RECIPROCAL PEER OBSERVATION: A FRAMEWORK FOR DEVELOPING TEACHING AND LEARNING SKILLS IN TERTIARY ENABLING SCIENCE COURSES

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Abstract: Reciprocal review is a multi-dimensional activity which involves colleagues, students and an in-depth understanding of teaching and learning theoretical framework. It can be adopted to teach ourselves about effective teaching and learning practices. This paper describes the process used in a tertiary enabling maths course, which resulted in an increased emphasis on reflective teaching, enhanced student participation and introduction of integrated communication skills. Issues involved in teaching and learning tertiary enabling maths are identified and solutions to the identified issues are presented. This article demonstrates that reciprocal collegial review can be an important component of ongoing professional development for teaching and learning in tertiary enabling mathematics.

Key words: Reciprocal Peer Observation, Tertiary Enabling Maths, Reflective Teaching.

Introduction

This paper presents the process where reciprocal collegial review was adopted to educate ourselves about effective teaching and learning practice. We visited and observed each other's lecture sessions. I observed the lecture session of Farha for 50-minutes portion of a class on the unit Foundation Mathematics, upon; measurements. Farha observed one of my lecture sessions on the unit Foundation Mathematics, upon; algebra. She observed the lecture delivery for 50 minutes and presented critical feedback on my student's surface and deep learning oriented towards their critical and imaginative thinking.

The critical feedback provided by us was found to be congruent with the problems suggested by Ramsden (2003) and the three basic teaching and learning approaches suggested by Biggs (1999): 'teacher-directed, peer-directed and self-directed'. Ramsden et al (2008) noticed that the three approaches proposed by Biggs were in a different category from the surface and deep learning model. However, this paper will link the solutions suggested to issues raised by colleagues in a discussion based on surface and deep learning with respect to the teacher-directed, peer-directed and self-directed teaching and learning approaches.

In this paper, critical issues indicated by colleagues are listed with reference to the problems specified by Ramsden et al. (2008) specifically for the small groups, which are:

i) Teacher deliver a one way lecture, not a mutual dialogue.
ii) It is difficult to motivate the students to contribute; they are hesitant to discuss the key issues in the class with each other.
iii) Students do not read the material before the lecture.
iv) Students expect solutions to the problems to come from the lecturer and are reluctant to discuss the issues in the class.

Discussion on the strategies associated with the teaching and learning to solve the issues and develop professional lecturing skills adopted from literature is also presented.

Issues: Observations

Observed Session 1: Measurements

I attended Nawaz's lecture on the unit Foundation Mathematics, upon; measurements. During the portion of the class attended I looked for evidence to answer each of the three critical questions (Biggs, 1999 and Ramsden, 2003) and recorded the evidence along with suggestions of how Nawaz could move towards the desired states embedded in his questions. I sat in the back row of the lecture theatre in order to have a full view of the class to observe the students' activities.

The lecture room was big enough for 40 students; about 25 students were present in the lecture. The lecture room was designed like a rectangle where the stage was very open with lots of moving space. The students sat predominately at the front of the lecture room and were well scattered in the three portions of the class room. Farha stood behind a dais operating a computer to move through PowerPoint slides that were projected onto a large screen behind her. She was observed to be static in her position though there was space to move in the class room.

The performances of understanding (Biggs, 2003), was considered as a fundamental instrument in this exercise. Following points were noticed during Farha's lecture that could be considered to improve the performances of understanding of the students:

i) Nawaz was very relaxed and composed for the lecture, but she could not project it towards the students to pass that relaxed and calm attitude to them.
ii) Nawaz's voice was clear and audible for all students in the lecture.
iii) Nawaz realised that she had a strong Asian accent and hence tactically she spoke slowly, though some of her sentences became quite long and by the end of the sentence some students could not keep up with the communication.
iv) Nawaz avoided any slang but could not resist using some Australian words which may have confused some international students.
v) In the big lecture room with the students seated wide spread she maintained a good eye contact and gave the message that she was in touch with each student. If Farha maintained the eye contact by presenting flexibility and moving around the class, then the student would have felt more relaxed and progressed with their performances of understanding.

In short, Nawaz's lecture was a good session of passing knowledge to the students and she succeeded in creating a communication relationship with her students. However, by injecting some relaxation in the class atmosphere he would have been able to make the students more confident to participate and reach the 'relational' outcome of SOLO taxonomy pointed out by Biggs and Collins (1982), and Approach C from the teaching approaches presented by Trigwell, Prosser and Waterhouse (1999).

It was observed that Nawaz wanted to take the students ahead of the slides and discuss the practical work, but whenever he posed a basic question about the concepts 'on the slide' the students became quite. He aimed to achieve the Approach C from Trigwell, Prosser and Waterhouse (1999), or at least the multistructural outcome of the SOLO taxonomy. But the students were not willing, or not prepared, or not motivated to go on to that level and they kept the lecture at Approach B with a unistructural outcome respectively.

Regarding the motivating factor, Nawaz could move around the class and illustrate flexibility in her attitude so that students could feel encouraged to throw in their ideas and contribute in the class. It was observed that the students were nervous or scared to say something assuming that they might be wrong. When Nawaz asked questions which he used as an effective tool to motivate the students, a sudden pause was observed. Then he had to rely on some specific few students who were confident to give their answers. Nawaz received all answers positively and provided productive feedback, even if the answers were distant from the expected response. It is advised that Nawaz could create a more personalised atmosphere in the class where students could see him more approachable.

Nawaz offered full support to the students who were participating and sometimes it felt as if there was a discussion among a class within the class. He tried to bring other students in the discussion and even directed his questions face-to-face towards the 'non-speakers' but they chose silence and Nawaz had to go back to the 'speakers' to continue with the delivery and flow of the lecture. Then he would go back to his presentation and

explain the topics with examples to improve the thinking skills of the students. But the lack of participation did not provide any valid evidence of this happening.

Observed Session 2: Trinometery

Nawaz observed one of my lecture sessions on the unit 'Foundation Mathematics' upon; algebra. He observed the lecture delivery for 50 minutes and presented critical feedback on my student's surface and deep learning oriented towards their critical and imaginative thinking. Apparently, there was similarity between the problems identified by Ramsden (2008) and the issues raised by Nawaz. The issues raised by Nawaz based on his observation of the teaching session on algebra are as follows:

i) Nawaz observed that I was lecturing about the basic concepts of algebra to prepare the students for more complex and applicable real world problems. In Nawaz's observations my pedagogy was similar to Approach B described by Trigwell, Prosser and Waterhouse (1999), or the uni-structural outcome in the SOLO taxonomy pioneered by Biggs and Collins (1982), further illustrated by Biggs and Tang (2007).

ii) Nawaz reported that I had to spend more time explaining the background and foundation of each topic since most students had not read the lectures' study material before the class. Reason for these laps in reading the study material was the distribution of the study material. Though Power point slides and part of study material was on Learnline site and was available in the form of a study guide too. But some practice questions were (outsourced) on other mathematical portals and websites. Moreover, I observed the lack of coherence in the material linked to the recommended text books. Hence I had to redesign the slides to cover the gap between the various study resources.

iii) Students were generally hesitant to talk in the class. I was asking them many conceptual questions to assess their level of understanding of the topic. The students avoided debate among them and let me explain the topics and answer the questions. Farha mentioned, I was floating the questions throughout the class and received some answers. I eventually acknowledged all answers and then gave my version of the right answer without saying who was right and who was wrong. Farha also thought that the lecture room was not of appropriate size as compared to the number of students. Bigger room was needed while available room was not sufficient to provide a nice environment for teaching and learning.

iv) Nawaz in his feedback pointed out one student, sitting in the front row, apparently dominated the class. Nawaz thought that when I asked any question, this student was quick to respond, even if he did not know the real answer. There could be a possibility that other students did not contribute since they did not want to counter or challenge his response. I had to realise that as he was among the very few vocal students in the class, her willingness to respond could be used as an ice breaker and to motivate the class to converse and generate different ideas and thoughts regarding the same topic. This point leads to another issue encountered in teaching in the class and that is the seating arrangement of the students. As flagged earlier, the Orange 4, level 2 in a small room, probably did not facilitate the learning practice of the students (McInerney & Liem, 2008). Small room was congested and students' self-selected seating arrangements, generally positioning them toward the back of the room, was not conducive to effective communication with me or with each other during the lectures.

v) The above mentioned issues from Nawaz are in line with the last problem suggested by Ramsden (2008), i.e., students expect solutions to the problems to come from the lecturer and are reluctant to discuss the issues in the class.

vi) The students developed a feeling that they could conveniently sit in the class without preparing and participating. Probably I was fulfilling their hope that if they were silent then I would come up with the answer, almost assuming that it was part of my job as the lecturer (Biggs & Tang, 2007; Day, 2000).

Solutions: Suggestions for Improvement

Based on contemporary literature on teaching and learning, the following solutions are suggested to help address issues about our teaching.

i) In order to teach more effectively the basic concepts of algebra and measurements to make the lecture more structured and deliverable, we adopted the advice from literature suggesting linking the objectives of the lecture with some tasks for the students that would motivate them to be prepared before a lecture (Biggs, 1999; Trigwell et al., 1999). We decided to use the on-line teaching supports in Learnline to inform the students about the material to be discussed in the upcoming lecture. We posted a brief activity on the 'Discussion Board' in Learnline connected to the subject. For example, before the 'Volume and area calculations' lecture we posted an activity asking students to login to the learnline watch the youtube recorded lecture for relevant topic and complete the worksheet attached. For this activity students had to read the relevant chapters of the study guide and apply the knowledge. Few students posted their thoughts on Learnline and we gave some constructive feedback that motivated other students who started working on the activity and posted their online solutions. Regular monitoring of their performance improved their involvement and quality of the work (Biggs & Tang, 2007).

ii) There are many models presented in the literature that suggest various approaches to improve the interaction of students in a classroom. However, we found that the discussion on students' surface and deep learning (Marton & Saljo, 1976) leading to their critical and imaginative thinking (Dearing, 1997; Gokhale, 1995) was the most effective choice to improve interaction. Moreover, since our students were learning Mathematical concepts, we thought they should be encouraged to have deep learning and be creative and critical in their observations to be successful in solving reaI world problems followed the strategy of using more examples (Biggs, 1999; Jones, 1978). We tried to make the material more interesting by doubling the number of examples linked to the topic. Another suggestion from Jones (1978) that we abided by was the assumption that we were sitting among our students in the class. This assumption enabled us to see ourselves sitting among the students; so we could set the pitch and tone of our voice and connect the topic with practical examples and the real world problems. We would also assess our own needs and preferences as a student from a lecture and lecturer, then while teaching we would endeavour to fulfil those needs and preferences. In order to enhance the class participation of the students, rather than only floating questions, we started to ask students specifically to answer the questions. Before implementing this idea, we made sure that we knew the first names of all our students. Then we started a discussion and asked a question to assess the background knowledge of the students, or their pre-class reading, then we would not say: "can any body answer this question". we would pinpoint at a student 'James or Muhiza' to discuss their thoughts related to the question or the topic. We would keep acknowledging the responses and continued to ask the question from various students until we thought a saturation of the ideas was achieved. At that point, we would present our concluding remarks and explain the topic linking our discussion to all answers deliberated by the students.

iii) The above solution elaborated how we improved the students' participation and contribution in the lectures. We re-strategise the approach to inspire them to be ready and prepared before coming to our lectures. This plan was useful to improve the peer review among the students during the individual class presentations (Hutchings & Shulman, 1999). In earlier tutorials students didn't respond to the solutions by individual students, they all waited for us to give the feedback after each worked solutions. Based on the literature we changed our approach and asked the students to assess the solutions of their own colleagues (Biggs & Tang, 2007; Day, 2000; Hutchings, 1996). This exercise helped the students to broaden their understanding of Mathematical concepts regarding shapes and algebra. This practice also encouraged competition among the students to perform better as they knew the assessment would be thoroughly and objectively conducted by their own colleagues and friends.

iv) The next issue we had to deal with was the academic effectiveness of the material provided with the unit. The study material consisted study guide, recorde lectures, revision questions and practice websites. All this material created confusion in the minds of the students due to its incoherence. The literature was

consulted and some ideas emerged to help the students in compiling and setting the material in an order most suitable for their learning (McInerney & Liem, 2008; Trigwell et al., 1999; Gokhale, 1995). Following the strategies presented by these authors we went back to the desired outcomes or study objectives of this unit. Then we started to link each objective with various study material and practice question used for this unit by dividing the unit into topics and weekly learning material.

v) Since Nawaz had pointed out the dominance of a single student in the class, I tried to keep a balance among all students and their participation in the lecture. I tried to use interactive engagement of students (Hake, 1998) by involving them in classroom activities. Adhering to the reflections of Biggs (1999) and Gokhale (1995), I reset the class atmosphere by changing the position of the tables and discipline by calling their names for involvement. After further observations I noted that this particular student used to speak up without raising her hands assuming that he had the best opinions. I made an announcement in the class that all students are equal, I facilitate all students to speak and participate in the lecture and it is my job to ensure that each student gets equal opportunity to contribute. Hence, I declared that when I ask a question of the students, or if any student has a question for me, then before speaking up the student or students will have to raise their hands. Then if I saw more than one hand being raised then I could choose which student should speak first. It also gave me more authority in managing the flow of discussion among the students since I knew what perspectives would be presented by various students. The particular student tried to say something whenever she got a chance, but I insisted upon her not to speak without raising her hand, which eventually became a norm in my lecture sessions. In view of the concern with class seating; the classical (Jones, 1978; Marton & Saljo, 1976) and modern literature (McInerney & Liem, 2008) was studied. The geographic structure of the room did not allow the students to sit in a semi-circle or a half square, so I had arranged a bigger room and ask students to move towards the front seats. Shifting in a bigger room has created a comfortable environment in the classroom. I also informed the students that sitting in the front seats will improve the communication between me and them, and it will increase the opportunities for equal contribution from the whole class.

vi) Considering the problems with the structure and layout of unit content and the clutter of information on Learnline we endeavoured to transform this site to a more user friendly layout. This problem of information available in different sections or windows of a course website has been identified in the literature on online education (Peltier, Drago & Schibrowsky, 2003; Laurillard, 2002). One of the solutions suggested by these authors is to remove the clutter and collect the useful information in minimum space on the website. The suggestion from Biggs and Tang (2007) was also adopted to put ourselves in the place of our students when accessing the material. This strategy helped us to see the website as a student might see it so that we could finalise the material based on our requirements as the 'student'.

One major change that we brought into our learnline unit was to place all important material under one page 'Learning Materials' and in one space for a specific week, students often find this very helpful. This helped the students to access all the material for a specific week by minimum clicks on the learnline.

Conclusion

The visits and observations to each other's lectures provided more critical insights to the teaching and learning system prevailing in our lecture sessions. We have listed the identified problems and analysed them with reference to the literature. Then we found the solutions for these problems from the relevant literature, applied them in our lectures and have presented them in this paper. The practice of teaching and learning adopting reciprocal collegial review taught us to objectively identify the vital problems faced in teaching and learning, and their possible solutions. We strongly recommend this practice to improve the quality of teaching learning for better education.

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