Enhancing Student Engagement and Learning Outcomes through Peer Feedback in an Advanced Nutrition Physiology Course

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Introduction

This project is based on a mandatory course in the master's program of human nutrition qualifying for 7.5 ETCs. The Advanced Nutrition Physiology and Metabolism course is a newly modified course that comprises 33 hours (h) for lectures, 18 hours for exercises, 15 hours for supervised reports, 124 hours for preparation, and 2 hours for written exams. In this course, 72 students were allocated to 12 groups by My study group application based on their personality traits to prepare a mandatory group report at the end of week 5 and work together on the class assignments. The intervention for this project was a group-based and then plenary presentation of a long-written assignment on the OneNote application to receive peer feedback inside and between the groups based on the presentation on OneNote. Afterward, they received feedback in plenum from the course coordinator.

In alignment with the Utrecht Roadmap for Scholarship of Teaching and Learning, my intention is to apply its core principles in order to enhance the quality of classroom teaching by emphasizing student learning activity and fostering a collaborative relationship with students. I believe that comprehending the cognitive, motivational, and regulatory processes within this educational setting can significantly contribute to a more profound understanding, empower students to actively engage in practice, and encourage them to take responsibility for their participation and contributions during teaching activities.(Kirschner, Wijsman et al.). Given the importance of reflection and sharing within this teaching approach, I arranged for brief discussions

between pairs to encourage reflection on the assignment. Additionally, I used Padlet as a platform for students to collaboratively share their insights on the outcomes of this group activity.

Peer feedback as the main part of this project is considered as a way of assessing and promoting learning(Falchikov 1995). Because the students can have an active role in their own and peer learning management and they can make progress by evaluating their own thoughts and comments as well as their peers (Liu and Carless 2006). As Nicol et al. suggested formative assessment as a part of group work can develop objectivity in each participant and they will make their own regulated learning by discussing and making decisions. As a part of the identification model, factors like feeling safe, similar to others, and having a supportive environment can make it easy to feel valued and belong, therefore the attainment will be available for all the group members (Crick 2012). Previous research suggests that working with peers in a group after a teacher lecture helps the students to learn better and helps the others to learn better. Moreover, cooperative learning instead of competitive learning increases the affinity among the students to have more clear and friendly dialogue in a safe environment (Osterman 2000). Certainly, the quality of peer feedback in a group matters a lot and it can affect the outcome of learning especially if the students have a great feed of learning materials before the group assignment(Geijsel and Meijers 2005).

The objective of the assignment was to enhance the overall learning outcomes and the effectiveness of group work by addressing and optimizing students' engagement. To achieve this goal, I implemented an intervention in the form of group work and peer-feedback. This approach sought to make a more dynamic and interactive learning environment, where students could actively participate in some relevant collaborative assignments and provide constructive feedback to their peers.

Materials and Methods

In autumn 2023, I had lectures on intermediary metabolism and just after my lectures, I planned an assignment for groups and in plenum. During the lectures, I prepared students for critical thinking and interaction by

asking relevant questions on the figures and metabolic pathways. Furthermore, I highlighted the main focuses through repetition and pauses between the sentences. Since I identified there is a gap between the theoretical teaching and complex concepts of intermediary metabolism, I planned the assignment to support students, simplify the complicated pathways, and make it more interactive among the groups of students to feel safe and do the assignment altogether.

The intervention

Before the lecture began, I ensured that the relevant literature had been uploaded on Absalon. Additionally, I asked the students to form small groups (6 participants) based on the predetermined groups assigned on Absalon (My study group application). Each group was given a partner assignment related to the course material, where they engaged in dialogue, take notes, and collaborate on the task.

After a given timeframe, I instructed the groups to provide peer feedback to one another within a 10-minute timeframe and I put the instructions on a slide. The students' group filled in the OneNote page as a plenary presentation. The OneNote assignment was anonymous, and they felt safe to discuss with together and write the answers in the table in a group-based work. Following this, I delivered a concise presentation summarizing the key points of the lecture, emphasizing the main take-home messages the day after this assignment as a flashback slide.

During the class session, I allocated time for the students to provide their evaluations of the course on Padlet. These evaluations were collected and included as part of my final project, where I analyzed and reported the gathered data in the results section.

In summary, the revised process involved uploading literature on Absalon prior to the lecture, organizing students into small groups, assigning them a collaborative task, facilitating peer feedback, presenting the lecture, and gathering class evaluations for inclusion in the final project.

The participants and course setting

The students had diverse backgrounds including Food Innovation and Health, Human Nutrition, Food Sciences, Biology, Biochemistry, Medicine, and Biotechnology from various universities and colleges for example University College Copenhagen (KP), University of Copenhagen, Aarhus University, other countries like Greece, The Netherlands, Germany, Spain, Italy, UK, Iceland, Indonesia, Bangladesh, Japan, etc. The international and diverse classroom environment can be a challenge to make proper teamwork for all the different backgrounds and personalities. We used My study group application to consider the introverted and extroverted students to match with their peers in a proper group.

Translation of the intervention into the learning environment

From my previous teaching, I knew that the students had diverse perspectives about group work, peer feedback, and plenary presentations. So, I prepared myself for questions from the students in the groups or on the Absalon or emails. Based on the questions I received, I found out that motivated students are more interested in getting peer feedback to optimize their learning process.

The assignment

The assignment was an online group-based activity in which they should think individually, discuss with peers, and write the answers in the table on the OneNote file in plenary. The allocated time was 60 mins after a 15-minute break between the lecture and the assignment. The instructions were written on a slide and were explained orally, too. The course coordinator was present during the group-based activity and followed the group dialogue, answered any upcoming questions, and guided them if it was unclear to the students. After 45 minutes, the table was filled in online, and the groups had available time to discuss the plenary and summarize the most important points together. The day after, the course coordinator presented the final table again as a flashback slide and asked the students to highlight the main points. The completed scheme of the assignment has been uploaded as an appendix.

Data analysis

The data analysis for this project involved a qualitative assessment of the assignment, primarily centered around the feedback and evaluations provided by the students through the Padlet platform. This analysis focused on understanding the students' perspectives and was instrumental in determining the assignment's impact on their learning experience.

The results of the analysis were reported in the form of percentages, providing a quantifiable representation of the students' responses. This approach helped me to gain insights into the overall effectiveness of the assignment based on the feedback gathered from the students.

Results

The four areas were evaluated by the questions: enhancement of learning, increased group work, assistance in active learning, and remembering the main points of the lecture. In the following pie charts, we have an overview of what the students think about the assignment after the lecture.

Q1- The use of interactive assignments in today's teaching enhanced learning among the students. A- completely agree B- agree C- neutral D- disagree E- completely disagree.

Q2- The use of interactive assignments increased group work among the students. A- completely agree B- agree C- neutral D- disagree E-completely disagree.

Q3- How much did the assignment help you to active learning? A- to a large extent B- to some extent C- neutral D- to a small extent E- nothing.

Q4- How much did the assignment help you to remember the main points of today's lecture? A- to a large extent B- to some extent C- neutral D- to a small extent E- nothing.

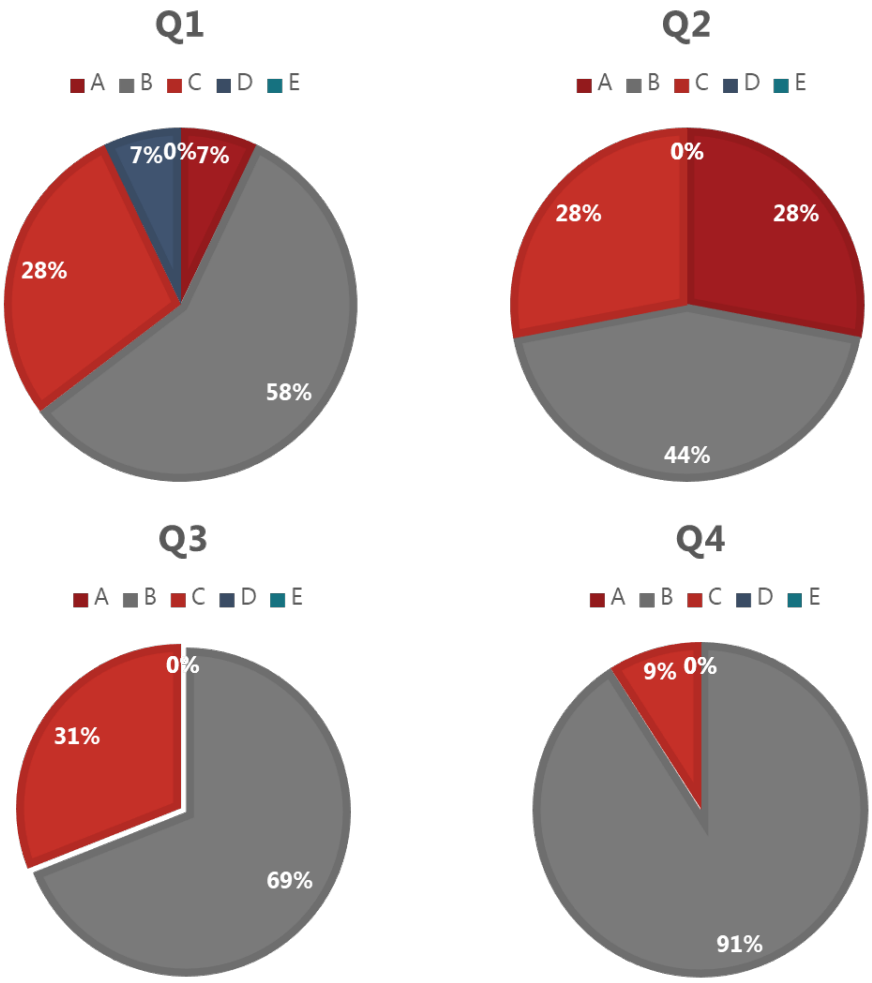

Fig. 1. The evaluation of students' after teaching in form of interactive assignments

As shown in Figure 1, 58% of the participants indicated agreement with the statement that interactive assignments in teaching enhanced classroom learning. In the context of group work, 28% and 44% of respondents fully agreed and partially agreed, respectively, that interactive assignments improved group collaboration. Regarding active learning, 69% of the participants affirmed that this teaching method enhanced the active learning process in the classroom. Lastly, an overwhelming 95% of students reported finding the assignment beneficial for retaining key lecture content.

Discussion

The current study offers evidence regarding the impact of peer feedback on the quality of learning and group work, albeit to a limited extent. While the outcomes of peer feedback may not be universally applicable to all student subgroups across various courses in the master's program, they do serve as a promising foundation for implementing more interactive assignments within the classroom. These assignments can help enhance the overall learning experience and engage students more effectively during lectures. Another study, similar to ours, explored student engagement with feedback and found that after receiving three different types of feedback in a second language writing course, students demonstrated improved engagement and more thoughtful revision(Zhang and Hyland 2022). While the peer feedback interventions in this study differed in terms of type and duration compared to our research, the results pertaining to student engagement, group work, and active learning were similar. A study examining the impact of feedback and assessment on student active engagement and readiness to engage suggests that the most significant influence on a course does not stem from teaching (listening) but rather from assessment and feedback (reflection and behavioral change), which can differ significantly from the traditional classroom environment (Handley, Price et al. 2011). Our experimental data partially supports these findings. However, we did not include tutor feedback in our study, and our primary focus was on peer feedback and interactive assignments.

Moreover, the students' perceptions of oral communication as a crucial component of peer feedback hold significant importance in facilitating the clarification and negotiation of feedback comments. A qualitative analysis of students' attitudes toward verbal interactions during peer-feedback sessions in a university classroom, specifically for academic writing, unveils mutual benefits for both the feedback provider and the receiver. However, certain challenges associated with peer feedback, including issues like unclear clarifications, uncertain judgments, and the need for teacher feedback, remain of large significance (Zhu and Carless 2018).

As a limitation of my project, the location of the classroom was allocated by the faculty block booking service considering the number of students and the type of teaching. Although the number of seats precisely matched the number of students, the area was not perfect for group-based discussions and class activities. The ventilation system was old, and the students and teachers felt humid and low airflow during the lectures and assignments. I had a weak voice due to an illness a week before this lecture and teaching time that made it difficult for me to speak up and for the students to listen to me easily. For the next time, I will ask the administration to receive a microphone to optimize the voice of the lecturer. After getting feedback from the pedagogical supervisors, I felt there was room to add more class activities during the lecture to engage my peers more to discuss the topic and get it easier to digest from the tables and figures that I added to my presentation.

Conclusion

The primary objective of this project was to enhance learning outcomes and foster effective group work. While the qualitative analysis indicates areas for improvement in students' perceptions and behavioral changes, the core goal of promoting active learning and boosting student engagement was successfully achieved. As an educator, I recommend introducing peer-feedback as a learning tool prior to its implementation to enhance its effectiveness. Furthermore, organizing students into clusters based on their personality types may facilitate better mutual understanding. Based on my experience, it's worth noting that the number of students and classroom size can also influence the outcomes of peer-feedback.

Acknowledgments

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References

Crick, R. D. (2012). Deep engagement as a complex system: Identity, learning power and authentic enquiry. Handbook of research on student engagement, Springer: 675-694.

Falchikov, N. (1995). "Peer feedback marking: Developing peer assessment." Innovations in Education and training International 32(2): 175-187.

Geijsel, F. and F. Meijers (2005). "Identity learning: The core process of educational change." Educational studies 31(4): 419-430.

Handley, K., M. Price and J. Millar (2011). "Beyond 'doing time': Investigating the concept of student engagement with feedback." Oxford Review of Education 37(4): 543-560.

Kirschner, F., L. Wijsman and I. Meijerman "Utrecht Roadmap for Scholarship of Teaching and Learning (UR-SoTL)."

Liu, N.-F. and D. Carless (2006). "Peer feedback: the learning element of peer assessment." Teaching in Higher education 11(3): 279-290.

Osterman, K. F. (2000). "Students' need for belonging in the school community." Review of educational research 70(3): 323-367.

Zhang, Z. V. and K. Hyland (2022). "Fostering student engagement with feedback: An integrated approach." Assessing Writing 51: 100586.

Zhu, Q. and D. Carless (2018). "Dialogue within peer feedback processes: Clarification and negotiation of meaning." Higher Education Research & Development 37(4): 883-897.

The appendices

Examples of a completed scheme of assignment in OneNote

Assignment

Friday, September 08, 2023 10:25 AM

questions The group	The fed state	The postabsorptive state	The fast state	The starving state
Which organs are involved?	Liver, gut, muscle, RBC, brain, adipose tissue	Liver, brain, adipose tissue, RBC, muscle	Liver, muscle, adipose tissue and brain	liver, brain, kidney adipose tissue, RBC, muscle
The first molecules	Glucose, Amino acids, TAG	Glycogen, Alanine, TAGs, Glycerol	Protein, TAGs, Glucose	TAGs, Alanine and glutamine,
The last molecules	Protein; TAG; CO2, H20, Protein; Glycogen, lactate	CO2, H2O, ATP, Pentoses+NADPH,	CO2, H2O, ATP, Pentoses+NADPH,	CO2, H2O, ATP, Pentoses+NADPH,
Is any molecule or pathway specific?	Glycogen, TAG, Glucose -> Glycogen	Specific pathway: Glycogenolysis Glycogen -> Glucose	Specific pathway: Gluconeogenesis - AAs used fot glucose instead of Glycogen -FAs, Hydrolysis	Ketones, kidney Less AAs -> body wants to keep them Muscle only use FA and Ketone to produce energy.
Comments on the pathways	This Pathway is necessary for storing the available nutrients.	Energy is obtained from fuels previously stored : (glycolysis, lipolysis...)	Amino acids from muscles become a source of energy.	Ketone as the main source of energy instead of the glucose. Accelerated lipolysis provides fatty acids and glycerol becomes the main glucogenic precursor in the liver.

Dimitra, Daniel, Lefteris, Yamina, Katerina

Monday, September 11, 2023 12:57 PM

questions	The fed state	The postabsorptive state	The fast sate	The starving state
The group				
Which organs are involved?	gut, liver , adipose tissue, brain and muscle	liver , adipose tissue, brain and muscle	liver , adipose tissue, brain and muscle	liver , adipose tissue, brain and muscle, kidney
The first molecules	amino acids, TAG and glucose	Glycogen, Alanine, Lactate, Glycerol, Fatty acids	amino acids, triacylglycerols	Alanine, glutamine, triacylglycerols
The last molecules	Protein, amino acids, glycogen, TAG, Lactate, CO2, H20,	CO2,H2O2, Pentoses+ NADPH	CO2,H2O2, Pentoses+ NADPH, ATP	CO2,H2O2, Pentoses+ NADPH, ATP
Is any molecule or pathway specific?	Gluconeogenesis , pyruvate, glycogen,	lipolysis and gluconeogenesis,	hydrolysis of muscles, glucose	ketones, Fatty acids, glycerol , accelerate lipolysis ,gluconeogenesis
Comments on the pathways	Pathway of amino acids, protein synthesis		hydrolysis	kidney fatty acids are transported

questions	The fed state	The postabsorptive state	The fast sate	The starving state
The group				
Which organs are involved?	Liver, gut, muscle, RBC, brain, adipose tissue	Liver, brain, adipose tissue, RBC, muscle	Liver, muscle, adipose tissue, RBC and brain	liver, brain, kidney adipose tissue, RBC, muscle
The first molecules	The gut: Glucose, Amino acids, TAG	Liver: Glycogen Muscle: Glycogen, Alenine Addipose tissue: Triacylglycerols	Muscle: protein Addipose tissue: Triacylglycerols	Addipose tissue: Triacylglycerols Muscle: Alanine, Glutamine
The last molecules	Muscle: Protein,TAG, glycogen, CO2, H2O Adipose tissue: TAG, Protein Brain: Protein, CO2, H20 Liver: Glycogen, Protein	Adipose Tissue: CO2, H2O, ATP Liver: CO2, H2O, ATP Muscle: Co2, H2O, ATP (from FAs) + CO2, H2O, ATP (from glucose) Brain: CO2, H2O, ATP RBC: Pentoses + NADPH + (ATP)	Liver: CO2, H2O, ATP Adipose tissue: CO2, H2O, ATP Brain: CO2, H2O, ATP RBC: Pentoses + NADPH + (ATP Muscle: Co2, H2O, ATP (from both glucose and FAs)	Liver: CO2, H2O, ATP Adipose tissue: CO2, H2O, ATP Brain: CO2, H2O, ATP (from glucose and ketones) RBC: Pentoses + NADPH + ATP Muscle: Co2, H2O, ATP (from both ketones and FAs) Kidney: CO2, H2O, ATP (from FAs) ATP, lactate (from glucose)
Is any molecule or pathway specific?	The TAG pathway (from the liver) + chylomicrons --> VLDL --> fatty acids. We do not need the TAG or protein for energy/ATP so we store it instead. We get more glucose than we need, so we store it as glycogen in the liver and muscle for later use.	We use glycogen to produce glucose/ATP When we don´t have more glycogen we enter the fasting state.	The production of glucose is very important in the fasting state. The glycogen deposits have now been emptied, so the body breaks down protein in the muscles to release amino acids to convert it to glucose for energy resource.	Ketone bodies from ß-oxidation FFA can produce ketones, which becomes the primary energy source by converting into glucose instead of AA. The kidney is used for producing ATP The cortex of the kidney can use FAs and lactate, whereas the medulla can only use glucose.
Comments on the pathways	In the fed state the body store the access energy it doesn´t need at the moment.			