

### **CURRICULUM STRUCTURE, CONTENT, LEARNING AND ASSESSMENT IN EUROPEAN UNDERGRADUATE DENTAL EDUCATION**

#### **Appendix 2 - Assessment**

##### **Introduction**

Undergraduate dental education aims to produce safe, competent and ethical practitioners equipped with the necessary knowledge, skills and behaviours (attitudes) appropriate to engage in the independent practice of dentistry. The purpose of assessment in dental education is to make decisions on student's progression towards becoming a competent dentist. As it is widely accepted that assessment drives learning (1) a strategic approach to assessment should be in place.

The goal of an effective assessment strategy should be that it produces aligned qualitative assessment throughout the programme of study. Students and staff should be fully engaged in the development and realisation of assessments. The outcome and evaluation of assessment should provide the springboard for students to adopt a positive approach to effective independent practice and reflective life-long learning after graduation.

All assessment procedures should be timely, meaningful, transparent and appropriate. They should be based upon the learning outcomes of the individual programme / course, so that academic and clinical student activity is directed towards those desirable outcomes. All dental schools should be encouraged to clearly present the purposes and processes associated with their assessments so that students and staff are fully informed.

##### ***Assessment and learning***

The assessment process is often considered as the hidden curriculum (2). The unintended effects of assessment include the tendency to study very hard just before examination and substitute superficial knowledge for desired reflective learning (3). Individual assessments should map to an over-arching assessment strategy and individual tests should be developed in a way that learning outcomes are demonstrated. The challenge is how to design an assessment process that fulfils all the criteria (4).

##### ***Goals of assessment***

Assessment may be formative, to guide future learning or shape values; or summative, to make a judgment about competence at a defined level or fitness for further learning (e.g. post-graduate education) (1)(2). Clearly, summative assessments are essential in monitoring student progression within the programme; formative assessments are critically important in developing student insight into a range of issues.

##### **Developing an assessment instrument**

##### ***Criteria***

The principles on which student clinical, oral and written performance are graded should be defined and should use agreed criteria. These criteria should reflect the fundamentals which all answers, performances and behaviours should demonstrate. Effective

assessments are developed using a blueprint that assesses different domains of learning and clinical skills at the level appropriate to the stage in the programme. Bloom (5)

developed a taxonomy with different categories of learning outcomes with each category divided in classifications. The three categories are:

Cognitive outcomes

Affective learning outcomes

Psychomotor outcomes

The classifications for cognitive learning goals are: remember, understand, apply, analyse, evaluate, and create (fig 1).

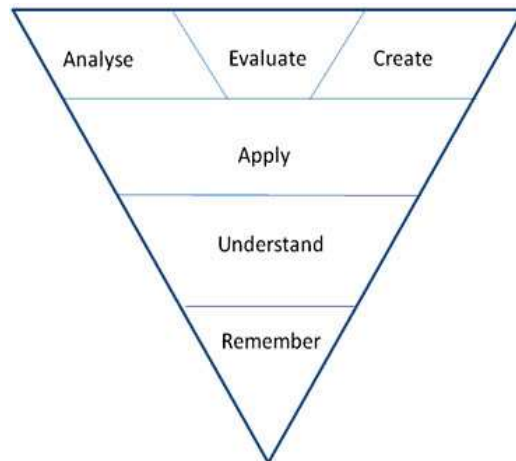


Figure 1 Categories in the cognitive domain of Bloom's Taxonomy (6)

The taxonomy is hierarchical; each level is subsumed by the higher levels. In other words, a student functioning at the 'application' level has also mastered the material at the 'knowledge' and 'comprehension' levels. When developing an assessment instrument, different levels of the taxonomy should be included in the assessment criteria.

To illustrate students' understanding of a subject, the SOLO (Structure of Observed Learning Outcomes) taxonomy may be helpful in identifying superficial or deep learning approach (7). The use of the SOLO taxonomy would require that it be introduced to students in the learning environment prior to examination. This would afford students an opportunity to develop their meta-cognition (or "knowing about knowing", for example knowledge about when and where to use particular strategies for learning) (8) and demonstrate this in the assessment. Such an approach must be revisited in post-assessment feedback.

### **Choosing an assessment method**

A number of assessment methods have been described to address different areas of student competence. Traditional methods were direct observation, oral assessment, case problems, essays, short answer questions and multiple choice questions. While many of these assessment methods are still used, they have now come to be replaced

and/or supplemented with additional assessment methods including objective structured clinical examinations (OSCEs), computer-based assessment, portfolios, multiple clinical observations (structured), reflective practice assignments and self-assessed questions (9).

The Objective Structured Clinical mode of examination (OSCE), for example, whilst no panacea for clinical assessment in dentistry, has many attributes that recommend its adoption for assessment of certain elements of competence (e.g. communication skills assessment or data interpretation, infection control) (10).

Different skills need different assessment types (11). An examination to test knowledge could use a multiple choice examination, but if one wants to test competence in patient care another instrument is needed. Miller (12) described this in a pyramid (fig 2). In this pyramid, assessment moves from the “knows” stage (multiple choice) via “knows how” (paper and computer simulations) and “shows how” (performance simulations such as the OSCE) to the final “does” level of habitual performance in day-to-day practice of patient care.

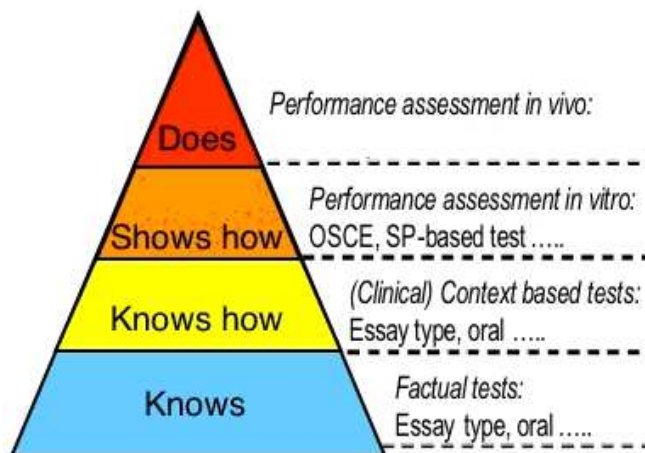


Figure 2: Miller's pyramid framework for clinical assessment of competence

### **Reliability: Sampling and inter-rater calibration**

It is simply not possible for ‘everything’ to be covered or assessed. Decisions must be taken that identify the sampling methodology to be used so that a broad enough sample is taken which can predict that the competent students will pass and the poor students will fail. The predominant condition affecting the reliability of assessment is domain - or content-specificity, because competence is highly dependent on context or content. This means that it will only be possible to achieve reliable scores if a large sample across the content of the subject to be tested is used (13). To ensure agreement between raters, attention should be given to the issue of staff development and the limitation of inter-assessor variability, through training opportunities and acknowledgement that inconsistencies should be minimised. Although training can reduce this effect, careful sampling across those conditions as examiners and patients is equally essential. With intelligent test designs, which sample efficiently across conditions (such as using different examiners for each station in an OSCE), reliable scores will generally be obtained within a reasonable testing time.

### **Validity: blueprint (matrix) and authenticity**

In order to ensure valid integral assessments, dental schools can design an assessment matrix, or blueprint, that ensures that all the competencies that are required are also assessed in the curriculum. The context in which a student learns and is assessed is shaping his learning. Therefore, the validity of any method of assessment could be improved substantially if assessment designers respect the characteristic of authenticity.

### **Standard setting**

Standard setting is a judgmental process, often with arbitrary decisions about what is 'good enough'. The use of standard setting methods helps to ensure that decisions or classifications are based on non-arbitrary explicit criteria, which are combined in a systematic, reproducible, objective and defensible manner (14). Standards can be categorised as either relative (norm-referenced) or absolute (criterion-referenced). In summative assessments the decision on passing or failing asks for an absolute passing score. A passing score can be calculated when a standard has been set. Different methods of standard setting can be used. In the Angoff standard setting procedure (15), judges are asked to review each item in a test and to estimate 'the probability that the 'minimally acceptable candidate' would answer (or do) an item correctly'. In the Borderline regression method the pass/fail standard is determined by judgment of the performance of individual students relative to a performance standard based on overall test performance (14). For relative decisions, a percentage of the examinees that should pass will be determined: i.e. 75% must pass, regardless of their absolute performance.

### **Feedback**

Feedback must be provided for students following assessment, it should be clear and positive, to offer deeper insight into strengths and weaknesses. The purpose of assessment is to stimulate learning and this requires formative feedback that encourages self-reflection and provides strategies for improving performance (3,16). Feedback can then stimulate continuation of the undergraduate learning process and future life-long learning (17). Indeed, the word 'assessment' is derived from the Latin *ad sedere*, "to sit down beside", emphasising the centrality of feedback in effective assessment.

As dental curricula are revised to provide more integration in design, so assessment practices should change to reflect that nature (alignment). It is not good practice to encourage integrated learning through thematic delivery, only to assess according to pre-existing subject domains. In other words, the assessments should be matched to the content, and to the learning outcomes overall i.e. constructive alignment. It is advisable to use multiple sources of information from various assessment methods to construct an overall judgment by triangulating information across these sources (4).

Finally, assessment should be trustworthy and take place in a non-threatening environment. Challenges for the coming decade are to develop instruments in undergraduate dental education for the assessment of professional behaviour, teamwork and performance during patient care. (18, 19)

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## Task Force II, Appendix 2 – Assessment. 2010 Update

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