Student Response System: Student Activation towards Better Learning in Large Classes

A Practical Guide

TLHE Final Project

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Abstract

Involving students in large lecture halls is a challenging task. Students learn better when they are engaged and participate. However, traditional lecturing styles do not allow in large groups the type of interaction that can easily be achieved in small classes. This article introduces a recent system that might open up new horizons for teaching in large classes: the student response system. It allows teachers to ask questions that can be instantaneously answered by all the students present in the class, and then summarize and display the answers in front of them. Based on my own experience with this system, I will provide practical advice for a good implementation of this system, and discuss its benefits. More precisely, I will show how it can be efficiently used during the lecture to enhance the learning of the students, to improve the retention of the material after the lecture, and to make the lecture more enjoyable both for the students and for the teacher.

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1 Introduction

Tell me and I forget.
Teach me and I remember.
Involve me and I learn.
— Chinese proverb.

Teaching in large classrooms is a delicate exercise that most teachers in higher education have to experience at some point in their career. Delicate, because it requires a different approach compared to teaching in small groups, and the techniques that usually work very well in the latter case are often not appropriate in large groups. One of the biggest challenges concerns the interactions between the teacher and the students. While asking a question to the students in a small class is usually harmless and can allow to start a discussion on a particular topic, in an auditorium with several hundreds of students it can turn out to be frustrating for the teacher, who will not very likely receive a spontaneous answer, and it can be traumatizing for the student possibly pointed at, who may be too shy to reply aloud in front of her whole cohort. In this context, many teachers feel they have no other choice than adopting a one-way lecturing style, presenting their teaching material very formally without expecting any feedback from their audience. In Economics, for example, most teachers follow this "talk-and-chalk" approach (Becker and Watts, 2001). But is it the way it should be?

This article will present a new tool that has recently been introduced in the auditoriums of some universities and that has the potential to revolutionalize the way teaching is carried out in large classrooms: Student response systems. Several versions of these systems exist, but all share the same principle: Each student is equipped with an electronic device that allows her to answer questions asked by the teacher during the lecture. Therefore, student response systems appear as one possible solution to create interactions between the teacher and the students during lectures, thus solving the problem. However, it would be unwise to prescribe an antidote before having fully diagnosed and understood the issue. This article will therefore try to analyze the roots of the problem, questioning the importance of the lectures in the learning process of the students, and investigating the role of the teacher in helping them achieve this goal of learning. In an era where information is instantaneously accessible everywhere, it is indeed legitimate to ask why we still need lectures, and what role the teacher is supposed to play. Reflecting on some recent results from pedagogical and educational sciences, it will become clear that students learn best when they are involved in the lecture, i.e., when they actively participate, rather than having a passive attitude that hinders learning. In this respect, student response systems represent a promising tool to make this technically possible, and "transform the lecture theatre into a learning theatre" (Biggs and Tang, 2011).

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Several systems are available on the market, with different features that constructors and developers try to put forward to gain market shares, but the basic concept is always the same: Students all have an electronic device they use to answer questions interactively. This device can be provided by the teacher (clicker system). It can also be one of their personal devices, as long as it is internet-enabled (laptop, tablet, smartphone, etc.) and there is a wireless connection in the classroom. In the latter case, they just need to log on to a website using an internet address and a code provided by the teacher, so that they can access the 'online classroom' where the questions will be asked. Socrative is one of these student response systems, and is gaining popularity among teachers. I will introduce Socrative in the following, explain how to use it in practice, and discuss its advantages. I drew this practical knowledge from my own use of this system in my lecture, which I will then describe in section 3.

2.1 A brief introduction to Socrative

Socrative is a web-based approach to the student response system. It does not require any specific material from the teacher (contrary to the clicker system that, despite other advantages, is more difficult and expensive to use in practice), and can be directly used during the lecture with minimal preparation. The teacher needs to create a profile (a 'teacher account'), and to prepare the questions she/he will ask during the lecture in advance. During the lecture, she/he just needs to log on and can start any of her/his questionnaires using an electronic device connected to the internet. A computer connected to a video projector is highly recommended, as it allows to show the students the answers on the screen during the lecture. On their side, the students log on using the internet address of Socrative, and don't need any account to participate. All they need is a code ('room number') provided by the teacher to get the questions and answer them.

The teacher can ask different types of questions: multiple-choice questions, true/false questions, or open questions where students can provide a short answer. This basic toolbox allows to ask a wide range of questions ranging from *convergent* to *divergent* questions (Biggs and Tang, 2011, p. 121). In the former type of question, the teacher has a correct answer in mind in the former case and tries to guide her/his students towards it, whereas in the former type, the question does not necessarily have a unique answer and serves to open up the discussion.

With Socrative, several questions can be asked at the same time, and the teacher has the option of letting the students answer them at their own pace, or to control the flow of questions. Questions can be answered anonymously, or with student names, and the order of the questions as well as of the possible answers can be randomized to spice things up. During the questionnaire, the teacher can see how many students are connected

Figure 1: Socrative's principle.

and how many have already answered. At the end, the answers can be summarized as histograms and displayed on the screen of the room, and also sent to the teacher for her/his records. Another possibility is for the teacher to ask an unplanned question during the lecture, without having prepared anything on her/his Socrative account in advance. The question can be asked orally, or written on the blackboard, and the students have to choose between different standard answers (true/false, or A/B/C/D in the case of a multiple-choice question). This option offers more flexibility to the teacher, and gives room for improvisation.

Questions can be saved on the website for future lectures, and can even be shared with colleagues. This gives the teacher the opportunity to improve the questions over time, tailoring them based on the feedback from the students. After each quiz, a report can be automatically generated and saved. This useful feature allows the teacher to keep track of her/his questions, and to compute basic statistics to follow the evolutions of the answers.

This brief presentation gives an overview of Socrative, and an idea of the multiple options it provides to make the lecture more interactive. However, it should be emphasized that this technology should only serve the learning objectives of the lecture and help the students better understand the material. This is why it should be used with caution, wisely, and always with preparation to make sure the teacher can make the most out of it. It can easily become entertaining, which can have the positive effect of creating a pleasant learning environment. However, it should not be distracting (nobody wants her/his learning theatre become the stage of 'Who wants to be a millionaire?'). This would in the end pull the teacher away from her/his teaching goals. Student response systems are a useful tool, but should be considered and used appropriately as such, and not become an object of distraction. The next section discusses some useful applications of Socrative, and give some advice on its use.

2.2 For what purposes can it be used?

As mentioned previously, student response systems are a tool that facilitates the communication between the teacher and the students, and in some way, also between the students themselves. Nevertheless, it is important to stress that they are only a tool that helps in the organization of a student activity, not the activity itself. The distinction is important, as the teacher should keep in mind that her/his energy should be concentrated on the design of a student activity that serves the learning objectives of the course, where the student response system only helps in its practical implementation. Hence the following questions: what types of student activities could be constructed using the student response system in an effective way? How to best use it? I am describing below a few possibilities that I successfully used in my own course.

Cold call questions. The teacher throws a question at the audience, and waits for an answer that might never come. In the worst case scenario, nobody volunteers to answer, an awkward silence sets in, making both the teacher and the students feel uncomfortable. Alternatively, the teacher might select a student at random and ask her the question directly, which might be even worse, as many students don't like being pointed at and do not feel at ease answering in front of their colleagues.

This technique is widely used by many teachers, and yet it is probably the least popular one, and in many cases the least effective as well. Why ask a question to a large audience without targeting any student, or address it to a single student, when it would instead be possible to address it to *all* the students simultaneously and explicitly expect an answer from each of them? This can easily be done with Socrative, and makes it easier (both for the teacher and the students) to ask questions.

Group discussions and peer instruction. Creating small groups where students can discuss a given problem during the lecture is a powerful tool to enhance learning. This technique was developped by Eric Mazur (Mazur, 2007), and has been proved to work very efficiently (Crouch and Mazur, 2001). The student response system can nicely be used for this student activity. It allows the discussion not only to be effective within each group of students, but also between groups, as anybody can see the answers of the other students.

Group discussions can be used during the lecture to enhance peer effects. A student can be sure she understands an important concept if she is able to explain it herself. So why not ask her to turn to her neighbor during the lecture to explain her the new concept that was just introduced in class? This student activity has been proved to greatly improve the learning of the students during the lecture. It makes them feel more confident with the teaching material, and they retain for a longer time the main points of the lecture. Additionally, it introduces a short break in the lecture, allowing the students

(and the teacher) to regain energy, for instance after a spell of lecture where they only had to listen to the teacher and concentrate on the material.

This student activity can easily be implemented, even in large lecture halls with many students. The teacher asks the students to discuss in small groups (usually three to five students) a particular problem related to the lecture, and give them enough time to fully address it. These group discussions can be completely unsupervised, or supervised by the teacher who can walk through the rows of the classroom and keep an ear open, or even participate in some of the discussions. In both cases, learning will take place, and this is all that matters.

The student response system can be used to improve these peer discussions. Consider the following example:

1. The teacher raises a difficult question and asks the students to answer it *individually* using the student response system.

2. She/He shows the answers on the screen and it turns out that they are very scattered, there does not seem to be any agreement on the correct answer.

3. Without revealing the right answer, she/he asks them to discuss in small groups the problem, and grant them enough time to do so.

4. She/He asks them again to answer individually using the student response system, and shows the answers on the screen.

5. If the answers are still scattered (but hopefully less than the first time!), the process can be repeated (possibly after changing the composition of the groups) until a consensus on the right answer is reached.

Recap of the lecture. It is always useful to finish a lecture with a wrap-up of the material that was just presented. Starting a lecture with a recap of the previous one, to refresh memories and make sure everyone is on the same page before starting a class, is also highly recommended (see, for instance, von Müllen, 2010). While many teachers prefer to do this recap themselves, some try to delegate this task to the students themselves. What a better way to start or finish a lecture by telling your neighbor what it was all about? Again, the student response system offers another alternative that is very attractive: A brief questionnaire on the key concepts of the lecture can be given to the students. At the beginning of the lecture, it will encourage them to recollect what they have learned so far, and make them more receptive for the upcoming class. At the end of the lecture, it will help them synthesize the most important points of the lecture, which will make them more likely to remember what they just learned. Research has shown that conducting a short test at the end of the lecture improves retention over time (Bligh, 1972).

Obtaining feedback on the lecture. Another possible use of the student response system is worth mentioning and concerns the feedback the teacher can get from the students on the lecture (*formative feedback*, see Biggs and Tang, 2011, p. 163-164). While the system provides permanent feedback to the teacher, as she/he can see in real time how the students respond, it can also be used more explicitly for this purpose. Some teachers might want to use it to ask the students about a particular point that is potentially hard to understand ('How comfortable do you feel with the new concept we just introduced?'), in order to adjust the path of the lecture and elaborate more if required.

The student response system can also be used to ask for feedback on the whole lecture. For instance, Socrative offers an option called 'exit ticket', where the student is asked the following questions:

1. How well did you understand today's material?
2. What did you learn in today's class?
3. Please answer the teacher's question. [open question specified by the teacher]

These questions are useful for the teacher to understand what went well during the lecture, and what could have been done better. They provide direct feedback, and can therefore help prepare the next lecture. If more feedback (or a different feedback) is required, the teacher can always design her/his own short survey and give it to the students through Socrative instead of the standard 'exit ticket.'

Assessing student learning. Socrative can be used in a more formal way to assess the students. When answered non anonymously, the answers can be saved and used to give a grade. Teachers who are used to give small tests on a regular basis to assess the work of their students will find this option very useful, as it is easy to implement, and alleviate the burden of correcting hundreds of copies after the lecture.

2.3 Benefits of the system

As we just saw, student response systems can have multiple usage. The benefits they provide are also multifaceted, both for the students and the teacher.

2.3.1 From the students' perspective

If many students remain silent during a traditional lecture, it is not necessarily because they are not interested or do not want to participate. Rather, the environment may be too intimidating for them to speak aloud to make a comment or reply to a question. Students response systems like Socrative can alleviate the situation, and help in involving the students for several reasons:

- **Participating at a low psychological cost.** Answering a question through the response system does not put any pressure on the student, as long as anwers are anonymous. They are not afraid of making a mistake or being off topic in front of the whole group with this system. Thus, it is very easy to engage everyone, even the shiest students who usually do not participate.

- **Formative feedback** (Biggs and Tang, 2011, p. 97). Thanks to Socrative, students get instantaneous feedback on how they performed at answering the questions. Many studies provide evidence that this direct feedback has large positive effects on the learning of the students (see, e.g., Juwah et al., 2004). As mentioned by Molloy and Boud (2014), "feedback is widely viewed as an intervention to improve learner performance" (p. 417). Moreover, the timing of the feedback is crucial, and Socrative allows students to get immediate feedback, which has been proven to be the most effective ("The majority of generic feedback models available to teachers advocate that feedback is most effective when delivered immediately post-task engagement" Molloy and Boud, 2014, p. 419).

- **Building self-confidence.** Students usually either think they perform worse than their fellows, or on the contrary feel they know the answers and do not want to shine in public. The other extreme case of the student who does not know but still wants to show off is also observed. These attitudes are of course highly cultural, and leads to different behaviors. The underlying question is the same for all students: How do I compare to the others? Student response systems address this problem, as anybody can see the answers provided by the other students. Thus, they easily realize they are not the only ones making mistakes, which has a stimulating impact and encourages them to participate and to self-correct.

- **Getting involved to better understand.** Learning takes place when the students are involved (Biggs and Tang, 2011, pp. 94-96). Students become more receptive and learn better when they are actively engaged in the lecture and interact with the material. The interactivity of student response systems allows this to happen, as the students are invited to think about a particular problem related to the lecture and thereby better understand the issue compared to a traditional lecture where the teacher would do this thinking process for them and they would only attend passively.

- **Breaking the routine.** Student activities organized around the use of a student response system break the routine of a traditional lecture. Students can not keep a high level of concentration for a long time, occasional breaks are required to allow them to regenerate and better focus on the material. See Bligh (1972), cited by Biggs and Tang (2011, p. 109).

2.3.2 From the teacher's perspective

The system does not only benefit the students, it also has a lot of advantages for the teacher:

- **Higher response rate.** Teachers might get frustrated of asking questions during their lecture when very few students (sometimes none) volunteer to answer, or avoid eye contact when asked directly. Some teachers even prefer to give up asking questions for these reasons. On the contrary, student response systems usually draw a lot of attention and most students are willing to answer.

- **Engaging the discussion.** The teacher can go beyond the online system and use it as an excuse to start an in-class discussion with her/his students. While many students remain quiet when a cold question is asked on a specific problem, it is much easier to start the discussion when they have already answered it through the response system.

- **Instantaneous feedback on the lecture.** As Molloy and Boud (2014) point out, "typically, feedback is viewed as a tool to help the learner. The less discussed function of feedback is as a mechanism to help the educator" (p. 418). With Socrative, the teacher gets an idea of how the whole group reacts to a particular problem, making it easier for her/him to adjust the pace of the lecture, for instance if it turns out that a particular concept is more difficult to understand than expected. When feedback is asked at the end of the lecture ('exit ticket'), the teacher can use it to prepare her/his next lecture, for instance clarifying some points that were not well understood.

- **Allowing breaks.** If students need regular breaks during the lecture to keep a high level of concentration and focus on the subject, the same goes for the teacher. The level of energy can rapidly go down during a lecture, and it helps to have short breaks where the students become the actors of the lecture.

2.4 Practical advice: What to do and what not to do?

So far, we presented and discussed how to use the student response system in an effective and productive way. In this section, I provide some practical advice on its practical implementation, based on my own experience with this system.

- **Prepare questions in advance.** Asking a good question cannot be improvised. It requires preparation, and also practice to design questions that foster the learning of the students. Therefore, it is highly recommended to prepare the questions before the lecture, and if possible to test them, for instance on colleagues, before trying

them on the students. Questions can then be recycled and improved for the next semester when the lecture is repeated, or discarded if they did not work. The only way to know if a question works it to try it on the students, but better be prepared.

- **Constructive alignment.** Make sure the questions asked are well aligned with the intended learning objectives of the course and are not off topic (Biggs and Tang, 2011, Chapter 4).

- **Don't ask the obvious, don't ask for the moon.** Since questions are asked to the whole group, not to a particular student, the level of the questions needs to be tailored appropriately. Who should be targeted? The mean student? The median student? Does the teacher even know the distribution of levels in her/his class? A too hard question will frustrate the weakest students. But if the question is too easy, many might get bored. The result will probably be the same in both cases: the attention might drop. Again, there is no obvious solution, only experience can help. The main advantage of a student response system like Socrative is that the teacher can immediately see the distribution of the answers, which greatly helps her/him get an idea of the difficulty of the question asked given the level of the students, and adjust her/his future questions if necessary.

- **Frequency and time management.** Another challenge is the organization of the student activities: How often to ask a question using the student response response system during a lecture? How much time to give the students? It is unfortunately impossible to provide a standard answer, as the use of student activities based on student response systems highly depends on the nature of the lecture. However, it seems to be good general advice to recommend to ask short questions that can quickly and easily be understood, instead of long questions that require elaboration, and to give enough time to the students to answer. The most important is to set the rules before the lecture, for instance to make it clear how much time they will have to answer a question (possibly using a timer to make sure time is respected). One of the pitfalls of this type of activity is that it can take a lot of time during the lecture if it is not organized carefully and monitored appropriately. It is also highly recommended to get familiar with the technical equipment of the room before the lecture, to make sure no time will be wasted during the lecture to launch the questions or to show the answers on the screen.

- **Polish the presentation of the questions.** Online response systems like Socrative are not very developed in presenting questions. For instance, no mathematical symbols are currently allowed,[1] which is a huge limitation for technical courses that heavily rely on equations. Moreover, if questions are easily displayed on an

[1] as of beta.socrative.com in June 2014.

electronic device, they are harder to see on the screen of an auditorium. It is therefore recommended to prepare the questions on a slide that can be displayed independently of Socrative's website. Another advantage of this approach is that the slides can then be posted online, and students attending the lecture who do not have access to an electronic device can also see the question and think about the problem.

3 Practical Implementation: Socrative in an Econometrics course at KU

I am teaching an undergraduate course in Econometrics at the University of Copenhagen (KU). In this third-year compulsory course, around 150 students are enrolled each semester, with very different academic backgrounds. The course is quite technical and demanding, so that many students do not feel highly confident with the material, although they show a lot of interest. As a result, it was very difficult to interact with them during the lecture when I started to teach this course. Many of my questions remained unanswered, and I could not grasp the level of understanding of the students during the lecture.

To remedy this problem, I decided to introduce the student response system into my lecture, in the hope of facilitating the communication with the students, and in the end making it easier for them to approach the material and to learn from my lecture.

3.1 Intended Learning Objectives (ILOs) of the course

The ILOs of the course are based on a combination of *declarative knowledge* (e.g., 'Give an account for the motivation and intuition for different principles for estimation and inference') and of *procedural knowledge* (e.g., 'Give statistically sound and economically relevant interpretations of statistical results. Use statistic and econometric terms in a correct way and be able to present econometric results in a clear and concise way.'). With a traditional lecturing style, the declarative knowledge would be transmitted by the teacher during the formal lecture, while the procedural knowledge would be acquired during the exercise classes where the students can put into practice what they learn.

However, this dichotomy does not need to be, and an interactive teaching approach relying on student activities and using student response systems can offer a better alternative where the students do not come to the lecture to receive knowledge, but become part of the teaching process and actors of their own learning. The decision to use the student response system Socrative started from this observation.

3.2 Setup

I used the student response system Socrative in various contexts, as described in section 2.2. Most typically, I used it to ask a specific question on a technical aspect of the course, to check if the students could understand the problems at stake. Each student activity was clearly announced, with one slide explaining the setup (link for Socrative, room number to log, etc.), and one slide asking the question. Enough time was provided for the students to answer (incoming answers can be monitored on Socrative), and when the time was elapsed, the answers were summarized and displayed on the screen.

However, the practical setup is only the first part of the exercise, and probably not the most important for the learning process of the students. Once the question has been asked and the answers from the whole class have been shown, I do not need to reveal the right answer right away and can use this particular setting to engage the discussion with the students. For instance, she/he can ask them what they answered and why they picked this answer rather than another one. While such questions directly addressed to the students during a traditional lecture might not be very popular, in the particular context of this student activity the context is completely different. The students have already replied to the question, have seen what the others replied, and are more willing to discuss the problem directly with me.

3.3 Personal impressions

The use of Socrative has completely changed my interactions with the students during my lecture. While at the beginning (before the introduction of Socrative) it was really difficult to make them participate, most of them took part in the online questions and I could more easily engage the discussion. But most importantly maybe, it provided me with feedback during the lecture on their understanding of the material. Some topics that I considered technical and hard were actually well understood, while others I would have thought were easier to grasp were not well received. Last but not least, it made the lecture more interactive and more pleasant, and allowed me to take short breaks while they were focusing on the student activities.

3.4 Students' feedback

At the end of the semester, I handed out a survey to the students to hear about their experience with Socrative. The survey was conducted in class, through Socrative itself and also using printouts for those who did not have an electronic device to answer. The same survey was also posted on Absalon and made available for one week, to give a chance to the students who could not attend the final lecture to answer. A total of 65 students replied to the survey, representing roughly 40% of the students signed up for this course.

50,8% of the respondents used Socrative in class, 23,1% used the printed version of the survey, and 26,2% responded through Absalon. The answers are presented in table 1.

These results are overall very positive and encouraging, as 90% of the students think it is a good idea to use the response system during the lecture, and that it helps them better understand the course material and be more receptive to the lecture. Not surprisingly, the answers were slightly more positive from the students who took the survey in class, compared to those who took it later on Absalon.

4 Conclusion

A student response system like Socrative makes it possible to teach interactively in large lecture halls. It allows the teacher to ask questions that can instantaneously be answered by all students. Even if the basic setup is very simple (multiple-choice questions, true/false questions, or open questions with short answers), the array of possible applications is very wide. It represents a useful practical tool, but the most important is the use the teacher makes of it. If it is used appropriately and with meticulous preparation, it can turn into a powerful tool to facilitate interactions between the teacher and the students, as well as between the students themselves, and to enhance learning. This article focused most specifically on the use of Socrative in large classrooms. However, it is worth mentioning that its use is not limited to this context of teaching. Student response systems can also be used in small groups, with the same benefits as in large groups. With this system, students no longer come to the lecture to listen to the teacher, they become part of the lecture.

Table 1: Student survey responses about the use of Socrative.

1)	Did you participate in the student response system during the lecture? (if you did together with someone else, please answer as well)	
	Never	9,2%
	A few times	26,2%
	Always	64,6%
	Not answered	1,5%
3)	Does the use of this system help you better understand the course material?	
	Yes	89,2%
4)	Do you feel you are more receptive to the lecture when you are asked to participate through this response system?	
	Yes	90,8%
5)	What do you think of the frequency of the questions asked during the lectures you attended?	
	Too many questions.	12,3%
	The balance was good.	69,2%
	More questions would have been good.	13,8%
6)	What do you think of the time required to ask/answer a question through the response system?	
	It took too long for each question.	20,0%
	It was fine.	78,5%
	It would have been better to have more time.	1,5%
7)	Do you think the questions asked were clear (independently of the difficulty of the topic)?	
	Yes, always.	29,2%
	Most of the time they were clear.	60,0%
	Most of the time they were unclear.	4,6%
	They were all unclear.	1,5%
	Not answered	3,1%
8)	In your opinion, what are good uses of the response system? (multiple answers possible)	
	Questions on the previous lecture as a recap.	73,8%
	Questions on an empirical example to engage the discussion in class.	63,1%
	Typical questions that could be asked during the exam.	73,9%
	Questions on the lecture itself to provide the teacher with feedback.	29,2%
	Not answered	4,6%
9)	Overall, do you think it is a good idea to use this response system during the lecture?	
	Yes	90,8%

References

Becker, W. E. and M. Watts (2001). Teaching economics at the start of the 21st century: Still chalk-and-talk. *American Economic Review*, 446–451.

Biggs, J. and C. Tang (2011). *Teaching for Quality Learning at University*. McGraw-Hill International.

Bligh, D. A. (1972). *What's the Use of Lectures?* Penguin Harmondsworth.

Crouch, C. H. and E. Mazur (2001). Peer instruction: Ten years of experience and results. *American Journal of Physics 69*, 970–977.

Juwah, C., D. Macfarlane-Dick, B. Matthew, D. Nicol, D. Ross, and B. Smith (2004). *Enhancing student learning through effective formative feedback*. Higher Education Academy (Generic Centre).

Mazur, E. (2007). Confessions of a converted lecturer. In M. J. Costa (Ed.), *Crítica do Contemporâneo: Conferências Internacionais*. Fundaçāo Serralves.

Molloy, E. K. and D. Boud (2014). Feedback models for learning, teaching and performance. In *Handbook of Research on Educational Communications and Technology*, pp. 413–424. Springer.

von Müllen, R. (2010). At forberede forberedelsen. Fra den pædagogisk-didaktiske værktøjskasse. *Dansk Universitetspædagogisk Tidsskrift 10*.