

## Using one-minute lecture reflection exercise to improve feedback mechanism

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***Abstract:** It is normal practice for every unit of study to have different assessment components to provide feedback to students and academics. However feedback on lectures has been neglected at large. This paper presents a fast and effective one-minute reflection exercise which allows students to provide feedback after each lecture. Both the lecturer and students can benefit from this practice immediately and any desired changes can be implemented quickly. This practice can also improve the quality of tutorials accompanying a lecture. This paper presents a case study on how this exercise was used in a unit of study of electrical engineering.*

### Introduction

Feedback is an essential component of a student's learning process. The existence of a proper feedback mechanism will assist students to keep track of the pace at which they are learning, and also enhance the quality of their learning (e.g. Rowe and Wood 2008). Students usually obtain feedback through the assessment components of a unit of study, such as tutorial, quiz, assignment, laboratory class and project. Students are commonly asked to provide feedback on a unit of study at the end of the semester. Such feedback aims to provide the lecturer with valuable input on different aspects of the unit of study such as facilities, assessment methods, lecturer/tutor quality and clarity of learning outcomes. However as such type of feedback is retrospective, any improvements can only be made when the unit of study is run again. This usually means that there is a time delay in the implementation of any improvements, and such improvements will only deal with, or fix, the overall unit structure rather than tackling any issues as and when they are identified. As learning is a dynamic process, the longer the time taken to rectify any issues or problems, the less effective the solution is likely to be. Moreover, the characteristic of students in a class differs from semester to semester in terms of intellectual level, background understanding, etc. and a the method which may have been effective for one semester may not be effective for the next.

A lecture is popular practice in university teaching, particularly where there is a large class setting. Abdulwahed, Nagy and Blanchard (2009) modelled the student learning process as a feedback control system. The reference level is the aims and outcomes of the unit and the feedback loop is the comparison of student output to this reference level. If there are any differences between the two, students must take action to fill the gap. While most learning activities are assessed and are feedback-oriented, the authors noted that a lecture is mostly an open-loop learning structure where reflection, feedback and student involvement in the learning task are largely absent. Maier (2009) proposed the use of an electronic classroom response system via mobile phones. One requirement of such a system is the need of the phone or the system to have internet access. The need for internet access by each student may be a barrier to the implementation of such as system. While the involvement of students in a lecture will make students more active participants in their own learning processes (Dufresne *et al.*, 1996, Fies and Marshall, 2006), students still need to assess whether, and how much, they understand all key points or theories covered in the lecture.

A tutorial has been identified as an effective learning tool as it is highly interactive, individualized, adaptive and creative (Bork 2001). If the tutorial questions are thoroughly and systematically constructed, students are able to master the theories through application via tutorial questions. Also, a highly skilled tutor should be able to assist his or her student's learning process by providing any responses, corrections and/or guidance promptly in the tutorial setting. In practice however, tutorials

face two possible issues. Firstly, timeliness. Rowe and Wood (2008) reported the importance of timely responses. The effectiveness of feedback is inversely proportional to the delay in receiving the feedback. In practice, due to the large number of units running concurrently within a department, it is difficult for every unit to have a tutorial session right after the relevant lecture. The longer the time between the relevant lecture and the relevant tutorial, the less the points or concepts students will recall during the tutorial. This practical issue makes a tutorial less effective. The students may not even remember which points or concepts they understand or have problem with at the lecture. Secondly, clarity. Unless there is an indicator in each tutorial question linking the theory or concept taught, it is likely that students may not know if the tutorial questions have covered all the theories or concepts they have been taught in the lecture.

A lecture reflection exercise is a feedback mechanism which aims to improve the quality of the lecture and also student learning in the lecture. Several lecture reflection exercises have been reported. Clynes (2009) focused on conducting self-evaluation of the lecturer and getting feedback from experienced peers and college lecturer. The Centre for University Teaching at the Flinders University (2009) has reported the approach of a one minute paper. Students were given one minute to write down the key points and/or questions of the lecture. The lecturer then collected the papers and used the first five minutes at the subsequent lecture to respond to the comments and questions. While this approach works well for mini-lectures, it may be difficult for a student attending a 2-hour lecture, to be able to summarize all the key points and concepts in one minute. This paper therefore proposes a systematic method to assist both students and a lecturer to assess how well a lecture has been delivered and how much of the lecture materials the students have understood. The proposed method does not replace the need for a tutorial but seeks to help improve the outcomes of a tutorial.

## Method

### Description of the one-minute lecture reflection exercise

As the name would indicate, the proposal being put forward is a short exercise to be done immediately after the conclusion of each lecture. The intention of the exercise is not to write a lengthy essay but to provide answers to a few quick and short reflective questions. Nowadays people are flooded with product surveys, service quality surveys, and many other questionnaires and it is common for people to get annoyed with having to complete these kinds of forms, especially when there is much to read and write. The longer or the more complicated the reflection exercise, the less likely that quality comments will be obtained. Therefore, the proposed reflection exercise only seeks to pinpoint the key concepts taught in the lecture together with a request for short comments. An example of the questions in a lecture is shown in Figure 1. The percentage (%) column represents a student's assessment of how much of each key point, concept or theory he or she has understood. The use of this percentage column gives students an opportunity to evaluate their confidence level in addition to ticking Yes or No. This action seeks to drive students to study the textbooks and notes if they find themselves unclear about a particular point. The last question of the exercise seeks comments from students and suggestions for improvement on the lecture or unit-related matters. The student will receive two identical copies of the exercise. One copy is for the student and the other one is for the lecturer.

### Advantages

As mentioned previously, the reflection exercise is done immediately after a lecture but before the accompanying tutorial. Depending on a student's assessment of his or her understanding of the lecture, this exercise provides the student with an opportunity to do some studying so that they will be better prepared for the tutorial and to ensure that students better use the tutorial as an opportunity to consolidate their learning. One may argue that the lecturer can put a bullet-point summary of the key points and concepts on the lecture notes or slides so that students can assess their learning by themselves. However, according to the author's experience, this method will only work for self-motivated students. Additionally, as we are facing a generation of students who are increasingly dependent on senses and visual effects when it comes to learn, the completion of the reflection exercise together in class seeks to cover, and benefit, a broader range of students. The existence of peer pressure may also help motivate students to do the task.

A collection of all the reflection exercise sheets which students have completed for all lectures during the semester should help them to revise for the final exam by assisting them to organize their thoughts on, and identify, the materials which they have or have not learnt. This is especially useful when students typically have to deal with four to five units of study in each semester.

If properly implemented, the outcome of the reflection exercise will benefit not only the students but also the lecturer. Once the lecturer collects the completed reflection sheets, he or she can see how well he or she has been conducted a particular lecture. If there is a particular point which scores a low percentage understanding level from a large number of students, then the lecturer can take action immediately. For instance, explain the point again via email, at the next tutorial session, etc. Apart from the lecture points, any comments and suggestions for improvement can also be promptly considered and dealt with as appropriate. For instance, voice and pace of the lecturer, writing of the lecturer, visual/audio equipment issues, further questions on the key points, etc. If the lecturer were to wait until the end of semester to obtain such feedback, it would be too late to implement any changes to improve the quality of the unit for the students and the quality of the unit of study and hence the performance of the class may suffer as a result.

One-Minute Reflection for Lecture 10				
After this lecture, I am able to ...				
		Yes	No	%
1.	Evaluate the performance of pumped hydroelectric storage system	<input type="checkbox"/>	<input type="checkbox"/>	
2.	Describe the operating principle of flywheel energy storage system	<input type="checkbox"/>	<input type="checkbox"/>	
3.	Explain the purposes of directive, regulations and standards for grid integration of renewable energy systems	<input type="checkbox"/>	<input type="checkbox"/>	
4.	Appreciate some aspects of the grid integration requirement such as grid synchronization, flickers, current harmonics and ride-through faults	<input type="checkbox"/>	<input type="checkbox"/>	
5.	Comment and improvement?			

**Figure 1: An example of the one-minute lecture reflection exercise**

### Limitations

The reflection exercise serves only as a diagnostic tool. It does not provide any solution to specific problems that students may encounter. It will rest with the student to take action or seek help from the lecturer or tutor. Since the reflection exercise only takes a few moments to complete, it will not provide, and is not designed to provide, an in-depth assessment of a student's understanding of the key points or concepts. Also, if the student is rushing to attend another learning activity it may affect the quality of their answers and hence possibly lead to inaccurate results. This problem can be mitigated by finishing the lecture a few minutes earlier to allow students some time to complete the reflection exercise.

## Case study and result

### Unit of study context

The exercise has been run and tested in a postgraduate unit of study in electrical engineering. The unit is called Sustainable Energy Systems. The unit builds upon the knowledge of engineering mathematics, electronic devices and circuit theory and simulation techniques. It deals with both technical and business aspects of sustainable electrical energy systems. From a technical perspective, it focuses on energy conversion and electrical characteristics of different renewable energy sources and integration of multiple energy sources into distributed electricity generation. From a business perspective, it focuses on economical, marketing and political aspects of installing and managing sustainable electrical energy systems in present and future society. The unit serves both the component level (different energy sources) and the system level (grid integration of sustainable energy systems) understanding. The unit has six assessment components: tutorials, laboratory classes, one research report, two quizzes, one design project and final exam.

### Example and results

There were twelve lectures in this unit. The exercise was conducted in each lecture. In the first lecture, the unit of study was introduced and the energy demand concept was covered. The statements and question used in the first reflection exercise for the first lecture were as follows:

1. I understand the importance of sustainable energy systems studies and how the unit is structured to help me learn, to achieve the learning outcomes
2. I understand what Carnot efficiency and heat rate mean
3. I understand the reasons for increasing electricity consumption from a domestic viewpoint
4. I understand the ways to increase electricity production via non-renewable and renewable approaches
5. I understand how a power plant works (coal-fired, steam, combined cycle)
6. Comment and improvements?

The results were collected and are plotted in Figure 2. In order to facilitate the analysis of the results, for each question, students who ticked Yes and who put down a percentage of understanding level of greater than 50% were placed into the same group. The other group represents students who ticked Yes or who ticked No but put down a percentage of understanding level equal to or lower than 50%. From Figure 2 it is shown that in the first lecture, the key points of the lecture (as covered in questions 1 to 5 above) were presented by the lecturer in a way which was understood by a majority of the students. However the results for question 4 suggested that there may need to be some more explanation or help for the students in respect of the key point regarding non-renewable and renewable approaches to increasing electricity production.

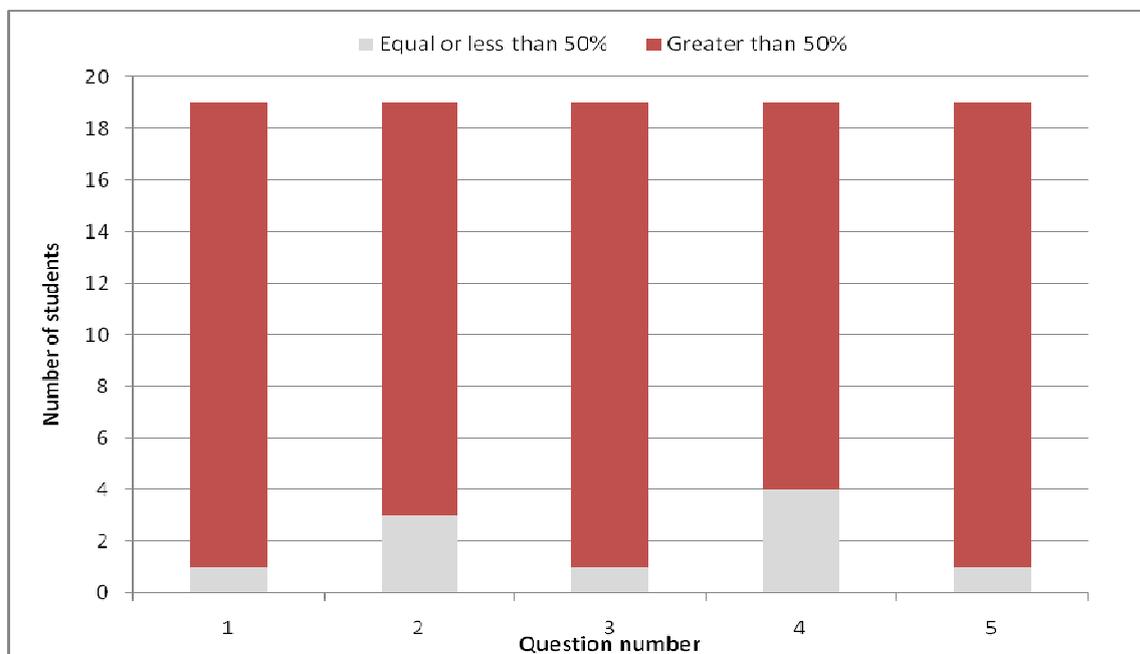
Students also wrote down some comments and improvement for this lecture. Some key comments are summarized as follows:

- “It would be better if the lecturer spoke a little bit more slowly.”
- “English spoke too fast sometimes.”
- “The topics could be dealt with in more detail.”
- “For this module, nothing to improve as I understand most part, although some parts are not in depth. But overall it is good.”
- “Basic ideas about renewable energy, but the subject is very interesting.”
- “The course is fitted with current demand of electricity generation.”
- “The lecture could have been more interactive.”
- “Good lecture, explain with simulation will be great.”
- “Do you think we need to buy the text book or just follow the notes? Thanks.”
- “Could you provide some websites from where we can get information?”

The above comments vary and are quite diverse, ranging from the pace of the lecture, the way of conducting the lecture, the course content, to the unit-related issues. This provided the lecturer with valuable information starting from the first lecture which could be used to improve subsequent lectures.

At the end-of-semester unit student evaluation session, the students were requested to comment on the usefulness of the one-minute lecture reflection exercise. The question given was, “Do you find the one-minute lecture reflection exercises useful? Why or why not?” Of the total 22 responses received (100% response rate), 17 have commented on the exercise. Of the 17 responded, 15 agreed the exercise was useful and 2 disagreed. For the two disagreed the usefulness of the exercise, they commented as follows:

- “...because it didn’t help me to improve on what I do not understand the lecture.”
- “I personally didn’t find it useful. It was for the professor I guess.”



**Figure 2: Statistical results of the first five questions of the one-minute lecture reflection exercise**

The first comment shows the limitation of the exercise as mentioned above. The exercise is only a diagnostic tool. Follow-up action still needs to be taken to assist the student with the understanding of the lecture. The second comment suggested to the lecturer that a better explanation should be provided to students to explain the purpose of the exercise so that the student will obtain maximum benefit from it.

For those who agreed that the reflection exercise was useful, their comments were mostly “good” and “useful”. Some other comments were:

- “...useful for improving the quality of this unit.”
- “...the lectures do improve after we filled in the feedback.”
- “...very useful in expressing opinions.”
- “...useful for us to review the topic covered by the lecture as soon as possible.”

## Discussion

At first the author distributed the exercise sheets at the end of the lecture. One student then requested (using the Comment and Improvement question part of the reflection exercise) that they be provided with the reflection exercise sheets at the beginning of the lecture. The reason provided by this student was so that they can know what concepts or key points will be discussed in the lecture and what they are expected to understand from the lecture and so that they can provide feedback on each statement as and when each concept or key point is explained. The author did what was requested at subsequent lectures. Several things were observed in the following weeks. Firstly, students rarely referred to the reflection exercise sheet during the lecture. They referred to it only at the time when they needed to complete it at the end of the lecture. Secondly, the feedback rate seemed to drop slightly. The distribution of exercise sheet did create an impulse-like behavior for students to finish the reflection exercise and hand it back. Further research needs to be conducted to investigate how to improve the feedback rate. Another observation is that the feedback rate dropped towards the end of the semester.

Although the results reported are from a postgraduate class, the author has implemented the same lecture reflection exercise in some undergraduate classes. However, the response rate is comparatively lower than that in the postgraduate class.

From the author's perspective, the reflection exercise sheet was a useful exercise as it allowed the author to evaluate his presentation of the materials for the relevant lecture. For example, a lecturer may believe that a lecture was well presented with key concepts well explained while this may not be the result for the students. However without an ongoing feedback mechanism in place, it is difficult for a lecturer to evaluate his or her performance and to continuously make changes to provide students with the proper assistance required.

## Conclusions

A one-minute lecture reflection exercise has been introduced in this paper. It provides a means to give both a lecturer and students feedback on the lecture. For a lecturer it is about obtaining feedback on the quality of the lecture and other unit-related issues. For the students, it gives them time to conduct a brief assessment of their understanding of key concepts and points presented in the lecture. It also provides them with a platform to give any comments on the lecture or the unit of study. The advantages and limitations of this exercise have been explained. A case study of a postgraduate unit of study in electrical engineering has been reported to demonstrate the effectiveness of the proposed method. The method is largely recommended by the students. Further work is needed to investigate the ways to improve the feedback rate.

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