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

Klein, M.E.

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Chapter 1

General introduction

Introduction

There is a “Need for evidence” in education (1) as also recently was concluded by Ronald Plasterk, the Dutch minister of Education and Science (2). In line with this trend assumptions about assessment should be tested, just as in the evidence-based dental and medical practice: the assessment methods that are used in health education should be evidence based.

This thesis is concerned with the assessment in dentistry and, in particular, the use of the Objective Structured Clinical Examination (OSCE) in the assessment of student’s clinical competences in dental education. As such the aim is to make a contribution to the improvement of the assessment methods and programs in dental education.

In this thesis several studies on the use of the OSCE in dental education are described. This introduction provides the context and rationale of the thesis and some background information about various aspects of assessment in health education. A review of the literature on the utility of the OSCE in dental education is included and this chapter concludes with a synopsis of the general aim of this thesis and the research questions derived from this aim.

The “new learning” Constructivism and Competences

During the past decade a changing paradigm in health education caused a new context in medical and dental education with constructivism and competences as central concepts. In medical and dental schools in Europe and North America competency based curricula (3, 4) were implemented with a new educational approach based on the learning theory of constructivism (5), in which active learning, learning in context and learning in collaboration are vital elements (6). Constructivism refers to the view that knowledge is a human, social invention, a construction. The student interprets new information on the basis of his existing knowledge structure (7, 8). In contrast to the classic view, where the teacher is the centre of the learning process, students are now stimulated to be responsible for their own learning, develop a critical academic attitude and become a reflective lifelong learner who can assess his/her performance and behaviour accurately. In stead of the described motor skills in the “old” curricula, in the new curricula competences are defined of the just graduating dentist or doctor. As Chambers (3) has defined “dental competences are skills essential to beginning the practice of dentistry and allied dental practice. Competences combine appropriate supporting knowledge and professional attitudes, and they are performed reliably in natural settings without assistance” (p. 791). Indeed, one could define competence as the integration of knowledge, skills and attitudes (9). Also important is another aspect of competence: being able to function in *context* of practice (10). In conclusion, competence is a complex concept, and definitions may be used to identify acceptable standards of performance at different stages of a course. In order to meet the purposes of these new educational approaches, also new competency-based clinical assessment methods have to be developed to measure the learning outcomes (9, 11, 12).

Purposes and goals of assessment of competence

One can define three goals of assessment of competence: assessment for the benefit of the individual student, the institution, and the patient. The purpose of assessment can be formative

or summative. Formative assessment is designed for feedback. In order to let students learn from formative assessment they should receive the feedback on which to build their knowledge and skills (13). In contrast to formative assessment, summative assessment is designed for judgment, and is for instance used for the benefit of the institution, when the school has to take decisions about the progress of the students to the next step in the becoming of a competent dentist.

The first and most important goal and purpose of assessment is to aid the learning of the individual student: Assessment drives learning (14) and is an inextricable element of learning. There is a lawful relationship between assessment and learning (1, 14). The feedback about the results of the assessment gives the student the information about his strengths and weaknesses. This information should stimulate the further learning and preparation for lifelong learning (15). Additionally assessment does define what students regard as important (16). The student will learn whatever the assessment program, the 'hidden curriculum'(17), asks from him/her, to maximize the chances of success. In contrast to what often is expected, the real written curriculum does not dictate the learning, but the examination program directs the student's learning. Therefore it is important to use an effective strategy in the development of the assessment program. To be valid, the total assessment program should be constructed in alignment with learning goals and the learning content to direct the students learning in the desired direction. Also the content of single tests should be carefully planned against learning objectives. A *blueprint* is a tool to meet this goal (13).

The second goal of assessment of student's performance, for the benefit of the institution, brings also the evaluation of the quality of education of the (medical or dental) school as institution (18). Assessment-outcomes of student learning are also a measure of the quality of the learning program. These results of a test provide the feedback about the strengths and weaknesses of the education to the teachers, the students, and the institution, to modify, develop and strengthen course and curriculum content (19). The assessment methods should therefore be of high quality, and summative, so that the feedback derived from it can be trusted and can carry through change and improvement (20). Therefore assessment methods should be evidence-based or based upon research.

Finally the third goal of assessment of competence is for the benefit of the public, the patient. An essential aspect of dental education is the providing of care in an invasive manner, the "drilling and filling". In dental education, this is an integral part of the clinical training and the running of university/hospital clinics. The dental student has a continued focus on physical interventions, as nearly an autonomous health professional (21). After graduation the dentist must be competent to treat patients in his own professional practice at a minimum standard. This is the basic difference to medical education and has to be taken into special consideration for quality assurance of assessment. The public, the dental patients should be confident to be treated by competent dentists. "Competent makes qualified" (in Dutch "bekwaam maakt bevoegd") is the adagio of the Law Concerning Occupations in the Private Health Sector (Wet BIG) that regulates the competence of health care providers. To ensure that dentists are competent after graduation, high quality summative competency assessment methods must provide evidence of this qualification.

In conclusion assessment methods and decisions derived from them must be defensible, to the students, the institution, and the public.

This last goal of qualification requires the establishment and agreement of expected *standards*. Decisions about passing or failing a student on the basis of scores of an examination can be studied from three test score interpretation perspectives: for relative, absolute, and pass-fail decisions.

1. *Norm test perspectives* for *relative* decisions: how is the student performing in comparison with the group?
2. *Domain test perspectives* for *absolute* decisions: how is the student performing in absolute terms, how much of the domain is mastered?
3. *Mastery test perspectives* for *pass-fail* decisions: will the student's score be above or below the pass-fail cut-off score (regardless how much above or below)?

For formative purposes the norm referenced decisions, where the student is compared with his group, are often good enough. However, when an assessment method is used for summative purposes the setting of a pass/fail standard has to be defined. This pass/fail standard should be based on absolute domain referenced decisions (22).

Key measurement issues in competence assessment

Next to blueprinting and standard setting, both providing evidence for validity, there are other desirable characteristics in the design of competence assessment. Effective assessment should be designed to provide a valid, reliable and practicable assessment of student performance (23) as the measurement properties of assessment in psychological testing. Rohlin et al (24) explained this in terms of a diagnostic test: "the aim of assessment is to obtain an accurate and precise measure of an attribute whilst minimizing the number of both false negative and false positive diagnoses, thus implementing a cost-effective method". Other issues in the design of assessment of competence are the educational effect, the acceptability, and the costs. Van der Vleuten combined these criteria for determining the usefulness or utility of a particular assessment method into a model (25). The five criteria or issues he described can be captured in the formula as a conceptual model for the utility (U) of competence assessment:

$$U = R \times V \times E \times A \times C.$$

Where R=Reliability, V=Validity, E=Educational effect, A=Acceptability, and C=Costs.

Reliability (R) is the degree to which the measurement is accurate and reproducible. Clearly, there are possibilities for error at many points. The sample may be based on a too narrow domain; it may be too small or too large to be meaningful, or it may not match the purposes / learning outcomes of the course/programme concerned. Reliability in testing formats is a measure of reproducibility, which is achieved through the reduction of testing error.

Validity (V) refers to the evidence that the test measures the competences, which it claims to measure. Blueprinting must be a guarantee to a valid alignment of the learning objectives and the assessment. Validity is an unitary concept, which looks to multiple sources of evidence (26): content, response, internal structure, relationship to other variables and consequences, i.e. how should scores be aggregated to a total, do questions sample the domain.

Educational effect (E) considers the impact of the test on present and future learning of the student.

Acceptability (A) of the assessment method to students and staff is obvious. When an assessment method is not accepted by its stakeholders it is doomed to disappear.

Costs (C) involved in the organising and the administration of the assessment must be feasible. Good assessment is definitely costly (25), but an investment in assessment is an investment in quality of learning and therefore worthwhile.

How are these issues applied in clinical assessment in dental education?

On used methods of clinical assessment in dentistry

In many dental schools the every day grading of the students performance in patient care, was not considered satisfactory, often based on numerical experiences combined with faculty evaluations. The practical examinations used in dental education were mostly tests of sensori-motor skills and seemed to test different aspects of the student's abilities as the daily grading by the instructors (27). The students clinical performances were only assessed by the quality of the restoration, "the filling", and the number of independent demonstrations of skill in patient and typodont procedures (27-29). The chairside skills, like communication and professionalism were neglected in these clinical assessments. Gerrow et al. (30), reviewed the potential causes of reliability and validity problems with traditional methods of evaluating a student's clinical prosthodontic skills. He advised that a combination of valid and reliable methods should be combined in an assessment program.

In 1999, Manogue et al. evaluated the values and practices of 14 dental schools in the UK (31) by a survey of teachers in restorative dentistry. The results showed also that the most commonly used assessment tools were day-to-day observation and judgment (glance and mark) which lack in reliability. Very often the criteria are the amount of fillings and crowns, the quantity, and no consistent approach in assessment was present. Only 45 % of staff offered feedback at the end of a clinical session. Manogue et al. concluded that the 'values of the dental teachers were in-line with evidence-based good practice, but their practices are not in line with their values' (Page 369). Objective, structured testing, more feedback, the use of self-assessment and portfolios figured highly on the wish-list but did not appear often in practice (the most common methods being based on implicit judgements and checklist schedules). Manogue et al. concluded that the shortcomings of methods of clinical assessment in dental education were: subjectivity, no consequent approach,

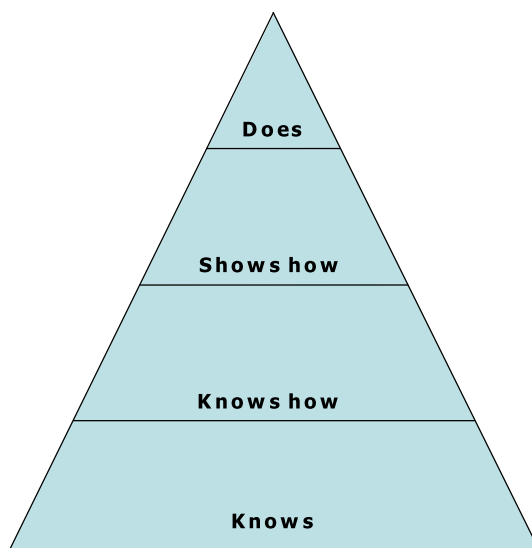


Fig.1. Millers pyramid. Framework for clinical assessment of competence.

no explicit criteria and only numerical requirements and merely testing of sensori-motor skills without testing of the communication and other chairside skills. There is a need for reappraisal of the used assessment methods of clinical competence in dental education,

A year later evolving methods of assessments were described by a group of European schools (32). A multi method combination was advised and assessment schemes to test the whole pyramid of competence, since no single assessment method can adequately measure all clinical competences. This pyramid has been described by Miller (33) as a simple conceptual model which outlines the issues involved when analysing validity of the assessment of competence (13). In his competence-pyramid (Fig. 1) the different facets in competence are shown.

Millers model described the assessment of clinical competence in 4 different essential facets: "Knows", "Knows How", "Shows How" and "Does". The base of the pyramid represents the assessment of the knowledge components of competence, the foundation knowledge. "Knows How" represents the facet, when applying that knowledge in concrete situations. In the facet "Shows how" the knowledge is applied in actual behavior, performance. And at the top level the student must be able to "Do" in daily practice, everything he can and knows. Miller stated that to valid test these different facets of competence, different methods of assessment need to be applied. For assessment of knowledge and applied knowledge, exams as multiple choice examination and orals and essays could be used. For the "Shows how" more sophisticated methods are needed (13). There is a difference between competence at the "Shows how" level and the top level of the pyramid: "Does", the performance in the real life situation. In the "Shows how" level the performance is simulated, and the assessment uses an artificial context: i.e. with Standardized Patients. Performance is concerned with what people do, what is actually done in the real-life

context. Then the actual behavior assessment during treatment of patients is the best choice, i.e. mini observations. Stated differently: What is one trying to assess? Is it factual knowledge, ability to apply and solve problems, clinical competences or indeed other attributes (34)? In conclusion, because of the complexity of competence more different tests should be used in the assessment programs in health education (13, 32, 35).

In search for better assessment, changes are implemented in dental schools to improve the assessment programs. Chambers reported on new developments in the USA (3, 36) where grading systems were adapted to the competency based curriculum. Licari and Knight (29) described that they progressed towards a program without numerical requirements, only an attendance requirement. In Australia (37) the dental school implemented a new assessment program: The system integrates both qualitative and quantitative assessment and uses criterion-based assessment as its foundation.

OSCE

To enhance assessment and provide a greater degree of objectivity and consistency and to make the clinical assessment more authentic, Harden in 1975 developed an Objective Structured Clinical Examination (OSCE) (23) and implemented this form of clinical assessment of competence into the medical curriculum. Since then OSCEs have been extensively used in medical education. Also in many other health education programs the OSCE became an assessment method of clinical competence, i.e. midwifery, physiotherapy, chiropractics and in even in the education for the police (38).

In an OSCE, the examinee circulates through a series of test-stations. At each station students are asked to perform a clinical task, which does test elements of clinical competence. In dentistry, such examples include diagnostic, clinical and communication skills, all based on relevant knowledge. To minimize subjective bias and inconsistent approaches, the students all face the same pre-defined clinical tasks, the same time limit (often 5 min) and the same standardized checklists (34). Their behavior is directly observed and scored by observers. Because a wide range of skills can be tested, a reliable overall view of the clinical competences of the students can be obtained (38, 39). In this way the OSCE can give a measure of clinical competence through observable behaviors. Manikins and simulated patients can be used to allow large numbers of students to be tested on the same clinical problem. Marking can be completed during the OSCE procedure and in formative OSCEs it is possible to provide immediate feedback. The development and the number of staff members needed as examiners can be cumbersome, but the OSCE does allow testing of competences that used to be ignored (32). The OSCE therefore, seems a good method to test elements of competence with explicit criteria, a more standardized consequent approach, and also the testing of different aspects of communication.

The OSCE did indeed improve inter-examiner reliability (40), but later research in medical education concluded that the greatest threat to reliable measurement in performance examinations is case specificity. Case specificity involves the variation in performance of each student from one station to the other. To achieve an adequate level of inter-case reliability many cases, or stations, are required (41).

Table 1. Characteristics of the studies, in chronologic order, about OSCE in dental education with number(N) of students and the tested criteria Reliability(R), Validity(V), Educational effect(E) Acceptability(A) or Costs(C)

Author and year	N	Aim of study	Method and used analyses	Results index used	Purpose OSCE used as tool for:	Criteria R, V, E, A, C
Adeyemi-Doro & Bamisaiye 1983(45)	166	Mentioning OSCE as tool to test group of dental and medical students	none			none
Gerrow et al. 1997(46)		Mentioning implementation of OSCE in certification examination of Canada	Case description			none
Davenport et al. 1998 (34)	55 and 54	To describe development of OSCE, evaluate feasibility, validity and reliability	Questionnaire to evaluate the attitude of staff towards OSCE.	Attitude of staff and students is positive Cronbachs $\alpha = 0.69$ and 0.67	Summative examination	Acceptability (face validity) and Reliability
Manogue & Brown, 1998 (38)	49	To assess the perceived usefulness of OSCE	Questionnaire qualitative analyses		Feedback to students	Acceptability
Brown et al. 1999 (47)	49	To study validity and reliability inter rater reliability an extrinsic reliability, Intrinsic validity, face validity, concurrent validity, predictive validity	Extensive analyses of the design and results of an OSCE	Cronbachs $\alpha = 0.68$ eta 2 coefficients ranged from 0.00 to 0.10	Feedback to students and staff	Validity and Reliability interrater and internal consistency.
Ogden et al. 2000 (48)		To study dental students as examiners in medical OSCE	Staff and dental students were compared as examiners Using Mann-Whitney analysis	95% CI for the difference in scores		Reliability
Mossey et al. 2001 (49)		To compare and contrast different types of scenarios in multi-station OSCE	Qualitative evaluation by a questionnaire	none	Curriculum-improvement	Acceptability and Validity
Boone et al. 2001(50)		To analyse the range of difficulty of the items	Rasch analyses	Rasch analyses	Benefit to staff, students, and patients	Reliability of test items
Zartman et al. 2001 (51)		Description of years use of OSCE	no	none	Curriculum improvement	none

Table 1. Characteristics of the studies, in chronological order, about OSCE in dental education with number(N) of students and the tested criteria Reliability(R), Validity(V), Education al effect(E), Acceptability(A) or Costs(C)

Author and year	N	Aim of study	Method and used analyses	Results index used	Purpose OSCE used as tool for:	Criteria R, V, E, A, C
Ogawa et al. 2003 (52)	18	Description of two OSCEs to test improvement of communication skills	Comparison of two OSCEs, comparison of items. Wilcoxon rank sum test, and Spearman correlation	Wilcoxon rank Spearman correlation	Benefit to the students	none
Gerrow et al. 2003 (53)	2317	To compare concurrent validity of written exam and OSCE in the National Dental Examining Board (NDEB)	Spearman correlation between scores of final year exam and OSCE in written exam in certification exam. Top 50% of students compared in the OSCE	Spearman correlation coefficient KR20 0.69-0.74 No students in the top 50 percent of their class at any faculty failed the NDEB OSCE	Licensing examination	Validity and Reliability
Licari and Knight, 2003 (29)	?	Mentioning an OSCE		none	Verifying competence	none
Amano et al.2004 (54)		Evaluating training of standardized patient for OSCE	Spearman correlation between the scores of the new SP and the instructors in the OSCE	Spearman correlation coefficient	Feedback to students	Interrater Reliability.

The place of the OSCE in an assessment program seems to fit to test the “Shows how”, of the Pyramid of Miller, when the student applies his basic knowledge and his developing clinical reasoning in this simulated context of the examination.

Review of the OSCE literature in dental education

The OSCE is extensively described and researched in medical education (413 studies cited in PubMed). In a Medline search in pediatrics Carracio & Englander (42) concluded that with appropriate attention to design, acceptable reliability and validity can be achieved for the OSCE. An international conference on the assessment of clinical competence was devoted to descriptions of applications and evaluations of OSCEs (43). Barman (44) concluded in a review of the literature from 1975-2004 that the OSCE in medical education can be a reasonably reliable, valid and objective method of assessment, but its main drawback is that it is resource-intensive. However, a search in PubMed about the OSCE in dental education showed only 13 articles. In Table 1 these studies are presented. *How are the desirable criteria for clinical assessment tested in research on the OSCE in dental education? Is there evidence for a defensible use of the OSCE for different purposes in dental education? We applied the model of utility of assessment methods to evaluate this.*

The utility of the dental OSCEs cannot be judged from the brief reports of their application in dental literature. However, for those schools, that want to implement an OSCE these articles might be helpful. The first OSCE for dental students was mentioned in a study about the evaluation of a course in Lagos in Africa, where the medical and dental students were both assessed by an OSCE. In the USA and Canada, the dental OSCE was implemented around 1994. In Canada the OSCE is part of the National Dental Examining Board since 1994. Gerrow et al.(46) mentioned the use of the OSCE in 1997. This OSCE is a case-based examination consisting of twenty-five stations each with a case history, photographs, models, or casts. At each station, candidates consider the case and answer four, single-correct answer, multiple-choice questions. More recently, OSCEs are developed to test observed behaviour of dental students, and this type of OSCE was well introduced into the curricula of a number of dental schools (34, 38).

The introduction of new methods can evoke resistance. There was a debate in the UK about the scope of the OSCE (49, 55) Some authors were worried about ignoring the testing of the operative skills, while others cared about the competences, that were not tested before. This discussion highlights the need for evaluation and validation of new assessment methods. While the OSCE is useful in the examination of diagnostic, interpretation and treatment planning skills, it has apparent limitations in the examination of invasive irreversible operative procedures.

The prolonged use of dental OSCE's in pedodontics in the USA has been described by Zartman et al.(51). They discussed the use of the OSCE and reviewed the process of incorporating their OSCEs into a curriculum. In Japan the communication competence of dentists in a postgraduate course are tested with an OSCE (52). In the implementation of a new curriculum the OSCE was mentioned (29) as assessment of clinical competence in an integrated dental practice.

More evidence for the utility of the dental OSCE can be concluded from the results of the following studies on elements of the desirable characteristics of an OSCE. With respect to

“Acceptability”, Davenport et al. (34) described the positive attitudes of staff and students towards the OSCE. A second study by Manogue & Brown (38) described the implementation of the OSCE in the UK and measured a positive perceived usefulness. Finally Mossey et al. (49) evaluated the acceptability of the OSCE of their students through a questionnaire. With respect to the “Reliability”, in 3 studies on OSCEs the “Reliability” was tested using the r coefficients of internal consistency of a test. Cronbachs α was reported twice (34, 47). Gerrow et al. (53) reported reliability with KR20. Interrater reliability was investigated with Mann Whitney test by Ogden et al. (48) to test the reliability of dental students as examiners. Also Amamo et al.(54) reported interrater reliability, he used Spearmans correlation to evaluate the training of standardized patients in an OSCE. With respect to “Validity”, Gerrow et al. (53) studied concurrent validity of a written exam and an OSCE for the Board examinations by correlating these exams with the final year results of the dental school program for 2317 Canadian students from 9 dental schools. The results of this study confirmed the concurrent validity of both parts of the National Dental Examining Board. The study by Brown et al. (47) analysed extensively validity evidence: the intrinsic validity, face validity, concurrent validity, predictive validity of a dental OSCE with 49 students. In this study blueprinting was used as tool for establishing content validity. Finally Boone et al. (50) used Rasch methods to carefully selecting the items of an OSCE.

As can be concluded from this review, too little is known about the utility and value of the OSCE in dental education.

General Aim, research questions, and outline of the thesis

The general aim of the present thesis is therefore to investigate the use of the OSCE in the assessment of clinical competences of dental students.

In order to meet this aim seven specific research questions were formulated on aspects of the utility of assessment methods: the acceptability (A), the educational effect (E), the validity (V), the reliability (R) and standard setting as part of validity.

More evidence is needed for the implementation and acceptability of the dental OSCE. For a valid OSCE the participation of staff in the development is desirable. However, change in education is difficult and can easily create resistance. 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. In this way the OSCE will be as well as more valid, as more accepted. This is formulated in the first research question:

1. Will an implementation strategy based on participation, information, and commitment be effective and will attitudes change positively towards the OSCE? (Chapter 2)

Although it is generally assumed that assessment drives learning, this relationship has not been much studied in medical education, possibly because it is highly context dependent (56). Likewise, in dental education, the effect of a change in clinical assessment methods on students’ learning strategies has not yet been studied empirically. In other words, there are no studies about the

educational effect of the OSCE in dental or medical education. Assessment drives learning, but how can that be studied? During a change in curriculum there is an opportunity to study this question:

2. Will the implementation of the OSCE in dental education improve students' learning of clinical competence? (Chapter 3)

The validity of the OSCE can be threatened by bias. In the EU with open borders, and free movement of people, there is a barrier in communication because of the different languages used. Effective communication is a key issue in both education and healthcare. One of the factors of communication is language proficiency. For example, limited language proficiency can be a barrier in gaining academic success. It has been shown that, the lower the level of foreign language proficiency the more important a factor it becomes in determining academic success in foreign students (57, 58) Furthermore, the quality of communication between patients and clinicians can have a major impact on the quality of care and treatment outcomes (59, 60).

In medical education, language difficulties might have an influence on the performance on the OSCE (61). How objective is the dental OSCE or is there intrinsic bias because of language abilities of non-native students? In dental literature no study on the bias caused by language problems has been reported. This problem brings two research questions:

3. What is the relation of the language ability of the non-native students with their performance in the dental OSCE? (Chapter 4)
4. Will the lengthening of the time of an OSCE test-station enhance the performance of non-native dental students? (Chapter 4)

How can we be sure that we make reliable decisions, when we assess our students with an OSCE? How many stations do we need for a reliable decision about passing and failing students after an OSCE? There are studies about the reliability of the OSCE in dental education, but these did not reveal the number of stations necessary for a reliable decision after a summative OSCE in dental education. When testing larger numbers of students the OSCE has to be delivered on different days of the week. Is this effect of delivering an OSCE on different days influencing the reliability? These issues are formulated in the questions:

5. Does a dental OSCE administered over multiple days result in reliable passing scores? (Chapter 5)
6. How many stations in a dental OSCE are required for a sufficiently reliable decision about the student's performance? (Chapter 5)

If the OSCE is used as a summative examination, this will emphasize for the determining of the pass mark and the development of reliable and defensible criteria and cut scores of the OSCE (22, 62). OSCE standard-setting procedures in medical education are not well developed. But how can we make the right pass/fail decision? Competent students should pass and incompetent students should fail, that dilemma creates the need for more evidence about the standard setting procedure of OSCEs.

7. Which standard setting method is the optimal instrument to prevent that incompetent students pass and competent students fail a dental OSCE?(Chapter 6)

Finally Chapter 7 summarizes and interprets the main findings of the studies of this thesis in the context of the research questions posed here, and offers suggestions for further research on clinical assessment and OSCE in dentistry.

Most chapters of this thesis are published as articles, and therefore some duplication in the introductions of each chapter will be inevitable.

The students in dental education are male and female, nowadays there are even more female than male students. In this thesis, when indicate a student as “he”, also “she” is intended.

References

1. Vleuten van der CPM, Dolmans DHJM, Scherpbier AJJA. The need for evidence in education. *Med Teach* 2000;22(3):246-250.
2. Hagers, M. Minister Plasterk is missing solid educational research (in Dutch: Minister Plasterk mist goed onderwonderzoek : Kluitjesvoetbalbeleid). *NRC Handelsblad*. Rotterdam, 2007:14th October.
3. Chambers DW. Toward a competency-based curriculum. *J Dent Educ* 1993;57:790-793.
4. Rohlin M, Petersson K, Svensäter G. The Malmö model: a problem-based learning curriculum in undergraduate dental education. *Eur J Dent Educ* 1998;2(3):103-114.
5. Whitman N. A review of constructivism: understanding and using a relatively new theory. *Fam Med* 1993;25(8):517-521.
6. Schuwirth LW, Van der Vleuten CP. Changing education, changing assessment, changing research? . *Med Educ* 2004;38(805-812).
7. Glaser R. Toward new models for assessment. *Intern J Educ Res* 1990;14:475-483.
8. Colliver JA. Constructivism: The View of Knowledge That Ended Philosophy or a Theory of Learning and Instruction? *Teach Learn Med* 2002;14(1):49-51.
9. Chambers, D. Preliminary evidence for a general competency hypothesis. *J Dent Educ* 2001;65(11):1243-1252.
10. Chambers DW, Gerrow J. Manual for Developing and Formatting Competency Statements. *J Dent Educ* 1994;58:361.
11. Yip H, Smales R. Review of competency-based education in dentistry. *Br Dent J* 2000;189(6):324-327.
12. Chambers DW. Portfolios for determining initial licensure competency. *J Am Dent Assoc* 2004;135(2):173-184.
13. Wass V, Van der Vleuten C, Shatzer J, Jones R. Assessment of clinical competence. *Lancet* 2001;357:945-949.
14. Brown G, Bull J, Pendlebury M. *Assessing Student Learning in Higher education*. London: Routledge; 1997.
15. Carotte PV. The assessment of dental students- a university education? *Br Dent J* 1993;175:220-223.
16. Brown S, Knight P. *Assessing Learners in Higher Education*. London: Kogan Page, 1994.
17. Snyder B. *The hidden curriculum*. New York: Knopf, 1971.
18. Rowntree D. *Assessing students – how shall we know them*. London: Kogan Page, 1987.
19. Jones M L, Hobson R S, Plasschaert A J M, Gundersen S, Dummer P , Roger-Leroi V, Sidlauskas A, Hamlin J. Quality assurance and benchmarking: an approach for European dental schools. *Eur J Dent Educ* 2007;11(137-143).
20. Rohlin M, Schaub RM, Holbrook P, Leibur E, Lévy G, Roubalikova L, Nilner M, Roger-Leroi V, Danner G, Iseri H, Feldman C. Continuous quality improvement. *Eur J Dent Educ* 2002;6 Suppl 3:67-77.
21. Wilson H J, Ayers K M. Using significant event analysis in dental and medical education. *J Dent Educ* 2004;68(4):446-453.
22. Kramer A, Muijtjens A, Jansen K, Dusman H, Tan L, van der Vleuten C. Comparison of a rational and an empirical standard setting procedure for an OSCE. *Med Educ* 2003;2(Feb):132-139.
23. Harden RM, Gleeson F. Assessment of clinical competence using an objective structured clinical examination(OSCE). *Med Educ* 1979;13:41-54.
24. Rohlin M, Manogue M. Assessment of dental students' competence. *Dentomaxillofacial Radiology* 2000;29:4-6.
25. Van der Vleuten CPM. The assessment of professional competence: Developments, research and practical implications. *Adv Health Sci Educ* 1996;1:41-67.

26. Downing, SM. Validity: on the meaningful interpretation of assessment data. *Med Educ* 2003;37(9):830-837.
27. Berrong JM, Buchanan RN, Hendricson WD. Evaluation of practical clinical examinations. *J Dent Educ* 1983;47(10):656-663.
28. Robertello FJ, Pink FE. The effect of a training program on the reliability of examiners evaluating amalgam restorations. *Oper Dent* 1997;22(2):57-65.
29. Licari FW, Knight GW. Developing a group practice comprehensive care education curriculum. *J Dent Educ* 2003;67(12):1312-1315.
30. Gerrow JD, Boyd MA, Doyle G, Scott D. Clinical evaluation in prosthodontics: Practical methods to improve validity and reliability at the undergraduate level. *J Prost Dent* 1966;76(6):675-680.
31. Manogue M, Brown G, Foster H. Clinical assessment of dental students: values and practices of teachers in restorative dentistry. *Med Educ* 2001;35(4):364-370.
32. Manogue M, Kelly M, Bartakova Masaryk S, Brown G, Catalanotto F, Choo-Soo T, Delap E, Godoroja P, Morio I, Rotgans J, Saag M. 2.1 Evolving methods of assessment. *Eur J Dent Educ* 2002;6(s3):53-66.
33. Miller GE. The assessment of clinical skills/competence/performance. *Acad Med* 1990;65(9 Suppl):S63-S67.
34. Davenport ES, Davis JE, Cushing AM, Holsgrove GJ. An innovation in the assessment of future dentists. *Br Dent J* 1998;184:192-195.
35. Schuwirth L, van der Vleuten C. Merging views on assessment. *Med Educ* 2004;38:1208-1211.
36. Chambers DW. Faculty ratings as part of a competency-based evaluation clinic grading system. *Eval Health Prof* 1999;22(1):86-106.
37. Tennant M, Scriva J. Clinical assessment in dental education: a new method. *Austr Dent J* 000;45(2):125-130.
38. Manogue M, Brown G. Developing and implementing an OSCE in dentistry. *Eur J Dent Educ* 1998;2(2):51-57.
39. Newble DI, Swanson DB. Psychometric characteristics of the objective structured clinical examination. *Med Educ* 1988;22(4):325-334.
40. Roberts J, Norman G. Reliability and learning from the objective structured clinical examination. *Med Educ* 1990;24(3):219-223.
41. Swanson DB, Norman GR, Linn RL. Performance-based assessment: lessons from the health professions Educ researcher 1995;24(5):5-11.
42. Carraccio C, Englander R. The objective structured clinical examination: a step in the direction of competency-based evaluation. *Arch Pediatr Adolesc Med* 2000;154(7):736-741.
43. Harden RM, Hart IR, Mulholland H, eds. Approaches to the Assessment of Clinical Competence parts I and II. Proceedings of The fifth International Ottawa Conference. Norwich: Page brothers, 1992.
44. Barman A. Critiques on the Objective Structured Clinical Examination. *Ann Acad Med Singapore* 2005;34(8):478-482.
45. Adeyemi-Doro HO, Bamsaiye A. A new course in basic therapeutic skills for medical and dental students at the College of Medicine, University of Lagos: student evaluation. *Med Educ* 1983;17(6):354-359.
46. Gerrow JD, Boyd MA, Duquette P, Bentley KC. Results of the National Dental Examining Board of Canada written examination and implications for certification. *J Dent Educ* 1997;61(12):921-927.
47. Brown G, Manogue M, Martin M. The validity and reliability of an OSCE in dentistry. *Eur J Dent Educ* 1999;3(3):117-125.
48. Ogden GR, Green M, Ker JS. The use of interprofessional peer examiners in an objective structured clinical examination: can dental students act as examiners? *Br Dent J* 2000;189(3):160-164.
49. Mossey PA, Newton JP, Stirrups DR. Scope of the OSCE in the assessment of clinical skills in dentistry. *Br Dent J* 2001;190(6):323-326.
50. Boone WJ, McWhorter AG, Seale NS. Purposeful assessment techniques (PAT) applied to an OSCE-

- based measurement of competencies in a pediatric dentistry curriculum. *J Dent Educ* 2001;65:1232-1237.
51. Zartman RR, McWhorter AG, Seale NS, Boone WJ. Using OSCE-based evaluation: curricular impact over time. *J Dent Educ* 2002;66(12):1323-1330.
 52. Ogawa T, Taguchi N, Sasahara H. Assessing communication skills for medical interviews in a postgraduate clinical training course at Hiroshima University Dental Hospital. *Eur J Dent Educ* 2003;7(2):60-65.
 53. Gerrow JD, Murphy HJ, Boyd MA, Scott DA. Concurrent validity of written and OSCE components of the Canadian dental certification examinations. *J Dent Educ* 2003;67:896-901.
 54. Amano H, Sano T, Gotoh K, Kakuta S, Suganuma T, Kimura Y, Tsukasaki H, Miyashita H, Okano T, Goto N, Saeki H. Strategies for training standardized patient instructors for a competency exam. *J Dent Educ* 2004;68(10):1104-1111.
 55. Walmsley AD, Manogue M, Brown GA. Scope of the OSCE. *Br Dent J* 2001;191(3):116-117.
 56. Van der Vleuten CPM, Schuwirth LWT. Assessing professional competence: from methods to programmes. *Med Educ* 2005;39(3):309-317.
 57. Vinke AA, Jochems W. English Proficiency and Academic Success in Engineering Education Delft: Studies in Communication and Education Technische Universiteit 1992.
 58. Graham JG. English Language Proficiency and the Prediction of Academic Success. *TESOL Quarterly* 1987;21(3):505-521.
 59. Stewart M, Brown JB, Boon H, Galajda J, Meredith L, Sangster M. Evidence on patient-doctor communication. *Cancer Prev Control* 1999;3(1):25-30.
 60. Anderson LM, Scrimshaw SC, Fullilove MT, Fielding JE, Normand J. Culturally competent healthcare systems. A systematic review. *Am J Prev Med* 2003 24(3 Suppl):68-79.
 61. Wass V, Roberts C, Hoogenboom R, Jones R, Van der Vleuten C. Effect of ethnicity on performance in a final objective structured clinical examination: qualitative and quantitative study. *BMJ* 2003;326(7393):800-803.
 62. Wilkinson TJ, Newble D I, Wilson P D, Carter J M, Helms R M. Development of a three-centre simultaneous objective structured clinical examination. *Med Educ* 2000;34(10):798-807.