The attitudes of food microbiology students towards transformation of lectures from a traditional ‘lecture tell’ to an active cooperative learning environment

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Abstract
There is growing evidence that most graduates from South African institutions of higher learning, universities being among these, are not employable. This is due to a lack of attributes appropriate or required in the working environment. The problem can, inter alia, be addressed through transforming teaching and learning, where lecture rooms are changed from a passive learning environment to an active cooperative learning one. Implementing cooperative learning will bring about new challenges for both the lecturer and students. However, it is our responsibility as professionals to address this in a scholarly manner, if we are concerned about the products we deliver and our contribution to the society. This study investigated the implementation of learning opportunities that promote active student participation. The study findings indicate that the majority of the students enjoy and gain a lot from active participation. However, they also indicate the reluctance of some students to change.

Keywords: Action research, cooperative learning, communication skills, transformation, critical thinking

Introduction
The SA education system is blamed for failing to produce thinking, competent individuals with problem-solving and creative abilities. This problem is said to be a result of the use of traditional, unimaginative methods of facilitating learning. These so called traditional approaches assume that all students process and organise data in the same or a similar manner (Arthurs 2007). This problem resulted in the introduction of Outcomes Based Education (OBE). OBE focuses mainly on what the students actually learn and how they learn it. Unlike the previous methods of teaching, it does not focus on what students are supposed to learn. It is a learner-centred approach that emphasises on what the student should know, understand, demonstrate and become (Malan 2000).

Lecturers should seek to better understand different ways in which students learn. This will allow them to improve students’ educational performance (Martin 2010). Students also have to do their part. They must take greater responsibility for their learning. Therefore they must regulate their own learning (self-regulated learning). This imperative is based on the fact that though learning is intrinsically influenced by a liking for certain approaches over others, it can be optimised when an individual starts to use other less preferred
approaches (Martin, 2010). Lecturers can help students with these changes by challenging students with questions that require the use of different learning strategies (Metallidou and Platsidou 2008).

Microbiology is a diverse field that will definitely benefit from individuals with different learning styles. The success of microbiology students can be improved by both encompassing learning styles while using multiple strategies for facilitating learning and incorporating active learning strategies in the microbiology classroom (Smith 2000). Cooperative learning promotes active learning and team building skills (Buxeda and Moore 2000) as suggested by the critical cross-field outcomes (SAQA, 2006). Cooperative learning happens when students share their own interpretations of learning experiences with others by constructing new meaning. It is one of the most effective ways of acquiring interpersonal virtues and building personal integrity. Students working in small groups learn together thereby increasing the quality of learning and helping each other maximize the individual and collaborative potential (Slabbert 2009).

Students should exit an appropriate learning environment with a different and better personal, educational, professional and social standing than that which they had before they entered the environment. They must have knowledge, skills, positive attitude, values and virtues required for making the world sustainable. If these are not attained, then no holistic education can be claimed. The American Society for Microbiology (ASM) recommended cognitive processes, communication and interpersonal skills. Microbiology lecturers should facilitate learning in such a way that students develop as life long learners in preparing them for the workforce (Buxeda and Moore 2000). Teamwork and communication skills are very important in any biology curriculum (Buxeda and Moore 2003). All these skills are what employers look for in incoming employees.

This study aimed to investigate the attitudes of students towards introduction of active learning in Food Microbiology, through answering of the following research questions.

**Research Questions**

**Overarching question**

- How will a change from a traditional passive lecture to an active co-operative learning environment impact on the students?

  **Sub questions**

  - Can innovative co-operative learning strategies be successfully implement in Food Microbiology lectures?
  - How will the students respond to a switch from a traditional lecture to a learning opportunity in which they are more involved?
  - Can mastering the learning outcomes be enhanced by implementing innovative techniques of facilitating learning?
  - Will the use of the innovative learning activities promote students’ mastering of the critical cross-field outcomes?
Methodology

Research design
This study was undertaken as an action research, whereby I was investigating my teaching practice. I define action research as “research actions taken by lecturers to investigate their teaching practice, with a view of acting in a positive way to research findings and to making their teaching practices innovative with the aim of promoting productivity and professional learning within colleagues and to construct a grounded understanding of their teaching practices” (du Toit, 2011, p.10). My action research was based on my interest in planning for transformation. In line with (du Toit, 2011), I regard my approach to action research as asset-based. Contrary to the initial step in traditional action research being problem identification, I start with an innovative idea of introducing active learning strategies during learning opportunities. My action research model was based on the model by Lewin (1946) as coded by (O’ Brien, 2001), as a process of a spiral of steps, where each step is composed of a circle of planning, action and fact-finding about the effect of the action. The action plan followed basic steps as adapted for lecturers by (McNiff, 2002). Since in this action research I was critically looking at my own teaching and learning practice, it has a social content as (McNiff, 2002) indicated that the improvement of one’s work from self critical improvement will influence others (McNiff, 2002), in my case the students involved and my colleagues.

Participants
This action research involved the students enrolled for Food microbiology (MBY 362) at the University of Pretoria in the year 2011. There were 51 students enrolled for the module. The contact sessions were scheduled for 50 min twice per week. Completion of feedback forms was voluntary and students remained anonymous.

Data collection
I used a mixed-method approach (both qualitative and quantitative data) for collection of data for this action research. The qualitative data was made up of photos, my personal observations and general comments from a student feedback questionnaire. The qualitative feedback from the general comments section of the questionnaires were used to get feedback from students about the learning activities used, as well as about the facilitation of learning, and whether the introduced learning activities and strategies added value to their learning. The quantitative data composed of scores allocated by the students on the feedback questionnaires, where they had to allocate a score for the ‘deliverables’ indicated in the questionnaire, and grades they allocated for the learning opportunities. Thin-Pair-Share (TPS) technique: I asked a question and then gave students a chance to turn to their neighbour and to share with them their opinion about the question asked. This was followed by a class discussion in which the different opinions or answers about the question were shared and critically evaluated.
The jigsaw method: Students (5-10 depending on the class attendance) were assigned into small groups and then given a question or problem to tackle. I then gave the groups 10 min in which those in the group sharing the topic can discuss about what they had to do, and come up with constructed meaning by means of a summary. Representatives from each group then formed new subgroups in which they explain what they did in the initial groups. The subgroups were then disbanded and representatives convened into their original groups. They discussed new findings each of them obtained from the subgroups, and then compiled the final summaries, incorporating any additional information. Then each group chose a delegate or in some cases one student volunteered to present (5 min) the groups’ summary to the entire class.

Burning question: Throughout the contact sessions, I gave the students a chance to submit at least one question at the end of each learning opportunity or at the beginning of the subsequent one, about what they found difficult to understand or any related matter they need clarification on. I collected the anonymous questions and analyzed them. The idea was to address the most common concerns in the next learning opportunity as class discussions before proceeding to the activities of the day. I planned to start the learning opportunity by asking these questions, using them as a way of recapping. This was regarded as an opportunity to check students’ understanding.

Data analysis
Data from questionnaires were summarized in the form of graphs. A sample of the qualitative feedback from the general comments sections of the questionnaire were compared with the information summarized in graphs as well as my observations to determine whether my perception of students’ behavior as observed during class corresponds with what they say about themselves, how they learn using different activities and how I facilitated their learning.

Ethical considerations
Students’ participation in the study was voluntary and the feedback forms were anonymous.

Action Research Findings
TPS technique
Generally, the students participated in class and discussed the idea with the persons sitting next to them. However, at the beginning of the lecture only a few students volunteered to answer the questions when the class was asked to share the answer with the whole group. As the lecture went on, the number of students answering questions increased. The learning outcomes of this specific lecture were successfully achieved. At the end of the learning opportunity I felt that the students enjoyed it.

The majority of the students indicated that they enjoyed the use of the learning techniques introduced. They showed that time spent in learning opportunities where new methods of
facilitating learning were used, was a productive. In terms of co-operative learning when using TPS, on average most students felt that they learned from their peers more than they contributed to their peers’ learning. However, more than 50% of the students did not feel that the use of the TPS technique helped them in achieving learning outcomes. Considering that TPS caters for students who learn better through discussions, it is probable that this group of students were challenged to use a learning style that they would rather normally avoid. Thus, they worked outside their comfort zones. The scores indicated that overall, the use of the TPS technique improved the students’ concentration in class, induced deep learning and allowed them to realise the link between the study content and learning processes and their real life applications.

Both negative and positive comments were obtained from students. This was anticipated because there are students with different types of learning styles in each class and therefore those that have preference for learning style accommodated by use of TPS technique and those who enjoy trying new ideas most probably will give positive comments. Those that prefer traditional lectures, that is, the more audio students, I would expect will have negative comments. Positive comments gave an indication that the TPS technique was useful for the students and above all they enjoyed it. What was also worth noticing was that the students were even suggesting ways in which I could improve my learning facilitation. The negative comments indicated reluctance and feeling of discomfort, anger and frustration by some of the students. These comments indicated to me how much work needs to be done in order for transformation to occur. Students are still used to passive lectures as most of them are still presented in that way. The concept of cooperative learning was unfamiliar to some students, and as far as some of them are concerned, there is nothing they can learn from their peers. The students were not comfortable with the new approach to learning facilitation implemented. However, according to Thompson and Crutchlow (1993), students need to experience discomfort in order to grow. Some student’s perception encapsulated in one of the comments about learning at the university, is contrary to what should happen at these institutions, universities should promote academic discourse. The debate, as referred to by the student, engage high levels of Bloom’s taxonomy (Scott, 2008). The benefits of debates include among others, critical thinking, oral communication, and listening skills (Kennedy, 2007). The students’ expectation is that the lecturer knows everything (lecturers are a source of knowledge and their duty is to pass this knowledge to the students). Is this maybe the impression we, as lecturers have always given the students through the culture of learning we created? The unfamiliarity of students to the type of learning introduced shows that a new culture of learning has to be established.

The jigsaw strategy
Students were generally interested and they participated in group discussions. However, they felt that time allocated to finish and present their summaries or answers to the given
topics or solutions to the problems were short. When coming to choosing group representatives to share with other groups, they showed some reluctance initially, but after the first two lectures they were familiar with the strategy and it became a lot easier, and they volunteered. When I listened to the students’ comments after lectures I could sense a positive attitude in their comments, and that they were enjoying what they were experiencing during the lectures.

The jigsaw strategy was on average scored higher than the TPS technique. Based on the percentage of students and the scores allocated, majority of students agreed or strongly agreed that the use of the jigsaw strategy urged them to study, stimulated their concentration during learning opportunities and encouraged them to think deeply. About 95% of the students indicated that they were able to envision real life applications of their curriculum. Interestingly, though there were still some students (12%) disagreeing (score 2) and strongly so (score 1) in certain cases, that they learned from their peers or contributed to their peers’ learning (18%, score 2), close to 70% of the students agreed or strongly agreed (scores 4-5) that cooperative learning did happen.

Only a few written comments about the jigsaw strategy were obtained. These comments showed progress on the students’ side, indicating acceptance of the new method of facilitating learning. I could no longer feel the anger that was enclosed within their comments made at the beginning of the lectures. Though there were still negative comments, they were now accompanied by suggestions for improvement. Students now realised their role in their learning process and they also knew that I valued their opinions and this gave them freedom to voice them out. The jigsaw strategy was well received by the students and they felt that they did better. Focusing on the three key outcomes that relate to active learning, namely concentration in class, learning from and contributing to learning of others and deep thinking, the jigsaw was scored higher (4-5) than the TPS by the most of the students. Comparing numbers of students scoring the jigsaw was allocated high scores, on average scored >72%, 61-66% and 83% while the TPS was scored >56%, 50-63% and 56% for stimulation of students’ concentration in class, co-operative learning and deep thinking, respectively. In terms of helping the students relating the curriculum to real life applications, the TPS was given a high score by 63% of the students while 94% allocated high scores for the jigsaw strategy.

Most of the students (47%) gave the opportunity in which TPS technique was used 60+ (Adequate, but requires significant improvement) and none of them indicated it was poor, regardless of several negative comments indicated. Some of the students (27%) did not allocate a score for the TPS technique though they submitted written comments. All students scored the jigsaw, 40% ranked it as very good, 35% good while 25% ranked it as adequate. These results showed that students were becoming familiar with the culture of learning introduced. The minority that disagreed are probably those students preferring different learning styles to those that were used.

Burning questions
The students only submitted the burning questions after the first three lectures. They did not submit questions even when I reminded them after every lecture and the beginning of the next lecture. It seems that this group of students did not prefer the use of burning questions and thus it was not satisfactorily explored.

**Conclusion**
Transformation of lecturers to an active co-operative environment can be used effectively in Food Microbiology. However, it may take time before this culture of learning is accepted by students as they are used to traditional lectures. Nevertheless, in order to challenge students and thereby give them an opportunity to not only learn the subject content, but to also acquire critical cross field outcomes such as time management, team work, communication skills, new ways of learning have to be introduced. Most importantly, facilitators of learning have to acknowledge that patience and practice is required before this can be done even more efficiently. Students need time to adapt to the change but once they do, majority of them appreciate and enjoy the new learning environment.

**References**


