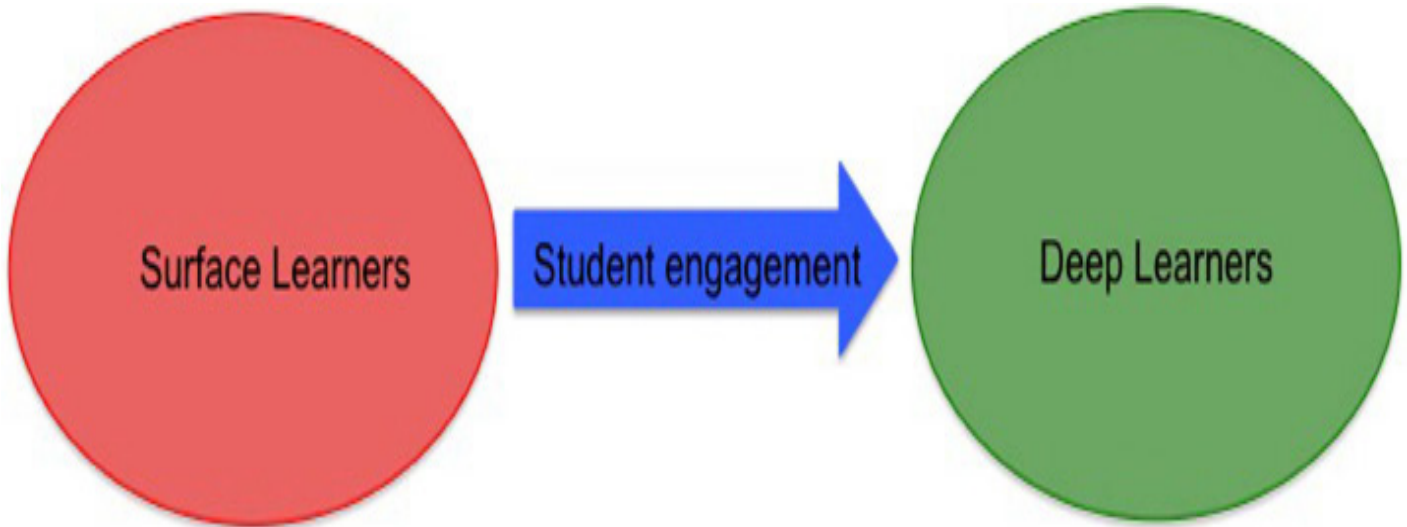


Figure 2: Student engagement as a driver of deep learning activity

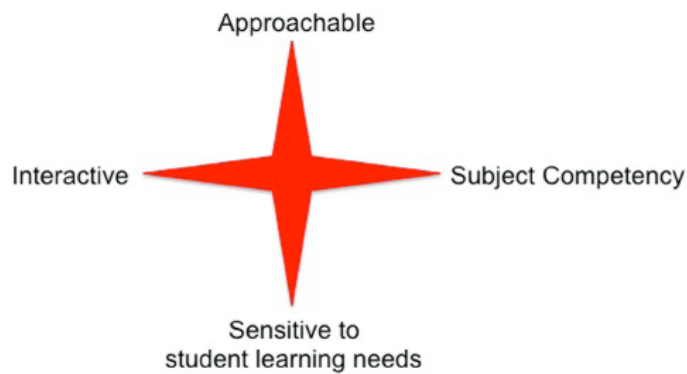


Figure 3: Teacher qualities which help in enhancing student engagement (Modified from Kuh *et al.*, 2006)



Figure 4: Student factors which are essential in enhancing their engagement with learning

Table 1: Module engagement matrix

Module Outcomes	Session (Level of engagement)
1. Understanding basics of neurophysiology	1
2. Understand how sensory physiology works	1
3. Understand Perception process	2
4. Understand Neurophysiology of pain	1
5. Understand the process of Spinal reflexes	1

1=Indicates no student engagement

2=Indicates moderate student engagement (1-2 students asking questions and/or answering questions directed to them in the class)

3=Indicates good student engagement (more than 2 students asking questions and/or answering questions directed to them in the class)

Table 2: Module engagement matrix post implementation of action plan

Module Outcomes	Session (Level of engagement)
6. Understand physiology of hearing	3
7. Understand physiology of vision	3
8. Understand muscle physiology	3
9. Understand physiology of cerebral circulation	3
10. Understand EEG and consciousness	3

1= Indicates no student engagement

2= Indicates moderate student engagement (1-2 students asking questions and/or answering questions directed to them in the class)

3= Indicates good student engagement (more than 2 students asking questions and/or answering questions directed to them in the class)

tive student learning on the specific real world events related to the subject being taught and then to specifically tailor the concepts presented in these lectures towards these topics. Such student-led identification of real world examples on professional applicability may significantly enhance student engagement. An additional approach in achieving this aim is the adoption of flexible learning approaches.^{5, 8, 22-24} Creating a flexible learning environment could involve dividing the class into small groups (forming online discussion groups) that discuss relevant topics prior to lecture (collaborative learning) in order to achieve specific and

targeted learning. Other approaches include reflection (giving students a few minutes to think about a problem or issue) or class discussion.^{6, 13} In our view, effective teaching and learning is the attainment of all the learning outcomes by a majority of the students. We believe that enhancing student engagement will be a vital step in achieving effective teaching and learning. One of the approaches we have adopted in this study is to increase the correlation of lecture notes to real world examples. Furthermore, following their initial introduction into the module learning outcomes, we have asked the student study groups to identify relevant clinical problems for discussion within the module. Hence we specifi-

cally aimed to analyse if introduction of real world examples into lectures improves student engagement in these learning sessions (based on the matrix in Table 1).

AIMS AND STUDY DESIGN.

Aim: To enhance student engagement in veterinary neurobiology lectures by linking the concepts taught with real word examples and to achieve improved learning outcomes.

Method to improve student engagement in lecture sessions (study design)

The class was randomly divided into groups of 5 students apiece (in our current class of 85 students, this led to the formation of 17 groups).

From week 6 onwards each of the groups was asked to suggest one clinical scenario or any real word example related to neurobiology based on their experience, which they would like to be discussed in lectures.

A 15-minute session was allocated in each lecture session (weeks 6 to 10) to reflect on the neurobiology concepts within the clinical scenarios suggested by the students, which was student-led but facilitated by the lecturer. The 17 topics were discussed over the next five lecture schedules (3-4 topics were discussed in 15 minutes slots/ lecture session).

The extent to which students engage in discussion (number of questions/ queries asked both during and post lecture) was quantified (Table 2).

RESULTS AND DISCUSSION

Collectively 26 topics of clinical cases/student experiences were identified by the student groups, from which 17 representative topics (one from each student group) were shortlisted for discussion in lecture sessions. Using real world examples (in the form of clinical cases or student experiences) and correlating them with the lecture contents improved the student engagement process, which was evident from the number of questions and the discussion produced during class. (Table 2). This improvement in student engagement may be directly related to the ability of students to relate the concepts discussed in lectures to its potential applicability in professional activities. The ability to correlate lecture contents with professional applicability generates curiosity and belongingness among students, which triggers student engagement. The increase interest was evident from the quality and quantity of questions asked by the students during the lecture sessions. Moreover, the identification of real world examples was led by the students based on small group discussions and such collaborative learning facilitates active learning, which is one of the many factors identified as improving student engagement. However it remains to be seen if this improved student interaction has any impact on students' learning outcomes, which will be evaluated in a future study.

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CONFLICT OF INTEREST

No Conflict of Interest to declare.

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