The Use of Self-Assessment in Pre-clinical Dental Education as a Learning Modality

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Abstract

The use of self-assessment in undergraduate dental and medical curriculum has become more accepted as a teaching modality in the past decade. The ability to self-assess is a critical skill that all health professionals must be able to do, in order to achieve competence. Brown et al (1997) states that one’s ability to self-assess one’s competence
or achievements for a particular skill is not an innate gift. Moreover, self-assessment can be learned, improved upon, or excelled through different modalities. This is exceptionally important in dental education, as students must become competent in clinical skills, as well as their ability to assess themselves constructively.

The project examined the ability for first year dental students to accurately self-assess themselves at set pre-clinical tasks. In the past, dental education has utilized traditional evaluations methods, which have identified several concerning issues. These include subjectivity in feedback, inadequate feedback and lack of grading criteria (Feil, 1982). The study evaluated whether dental students are able to critically evaluate their work and whether their abilities to self-assess improved over the term. The dental students self-assessed their individual pre-clinical work both quantitatively and qualitatively according to a set of defined marking criteria. Similarly, one instructor assessed students’ work on a quantitative and qualitative level. Deviations as well as similarities between the two assessment groups will be indicative how well the student can objectively assess their work.
Introduction

The dental school curriculum places significant emphasis on the acquisition of technical skills resulting at the end of dental training, a competent dentist. The goal of dental education is to prepare future clinicians for a general dental practice. The curriculum delivery utilizes learning methodology that includes lectures, pre-clinical laboratories, problem-based learning, clinical internships and externships. Students become familiar with this didactic approach based on the lectures and the “signing off” of student work (Manogue et al 1999). To shift from the didactic approach to more of a problem-centered approach involving independent learning, self-assessment and reelection is difficult for students to do (Manogue et al 1999). The introduction of a problem-centered approach earlier in the dental curriculum can be beneficial from an educational point of view. Self-assessment as an educational modality has been used in various health professional programs as a means to ensure competence (Migrom, 1985 & Asadoorian & Batty, 2005). Throughout one’s professional career, health professionals must continually assess their base knowledge, skills and performance and most importantly, act upon these assessments (Gordon, 1992). Boshuizer et al (1990) states that accurate self-assessment is a pillar towards effective learning that involves two key elements. Firstly, to understand the given standards and criteria. Secondly, the ability to accurately judge whether one’s work meets the former. If both of these key elements are fulfilled, only then can evidence support that self-assessment methodology accelerates the learning of novices. However, this is a dramatic shift from longstanding dental curriculums in which didactic lecture-based and grading of procedures were the
predominant determinants of student performance. With a self-assessment approach, student work enters a more problem-centered field. Thus, reflection, independent learning and collaborative assessment play key roles in the entire learning process. (Manogue, et al. 1999).

Self-assessment is based on two underlying principles. Self-reflections firstly lead to deeper understanding. Secondly, collaborative assessment with instructors leads to more accurate self-assessment (Geissler, 1972). Self-assessment has been shown to increase student motivation to learn and shifting of the mindset from “how have I performed to how I can get better” (Epstein & Northrop, 1994). Students must be trained to critically evaluate their work through self-evaluation. Koenigsberg et al (1979) found positive correlations between pre-clinical performance and self-evaluation. From an instructor’s point of view, discrepancies can serve as an educational diagnosis to inherent problems within the student’s abilities to self-assess. (Kunovich, 1987) It has been suggested that self-assessment is a skill required for lifelong learning to occur (Arnold et al, 1985).

Theoretical foundations of self-assessment have not stemmed from a single theory, but multiple theories all contributing to the overall theory. Malcolm Knowles theories of adult education have been credited too much of the early work in the development of adult education. He describes the need for adults not only to learn how to learn as opposed to learn only what is already known. Knowles (1975) describes this process as the beginning of self-directed learning.
Materials & Methods

The study examined whether there is a positive correlation between student self-evaluation scores and instructor scores in the first year Operative Dentistry course at the University of Manitoba. Furthermore, whether this correlates with the clinical progress of the students over the year.

Twenty-nine first year dental students were familiarized with and provided with the opportunity to use the Criteria-based evaluation forms for their own work. Criteria-based evaluation forms were created for each of the operative dentistry procedures; preparation, restoration, and finishing of Amalgam procedures. The Criteria-based evaluation form evaluated thirteen specific categories of the given procedure. Students were expected to compare their results with the faculty evaluator throughout the two terms. From October 2006 to March 2007, eight practical examinations were conducted in the course. At the end of each practical examination, students were given ten minutes to complete the Criteria-based self-evaluation form and assign themselves a mark. One faculty member blindly evaluated and assigned a mark for the practical exercises using the same evaluation form without the knowledge of the students’ self-evaluation. Marks were awarded on a 1-4 scale based on mark guidelines within the marking rubric (Table 1). The following formula was used to calculate a final score for the pre-clinical procedure. The formula took into consideration whether the students marked themselves too high or too low.

Faculty Evaluator Mark – (Student self-evaluation mark - Faculty Evaluator Mark) = Final Mark
Table 1: Marking Rubric for Operative Dentistry.

<table>
<thead>
<tr>
<th>Grade</th>
<th>SKILL LEVEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Excellent or superior result</td>
</tr>
<tr>
<td>3</td>
<td>An acceptable or satisfactory result</td>
</tr>
<tr>
<td>2</td>
<td>An unacceptable result; significant modifications are required to achieve an acceptable result.</td>
</tr>
<tr>
<td>1</td>
<td>An unacceptable result; Errors are not correctable by modification; procedure must be redone.</td>
</tr>
</tbody>
</table>

Results

The mean evaluation scores for both student self-evaluation and instructor were calculated. The mean student self-evaluation and instructor values were plotted on a graph to display differences, if any (Figure 1). The data was analyzed using Repeated Measures Analysis of Variance (alpha=0.05). The students’ self-evaluation for the procedures did improve with experience as there was a statistical difference between the student and instructor means over time (p<0.05, df = 7, t = 2.63). Thus, the null hypothesis is rejected and the alternative hypothesis of an improvement of student learning in the course Operative Dentistry over the year with the use of self-evaluation is accepted.
Figure 1: Instructor and Student mean evaluation scores for Tests 1-8 in the Pre-clinical Operative Dentistry course.
Discussion

The results concerning self-evaluation among first year dental students in pre-clinical procedures who rated themselves regularly throughout the course year exhibited some expected outcomes as well as some incongruities. Overall, the students’ self-evaluation for the procedures did improve with experience, as there was less difference between the student and instructor means. Dental pre-clinical procedures are difficult for beginning dental students. However, this is true for not only performing the task, but also for perceptually understanding the task at hand. This could explain the large mean difference comparatively between the student self-evaluation and instructor mark (mean difference = 0.20 marks). In all but one test (Test 4), students’ over-inflated their self-evaluation marks for the test procedures with a mean difference of 0.71 marks above the instructors’ marks (Figure 1). In Test 4, the Instructor means mark was 0.15 points higher than the student self-evaluation mean mark. This incongruence could be attributed to the level of difficulty of the Test 4 pre-clinical task. As in Test 4, the pre-clinical operative task was more complex than the previous Test 1-3 tasks. Thus, the student is perhaps less aware of how to effectively mark their clinical work.

With experience, the students’ abilities to self-evaluate improved over the terms from Test 1-8. Student assessment of their work over time became closer to the instructors’ assessment mark. This could be attributed to improved student understanding and learning of the pre-clinical task. Moreover, students could have become better predictors of how the instructor would mark their preps, based on the previous tests. Figure 1 illustrates that there is a negative trend towards lower marks as the term progressed. Therefore, there were lower marks given by both students and instructors.
from Test 1 to Test 8. This trend could be the result of the level of difficulty of the pre-clinical task increasing from Test 1-8. Furthermore, students could have developed better self-evaluation skills of their work, despite the level of difficulty of the task.

The intent to utilize the Criteria-based Self Evaluation sheets to help the students’ learn and evaluate their pre-clinical work was successful. The Criteria-based Self-Evaluation sheets provided the student with an orderly and systematic approach to evaluating their clinical work. The results are encouraging for the utilization of Self Evaluation in pre-clinical dental education. As these forms are only utilized in two pre-clinical first year courses at the Faculty of Dentistry, the adaptability and relevance to improved student learning could be transferable to other pre-clinical courses. Literature supports the concept of independent self-assessment as an important lifelong learning skill (Kiyak & Brudvik, 1992).

Finally, self-evaluation is applicable for everyday clinical practice. Self evaluation has been cited to improved the overall efficiency of professional learning (Abrahamson et al, 1999). Knowles (1975) stated that “the clearer that learners are about their needs for learning in a particular situation, the more efficiently can they plan their learning”. It is the study’s objective to improve dental student learning and the efficiency of learning through the use of Criteria-based self-evaluation sheets in the pre-clinical Operative Dentistry course at the Faculty of Dentistry.
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**Works Cited**


Figure 1: