IN BRIEF

- Learning outcomes are not an end in themselves but the basis of the educational programme
- In an outcome-based approach, decisions about student selection, curriculum planning, teaching, learning and assessment should be driven by the agreed learning outcomes.
- Harden's three-circle model, adapted for dentistry to specify learning outcomes, offers an attractive and effective model to support student selection, curriculum planning, teaching, learning and assessment.

Applying learning outcomes to dental education

J. D. Clark,[1] L. J. Robertson[2] and R. M. Harden[3]

Increasing emphasis is being placed in dentistry, as in other areas, on outcome-based education and on the specification of learning outcomes. An earlier paper by the same authors described the adaptation for dentistry of Harden's medical three-circle model to specify learning outcomes. This paper shows how learning outcomes can be applied in dental education, in particular in the areas of student selection, curriculum planning, teaching, learning and assessment.

INTRODUCTION

The definition of learning outcomes and an outcome-based approach to education is neither a new concept nor a passing phase. Learning outcomes focus on the end product and define what the learner is accountable for. The approach is equally applicable throughout the educational continuum in dentistry from undergraduate to postgraduate training.[1,2,3]

The General Dental Council[4] has adopted the three-circle model described by Harden *et al.*[5] (Figure 1) to specify and summarise learning outcomes in undergraduate education. A modification of this framework to meet the specific needs in dentistry has been described by Clark *et al.*[6] and is an attractive model to encapsulate the learning outcomes identified in the *First Five Years* and beyond, into postgraduate education.

[1*]Consultant Orthodontist, Tayside University NHS Trust, [2]Curriculum Development Officer, Dundee Dental Hospital and School, Park Place, Dundee, DD1 4HN [3]Director of the Centre for Medical Education, University of Dundee, and Director of the Scottish Council for Postgraduate Medical and Dental Education's Education Development Unit, Taypark House, Perth Road, Dundee
[*]Correspondence to: Mr J. D. Clark, Consultant Orthodontist, Tayside University NHS Trust, Dundee Dental Hospital and School, Park Place Dundee DD1 4HN
Email: john.clark@tuht.scot.nhs.uk

Refereed Paper
Doi:10.1038/sj.bdj.4811084
Received 22.04.03; Accepted 12.11.03
© British Dental Journal 2004; 196: 357–359

The model offers an effective and user-friendly format based on the three dimensions of the work of a dentist. What the dentist is able to do ('doing the right thing'), how the dentist approaches their practice ('doing the thing right'), and the dentist as a professional ('the right person doing it'). However, outcomes are not an end in themselves but the basis of the educational programme. In an outcome-based approach, decisions about student selection, curriculum planning, teaching, learning and assessment should be driven by the agreed learning outcomes.

This paper describes how the three-circle model can be applied in dentistry, in particular in the areas of student selection, curriculum planning, teaching, learning and assessment.

LEARNING OUTCOMES AND STUDENT SELECTION

At present the fundamental pre-requisite for selection is academic ability, but this is only part of being a dentist – there are

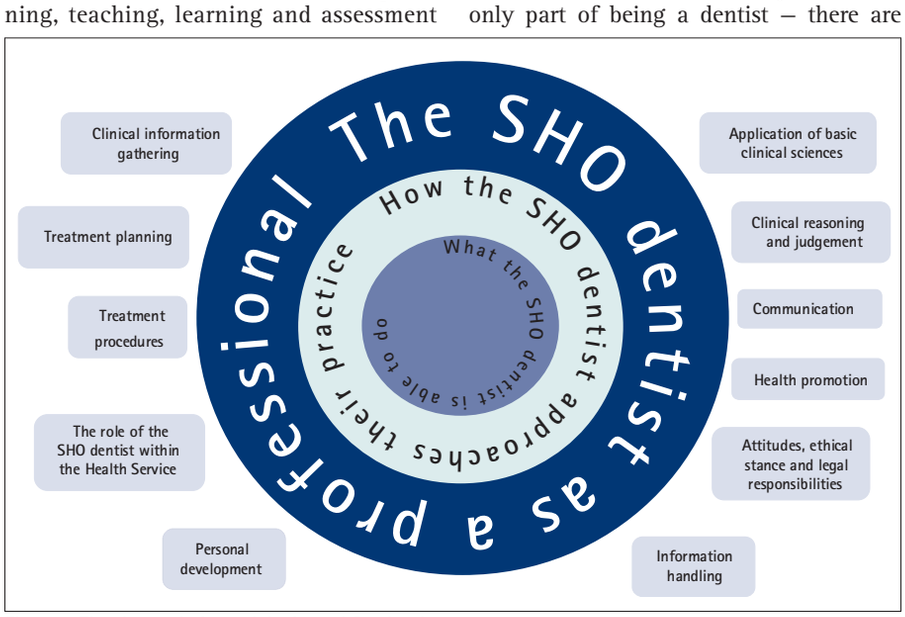

Figure 1 The three-circle model adopted for dentistry

other important aspects such as practical, communication and interpersonal skills which should also be considered. Despite the fact that some are more difficult to assess than others, an attempt should be made to take them into account and to establish minimum standards for each of the three dimensions in the selection process. Appropriate evidence to support these should be agreed before selection and looked for at interview.

This is consistent with the general view that selection of students should be based on wider criteria than academic criteria alone. If students are selected without reference to the full range of learning outcomes, it should not be surprising that some may still have major deficiencies in their abilities by the end of their training.

CURRICULUM PLANNING

Planning and implementing the curriculum within an institution is a multi-faceted and important responsibility for everyone involved. The process is becoming more complex with the introduction of a variety of learning opportunities such as electives and special study modules and an emphasis on a student-centred approach to learning.

Harden and Crosby[7] have identified many issues that need to be addressed in curriculum planning. These include; the needs that the curriculum should meet, expected learning outcomes, content and organisation, educational strategies, teaching methods, assessment procedures, communication about the curriculum to staff and students, educational environment and the procedures for managing the curriculum. The simplicity of the three-circle model, with the learning outcomes clearly identified, helps curriculum planners to review and address these issues, simplifying the management and organisation of the course.

The contribution of the elements that make up a particular outcome throughout each year of the curriculum can be identified clearly and the contribution that each learning outcome makes to the whole can be traced through the course. What matters, for example, is not the academic understanding of the student at the end of their early years of the course but the application of their knowledge in subsequent years in the context of, for example, the operative techniques in the laboratory and in the clinic with their own patients.

The progression of a learning outcome in a vertically integrated curriculum, with learning outcomes from the early part of the curriculum reinforced later, is emphasised. An example of this would be learning how to obtain consent from a patient for different procedures. The subject may be covered in an introductory law and ethics lecture course in the first year, observed by the student during chair-side teaching during the first clinical year and subsequently practised under supervision for a variety of procedures until assessed (perhaps by means of a check-list) until found to be competent. In the final year there might be small group teaching using case studies based on complex scenarios to reinforce previous learning and to develop further understanding.

A transparent curriculum with the learning outcomes specified to inform both students and teachers about the content promotes a student-centred approach to teaching, which focuses on the needs of the student rather than a teacher-centred approach where the teacher may be tempted to place greater emphasis on what they prefer to teach.

The contribution of electives and special study modules to the curriculum is at times uncertain. Their role is clarified by making explicit the learning outcomes for these components of the course. A learning contract can be agreed and subsequently verified by the student's report, describing how these outcomes have been accomplished.

Specification of the learning outcomes for the different phases of education, emphasises the continuum of dental education, and the transition from one phase to the next is easily monitored. The application of the framework to the range of postgraduate education, including vocational training, general professional training and specialist training, facilitates a meaningful dialogue between undergraduate curriculum planners and vocational or general professional trainers.[6]

LEARNING OUTCOMES AND THE TEACHER

The move towards a more student-centred view of learning has required a fundamental shift in the role of the teacher. Harden and Crosby[7] have summarised the diverse activity of the contemporary teacher: this includes information provider, role model, facilitator, assessor, and curriculum and resource planner. It is no longer possible for each teacher to have a complete understanding of the whole dental curriculum or to have the range of skills to deliver it. However, it is very important for all teachers to have an overview of the curriculum and an in-depth understanding of their contribution and the particular skills they bring to the students' learning. This is particularly true for teachers who are increasingly involved in the context of outreach clinics and who may feel remote from the dental school. The three-circle learning outcome model provides such an overview.

The teacher can see more easily how each course contributes to the curriculum and can verify that all outcomes are covered. Teachers can be allocated efficiently to tasks, avoiding the possibility of duplicating responsibilities. For example, one individual might assume the responsibility for co-ordinating a particular outcome, such as cross infection control, throughout the curriculum.

LEARNING OUTCOMES AND THE STUDENT

Harden and Crosby[7] have noted the increasing emphasis on student autonomy in medical education, which, as in dental education, has moved the centre of gravity away from the teacher and closer to the student who now has more responsibility for his/her own learning. It is also recognised that students have different approaches to learning and a variety of learning styles.

These changes make it all the more important for the student to have a clear understanding of the learning outcomes and the different opportunities available to achieve them. The three-circle model can be used by the student in the course to clarify where, when and how a learning outcome should be addressed and when it is assessed, thereby emphasising a student-centred approach to learning and providing the student with an 'advanced organiser' which they can use to plan their learning.[8] By mapping learning opportunities to outcomes, the student can choose appropriate learning methods to achieve them, thereby facilitating the learning process. The student is also able to see how learning opportunities, for example an operative techniques class, relate to the course outcomes. This is particularly important for learning opportunities such as problem-based exercises, special study modules and electives where the learning expectations are not always clear.

The progressive nature of learning is also emphasised by an outcome-based approach. The student is reminded of the need to revise earlier learning and apply it in a clinical context. For example, in earlier years, the student will acquire knowledge of the histology and histopathology of the dental pulp, which is the basis for the operative skills they will acquire later in the course.[9]

LEARNING OUTCOMES AND ASSESSMENT

The GDC have identified learning outcomes that define the product of undergraduate education, which they define as *'a caring, knowledgeable, competent and skilful dentist who is able, on graduation, to accept professional responsibility for the effective and safe care of patients, who appreciates the need for continuing professional development, who is able to utilise advances in relevant knowledge and techniques and*

who understands the role of the patients in decision making'.[5]

A key feature in outcome-based education is that the complete range of learning outcomes is assessed. This is of relevance to students, their teachers, and to the public.

The public must be satisfied that assessment correctly identifies students who meet the expected level of achievement or minimum standard of performance for all learning outcomes. At present there are still occasions when it is possible for students to compensate for relatively poor performance in one or other aspects of their training by performing better in other areas.

Assessment provides the student, (and their teachers) with feedback on the effectiveness of their learning (and their teaching) in terms of whether or not there is progression in the achievement of the learning outcomes. In this way the assessment can rapidly identify problem areas in the curriculum and can provide feedback to individual students.

Harden[10] has noted that the assessment of learning outcomes in medicine is a complex subject that has not kept pace with curriculum change and that there is still much research to be carried out. Dentistry is no different in this respect. The three-circle model can reduce some aspects of the complexity by providing a tool to develop an integrated, transparent, assessment system in which assessment is mapped to the range of learning outcomes and which is readily understood by students and staff alike. The specification of the learning outcomes provides a useful framework for planning and checking the relevance of assessments to demonstrate clinical and professional competence at different stages of the curriculum.

It is impossible to find a single assessment method that is, at the same time, fully valid, reliable, feasible and appropriate, reflecting real practice.[11] A range of techniques is required to match the outcome being assessed. These include essays, multiple choice and multiple short answer questions, (which assess knowledge), constructed response questions (which assess the application of knowledge), checklists, OSCEs and SCOTs, (which assess performance) and portfolios (which assess learning outcomes such as professionalism, not easily assessed by other methods).

By clearly identifying the learning outcomes that are to be assessed, the three-circle model provides a straightforward means of checking the relevance and timing of assessments, assisting their integration where appropriate and avoiding duplication. For example, some of the communication outcomes could be assessed at the same time as some of the outcomes relating to clinical skills. It will also help to ensure that all the learning outcomes are assessed, including the more difficult behavioural or attitudinal outcomes.

CONCLUSIONS

The process of education is becoming more complex in terms of content, staff involvement, educational strategies (such as problem-based learning), the use of new learning techniques (such as computer-based learning) and the demands of a more robust approach to assessment. Unless specified clearly, some learning outcomes may be ignored. The specification of learning outcomes can assist the teachers in the delivery of the curriculum and the students in their learning.

Despite the progress made in recent years with regard to outcome-based education, the concept will be new to many staff involved in delivering undergraduate dental education. Staff development will be a vital part of the process of moving to this form of education. Staff should be familiarised with the relevance of learning outcomes to student selection, curriculum planning, teaching, learning and assessment. The three-circle model provides staff with a clear, intuitive presentation of learning outcomes, which provides them with an overview of the curriculum, and the part they play in delivering the programme. It will also help them to be familiar with the methods of assessment used in their school. This may, in turn, encourage them to become involved in the design and development of assessment methods for the outcomes most relevant to them.

The three-circle model provides a useful and user-friendly means for both teachers and students to focus on the learning outcomes. It will assist curriculum planners and teachers to develop a programme in which the expected learning outcomes are achieved. It will also assist students to be more in charge of their own learning than previously was possible.

1. Spady W G. Organising for results: the basis of authentic restructuring and reform. *Educ Leadersh* 1988; **45:** 4-8.
2. Harden R M. Early postgraduate education and the strategy of the dolphins. *Med Teach* 1999; **21:** 365 - 369.
3. Harden R M. Developments in outcome-based education. *Med Teach* 2002; **24:** 117 - 120.
4. General Dental Council. *The First Five Years – a framework for undergraduate dental education.* 2nd ed. London: The General Dental Council, 2002.
5. Harden R M, Crosby J R, Davis M H. An introduction to outcome-based education. *Med Teach* 1999; **21:** 7-14.
6. Clark J D, Robertson L J, Harden R M. The specification of learning outcomes in dentistry. *Br Dent J* (in press).
7. Harden R M, Crosby J R. The good teacher is more than a lecturer: the twelve roles of the teacher. *Med Teach* 2000; **22:** 334-347.
8. Ausabel D P. *Educational psychology: a cognitive view.* New York: Rinehart and Winston, 1968.
9. Smith A J, Murray P E, Lumley P J. Preserving the vital pulp in operative dentistry: I. A biological approach. *Dent Update* 2002; **29:**64-69.
10. Harden R M. Progress in medical education. *Med Educ* 1996; **29 Suppl 1:** 79-82.
11. Dent J, Harden R M (Eds). *A practical guide for medical teachers.* Edinburgh, New York: Churchill Livingstone, 2001.