

Improving Student engagement– Strategies for deepening understanding of the course material

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Context

The Medicinal and Biostructural Chemistry (MBC) course is a master level course in Pharmacy and Pharmaceutical Sciences, which is mandatory for students that are enrolled at the MSc programs in Pharmacy, Pharmaceutical sciences, and Medicinal Chemistry. The curriculum is expected to dive deep into the complexities of molecular structures, drug interactions, and biochemical principles. The course has one course leader and involves ~ 15 teachers. The course includes lectures, exercises, quizzes, and journal club-based classes. The exam has a multi choice format where students should select 1-2 correct “statements” based on the presented problem. The current project concerns the journal club-based classes where around 30 students participate in each class. The students are divided into presenting and opponent groups. They are handed out a recent scientific article of relevance to the course contents, having several days to read it on their own and consult whichever sources they find necessary (e.g., review articles) to understand elements of the research article under study. The presenting group gives a presentation on the article’s contents and the opponent group will ask them questions regarding any topic, technique or concept the article covers. I, as the teacher, will also guide the discussion at the end of the class and involve all the students in the final brainstorming session.

1. Background

In the journal club-based format, the students become acquainted with key scientific skills such as searching databases, reading scientific literature, presenting research findings, and driving a scientific discussion. With this class format, we aim to develop the problem-solving abilities,

critical thinking skills, and communication skills of the students. It further provides the opportunity for the students to work in groups, where they will find and evaluate research materials, that could lead to life-long learning (Duch *et al.*, 2001). Working in groups as a basis for cooperative learning aims to improve the learning outcome relative to individual works (Johnson *et al.*, 1998).

2. Motivation

Based on the feedback evaluation of MBC class 2022, only 40% of students experienced that the description of objectives for the MBC course was clear, and they seemed to feel a lack of direction regarding the learning objectives (<https://kurser.ku.dk/course/sfak20010u/2023-2024>). Further, a misalignment between the teaching methods and learning objectives could be observed, where the students could not see the connection between what they are taught and assessed. And as a general observation, a clear lack of students' active learning in the journal club classes of 2022 was evident that could also lead to the disconnect the students experienced. Interactive and dynamic learning environment will enhance students' understanding and retention of course material (Wang *et al.*, 2020). It will also contribute to a positive atmosphere, promoting enthusiasm for learning and performing better in final exam (Liu *et al.*, 2012).

Open Question – Could we improve students' engagement? Would this result in active learning?

3. Experiment

The traditional format of the class is that the presenter group, presents the article in 25 minutes, then the teacher goes through the basic concepts of the article, and then the opponent group asks questions. Finally, there are some pre-defined questions that the teacher and students go through together. These final questions act as a wrap-up of some methods and concepts the students get exposed to in their lectures and practical exercises.

1- For this project, one month before the main classes, I started by an introductory 30-minute session where I described the objectives and expected outcomes of the class during a presentation to address the problem of missing the link between the objectives and outcome as stated by previous evaluations. I further introduced the format of the class and assigned the remaining students into groups.

2- Before the class, I extensively updated the content of the teacher's presentations (my presentation which I then shared with other teachers), as I realised the content has not been updated for over the past > 5 years, while our field of expertise has been revolutionised (Structural biology using single particle cryo-electron microscopy). I aimed to address the development of the field over time for the students to better realise evolution of key methodologies, and advancements shaping its trajectory. I further included short (1-2 minutes) schematic videos addressing the biophysical methods of the paper.

3- During my presentation, I had included an online quiz (Wang *et al.*, 2020) where I had incorporated a figure from the paper and asked the students which 2 out of 5 statements are correct resembling the format of their final exam (Appendix 1). I asked them to talk to their neighbouring student and have a look at the paper if necessary. I gave them 10 minutes to think, read the section, and talk to each other, and 2 minutes before the time-up announced the time.

4- I included extra slides criticizing a few points in the article, where I aimed to further involve all the students in the subject area and promoting a way of critical thinking.

5- With the pre-defined questions from the course manager, I also tried to guide the students, step by step through each question, so they could get to the correct answers themselves, which was an interactive experience.

6- Both the presenting and opponent groups received my summative feedback, where I started by praising their strengths and aimed to address what was missing in their preparation as a follow up in my own presentation. Giving feedback to the presenting group, I only focused on the content of presentation and not the presenting style.

4. Evaluation

During this experiment, as stated above, my aim was to engage the students “as much as the format of the class and the time limitation of 2 hours could allow”. I aimed to create an atmosphere that would encourage student participation by using a conversational tone and not criticizing students’ performance in presentation or asking questions.

1- After the initial introduction to the class, I asked the students if they found the introduction slides addressing the objectives and providing them an overview of the class format useful, as this was a new trial (Appendix 2). Out of 25 students, 5 students answered the question online, with a 100% positive response. Of these 5 students, 3 also provided a written comment asking for even more in-depth information as introduction.

2- Updating the content of the slides and using the short video tools had an obvious positive impact on the recipient side as it prompted the students to ask questions getting a deeper insight into the concepts of the paper.

3- 14 out of 16 students participated in the quiz, of which 35% selected the first correct statement and 19% the second.

4- The extra slides criticizing a few aspects of the research article received obvious positive feedback as it encouraged several students to ask further questions to understand the method/concept better.

5- Following the theory of instructional “scaffolding” that was first introduced by Jerome Bruner in 1976 (Wood *et al.*, 1976), and applying such method, I believe I could successfully guide the students bridge the gap between their level of understanding and the desired learning goal of the class.

5. Limitations and Discussion

This experiment was limited to one class of 26 students out of a total of around 200 students enrolled in 2023 program. The evaluation is only based on this one experiment and my own observation, and therefore will not be well reflected in the students’ feedback at the end of the semester. As there are several teachers on this course, each responsible for two holds of students (2 x classes), there is a clear need for the alignment of

content and format between the teachers. The students feedback has also been limited to qualitative feedback, in which only 25% participated. The implemented quiz question in the teacher's presentation (Appendix 1) could have had a positive effect on engaging the whole class in the content of the paper and not just the presenting and opponent groups. Such experiments, however, should be performed across all classes and by all teachers and a statistical analysis on the exam results combined with feedback from students and compared to previous years could shed light on whether such adjustments had been helpful in the learning process.

Following up on the adjustment in this experiment with the course leader, who is also my supervisor at the department, he also agreed on the need of updating the course material, including more visual tools (short videos mentioned above), including the "Objective" contents in the introduction and all presentations, and updating the warp-up questions as to better capture the students need and the current state of the field. The time limitations of this class, considering that the 2 hours should accommodate 2 presentations (teacher and presenting group), opponent groups questions and final discussion, cannot allow for e.g., a complete flipped format. Even though the effectiveness of such format to engage the students has been proven (Strelan *et al.*, 2020). Bruner's scaffolding theory was a part of social constructivist theory, influenced by the work of Lev Vygotsky (a psychologist) (Wood *et al.*, 1976). They believed the learning occurs most effectively in a social environment where the learners construct the meaning through interactions with others. Bruner further built his theory on the basis that learners learn more in the presence of a knowledgeable other person (Wood *et al.*, 1976). Perhaps applying such methods, as I did in leading the discussions by breaking down the questions into smaller ones and leading the students to the right answer, would be a valid alternative to a flipped class in further engaging the students and enhance their active learning process. The results of this experiment have led to follow up discussions with the course leader and the team of teachers to evaluate and update the format and content of the whole MBC course which will be implemented over the next one year.

References

- Duch, B. J., Groh, S. E, & Allen, D. E. (Eds.). (2001). *The power of problem-based learning*. Sterling VA: Stylus.
- Johnson, D., R., and Smith K. (1998). *Active Learning: Cooperation in the College Classroom*, 2nd ed., Interaction Book Co., Edina, MN.
- Wang A. I., Tahir R. (2020). *The effect of using Kahoot! for learning – A literature review*, Volume 149, Computers & Education.
- Liu O.L., Bridgeman B., Adler R.M. (2012). *Measuring learning outcomes in higher education: Motivation matters*. 41 (9), (pp. 352-362). Educational Researcher.
- Strelan P., Osborn A., Palmer E. (2020). *The flipped classroom: A meta-analysis of effects on student performance across disciplines and education levels*. 30 (100314) Educational Research Review.
- Wood, D. J., Bruner, J. S. and Ross, G. (1976). *The role of tutoring in problem solving*. 17(2), (pp. 89-100). Journal of Child Psychiatry and Psychology.

Appendix 1 – The Quiz in the teachers’ presentation.

Which of the two following statements are correct?

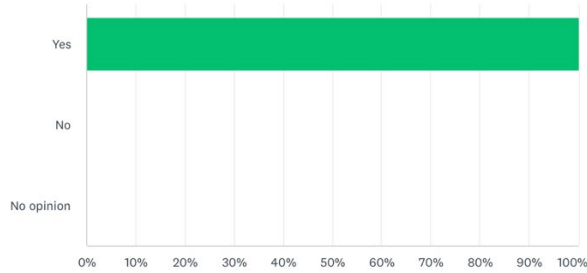
- A) Because of the limited resolution of the diffraction data, it is not clear if (S)-citalopram is positioned correctly in the map.
- B) Fluorophenyl groups of (S)-citalopram and paroxetine are positioned in different subsites (A-B-C).
- C) Subsite C is particularly important for high-affinity antidepressant interactions.
- D) Residue F341 forms an aromatic interaction with both (S)-citalopram and paroxetine.
- E) Residues S336 and T497 form the extracellular gate

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Appendix 2 – Students’ feedback after the introduction session

Did you find the introduction slides useful?

Answered: 5 Skipped: 0



- There could perhaps be a more indept explanation and perhaps an example of what we were looking for and word explanation :) but it was an okay class
08/12/2023 22:14 [View respondent's answers](#) [Add tags](#)▼
- The introduction could be a little longer as it is quite hard to get into the questions when there has been little material dircetly to the quizzes to prepare:)
08/12/2023 14:14 [View respondent's answers](#) [Add tags](#)▼
- They were very useful, but there could be even more information or more slides, because I felt a little lost at the beginning:-)
08/12/2023 14:14 [View respondent's answers](#) [Add tags](#)▼

Appendix 3 – Correct answers B and D

14/16 Students Answered

