The use of the objective structured clinical examination (OSCE) in dental education

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Chapter 2

An implementation strategy for introducing an OSCE into a dental school

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Abstract

Introduction: The Objective Structured Clinical Examination (OSCE) uses a series of test-stations to test clinical competencies. The introduction of an OSCE in a dental school is always a new experience for both staff and students and may result in a change in assessment methods. As resistance could develop when changes are introduced into an organisation, the use of a strategy for the implementation of such change will help to diminish opposition and may therefore result in the co-operation of staff and their departments. The objective of this study was to investigate the effectiveness of an implementation strategy by measuring attitudes of both staff and students towards the OSCE as a new form of clinical assessment in a dental school (ACTA).

Materials and methods: ‘Stepwise’ behaviour change (with information, participation and commitment as tools) was used as a strategy to minimise protective behaviour to the introduction of an OSCE. After lectures on assessment, 59 staff members participated in a mini-OSCE with eight test-stations, playing both the role of a student and observer. A questionnaire, designed to test attitudes and commitment towards the new OSCE was completed after the examination. Six months later, 22 staff of all departments had developed and run a pilot OSCE for 44 students. A similar questionnaire was answered by staff and students. A year later, another OSCE for all 103 third year students was designed, organised and evaluated with full co-operation of the clinical teaching staff.

Results: Staff total attitude grew positively (P < 0.001). Student's total attitude was lower than staff (P = 0.001) The results of the survey after the mini-staff-OSCE and pilot and final OSCE were favourable in terms of the acceptance of use of an OSCE for the assessment of clinical competences.

Conclusion: The implementation strategy appears to have been successful. The objective of gaining the co-operation of staff and departments and avoiding resistance to change was achieved.
Introduction

Assessment is crucial in the learning process of students (1). As Brown and Knight (2) stated, ‘Assessment is at the heart of the student experience’. Indeed, assessment is used to measure student learning. In general, one can define the process of assessment as taking a sample of student work, making inferences from it and then estimates of its worth in terms of marks or grades. These are broadly accepted educational principles (1–5).

The nature of assessment tasks influences the approaches to learning which students adopt (6, 7). Newble and Jaeger (8) described how changing clinical assessment in the final year from a pass/fail system based on ward reports, to a clinical practical examination increased the time spent by medical students on the wards. This change in assessment method may be used to improve the quality of education (4, 5).

As Boud (3) described, ‘There is a tension for teachers between teaching and assessing’: there is a continuing potential for conflict between being a facilitator of learning and being an assessor, as the latter may also have a key role in certification. These roles are often not easy to separate or make compatible. In a survey of 14 undergraduate dental schools in the UK, shortage of staff time was highlighted as a barrier to effective assessment. Only 45% of staff offered feedback at the end of the clinical session (9). To enhance assessment and provide a greater degree of objectivity and consistency in clinical assessment Harden developed in 1975 an Objective Structured Clinical Examination (OSCE) and implemented this form of clinical assessment into the curriculum (10, 11). More recently, OSCEs have been introduced into the curricula of a number of dental schools (12, 13).

In an OSCE, the examinee circulates through a series of test-stations, which test elements of clinical competence. In dentistry, such examples include diagnostic, clinical and communication skills, all based on relevant knowledge. To minimise subjective bias the students all face the same pre-defined clinical tasks, the same time limit (often 5 min) and the same fixed checklists are directly observed and scored by observers. Because a wide range of skills can be tested, a reliable overall view of the clinical competencies of the students can be obtained (14).

However, resistance may develop when changes are introduced into an organisation. An explanation of the resistances to change may lie in three aspects: (i) logical, rational objections, (ii) psychological, emotional objections, and (iii) sociological factors and group interests (15). When a change in assessment methods (e.g. an OSCE) is developed, its introduction must be carefully implemented in order to gain acceptance and to minimise the occurrence of defensive behaviour from (dental) teachers and students (12).

To avoid and overcome these resistances and to monitor the effectiveness of the implementation of a change in an organisation, Argyris (16) recommended developing an implementation strategy of advocacy and inquiry to encourage the acceptance of personal responsibility. The three governing variables of his strategy are: (i) valid information, (ii) free and informed choice, and (iii) internal commitment to that choice. Argyris recommended that effective implementation requires creation of situations where participants can, jointly, control the tasks and participate in the design, development and implementation of the new method. He advised evaluation and testing.
of the method in public. Plant (15) mentioned the importance of ensuring early involvement and communication. Whilst implementing a change in dental education, Townsend et al. (17) used staff ‘participation’ and ‘academic reasoning’ to help implement change in development of the curriculum from a traditional delivery to a problem-based learning curriculum. Lazarus and Kent (18) stated that a new clinical examination should not only be seen as valid by the staff, but should also be perceived as a relevant and acceptable alternative to current assessment methods by the students concerned.

The objective of this study was to investigate the effectiveness of an implementation strategy by measuring attitudes of staff and students towards the OSCE as a new form of clinical assessment in a dental school (ACTA).

**Materials and methods**

Table 1 shows the stepwise implementation strategy of a new assessment method, the OSCE. Information, participation and commitment were used as tools to avoid resistance against change and to gain effective implementation with co-operation of the staff and departments. The first step in this strategic plan was to involve departments and their clinical staff. After 6 months, students were involved.

At baseline, an OSCE was designed by one of the authors (M.S.) with only eight test-stations (a mini-OSCE). Clinical teachers and staff members of the departments (n = 59) were invited to attend seminars about the place and function of assessment in the dental curriculum, using the OSCEs and portfolios as examples. This was followed by a short introductory lecture about the OSCE. Staff were invited to participate in the mini-OSCE. To quantify commitment at baseline, staff were asked two questions about willingness to help develop and assess OSCE test-stations.

To help further implementation, a letter was sent to all clinical departments, asking for the development of two or three OSCE test-stations. This letter included the guidelines on how to

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<td>dental staff, 4th year</td>
<td>30</td>
<td>Develop and use final OSCE for all students</td>
<td>Implementation</td>
<td>Participation</td>
</tr>
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organise the OSCE test-stations and an offer of support to the department in developing the examination. Thereafter, 22 staff members and clinical teachers participated in the development and implementation of the first OSCE for students. This pilot OSCE was evaluated both by staff and students. New seminars and a workshop, given by an outside lecturer with expertise in this area were organised to help staff to develop OSCE test-stations. The final OSCE was developed and evaluated with full co-operation of staff and departments.

All staff members in the pilot and the final OSCE had participated in the mini, staff, OSCE except for two changes. The staff members in the pilot were also involved in the final OSCE. In the final OSCE more staff members were involved because of the scheduling over 3 days.

The mini-OSCE
The 59 staff members in the mini-OSCE were involved in playing both the role of a student and observer in each test-station. Two staff members were ‘students’ and two staff members were ‘observers’ at each station. The eight test-stations contained tasks related to endodontics, prevention, complete dentures and articulators, periodontology and radiology and resuscitation (Annie). One rest station was also included. Both groups underwent role reversal; all of the 59 participants completed the mini-OSCE as both student and observer. A questionnaire, to evaluate the attitudes and commitment of staff towards this examination, was distributed to all 59 dental teachers directly after the mini-OSCE.

The pilot OSCE
A format for the OSCE questions was offered to departments for the design of test-stations and the development of a pilot OSCE for students. Two months later, 22 clinical staff from all departments had developed and run a pilot OSCE (20 stations) for 48 (selected) students. For logistical reasons (availability), 48 students were selected from the 124 students in the third year of the programme and received an introduction. Forty-eight students were divided into two groups and therefore 24 stations were developed. Both groups undertook 20 active test-stations plus four rest stations. The 20 test-stations were designed in the areas of cariology, endodontontology, periodontology, prosthetics, radiology, orthodontics, surgery, and cross infection control. The domains of competencies tested across the test-stations were: communication, clinical and diagnostic skills all based on prior tested knowledge (see Table 2). The test-stations were observed directly and rated using checklists with fixed items of adequate performance, using yes/no responses per item and a rating range per test-station of 1—10. Each test-station was allocated 5 min. Four students were ill on the day of the OSCE. The attitudes towards OSCE of staff and students were evaluated by a similar questionnaire as used after the mini-OSCE.

The final OSCE
After a seminar and a workshop about designing OSCE test-stations, an outline was made of the competencies to be tested and a year later, a more definitive (‘final’) OSCE with 17 test-stations and three rest stations was developed for all third year students (n = 110), with the co-operation
of 24 staff. The competencies tested were the same as in the pilot OSCE. The design of the test-stations was improved according to the comments of staff and students after the pilot OSCE. Two test-stations were removed: one test-station was found not to be in alignment with the received education; one further test-station was removed because of lack of availability of staff.

Seven students were ill; 103 students took the OSCE and 24 staff were observers. Again, attitudes towards OSCE of involved staff and students were evaluated with the questionnaire as used before (response rate students: 95%; response rate staff: 60%)

Because of the large number of students, the final OSCE was scheduled over 3 days, but the station scenarios were the same in all 3 days.

The questionnaire
A questionnaire (Table 3), designed to test attitudes and commitment towards an OSCE, was completed anonymously by staff and students, immediately after the OSCE sessions. The questions contained six items: ‘enthusiasm’, ‘increase use’, ‘good test’, ‘relevant test’, ‘confidence’ and ‘ease’ (= the level of difficulty of the OSCE). The questionnaire was adopted and translated into Dutch from a questionnaire used in the UK. It consisted of a Likert-type 5-point scale, which contained six statements about the OSCE quantifying the attitudes of staff towards the OSCE as a method of clinical assessment. There was an option for additional remarks. The students were given a similar questionnaire.
An implementation strategy for introducing an OSCE into a dental school

Statistical analyses
Statistical analysis was carried out using SPSS-11 for Windows. Principal component analysis was applied, using the six items of the questionnaire to test the internal consistency of the scale and Cronbach's alpha was determined to provide quantification of reliability. A Mann-Whitney test was applied to compare the attitudes of groups of staff and students of the mini-OSCE, the pilot OSCE and the final OSCE. Items were analysed using the Mann-Whitney test as the Likert scale is an ordinal scale. As the total attitude score can be considered as an interval scale, a t-test was used to test for differences of the total attitude score between the five groups of staff and students.

Differences between the performances of students at three different days in the final OSCE were tested using a one-way ANOVA, with a Bonferroni-corrected post hoc test. P < 0.05 was accepted as statistically significant.

Results
Baseline evaluation showed that 61% of staff (n = 59), who participated in the mini-OSCE, were willing to help develop a pilot OSCE and 71% of the staff (n = 59) were willing to assess OSCE test-stations. From the analyses of the questionnaire, two components were extracted. One component was a combination of the items ‘enthusiasm’, ‘increase use’, ‘good test’ and ‘relevant’ and explains 61% of the variance. A total ‘attitude’ score was constructed from these four items. The reliability (Cronbach’s $a$) was 0.74. Because ‘confidence’ appeared difficult to translate into Dutch and several staff members did not understand this question, a total score was only computed of the first component and the item ‘confidence’ was omitted. The item ‘ease’ was analysed separately.

Table 4 shows the separate items ‘enthusiasm’, ‘increase use’, ‘good test’ and ‘relevant’, together with the ‘total attitude’ score and the item ‘ease/difficulty’.

Five groups were evaluated: staff involved in the mini-OSCE (n=59), the pilot OSCE (n=22), the final OSCE (n = 24), students performing in the pilot OSCE (n = 40) and students in the final OSCE (n = 98).

The ‘total attitude’ score towards OSCE within these five groups was as follows:
- Staff attitude after the pilot OSCE was more favourable than after the mini-OSCE ($P = 0.001$).
- Student attitude towards the pilot OSCE was lower than that of the staff ($P < 0.001$).
TABLE 4. Mean Likert scale values and standard deviations for the various attitude items towards OSCEs, values are given as mean (SD).

<table>
<thead>
<tr>
<th>Questionnaire items</th>
<th>Staff</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mini OSCE (n:59)</td>
<td>Pilot OSCE (n:22)</td>
</tr>
<tr>
<td>enthusiasm</td>
<td>4.02 (0.78)</td>
<td>4.45 (0.51)(^1)</td>
</tr>
<tr>
<td>increase use</td>
<td>4.08 (0.68)</td>
<td>4.27 (0.63)</td>
</tr>
<tr>
<td>good test</td>
<td>3.64 (0.80)</td>
<td>4.27 (0.55)(^1)</td>
</tr>
<tr>
<td>relevant test</td>
<td>4.00 (0.68)</td>
<td>4.58 (0.61)(^1)</td>
</tr>
<tr>
<td><strong>Total Attitude</strong></td>
<td><strong>3.94 (0.55)</strong></td>
<td><strong>4.39 (0.27)</strong>(^1)</td>
</tr>
<tr>
<td>difficulty/ease</td>
<td>3.25 (0.80)</td>
<td>2.82 (0.85)(^1)</td>
</tr>
</tbody>
</table>

\(^1\) Staff pilot OSCE different from staff mini OSCE (p<0.05)
\(^2\) Pilot OSCE students different from pilot OSCE staff (p≤0.001)
\(^3\) Final OSCE students different from final OSCE staff (p<0.05)

OSCE = Objective Structured Clinical Examination.
No significant difference was found between the attitude of students to the pilot OSCE and final OSCE.

No significant difference was found between the attitude of staff to the pilot OSCE and final OSCE.

Further analyses of the individual items of the total attitude score revealed that the staff rated the pilot OSCE more positively than the mini-OSCE; staff were more enthusiastic (P < 0.05); they perceived the OSCE as a better (P = 0.001) and a more relevant (P = 0.001) test for clinical competencies. In addition, when staff and students were compared it was shown that both after the pilot OSCE and final OSCE, staff were more enthusiastic (P < 0.001 and P < 0.05) and more convinced about the relevance for clinical practice (P < 0.001 and P < 0.001) than students after these OSCEs. Furthermore, staff after the pilot and final OSCE wanted an increase in use of this examination, where students (with a mean score just below 3) hesitated (P < 0.001).

Apart from the attitude items it appeared that the ease of the different OSCEs was perceived to be about equal by staff and students, however, staff perceived the mini-OSCE as being more difficult than the pilot OSCE (P < 0.05).

Table 5 shows the total performance score of the students in the final OSCE on the 3 days. No significant difference was found between performances of students at day 1 and day 3. Students at day 2 showed a lower total score than those at day 3 (P = 0.012).

**Discussion**

This study reports the introduction of an OSCE into a large dental teaching hospital using a stepwise implementation strategy with information, participation and commitment of staff in a mini-OSCE, a pilot OSCE and a year later the use of a 'final' OSCE. This allowed staff to become familiar with this 'new' examination method and the results showed that an OSCE can be successfully implemented.

The objective to diminish defences was achieved. Staff and students' attitudes became increasingly positive towards OSCE during the implementation process. Involvement in developing a pilot OSCE led to a more positive evaluation by staff after the pilot. Analyses of the data showed that the rating of the staff after the final OSCE was not statistically significantly different from the mini-OSCE, although a trend towards lower values seems to be present. This phenomenon could reflect the more difficult logistics of the final OSCE due to the high number of students participating in the examination.

**Table 5. The total performance score, mean score (and SD) of the students in the final OSCE during three different days of 1 week.**

<table>
<thead>
<tr>
<th>Day</th>
<th>Total Performance Score</th>
<th>Mean Score (SD)</th>
</tr>
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<tbody>
<tr>
<td>Day 1 (n = 36)</td>
<td>104.4 (14.6)</td>
<td></td>
</tr>
<tr>
<td>Day 2 (n = 36)</td>
<td>96.5 (13.1)</td>
<td></td>
</tr>
<tr>
<td>Day 3 (n = 31)</td>
<td>107.0 (16.1)</td>
<td></td>
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</table>

OSCE = Objective Structured Clinical Examination.

1 Students at day 2 showed a lower total score than those at day 3 (P = 0.012).
Students showed a significantly less positive attitude towards OSCE than staff, although a mean score for ‘enthusiasm’ of 3.63 can still be considered as relatively high. Twelve per cent of the students were not enthusiastic and in the open remarks, some students expressed their fear of an OSCE as a rating instrument if the examination would be summative. Feedback from this formative OSCE was, however, appreciated. This attitude may change when students have more exposure to this type of examination, but the finding is not dissimilar to the results of other studies (14, 19).

The evaluation of the difficulty of the OSCE showed that the students perceived the pilot OSCE and the final OSCE to be as difficult as did the staff, but it is probable that the two groups were thinking about the ‘difficulty/ease’ of the OSCE from different perspectives. From other studies it appeared that, in general, students perceive exams to be more difficult than staff (14, 18), so it would be worth exploring this facet further (although it might be possible that this is related to the fact that the examination is not yet formalised and had therefore no consequences for the students’ progress).

The perceived relevance for clinical practice was high: 60% of staff after the mini-OSCE rated the relevance to be ‘4’ and 63% of staff involved in the pilot OSCE rated it ‘5’ (where 5 is the maximum available in the Likert scale and 1 the minimum). The students seemed to be more moderate than staff in their view of the relevance. This might be due to the minimal exposure of the students to a real dental practice environment.

This study confirms the recommendations of Argyris (16) that more involvement and more ownership create greater commitment. The commitment of staff was high after the involvement of staff in the mini-OSCE in their role as student. At baseline, 61% expressed the intention to help design a new OSCE and 71% were willing to help assess OSCE test-stations. Thereafter, all invited departments were able to provide test-stations in the pilot OSCE and the final OSCE, including personnel for the assessments. It was noticed that staff of all grades (from professor to postgraduate students), including dental nurses, participated.

As the scenarios that test-stations present are critical to students’ perception (20), a possible influence on their attitude could be that some of the test-stations of the pilot OSCE were not well designed. The possible causes of these are:
1. the test was too time consuming (more than the 5 min);
2. the question was too complex for students to answer;
3. the test was not objective (more about interpretations by judgement);
4. the observer did not just observe, but helped the student, as if the test-station were a tutorial.

The criteria for the test-stations were set by the departments and there were no students involved in this process. For better implementation, the involvement of students might enhance development (4). To achieve a better quality of the examination and therefore better implementation and improvement of dental education, further research is needed concerning the criteria of a well designed test-station.

The scheduling of the final OSCE over 3 days was needed because of the practicalities of the large number of students involved. Results showed that there was a difference in performance between
day 2 and day 3. However, there was no statistically significant variation in performance between students undertaking the examination on day 1 and day 3. The finding that at day 2 lower scores were obtained might be due to the fact that a number of students had delay in theory progress and were therefore excluded from the clinic during the past months.

The present study included a formative OSCE. After successful introduction in the third year, more formative OSCEs are being developed in the first year and in the second year of the programme at ACTA. Whilst it could be argued that the implementation of the OSCE will not be complete until it is used as a summative examination and written in the 'education and examination regulations' of the dental faculty, this belies its strength as a tool to improve learning (12).

If the OSCE is to be used as a summative examination, its design has yet to be standardised by staff and more training is required in this area, including stating the aims and objectives more clearly (12, 21). To develop an academic approach, validity and reliability have also to be assessed (14). A competence matrix was made before the final OSCE to ensure that several different competencies were measured in the various test-stations. The passing score was constructed after the final OSCE: some studies suggest that this be agreed upon beforehand for each test-station and the whole OSCE (12, 22). The evaluation of such planning and the setting of the passing score require further research.

A positive side effect of the OSCE implementation was an increased interaction of clinical departments. The examination generated much interest and colleagues who were not involved with the OSCE wished to be involved. Teachers were curious about what other departments were assessing in their test-stations. Therefore, another advantage of the OSCE is that barriers between departments may be broken down.

There was agreement amongst the management of the school that the whole process was very staff intensive, although the examination has advantages in that marking is made 'on the spot' and therefore requires less work (certainly after the examination) in comparison with written examinations. However, the costs of administration of an OSCE should be seriously considered in the organisation of such an examination (23).

Generalisation of the strategies reported in this paper to other situations or other dental schools must be performed with great care: there may be differences in the culture of other schools that can lead to different outcomes/effects.

In conclusion, it appears that the implementation strategy for introducing an OSCE into a dental school was successful. The objective of gaining the cooperation of staff and departments and avoiding resistance to change was achieved.

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Chapter 2

References