

Integration of novel motivational teaching tools for large lecture sizes

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Introduction

Class entry sizes for Veterinary Science at the Faculty of Life Sciences (University of Copenhagen) have been increasing annually the last few years and may continue to do so in the coming years. The size of the current first-year class is 186. I have been involved in teaching components of a first-year course, Anatomy and Physiology II to these students. The course includes lectures, practical demonstrations and exercises. The lectures, practical demonstrations and exercises, both microscopic and macroscopic, are performed by the whole year group at the same time, either in a single lecture hall, the large histology rooms or in a single dissection hall. For more details of the course information, see link: <http://www.kursusinfo.life.ku.dk/Kurser/300059.aspx> (from University of Copenhagen website).

The current teaching methods employed for lectures within this course are based on standard school lecture principles. That is, lectures are designed as monologue-teaching with PowerPoint presentation from a single teacher to a large hall containing 186 students. The amount of anatomical structures and Latin names that need to be learned and memorized are extensive. From my own observations, attendance at lectures is not at full capacity. This may be due to a lack of motivation and difficulties in learning in such large-scale teaching environments. From my own experience at another university and participation in large lectures with over 200 students, I found the teaching to be un-motivating and I was easily distracted. When questions are posed in large lectures, the student answering may be difficult

to hear (due to distance) and participation is limited to a single individual in the class (and usually only the confident students who are not scared to answer). As student class sizes continue to grow, it should be expected that our teaching styles will adapt accordingly to maximize the learning outcomes and provide high-quality teaching, which keeps the students motivated in what could be considered an un-motivating scenario for many of them. This lack of motivation may stem from one or more of the following: little personal interaction with teachers, difficulty to express and provide feedback or questions, or a general feeling of students being distant from the education programme and the teachers, in general.

Proposal

It would be useful to integrate more modern teaching approaches to improve the participation of the students in learning, to improve their motivation and ultimately to increase their learning capacity and to be interested in and want to attend all the lectures. In this project, I will analyse the pros and cons of different interactive tools for teaching in large environments. I will reflect on my own teaching experience where I applied two such tools. I will also reflect on how to integrate, in a practical sense, these tools in such classes (taking into consideration, the “selling” of these techniques to other teachers and the teaching coordinator as well as the current departmental budgets). I will also try to contact other universities (mostly based in the United States) employing such interactive tools in their teaching and obtain feedback about implementation and usefulness of these tools in their curriculum.

Overview and definition of novel interactive tools

In this paper, I will review three different interactive tools which are applicable in large lecture teaching: 1. Clickers 2. Flash Cards 3. Interactive quizzes. Some simple definitions of these tools are as follows:

Clickers

Clickers (also known as Classroom Response Systems (CRS)) are simple electronic handheld devices used by students to send electronic (infrared)

responses to the teacher. The device may allow at least two different options that the students can choose from (usually they have multiple options). Therefore, the question posed by the teacher must be constructed to include at least two different possible answers that the students must decide between. The feedback is directed back to the software and to the teacher's computer and may be reported immediately back to the students, often shown as a graph in percentage of answers for either A, B etc. Most often, the responses made are anonymous, however, in some clicker packages software the teacher can choose to track the responses from individuals over time. The use of clickers has been growing rapidly, in particular in the United States with the Interwrite PRS RF clicker adopted at the University of Delaware, and the iClicker at Colorado State University, the University of Miami and the University of Alberta. Ohio University and the University of Utah currently use Turning Point clickers, which includes Turning Technology software that can be used through a dedicated clicker, or the students' own smart phone or mobile phone. University of Iowa is using a clicker called ResponseCard.

Flash cards

Flash cards are a low-technology alternative to clickers and generally include colour, text or image cards that students can raise order to respond to directed interactive questions during the class. As in the case of clickers, these are used to respond to multiple-choice questions. Generally there are at least two card alternatives to choose from. Some booklets are available with a number of different response alternatives to choose between.

Quizzes

Quizzes are a set of written questions given to pairs or individual students and may be developed in varying ways. Effectiveness in large classes may mean adaptation of quiz styles to reflect the class size. Feedback may or may not be given directly in class. To be considered an interactive tool, responses should be given and discussed during class.

Pros and cons of novel interactive tools

Clickers

Pros

There are a number of features in using clickers that are considered advantageous. One is that they give the student a feeling of anonymity in answering. Their friends by their side may not even know their chosen answers. This may also lead to a feeling of self-confidence and more willingness to contribute to giving feedback during class, particularly for those who have less confidence in speaking up or participating in classes. More importantly this feedback gives detailed responses to the teacher and statistical feedback on questions posed which helps the teacher gauge how the students perform at problem-solving and in grappling with the new themes presented during class. This feedback can be used to further develop problem solving or get students to discuss between themselves why these answers were or were not chosen. In some scenarios, students may be asked to discuss in pairs why their answer was chosen and then asked to respond a second time, before the correct answer is revealed. This can lead to an improvement in responses. It is known as peer instruction and is described by (Bruff; 2009) and further referred to in figure 3.1.

The types of questions used need not necessarily be restricted to multiple-choice questions. They may also include: 1. Recall questions (which can be used to recall facts, concepts or techniques), 2. Conceptual understanding questions, 3. Application questions (where students apply their knowledge to particular scenarios), 4. Critical thinking questions (where students can analyze relationships between multiple concepts), 5. Monitoring questions (on course design, structure and working dynamics) and many others listed on the website: <http://cft.vanderbilt.edu/teaching-guides/technology/clickers/>.

Molly Morris, an Associate Professor at Ohio University believes that her students get a lot more out of her class when she uses clickers (see video link: <http://www.citl.ohiou.edu/quickstarts/clickers/stub.html>). Professor Eric Mazur from Harvard University claims he would not revert to another teaching style after adopting clickers in his physics class.

Cons

Leslie Madsen Brooks, a pedagogic specialist from California speculates that there may be some drawbacks with the use of clickers. She also men-

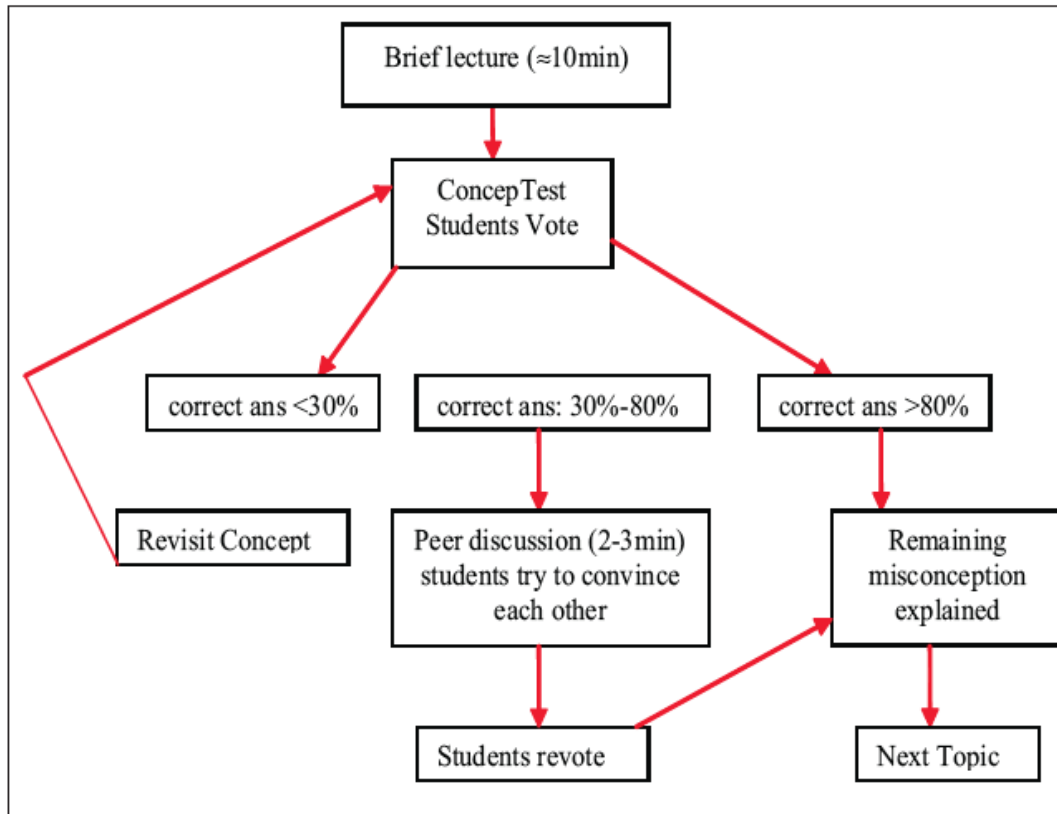


Fig. 3.1. A peer instruction implementation algorithm (From: Lasry (2008)).

tions that there is a price to pay for such technology. Whether this becomes a cost for the student or the University is something that has to be ascertained by the university curriculum. Bugeja (Retrieved December 8 2010) reported that a student advisory committee was against clickers as students deliberately were slowing down the class by selecting incorrect answers. There is also the potential for students to answer on other students' clickers.

It can also be considered that the impact of the clicker tool relies greatly on the teacher's ability to formulate appropriate questions. It also requires the ability of the teacher to interact with the students and their responses to generate the most value from the tool. In some cases, training of teachers in the use of the product would be recommended. Not all teachers will be open to adapt to such new tools for varying reasons. Added workload or a lack of willingness to change their teaching style may contribute to this. Simply launching a new tool within a curriculum does not necessarily

improve teaching and student learning. It does require teacher training and instruction on how best to utilize the technology.

Flash cards

Pros

There appears to be little pedagogical difference between flash cards and clickers, provided the questions are applied in the same way. These tools allow for interactive questioning, asking multiple-choice questions etc. They improve interaction between all students and the teacher and may stimulate learning by the students.

Cons

When compared with clickers, one issue arises: that votes can only be visualized by the teacher and the answers can then only be approximated and not accurately calculated. There is also the concern that students can look around the room and see the answers being displayed which may make them doubt their own answer and change to fit the majority of answers being displayed. There is also less anonymity with flash cards than clickers, as individuals can be identified for displaying either the right or wrong answer. The lack of anonymity may be a concern for some students. Neither can the teacher track the response record from students over time, as is the case with some clicker software programs.

Quizzes

Pros

These are good tools for helping students to engage in a lecture. It improves their listening ability and concentration. Quizzes are useful if feedback is given either at the end of class or later in follow-up classes. They may also be useful for summarizing the main points or concepts in the class and placing focus on those concepts that are potentially more important than others. They also induce “active” participation of students in the lecture, and this may be important in their attitude towards lectures and improve their motivation.

Cons

Quizzes may not necessarily improve interactive participation between teacher and students if they are not applied properly. It may also distract the student from listening to other key concepts if he or she is mostly focused on the quiz material. Quizzes are not so useful if feedback is not given, as the students become unclear whether their answers are right or wrong. Quizzes need to be designed well if they are to function well. Too much information can overload and distract the student.

Implementation of novel interactive tools in large class sizes

In my own classes, I applied both flash card questions and quizzes simultaneously to a large lecture hall containing approximately 180 students on two separate occasions. The flash cards used were of two colours, orange and blue, thereby allowing only one choice of two alternative answers. These cards were distributed at the beginning of the class along with the quizzes.

The aim of the flash cards was to stimulate thinking and motivation and participation of the students and to ascertain how much they were obtaining from the lectures. Three flash card questions designed as “True” or “False” were posed during a 50 minute lecture and followed directly after a particular topic. The students were allowed to talk in pairs for one minute before responding and then flash their chosen colour card. The answer was then revealed and feedback given directly. An example of a flash card question can be viewed at the end of this chapter. Some questions in particular worked better than others. The questions that did not work well, were those that elicited an almost 100% correct response (i.e., they appeared to be too easy). Some questions worked much better and gave more mixed results, which could be followed up in going through the concept again briefly. At the end of the second lecture, students were asked to use their flash cards to reveal whether they thought that this tool helped them to acquire the key points of the lecture. They unanimously voted True, which was very encouraging.

The aim of the quiz was more for motivational participation by the students. In this case, it was necessary for the students to determine three or four answers, which were mentioned during the PowerPoint presentation

lecture and were required to fill in the gaps needed. The responses were then presented at the end of the lecture and the students were allowed to keep the information, which was on clear anatomical differences between the different animals that were discussed, as good preparatory material for the exam. A final flash card question asked whether the students found that the quiz helped to show fundamental anatomical differences between different animals and they all agreed. There were a few selected cards that did not show this, which might suggest that a refinement of the complexity of the quiz could be performed.

Feasibility of application of novel interactive tools

In the case of clickers, if the university decides to invest in this teaching tool, it is probably worth setting up classroom pilot tests using clickers from different vendors. There are a growing number of different clicker devices available with a variety of functions and practicalities and it is useful to test these in advance to find the right one, not only by price but also by their functionality and applicability to the course(s) being taught. One useful suggestion could be that the students pay the full price of a clicker, and the campus bookstore pays 50% to buy back the device. It is also a considerable advantage to have a multichannel device, so that nearby classrooms, which may also be using the device, are not affected by the same channel being used. It may also be an advantage if the teacher has the possibility to track answers made by individual students which gives them the ability to track the progress of students during the course and to make changes during the term to match the progress. Ultimately these decisions are made according to the curriculum and this needs to be made to an educated decision. The teachers need to be informed of the considered values of the clicker and the warrant for its introduction into lectures. It may be worth beginning with flash cards, in this case, to gain the students' and teachers' appreciation of interactive teaching with large class sizes before such decisions are made.

Flash cards and quizzes are easily implemented into teaching and certainly do not come at any cost to the institution. It is more up to the teacher to take upon the decision to bring in interactive teaching into his or her classes. Spreading the word through colleagues or introducing fellow teachers and colleagues to one's own classes may open up the discussion and potential spread of such interactive tools.

Quizzes need to be designed well in order to function well. They need to be relatively short and precise and focus on important concepts and themes in the lecture material. Careful consideration of the types of questions posed in quizzes is also important. Multiple-choice questions work well, as do short one-word or short-phrase responses. The key is not to distract the student from the lecture, and provide time during the lecture for the student to be able to respond. Getting interactive responses from the students could be performed in combination with flash cards to get immediate feedback on the answers provided.

Reflections on use of novel interactive tools

“Each instructor’s choices regarding how to use these systems depend on his or her teaching goals and context. A type of question or a structure for a classroom activity that uses clickers might work well for one instructor, but not as well for another instructor teaching a different kind of course in a different discipline to different students”. (Bruff; 2009, p. 13)

Therefore, it is important that the use of the clickers remains flexible, but still obtains maximal output from the students, that is, improved learning.

In an article written by (Lasry; 2008), a Physics professor from John Abbott College in Montreal, Canada, summarizes that from a teaching perspective, there are significant advantages in clickers compared with flash cards, as they give precise feedback and store students’ responses. However, from a learning perspective, there are no significant advantages for the students in using clickers compared with flash cards. His concluding sentence is “The pedagogy is not the technology by itself”.

The benefits of both clickers and flash cards definitely appear to outweigh their disadvantages. I think, from an economical perspective, it may be worth beginning with flash cards before convincing the teaching advisory boards to invest in clickers. If economy is not an issue, then they should seriously be considered. Given the positive feedback from lecturers and professors using clickers in the United States, it seems that there is more to gain than to lose in applying them in the teaching environment.

In retrospect on my own application of flash cards and quizzes, I did note an advantage in using them in large lectures. The students did appear engaged and responded well to both tools. Some members of the class even came down to me afterwards with some positive words of encouragement

on the use of flash cards and quizzes. However, there are ways of adapting and improving the use of them in class. Next time in my own class, I would add one or two additional colour options for the flash cards, giving the students more options and more opportunity to reflect on right and wrong answers. A 50/50 scenario with two cards could be a little too limiting. In addition, I think the quiz could be refined so that less information is presented and there is more discussion afterwards of the answers. Further quizzes could be designed which also pick out main concepts from the lecture. Gaining further feedback on these tools from the students is also vital to ensure that they benefit from them.

A Example of a flash card question given in lecture 1

Flashcard question

The uteri of domestic mammals can be defined as a uterus duplex.



FALSE - The domestic mammals have a **uterus bicornis** (partly fused, partly separated)

All contributions to this volume can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/2010-3-1/

The bibliography can be found at:

http://www.ind.ku.dk/publikationer/up_projekter/kapitler/2010_vol3_bibliography.pdf/