

Featuring dental education research: Applying the principles of action research to improve teaching of dental prosthetics

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SUMMARY

This article focuses on educational research conducted at the newly merged UWC faculty of dentistry. The research emphasises the change in teaching methods employed to address the concerns experienced in teaching the new large classes as observed in the prosthetic techniques module. These educational interventions were conducted over 5 years and the study design included the principles of action research. Students were assisted in learning the theory of the practical procedures and the subsequent completion of these procedures with the accurate application of the theoretical concepts. Changes in the teaching methods enhanced students learning and successful translation of the theory into practical work. The active learning exercises incorporated into the teaching further motivated and assisted students with deep learning. The debates indicated that students know and accept the value of the module as part of their training.

INTRODUCTION

Self - reflective teachers must be sensitive to the many learning differences in the classroom to ensure that successful teaching occurs within this environment.^{1,2,3} Effective teaching ensures that all differences in one classroom be attended to, be it cultural, cognitive or learning styles of students.^{3,4,5,6} Self - reflective practitioners must therefore reflect on their teaching practices in order to improve the learning environment of students. Action research is a qualitative research approach that encourages self-reflective practice and provides lecturers with easy, practical and analytical ways to improve the learning in their classroom.⁷ It can be conducted using several cycles of plan, act, observe and reflection for effective teaching to occur.^{3,7}

Active learning strategies are defined as "instructional activities involving students in doing things and simultaneously thinking about what they are doing".⁸ A series of active learning exercises is available that can be used to supplement didactic teaching and thus adequately address students' learning differences.^{8,9} These exercises can assist students to adopt a deep approach to learning.^{9,10}

It is the activities within the classroom setting that will encourage appropriate learning such as deep learning (i.e. meaningful comprehension and retention of content) to occur.² Traditional teaching methods, for example, lecturing, tutorials and individual studying on their own do not support deep learning strategies.³

This precarious situation is no different within the South African context. Globalization has occurred within the classroom setting,

even in South Africa since the 1990's due to the restructuring, expansion and refinancing of the tertiary sector (*Biggs, 2003*). According to Gravett and Geyser (*2004*) the varied groups of students and the diversities that can be experienced in these new classes include the following:

- larger classes;
- differing motivations, aspirations and abilities of students;
- varied cultural backgrounds and
- an increase in language barriers amongst students.¹¹

These diversities motivated teachers to rethink and evaluate their teaching and teaching practices and to restructure and institute changes.^{3,11} The merging of institutions (as experienced at this faculty) like elsewhere in the world has had a major impact on the heterogeneity of the new student population. With this came a progression of issues that needed to be redressed as different learning approaches are rooted within specific cultural communities.^{5,6}

OBJECTIVES

In this research conducted over 5 years, a series of concerns observed in teaching this dental prosthetic techniques module were examined, including the following:

- Difficulties in translating theory and practical procedures;
- Meagre understanding of concepts and the content of the module;
- Poor long term retention of information;
- Differences in learning styles of this diverse student population and
- Dissuasive attitude of dental students towards this techniques module.

This brief communication will report on what was considered as practical solutions to some of these concerns.

LITERATURE REVIEW

Border and Chism (*1992*) as well as Vaughn and Baker (*2001*) advised that lecturers should be especially mindful of the many learning differences amongst students, especially following a merger of institutions, to ensure that effective learning occurs.^{1,4} According to educational researchers such as Biggs (*2004*), good learning is supported by the following:

- a well structured knowledge base;
- an appropriate motivational context and
- learner activity including interaction with peers and teachers.³

Several authors have stated that teaching (including traditional and/ or supplemented by interventions) at tertiary level requires that students be sufficiently encouraged and positively motivated so that they can adopt a deep approach to their learning.^{1,2,3,9}

What is action research?

Action research is defined by Biggs (2004) as:

- A cyclical process allowing lecturers to plan, act, observe and reflect on teaching practices;
- A process of systemic reflection, enquiry and action to assess professional practices; and
- Gathering of data to better understand aspects of teaching and learning and applying the outcomes to improve practice.³

Benefits of action research?

The principles of action research also allow inquiry into the needs of the class.^{3,7} It thus permits the lecturer to subsequently design changes that can be implemented and allows reflection upon the effectiveness thereof.^{3,7} Classroom action research is a form of systematic inquiry, allowing teachers to establish what their class' needs are and how it can be changed in their particular situation.¹² The ultimate purpose of action research is to improve the teaching and more importantly the learning of students. It also allows teachers to reflect on the relationship between theory and practice.⁷

How is the learning of students affected?

Many research studies have concluded that the teaching environment has an impact on students' choice of approach to learning.^{2,3,13,14} Research by Strayhorn (2004), related to the effects of motivation of students to learn, conducted in the US suggests that it is what happens within the classroom that influences students learning of module content.¹³ Teaching and pedagogy have evolved and there is a move towards using methodologies that specifically encourage a deep approach to learning.⁵ Anderson *et al* (2002) showed that students learn and retain knowledge as they engage more with the material. In fact, lecturing allows only 20% learning, observing a procedure combined with lecturing allows 40% of learning but more importantly, 75% of learning occurs when students observe, listen and actively do procedures.¹⁵ It is this active engagement in the form of listening, writing, peer-teaching and observing that we want students to be exposed to so that deep learning can transpire.

According to Biggs' constructivism theory of students approach to learning, which includes the strategy and the motive of the student together with the teaching approach of the teacher, successful engagement of the work is ensured.^{2,6,10} Within this constructivist paradigm students are active in their own learning, but the teacher's role as guide and mediator in the classroom will facilitate learning.^{2,6,10} Thus understanding the dynamics of the class (and the students as such) will have an important influence on the teaching methodology per se. It can convince lecturers of the type of intervention to be utilized per class and per module. Pintrich (2004) stated that students have different learning strategies for different modules and that the strategies are module specific, a fact observed in my empirical experience with dental students over the years as well.¹⁶ Students for example know that the practical work covered in the techniques module will later be the responsibility of dental technicians and as such, their attitudes towards this module is very lax and their interest very low. They do not yet see their role in this relationship between patient, den-

tists and technicians. The role of the lecturer thus becomes that of encouraging these students to engage the work and so ensure the understanding and relative application of the concepts of this module.

TYPES OF INTERVENTIONS:

The difficulties observed with the teaching of the prosthetic techniques module were addressed using the principles of action research with the following interventions:

a) Scaffolding of reading material or guided reading -

Scaffolding of module content involves providing students with questions related to the content (more specifically with a section that is difficult to translate to practice) allowing problems of reading ability to be addressed. Reading without comprehension and fluency affected students learning of the content, hence the types of concerns expressed earlier. It has been found that encouraging pre-reading for lectures allows students to develop a verbal and graphic illustration of the content and allows them to develop good dental motor skills. All this is in preparation of the clinical situation, where recognition precedes production which then allows them to evaluate these procedures.

b) Active learning exercises e.g. structured tutorials; question papers; debates and a mock test -

Active learning exercises serve only to supplement the traditional didactic form of teaching and these should not be used without lecturing the content and objectives of the module.⁹ According to Bonwell and Eison (1991), using these techniques is vital as these tend to have a dominant impact on students' learning.⁸ These active exercises will encourage further learning, thus stimulating deep learning.⁹ The active learning exercises to be used should be simple, relate to the level of students' understanding and of such a nature that it can be integrated in the teaching of that specific class and for that specific module.^{9,17}

The literature has shown that effective teaching requires flexibility and an understanding of learners' needs and learning styles.^{4,11} Research indicates that the learners' diverse learning styles (reflecting student diversity) can be addressed using active learning exercises and at the same time they will be encouraged to adapt to appropriate teaching styles.^{1,4,9}

BACKGROUND

Undergraduate dental students' first encounter with practical dental work serves as a challenge in translating theory into practice, memorize for understanding and with long term retention of information. This prosthetic technique module poses an extra challenge as it is work that will in the near future be the responsibility of the dental technicians, a fact dental students are very conscious of.

AIM

To reflect on my teaching methods and students' concerns, institute changes and reflect upon the effectiveness of these changes from 2004 – 2008

METHODOLOGY

Cycle 1: Students were provided with questions to guide their reading of the practical work of this Module.

Cycle 2: Active learning techniques (e.g. tutorials; drawing up question papers and memoranda and a mock test) were introduced allowing students to engage with the content of this module. A questionnaire (John Biggs' R-SPQ-2F as a guide) was then

drawn up to assess their attitudes and learning strategies with the exercises.¹⁸

Cycle 3: Debates (an active learning technique) were also conducted in my structured tutorials to ascertain whether students understand the value and location of this module (Figure).¹⁹

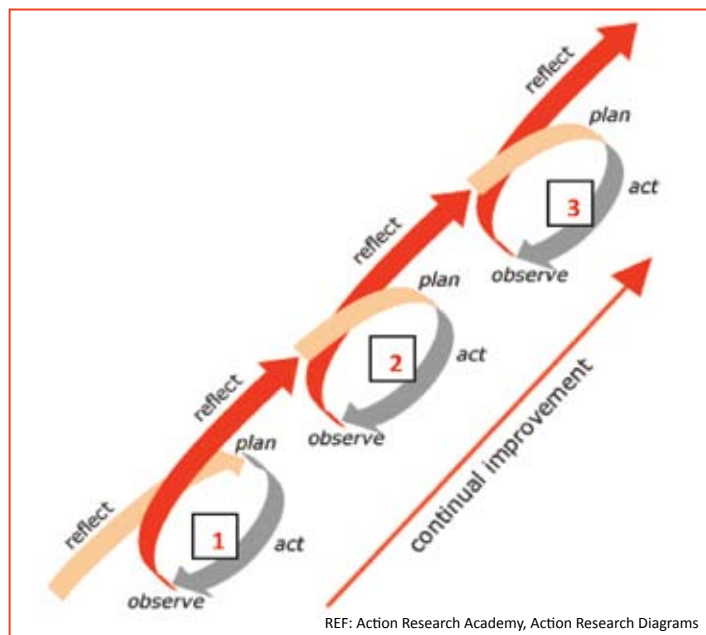


Figure 1: Cycles of Action conducted for the past 5 years

CYCLE 1:

- **Observe:** Poor translation of theory into practice by students
- **Plan:** Provided questions to guide reading course material
- **Action:** Tested students at different stages of teaching following guided reading, a lecture and a practical demonstration of the procedure.

CYCLE 2:

- **Observe:** Poor retention of course material over long periods
- **Plan:** Active learning techniques to foster DEEP learning
- **Action:** Questionnaire to assess effects of active learning techniques.

CYCLE 3:

- **Observe:** Students' dissuasive attitude towards prosthetic techniques module
- **Plan:** Debates in class to highlight reasons for teaching this module to students
- **Action:** Students understood reasons for techniques module as part of training; teaching to highlight these reasons.

DATA ANALYSIS

Both quantitative and qualitative (triangulation) analytical methods were used in the data analysis. An important aspect of action research is that it allows the researcher to use a variety of data collection methods to validate the results.

RESULTS AND DISCUSSION

1st Cycle: Qualitative analysis indicated that students read the handout, understood the concepts, but few read other notes. Students had better marks for their own set-ups 5 months later when compared to the 2005 class.

2nd Cycle: 44% valued innovations; 39% memorized for understanding; 52% reflected no interest and 38% kept work to a minimum. Results also showed that very few students had a low score for a deep approach to learning with only one student with a high score for adopting a surface approach.¹⁸

3rd Cycle: 86% wanted to debate the importance of having this module as part of their training. Arguments for having it in the curriculum included that it assisted students with understanding

the theory, remembering the work and for better communication with dental technicians in the future.

There were limitations as no control group was in place. It is thus not possible to know if the interventions introduced were exclusively responsible for the results obtained.

The contribution this research makes is that of supplementing the didactic teaching with interventions and the positive effect on student learning, even with the reported limitations. Equally significant is the fact that had the active learning exercises not been completed under direction and contribution from the lecturer, it would not have been apparent that the work was that of the students. What is equally meaningful with this research is that the teacher acted as a reflective practitioner which had an encouraging consequence on the students' learning. These interventions and more specifically, the categories of active learning exercises can also endow students with a comparable approach when doing other practical modules.

CONCLUSIONS

1. Changes in teaching practices enhanced learning and successful translation of theory into practical work.
2. Active learning techniques incorporated into the teaching motivated and assisted with deep learning.
3. Debates indicated that students know and accept the value of the module as part of their training.

This particular research emphasized two important factors:

- a) **the understanding of students' learning difficulties -** These interventions can serve as a guide to students as they all learn differently. Conducting action research also helps improve the lives of students. This module is the students first contact with practical dentistry, thus developing good learning strategies at this early stage can then ensure greater success with future clinical modules.
- b) **searching for easily implementable practical solutions to address these difficulties -**

It highlights learning principles that teachers can utilize to improve their own teaching. Thus, the emphasis of this research is also that it provides different kinds of strategies that can be used in the classroom setting. These strategies can be applied to different and /or similar modules. It thus allows you to make meaningful changes and become an influential educator.

Lastly, the value of finding practical solutions in teaching a techniques module, especially following a merging of institutions, to assist students with effective learning strategies cannot be overemphasized.^{2,9,17}

Declaration: No conflict of interest was declared

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Additional references (7-19) are available on www.sada.co.za