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Human nutrition lectures - an experiment of student activation in large classes

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Introduction

The general perception of university teaching is, if you put it in black and white, like a scene from a movie where hundreds of students are gathered around a lecturer who possesses all the knowledge and try to pass it on to the students in a more or less comprehensive way. Even though university teaching fortunately is more than that, in many universities a major part is actually centered on large class lectures (Gibbs; 1981). Having said that, teaching quality is now of high priority for most universities, and a focus on how to improve student learning and outcome is increasing (Biggs and Tang; 2007). "Dietary Intake and Nutrition Physiology" is the first course for the students on the Master Degree programmes in "Human Nutrition", "Clinical Nutrition", and "Gastronomy and Health" at The Department of Human Nutrition. It is a basic theoretical course that covers lectures and theoretical exercise sessions. Over the last few years the number of students participating in this course has more than doubled, going from less than 40 to now more than 90 students. To overcome this fundamental problem with rapidly increasing class sizes and to minimize the risk of a resulting decline in quality, it is necessary to focus on and evaluate the teaching methods used.

Background

A way to improve teaching is by outcome-based teaching and learning (OBTL). This involves firstly to define what we intend the outcomes of the course to be, i.e. the intended learning outcomes (ILOs), secondly to set the structure of the teaching so that most students are able to achieve those outcomes, i.e. to define the teaching-learning activities (TLAs), and thirdly to assess how well the outcomes have been achieved, i.e. by a proper assessment task for the students (Biggs and Tang; 2007). Many studies have established a consistent relationship between surface approaches to learning and lower quality learning outcomes. Furthermore, it has been shown that teachers, who center their activities around the students by encouraging self-directed learning, are more likely to encourage a "deeper" approach to learning (Trigwell et al.; 1999). Teaching is therefore not only to communicate knowledge to the students but also to increase the level of engagement from a "surface" approach towards a "deep" approach, i.e. to get most students to use the level of cognitive processes needed to achieve the intended outcomes that the more academic students use spontaneously (Biggs and Tang; 2007).

But how can we improve the level of engagement towards a 'deep' approach? A major issue in trying to increase OBTL is to set the stage for effective teaching and include relevant and supportive TLAs in the teaching process. Some teachers prefer to adopt totally new ways of delivering courses. I do though find it possible and reasonable to innovate and hold on to quality by gradually changing traditional methods. Jenkins (1992) argues that, even in the large class lecture situation, it is possible to break up the lecture into short segments, many of which are devoted to students in small groups working at tasks devised by the lecturer. Students in large classes can thereby work actively and feel personally involved.

In this project I will therefore investigate how large class lectures can become more interactive. This will include an analysis of what methods are useful as student activation tools within the course "Dietary Intake and Nutrition Physiology", and then to test some of the methods during two lectures, followed by an evaluation of their effect from both my and the students' perspective.

Methods

As many other courses the teaching within each topic in the course "Dietary Intake and Nutrition Physiology" is built up around a lecture followed by tutorials where the students work on problems. Acknowledging that the strategy has to be focused on the students and not the teachers (Trigwell et al.; 1999), changes have been made to increase the relative time spent on theoretical problem solving compared to the lecture sessions over the last years. Nonetheless, to increase deeper learning it is of high relevance to adopt a student-focused strategy during the lectures as well. In this course, this will be done by changing the settings of the lectures so as to look at them not as a TLA in itself, but as a situation where a range of various TLAs can take place and put the students in focus, as suggested by Biggs and Tang (2007).

According to Biggs and Tang (2007) the choice of suitable TLAs depends on what kind of knowledge the students are to learn, i.e. declarative versus functioning knowledge. The course "Dietary Intake and Nutrition Physiology" is based mainly on declarative knowledge, but on a high SOLO taxonomy level. An important issue to take into account when searching for suitable TLAs, is to be aware of the high number of students attending the class. In this particular class more than 80 students are present for each session. This gives certain limitations as described in our KNUD pre-project report (Bering et al.; 2009). In the report we look at the students' perspectives and experiences with implementing student activities in large classes. A major obstacle in these classes is to get the students to actively discuss in big forums, so the task is to find TLAs that focus on smaller group interactions. Suggested TLAs that I find very suitable in large classes to increase declarative knowledge include (Biggs and Tang; 2007):

- Students reflect on what they think they have just learned, then in pairs tell each other what they saw as the most important point in the preceding 15 min of lecturing. This TLA will get them to explain.
- Each student writes down a question or a comment sparked by the previous 15 min for their neighbor to respond to. This will get them to question and explain.
- I pose questions for them to answer after buzzing with their neighbor. This will allow them to discuss.
- I set small problems for them to work on individually or in pairs. This will allow them to discuss.

- Towards the end of the lecture I will allow 5 min for each student to tell their neighbor what they think was the thrust of the session. This allows for active review and gives them other interpretations of the perspectives than their own. Furthermore, it will again allow them to explain and discuss.

Two lectures of two hours each were planned in which I wanted to implement several of the TLAs described above. The theory of didactical situations (TDS) was used to plan the lectures with the aim to increase the students' motivation for engaging in the planned TLAs (Christiansen and Olsen; 2006; Warfield; 2006). A general overview of the didactical phases implemented in the two lectures is given in Figure 2.1. During the lectures the TLAs were used both in the beginning of the lecture, during the lecture and in the end, so as to get them activated from the beginning and inspire and make them curious about the topics, in the middle to let them work independently with the theory, and in the end for the students to evaluate what they have learned as described in the points from Biggs and Tang (2007) above. To ensure that the students were prepared for the kind of teaching that they were to be presented to, and for them to be committed and engaged in the setting, I wanted to make a didactical contract with the students. Therefore, I started the course with an introduction session in which the form of teaching used during the course was introduced. It was outlined that the lectures were viewed upon as a setting where different TLAs were to take place, not as a form of teaching. Furthermore, TLAs that are suitable for the large class setting was introduced, and they were told that TLAs that students normally are less fond of would be avoided (Bering et al.; 2009). So as to let them know that students opinions on how to implement activation was acknowledged, but also to stress that I expected them to engage fully when meeting them on their terms. A description of the TLAs used during the two lectures is given below.

Lecture I

In the first lecture, "Gastrointestinal physiology and digestion and absorption of nutrients", the lecture was sparked by an initial question for the students, asking them what the topic was about. They had to think and discuss with peers for two minutes and then write their suggestions on a paper to hand in to me after the session. In this way the students were tuned in on the topic, searched their brain for their background knowledge on the

Content	Didactical phase	Commitment
Introduction	Devolution	Lecturer
TLA 2 *Curiosity*	Action Formulation Discussion	Students
Plenum discussion	Validation	Students/lecturer
Theory	Devolution	Lecturer
TLA 2 *Problem related to theory*	Action Formulation Discussion	Students
Plenum discussion	Validation	Students/lecturer
Theory	Devolution	Lecturer
TLA 3 *Context*	Action Formulation Discussion	Students
Plenum discussion	Validation	Students/lecturer
Conclusions	Institutionalization	Lecturer

Fig. 2.1. General overview of the planned didactical phases during the 2 hour lecture sessions in the course "Dietary Intake and Nutrition Physiology". Three brakes were included, appropriately adjusted to time and topic.

subject, and by handing in their suggestions on paper, I got a chance to validate their level of background knowledge, which is especially important when the students comes with various different backgrounds. The specific task was:

- TLA 1: *What do you think of as the main functions of the gastrointestinal tract?*

Secondly, in the middle of the lecture, the students the students were asked to come up with a question for the session for their peer to answer, and vice versa, for a two minutes discussion. As described in Biggs and Tang (2007) this allowed for making questions, explaining and discussing, and also for active review. Furthermore, it would give them other interpretations of the perspectives than their own. The specific task was:

- TLA 2: *Make a question to the topic of the previous session for your peer to reply on. It can be about what you think is most important, something you did not understand, etc.*
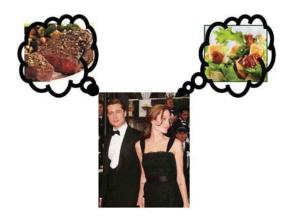
Finally, by the end of the lecture, the students were asked to work on a specific problem for two minutes, based on the theory that was introduced. This worked as a concept test where the students got to work with and use their newly acquired knowledge. After the peer discussions the answer was discussed in plenum for validation followed by explanation by me for institutionalization. The specific task was:

TLA 3: *How would you design a rehydration solution needed for this infant to solve the problem with severe diarrhoea and dehydration?*
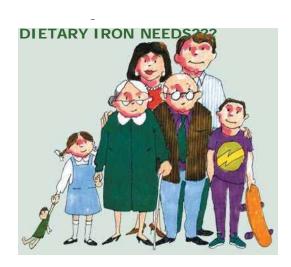
Lecture II

As the first lecture, the second lecture "Iron nutrition" was built up around the same TLAs. Firstly, the students were to initially reflect on what they think the topic was about, this time by using a little quiz. The students were introduced to an eye-catcher slide with a famous couple to increase their interest in the topic. I indicated that there was a mistake on the slide that we during the lecture would be able to locate. This was to stimulate their curiosity and interest in the topic. The mistake was revealed in the end of the lecture.

TLA 1: *Think about what could be wrong on the picture in relation to iron nutrition*

Secondly, in the middle of the lecture, the students were asked for a specific problem to work on with their peers, based on the same arguments as TLA 3 in lecture I. The specific task was:

TLA 2: *Write down and explain the recommended daily intake of iron for the individual family members on the picture*

Finally, by the end of lecture II the students were asked to discuss a specific real-life related situation on iron fortification of food with their peers for two minutes, allowing them to put the topic and acquired knowledge into context. The specific task was:

TLA 3: *Discuss pros and cons of iron foods fortification*

Evaluation

The evaluation is based on my own reflections plus reflections and comments from my departmental and pedagogical supervisors, who supervised the sessions. It includes specific reflections relates to the didactical phases in each of the two lectures followed by some general thoughts on the process.

Lecture I

- By starting the teaching with a TLA, all students were aware and listening right from the beginning and with the following two TLAs, the students actually kept their awareness throughout the session.
- As regards TLA 1, the students got on with the assignment really well, and during my walk around in the lecture hall, I got the feeling that most students got into good discussions. I wanted the students to hand in their suggestions, but forgot to ask for the assignments in the end. 12 students handed in the assignment anyway. It was nice to receive their responses to evaluate their background level of knowledge, and I must remember to do the final collection next time.
- I skipped the first planned break as I thought it was too early (after 20 min). This was obviously a mistake. The students needed the brake, and I felt it immediately when continuing. I then introduced a break a bit later, but should clearly have stuck to the original plan. Lesson to learn: You can never take a break too early.
- The TLA 2 was planned to take place after a theory session with devolution. Since there was no TLA to introduce this session, the students quickly developed a 'laid back' attitude in the beginning of the session, i.e. only listening. But I felt that they were aware and quiet. I would have liked to make an announcement of the second TLA before starting with the theory and describe the content of it to make them aware that they needed to come up with a question in the end. This would probably also have helped them to keep focus.
- Even though the project was about finding alternative ways to activate the students and not by asking questions, I did use questioning as an awakening and awareness tool during the devolution and institutionalization phases. Even though the class was large, the students were not afraid of asking and answering the questions that I posed. The response

to questions did though depend on my way of posing them. When thinking back I have a tendency to ask rhetoric and closed questions and also allowing too little time for the students to think about them before answering. I should be clearer as to whether I expect to get an answer or not, and to give them more time to answer. The problems could be managed by better planning of the questions before the lecture to evaluate and turn rhetoric questions into open questions. Finally, when the students answer, it is very important to repeat the answer so that I turn a two-way communication into a group interaction.

- As regards TLA 3 my plan was for them to work on it, and after that I would provide suggestions for answers which I told them beforehand. This was to investigate if they were more relaxed and discussed more easily if they did not have to worry about having to answer in the large class forum which from theory seems to bee hard. The students were though actually very keen on the assignment and participated lively in the plenum discussion. This shows that if I give them the time to reflect and evaluate with their peers, then it is less difficult for them to participate in discussions and makes it a positive experience.

Lecture II

- As regards TLA 1, the eye-catcher slide where they have to find a mismatch in relation to iron nutrition was very efficient as an inspiration tool. With that slide I met the students on their level and with humor. They paid attention right away.
- TLA 2 was a good assignment for the students. It is a very tangible assignment in the sense that they can look up the data, and when doing that it gets obvious for them that there are differences between the groups. On the basis of the theory they have just been through they can discuss why and actually come to an answer themselves. They were very happy and enthusiastic about the assignment.
- Many students can hide during plenum discussions but it felt like there was a lot of activity around the TLAs, and questions arose that they actually discussed and also did come forward with during plenum discussions.
- As a follow up on the lecture I tried to slow down and ensure that the students understood the important points I tried to make. I did that by asking them about the speed, understanding, etc. I needed to go back and repeat certain things. It was important for me that they actually had

confidence in asking for repetition. The lecture took longer time than expected and I had to leave some of the planned things out accordingly. It was though a good feeling to be able to adjust the time-frame during the lecture and to take into consideration what was actually important and realizing when the students cannot digest more information and need to work themselves.

- TLA 3 was not as practical and specific as the TLA 2, which made the students more weaving. It was though a specific learning goal to be able to discuss the topic more broadly and put into context and institutional- ization, and they actually came up with a lot of good ideas, so I found it was a good TLA for them to practice rising to a higher Structure of Observed Learning Outcome (SOLO) taxonomy level.

To sum up, I found the suggested TLAs for large classes by Biggs and Tang (2007) very inspiring. They fitted nicely into the picture that we had obtained from the student interviews in the pre-project (Bering et al.; 2009) in the sense that the students are in fact interested in getting small problems to work on, and to discuss and formulate hypotheses themselves or in small groups, as long as it does not require them to speak individually for the whole class, especially not without rehearsal. I found that the idea of using TDS to structure the lectures and then implement at least three TLAs during each session worked very well. With the implementation of an introductory TLA to increase the students' curiosity for the topic and inspire them to engage in the session, a mid-part TLA that makes the students work with the topic, and a closing TLA that puts the topic into context, a new perspective on how to structure teaching sessions began to arise. The students were very engaged in the TLAs, and a lot of activity and discussion was initialized. Many students even participated in the following plenum discussion, even though this is most often what they dislike. It demanded a bit of imagination for me to come up with appropriate TLAs, but now that I have the structure of the sessions using TDS, it will be easier to develop new TLAs in my the teaching in large classes to come.

Student evaluation

The students' evaluations of the course were generally positive, and they were very satisfied with the structure combining lectures and theoretical exercises. Some specific comments to the TLAs included in the lectures are given below:

What was good about the course?

- *"Good mixture of lectures and exercises, both the small assignments and questions during the lectures and the big exercises in groups"*
- *"It is good with small thinking questions during the lectures. It does not need to take more than 5-10 min if there is not much time, but the fact that you stop up and think is good"*

Conclusion

The aim of reflecting on and experimenting with the teaching strategy in this course was to obtain better alignment between the ILOs for the course and the TLAs that are actually being used during teaching. By implementing TLAs during the large class lecture settings in the course "Dietary Intake and Nutrition Physiology" that were in conjunction with the TLAs suggested by Biggs and Tang (2007) to increase interactive teaching of declarative knowledge in large classes, I felt that the student activation and interest was increased, and thereby also their level of "deeper" learning that I aimed for. Furthermore, I felt that what we are asking for at the examination is actually something that the students have worked with on their own or in groups. Although these are not dramatic changes and we still have to face teaching in the form of lectures, implementing these TLAs during lecturing I believe will help to overcome the fundamental problem with rapidly increasing class sizes in this education to minimize the risk of a resulting decline in the quality of learning.