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Feedback for student-centered learning in two different teaching settings

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Summary

Feedback, defined as information provided regarding aspects of one's performance or understanding, is aimed to make students learn. Learning-oriented formative feedback is an important tool to increase student learning by reacting to students' performance or understanding timely and constructively. Different teaching settings may require different ways of formative feedback to achieve student-centered learning. In this project, we apply two ways of feedback, 'peer-feedback' and 'reviewing progress with students', in two different teaching settings. These two ways of feedback are described on the website of University of Edinburgh (http://www.enhancingfeedback.ed.ac.uk/staff/resources.html). The first setting is research-based teaching with second-year master students and the second setting is theoretical lectures with heavy text book contents. We intended to investigate whether different ways of feedback can improve student learning in these two teaching settings.

Background

In recent years, feedback has been considered as one of the most crucial sources for learning increasingly. A large Danish investigation of study conditions in 2011, a survey in 11,401 students (Aarhus University's Study Environment Survey), found that many students would prefer more feedback (Jensen, 2011). However, giving and receiving feedback is also a very

challenging pedagogical task. Limitation of time allocated for providing sufficient feedback is always a genuine problem for the teachers. For the students, empirical research has shown that feedback provided by teachers is not always well-taken or used, even though they claim to require more feedback. The reasons behind this are multi-factorial and complex: for example, feedback is delivered in a manner of non-prioritized, continuous, line-by-line comments, rather than prioritized and structured; feedback is given too late to be useful for the evaluation/exam; students feel threatened to their self-esteem (Hounsell, 2008). Therefore to provide learning-oriented and structured feedback suited for different situations is a crucial exercise for teachers.

In this pedagogical investigation, we applied two ways of giving feedback in two different course settings. The first course is called Pediatric Clinical Nutrition and located in the 4th block in the first year of the 2-year MSc in Clinical Nutrition (training for dietitians). The lecturer, Dr. Yanqi Li, (indicated as "I" in this paragraph) taught about premature infant nutrition. The course material is mainly about the nutritional recommendations for premature infants with a lot of numbers and references. This information can be quite monotonous for the students to follow during the lectures. Therefore I believe teaching the research behind these numbers and how to design and set up research in this area will stimulate students' learning much better. Due to the time limitation, it is not feasible to involve students in real research projects. I therefore plan to incorporate research into a 3-hour teaching session with the following three aspects: 1) Relevant research questions in this field; 2) Examples of research projects in this field; 3) How to design studies to investigate these research questions. To make sure that the students can really learn from the process, giving formative feedback is a critical step. Peer feedback, where students give feedback to, and receive it from, their fellow-students is evidently beneficial for student learning (Falchikov, 2002; Liu & Carless, 2006; Miller, 2008; Orsmond et al., 1996). In the above described course, I think peer feedback is the most optimal method as 1) it is quicker and more accessible than teacher-provided feedback to others; 2) giving feedback to others is also a way to test whether students understand high-quality research; 3) giving peer feedback is a common practice in real research environment.

The second course is called Advanced Cell Biology and Neurobiology (SHUA13002U). The course is compulsory for Master education in Human Biology, Faculty of Health and Medical Science and the course description can be found at: https://kurser.ku.dk/course/shua13002u/2016-2017. The

course is placed at the beginning of the study in Block 1 of the two-year Master education and lasts for 6 weeks. The course consists of lectures (31 h), seminars in form of scientific article presentations (4 h), a one-week laboratory exercise in groups (35 h), independent preparations and written project work (81 h), and an oral exam. The role of Dr. Stanislava Pankratova (indicated as "I" in this paragraph) in the course is to give 6 lectures, and to lead 1 SAU and one-week laboratory exercise. Particularly a block of four lectures includes molecular pathways with very heavy text book content. I have taught in this course previously, but whether the students actually learned the intended learning outcomes (ILOs) was not clear until the final exam. Previously, there was no time set aside for continuous or even mid-term feedback to students. I believe inclusion of some forms of formative feedback during heavy lecture contents will help students to understand whether they learned the theoretical part of the course in good time. Also it will serve as an indicator for them what subject(s) they should pay more attention to during the preparation for an exam. Furthermore, continuous or mid-term feedback will help teachers to improve their lectures during the course and for the next year. I think reviewing progress with students with timely feedback during my lecture is a good way to provide formative feedback and to secure their learning by identifying to what extended they reached the ILOs early.

Objective

The aim of this project is to improve student learning by implementing feedback during lecture sessions. We intended to investigate two ways of feedback, i.e. peer feedback and midterm-feedback to review progress, in two different teaching settings.

Method

Peer feedback

I designed an exercise in my lecture including peer feedback ('I' indicates Yanqi Li in this paragraph). I asked the students to make a research proposal for a research topic they have chosen. The learning outcome of this exercise was for them to be able to discuss current trend of research in premature

infant nutrition and suggest relevant research methods for a specific research question. The students worked in groups and wrote a short proposal describing the research question they have formed and the relevant research methods they have chosen on Padlet (https://da.padlet.com/dashboard, an online tool to share texts at plenum). For fast learners, they could also describe how they were going to design the studies. When they have finished the proposal, I let the students elaborate their thoughts and ask questions to each other. Then students (also in groups) took a look at one proposal made by another group and gave their peer feedback. I have prepared the following questions in order to guide them: 1) how do they find the research question relevant within that research topic; 2) whether the research question is formulated in a logical and precise way; 3) whether the research method chosen suitable for solving the question and why; 4) and if not, what methods do you suggest? Students wrote their feedbacks on Padlet and we took a look at the feedback together. While we reviewing the feedback together, I asked the feedback-receiving group to read and reflect on the feedback they got. Then the feedback-giving group could elaborate on their comments if needed. After the course, I talked with some students to evaluate the group work and the effect of providing peer feedback on their learning.

Reviewing progress with students

To address the issue described in the background regarding Advanced Cell Biology and Neurobiology, lectures were adapted to test student's learning with predesigned questions followed with feedback from the teacher at plenum. Specifically, at the end of the 4th lecture of a block focused on Signal Transduction, students were asked to answer a series of questions (Appendix A) organized in an online tool (mentimeters.com). Students were informed in advance about the expected activity and asked to bring mobiles. The questions were designed to meet criteria for ILOs and the degree of complexity was adjusted. The whole survey took ca. 20 min. The answers were analyzed and a feedback session was performed at the end of a following lecture. The feedback was given orally for ca. 15 min, formatted for the whole course and clearly illustrated with power-point presentation. Each block of question/answers was analysed in details and explicitly illustrated with relevant lecture material. The described intervention was later discussed with students during the following practical course in order to estimate whether the midterm-feedback was helpful to grasp the concept and the mechanisms. Based on the performed interventions, additional ques-

tions were raised by students and were also discussed either immediately after the provided feedback or during the practical course.

Results

Peer feedback

Students got 10 min to give feedback to others' research proposals on Padlets (Figure 11.1). The written part of the peer feedback covered from study design, research methods, outcome measures, to ethical considerations, reflecting many aspects of research. In a plenum discussion, the feedback-receiving group read and reflected on the feedback and the feedback-giving group could elaborate on their comments. By doing so, students created direct dialogs between groups even bypassing me as a teacher. I ('I' indicates Yanqi Li in this and the next paragraph) chipped in when I felt necessary, otherwise I just let them talk. It created a very nice atmosphere and the students were very activated and involved in giving critical comments and defending their research proposal.

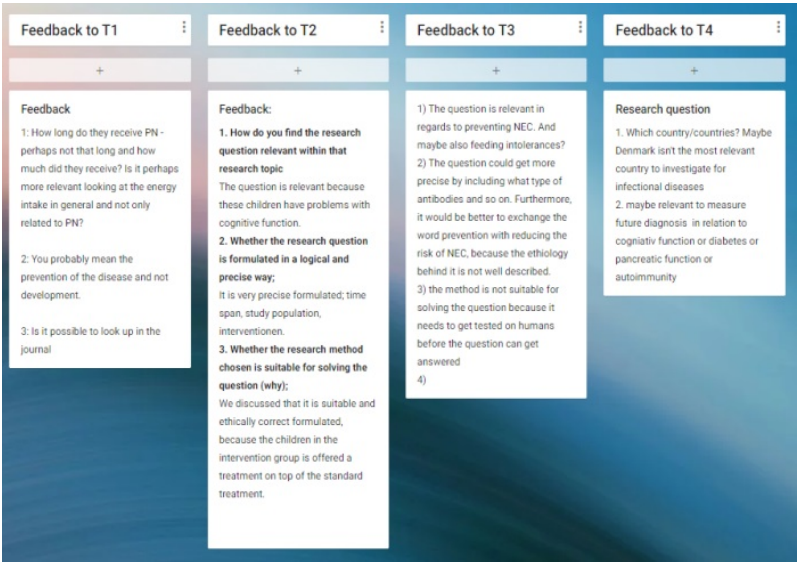

Fig. 11.1. Research proposals and the peer feedback on Padlets.

After the lecture I talked with the students to evaluate the effect of this intervention. Students were in general very positive towards this peer feedback method, which is not used in their previous lectures. They were very familiar with group work throughout their education, so grouping them together to give and receiving peer feedback made them very comfortable and more acceptable than doing it at individual bases. They were happy about the instruction I gave to them regarding the content, criteria, form of feedback and roles of the feedback giver and recipient, which equipped them with necessary tools to do this exercise. As the teacher, I was able to chip in at the right time to guide the dialogs. The students believe that they had better understanding of research process in preterm infant nutrition area which is enhanced when they had to comment on others project proposal. They felt that the questions I provided to them were not only very useful to perform this exercise, but also guided their critical thinking for future research work. This process is very beneficial for student learning, as they not only can learn from peers' feedback how they performed the task, but

also learn to judge and defend research proposals which is an important competence in research.

Reviewing progress with students

Most of the students participated in the intervention, and therefore the obtained results are considered representative (Figure 11.2). A majority of students preferred to answer individually, whereas only a few of them took a discussion in a small group (2-3 people). The feedback was given in a form of collective feedback with elements of short exemplary feedback (Rienecker & Bruun, 2015). The provided feedback (Figures 11.3) was in a form of discussion about the results and suggestions for to what part of lectures additional attentions should be paid in order to prepare for the exam. The analysis of students' answers revealed that information given on the lectures was well settled, however one specific signaling pathway, TGFb signaling, was misunderstood by ca. 50% of students (Figure 11.3). On the feedback session, this was highlighted and recommended to keep in focused during preparation for the exam.

The effectiveness of applied method was evaluated during discussions with students at a following practical course. It revealed that the mid-term feedback was helpful in understanding the main mechanisms of signal transduction. Based on individual feedback I ('I' indicates Stanislava Pankratova in this paragraph) got from students, I can see that the questions were received positively by students. In addition to the subject-related questions, I got a group of questions, particularly from international students, related to exam process and the potential expectations of examiners. These questions could be generally described as "What we need to know" and "What is nice to know". This was indicative for me that more clear information regarding the teachers' expectations has to be provided at the beginning of this course, since this course placed as the first step of a 2-year education program and about 1/3 of students have international background. In addition, the results of the final exam showed a slightly higher average score compared with the previous year, which might be related to the mid-term feedback intervention, although more research is required to confirm the causal effects.

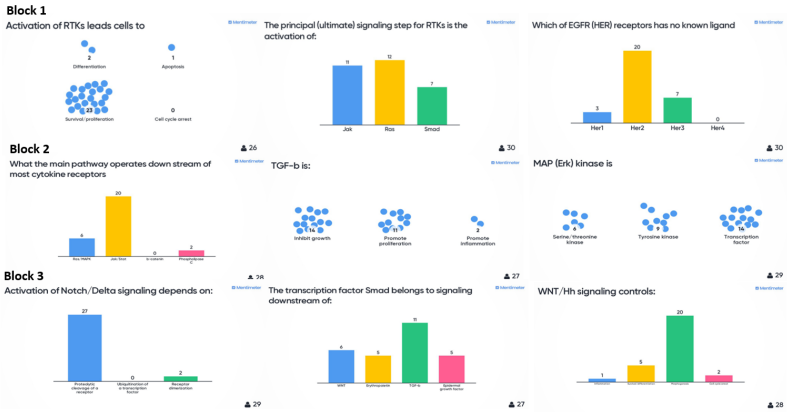

Fig. 11.2. Illustration of the Menti.com slides with answers.

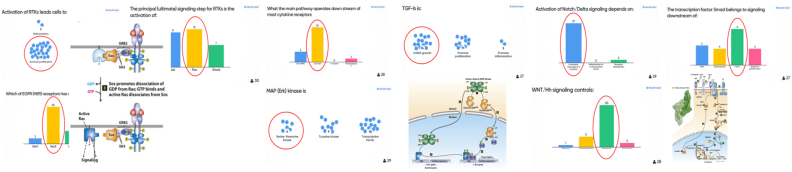

Fig. 11.3. Illustration of provided feedback with highlighted correct answers and pathways which should be additionally considered when preparing for the final exam.

Discussion

Feedback is considered as one of the most critical steps of learning (Lotte 2015). In this pedagogical investigation, we improved student learning by implementing two ways of feedback in two different teaching settings during lecture sessions. To be successful in implementing feedback process during lectures, teachers need to plan ahead considering many aspects: first, choosing the right forms of feedback with 'enhancing student learning' as the ultimate purpose, not just for fulfilling a 'pedagogical requirement'. To

choose the right forms, it is important to consider: how much time I have; at plenum or individual-based is more beneficial; at what time during the lectures, etc. Second, communication with students about the feedback process, including the time frame and forms of feedback, objective and criteria of feedbacks, and how students should use received feedback; Last but not least, asking for a short evaluation of the feedback. This is not to force the students to use any part of the feedback, but rather to see whether the feedback is useful for the students and to make improvement for future.

Benefit of peer feedback in research-based teaching

Research indicates that feedback givers benefit similar to or even more from the process than the recipients (Chanski & Ellis, 2017; Cho & Cho, 2011). When analyzing other's research proposal, the students focused more on the criteria given by the teacher on how to assess a research proposal and became more responsible for identifying the strength and weakness of a proposal and applying them to their own work, rather than simply following instructions. In this way, it does not matter critically whether the received peer feedback is 'correct' or not, as it is the giving/receiving process increases the students' learning. Many teachers care about the accuracy of feedback and for courses that require 'correct answers' (e.g. how to solve a mathematic problem), it is more difficult and risky to just apply peer feedback. But in our investigation when teaching research, peer feedback seems to be a good way to stimulate student's learning, from both receiving and giving feedback. It is worth noting that justification is one important element in peer feedback, because students are more likely to use feedback if it is justified (Gielen et al., 2010). Therefore it is important to instruct students to give feedback in a justified way, e.g. they can ask or suggest, but not accuse or depreciate.

Benefit of mid-term feedback to review progress in heavy theoretical content lectures

The obtained information provided some evidence of the beneficial effects by implementing mid-term feedback to increase students' learning and improve motivation and acquisition of the theoretical content. However, as a limitation of our study, the results cannot provide causal relation or confirm the improved learning quantitatively. Mid-term feedback motivated students to focus on study objectives in good time before the final exam, which is in agreement with previous research showing the enhanced impact

of feedback (Hounsell, 2008). Thus, one of the advantages of mid-term feedback is its timely fashion, which can be useful tool for exam preparation. Furthermore, mid-term feedback contributed to establishing tighter connections, in form of a dialog, between teachers and students. In addition, based on received feedback, some students have revised their expectations towards the final exam and adjusted their learning from details-oriented to more key process-oriented. Finally, the feedback process could be further improved; for example, the feedback could have been given immediately after the questions were answered by the students, rather than at the end of another lecture.

Conclusion and perspectives

We concluded that both types of feedback (peer feedback and mid-term feedback) were positive for the learning of ILOs and received well by students. It is critical to choose the right form of feedback in different teaching situations. It is worthwhile to mention that the mid-term feedback has been suggested to be implemented in the course platform of Human Biology education. In addition, mid-term feedback revealed that expectations towards the final exam are not well communicated between teachers and students, which should be improved, specifically in programs with many international students enrolled.

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A

Appendix 1: Questions provided to students

Block 1:
1) Activation of RTKs leads cells to:
   Differentiation
   Survival/proliferation
   Apoptosis
   Cell cycle arrest
2) The principal (ultimate) signaling step for RTKs is the activation of:
   JAK
   Ras
   Smad
3) Which of EGFR (HER) receptors has no known ligand?
   Her1
   Her2
   Her3
   Her4
Block 2:
4) What the main pathway operates down stream of most cytokine receptors:
   Ras/MAPK
   Jak/Stat
   b-catenin
   Phospholipase C
5) MAP (Erk) kinase is:
   Serine/threonine
   Tyrosine kinase
   Transcription factor
6) TGF-b is
   Inhibit growth
   Promote proliferation
   Promote inflammation
Block 3:
7) Activation of Notch/Delta signaling depends on:
   Proteolytic cleavage of a receptor
   Ubiquitination of a transcription factor
   Receptor dimerization
8) The transcription factor Smad belongs to the signaling downstream of:

WNT
Erythropoietin
TGF-b
Epidermal growth factor

9) WNT/Hh signaling controls:
Inflammation
Survival/differentiation