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The roadmap for quality improvement from traditional through competency based (CBE) towards outcome based education (OBE) in dentistry

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1. Introduction

Higher education globally has faced major face change over years, shifting from the traditional curriculum that was subject centred, teacher oriented, didactic towards a curriculum that is more learner centred, learner oriented, flexible, interactive, integrated, competency based, outcome based and gives ownership of learning to the students. As with other fields of higher education across the world, dentistry has also gone through these major curricular changes with the claim to improve learning, quality of education delivery and patient outcomes. The aim of this article is to review the roadmap of delivering quality dental education in India and globally, and its impact on learning outcomes as reported in literature.

2. Review of educational processes in healthcare curricula

2.1. Traditional curriculum

Traditional Curriculum is exam driven, where emphasis is greater on teacher led teaching. Here, the assessment is also instruction driven. The basic characteristic of this curriculum has been the incremental delivery of content[1] with the purpose of instilling knowledge and retention by the learners. It is hence more discipline based. The problems with this educational process is that the assessment scores could not be correlated or extrapolated to what performance the student will deliver in real situations. Also, there is no clear expectations of performance communicated to the student. As it is known that assessment drives learning, this system fails to expose the students to levels of critical thinking and decision making across variation in clinical situations which they might face in practice. It is suggested to inculcate only mechanical processes of learning content and skill in the learners.[1] Besides learner perspectives, the traditional curriculum also fails to respond to change in healthcare needs of the society.[1] There is also no provision of evaluation/defined measures of the curricular plans that can give evidence of effectiveness.

2.2. Competency based education (CBE)

At global platforms, there has been a shift in understanding of the terms 'knowledge and learning' within the context of curriculum in healthcare education. As thought of earlier it was assumed to be instructed by the teachers. But now, it has been thought of being 'constructed' by learners. This construction involves using self-directed capabilities to organize and synthesize what they read, link information, infer and then apply in practice. Based on this pedagogy of learning, there has been a shift from teacher-centred traditional didactic lecture based teaching to a student-centred learning environment.[2] With the aim of adopting such student centred learning environment, competency based curriculum was introduced, which could focus more on the expected learning outcomes of the dental graduate.

Across the world competency based education has been adopted by the different regulatory bodies of the subject.[3,4] The undergraduate curriculum regulations released by Dental Council of India also mentions the core competencies for a dental undergraduate in general and subject wise.[5] 'Competency' is a term that has developed as a concept over two decades, and was introduced in dental education in 1993 by Chamber.[6] Several definitions of 'competency' have also been introduced since then. The American Dental Education Association (ADEA) defines 'Competency' as: a complex behavior or ability essential for the general dentist to begin independent, unsupervised dental practice.[3] A systemic definition of Competency based education in medicine has been derived by Frank et al. through various reported research articles in literature.[7] They define it as: "… … an approach to preparing physicians for practice that is fundamentally oriented to graduate outcome abilities and organized around competencies derived from an analysis of societal and patient needs. It de-emphasizes time-based training and promises greater accountability, flexibility, and learner-centeredness".

The important facet of these definitions is the relationship they assume and predict in quality of professionals that graduate and the quality of care delivered to the society. This is because Competency includes knowledge, experience, critical thinking, problem-solving skills, professionalism, ethical values, technical and procedural skills.[3]

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Learning objectives as related to all these components are well defined in the Competency based curriculum, and are well communicated to teachers and students. Achieving competence in those objectives implies achieving the expected quality within. Hence for a successful implementation of Competency based educational process, well defined and mapped curriculum is essential. The Competency Based Curriculum should contain the defined competencies as a whole and also within specific disciplines, the process that would lead to attainment of these competencies and also a well-crafted assessment system to evaluate this attainment throughout the implementation. Hence, more emphasis is given on a continuous, formative assessment than end of course summative assessments. A very important element with the use of competency based curriculum is the 'Authentic assessment' that assesses the performance of the learner within real clinical situations.[2,6,8] All these aspects ensure quality of professional produced and the service he/she will render to the people/society.

2.3. Outcome based education (OBE)

Though the Competency Based Education has been observed to be successful at several places across the globe, an emerging and broader concept over it is the Outcomes based Education. Literature however, reports OBE not as a novel, paradigm shift in education, rather it has been viewed as a derivation of the best educational practices followed in the past.[9] It has been suggested to be conceived from several of the educational practices like, educational objectives approach, mastery learning, CBE, collaborative learning, Criterion referenced instruction and assessment.[9] OBE overlaps with these approaches, combining several of their good characteristics. What makes them differ from these approaches are: Whereas CBE/mastery learning may answer the question: what the professional should know, OBE offers to go an extra mile to answer additionally: why the professional should know OR in other words- Why the learner be proficient matters?

Spady identified ten important key components of OBE being outcomes-defined, having expanded opportunities for learners, performance 'credentialing', involves concept integration, instructional coaching, culminates achievement, characterised by 'inclusionary' success, cooperative learning, criterion validation and collaborative structures.[10]

To understand in simple words OBE approach is needs-driven, outcomes-driven, design-down approach, specifies outcomes and levels of outcomes, shifts focus from teaching to learning and provides a framework which is holistic in its outcomes. The learning objectives serve as a means of attaining goals/aims of the programme as whole, and the purpose is not just to achieve learning objectives per se. It follows the design-down and deliver-up approach implying, turning the curriculum upside down, that is starting from the endpoint-from the outcomes expected from the whole educational program. When planning instruction/pedagogy, teachers teach what students need to learn, to demonstrate these set outcomes. OBE differs from traditional education in assuming that all students cannot achieve the same level of learning in the same way and same duration. This however, will need extra efforts combating and adjusting instruction to the pace of learners. The holistic nature of the approach is reflected in the assessments as well. In fact, even the smallest unit of assessment must cover knowledge, skills and values in an integrated way as applicable in the healthcare practice[11] (Sana et al.). The assessment also will provide expanded opportunities to the learners to demonstrate attainment of outcomes and not just one.

OBE is based on a socio-constructivist approach, that is 'collaborative structures allowing for democratic inputs from the community.'[9] This characteristic makes it highly different from the past educational practices.

3. The road ahead for implementation

The limitations of traditional curriculum and comparative advantages of new concepts of CBE and OBE are quite evident from the review of these educational practices above. If the quality of healthcare delivered to the society is to improve, then the underlying educational practices involved in sculpting our learners also need to improve. This involves choosing the best model that works for the needs of the society. This need assessment has to be from all the stakeholders of dental education including the society. A task force may be established that assesses oral healthcare needs of the society, extracts the huge amount of data collected to provide a roadmap for curriculum development. Depending on the needs, the developers can choose from different educational practices-mastery learning/CBE/OBE and move towards implementation.

3.1. CBE implementation

A thorough implementation of Competency based education (CBE) in Dentistry with success needs:

- Delivering the concept across minds of administrators, faculty and students in a way that help them understand its rationale. This requires sensitisation through professional development programmes. Such programmes/modules can be reinforced by regulatory authorities of dental education, can be made mandatory to some extent or incentivised for participation. But the whole purpose of adoption fails if the executors themselves fail to realise the importance/rationale.
- Creating a blueprint of curriculum that includes identification of competencies, specific learning objectives aligned to each competency, the teaching–learning processes/pedagogical approach involved, learning resources that will aid in achieving and assessment methods/tools for evidence of attaining competencies. It should be a careful alignment of all components, rather than just the addition of newer assessment tools.[2] The learning objectives across subjects of dentistry should be integrated horizontally and vertically depending on the stage of the learner. The teachers need to shift to take role of facilitator, and become aware of instructional techniques/pedagogical approaches that are suitable to meet desired learning objectives by the learner. Assessment methods again should be designed/chosen to bring out a measure of desired competencies, preferably authentic. Competency based education emphasizes on the learning process rather than the teaching itself. It makes the teachers realise that learning evolves through different stages with each stage having its own specific/suitable strategy of instruction and evaluation.[8] For example, novice dental professionals may be introduced to metacognitive skills in earlier years of graduation, so that by the time they face clinical situations with complex decision making in third and final professional years, they are experienced and trained to use these skills for learning and performing. The pedagogical approach for this is introduction of *portfolios*.[12] Similarly 'early clinical exposure' in different aspects like dental material manipulation will aid in achieving competence during authentic evaluation during later years of graduation. Assessment, on similar terms can be designed for specific competencies with overlaps of cognitive, psychomotor and affective domains. Psychomotor skills may be assessed following the gradual hierarchy of Miller's pyramid.[13] Technology enhanced learning should be incorporated where suitable. Again, all these efforts first need capacity building of those involved in execution (administrators and faculty). ADEA (American Dental Education Association) has outlined competencies for the general dentist.[3] The document clearly shows the deviation from subject specific competencies to a more holistic, comprehensive approach of competencies for a dental graduate as a whole. Hence, shifting to CBE approach requires a complete revisit of the

traditional curriculum.[2]

➢ Implementation and evaluation of the curriculum. This involves the actual execution of the blueprint created and evaluation of the curricular program. Implementation is critical, as the efforts of creating the blueprint go in vain if not properly executed. It needs careful, planned and dynamic execution of all the curricular plans to be translated to lessons delivered by faculty as facilitators and the student as an active participant. Once the curriculum is implemented, it needs regular evaluation. The need of evaluation is supported by the facts that it will ensure quality. Curriculum evaluation brings out information to ensure learning objectives were met, standards of implementation were met and areas where remedial actions are needed. The policy makers and administrators need to take responsibility of implementation and evaluation process of curriculum. There are several models of curriculum evaluation which can be followed. Curriculum evaluation is discussed later in the article.

Within this well-defined Competency Based Curriculum, some of the concerns have been reported for incomplete adoption.[14] The reasons reported have been inconsistency in understanding of the construct of CBE, differential adoption across institutes/universities, differential acceptance between administrators, faculty members and students, difference in areas of application within educational programs and variation in perceived impact or benefit. Many of these concerns relate to Dental Education in India as well. So, mere identification of competencies within the curriculum does not serve the purpose of improving quality. Besides these concerns, assessment in CBE has also raised some concerns. There is also uncertainity over the role of 'minimal requirement' for different procedures-to be allocated weightage for promotion/passing or not.[15] Another controversy that is emerging is the authenticity of assessment.[14] Most of the tools for authentic assessment in CBE, like portfolios, assess the 'performance' of the individual, that is 'the act itself', rather than the 'competence (capability to perform)'. When the threshold of 'performance' is achieved by means of rubrics/checklist, the learner may not be motivated enough for the 'competence'. These facts place the actual rational of CBE on a backward foot. However, a different aspect to view this concern is the fact that competence being an integration of knowledge, skills, and attitudes, is difficult to be assessed separately under every component. Hence, there are still variations in understanding of the 'construct' of CBE, especially in dental education. CBE is considered to be a basic set of values and not a fixed process, and hence the variation is ought to follow. But what is needed is doing away with practices that violate this concept. For example, keeping competencies alongside basic minimum procedural requirements will do justice to neither of the ideologies.

3.2. OBE implementation

Within higher education across many disciplines OBE approach has been increasingly adopted within credit frameworks and by national quality and qualifications authorities such as the QAA (Quality Assurance Agency for Higher Education) in the UK, the Australia, New Zealand and South African Qualification Authorities. Its implementation follows similar principles as CBE.[16] As with any other curriculum development approach, OBE also needs a need assessment first.[11] This assessment should be able to identify all attributes of a health professional that our society needs at local and national levels. These may include attributes of a clinician, an oral healthcare provider, an academician and educationist, a leader and a manager in various aspects of delivering care to the society. These attributes of an oral healthcare professional will then direct the formation of institutional outcomes. Institutional outcomes are further broken down into more concrete expectations. The institutional outcomes lead to development of different program outcomes. These are clear, demonstrable statements of what a learner can be expected to know, understand and/or do as a result of his/her learning experience. Outcomes can also be explained as actions and performances of the learner reflect his competence in using content, information, ideas, and tools successfully. Program outcomes may vary depending on the level (undergraduate and postgraduate). Like the institutional outcomes, program outcomes are made more concrete by splitting them down into clear, specific competencies. Outcomes and competencies are the minimum standards which the professionals should be able to demonstrate. These lead to development of Curricular goals and instructional objectives. These goals and objectives are converted articulations at the student level. This is followed by identification of curricular content and its organisation and sequencing.

Spady suggested the critical domains of outcomes that can help in planning curriculum content and organisation.[10] These are:

- Literacy (tools for acquiring knowledge, skills, and attitudes (KSA), required to develop others competencies
- Content: Essential core knowledge, skills, attitudes without which performance is impossible
- Performance: Ultimate outcomes that graduates should be able to perform

The content organisation is followed by identification of appropriate teaching –learning strategies or experiences to be created in order to align backward with program and institutional outcomes. This is the real challenge which needs the transformation of the classes to actual workplace environment where learners can easily demonstrate the expected learning outcomes. OBE hence follows the gradual hierarchy of Miller's pyramid. What accompanies the teaching-learning strategies, as with any other curriculum development model is the choice of assessment methods, again with the aim of assessing demonstrable outcomes.

While developing a curriculum with OBE approach, one of the most important things that relates to its successful implementation is creating the right learning environment, that helps the students to engage in cooperative learning, practicing skills in expanded opportunities, and that allows integration of various concepts in practice setting. Information and communication technology (ICT) also is a part of OBE, enabling use of combination of virtual and real learning environments for learning.

The central theme of OBE are the learning outcomes and the curriculum is woven around to make the learner achieve the 'higher order thinking skills'. These skills enable the learner to perform under various settings and circumstances with precision. Such adaptive quality practice is what is needed for our healthcare providing environment. As with CBE, successful implementation needs sensitisation, training of those involved in development and implementation, and above all, evaluation of the conceived product.

3.3. Literature evidence for successful implementation

Literature provides examples of the implementation process of CBE and OBE in medical and dental curriculum. Several countries are introducing the concept of CBE into entire or specific parts of the curriculum even in some of the developing countries as well.[17,18] Same pattern of development, though less vigorous than CBE is observed for OBE implementation[10,19]

4. Educational evaluation

"Educational evaluation is best understood as a family of approaches to evaluating educational programs". We need to evaluate the curriculum that we develop in order to improve its expected outcomes, that is, most importantly the quality of healthcare providers we give to the society. Traditionally, such evaluation referred to only to student performance. But, now it extends to involve evaluation of the

development process, the quality of objectives/outcomes/competencies set, the student performance as influenced by the curriculum, the implementation and the attitudes/perceptions of the stakeholders. The recent and newer evaluation models explore the dynamic processes within the educational programs. This helps in understanding the areas for program improvement.

Several models have been reported in literature that have been utilised for evaluating the curricular process and its implementation. The models/tools of evaluation may vary, but the underlying principles remain almost the same. The commonly used models are-experimental/quasi-experimental approach to evaluation[20]; Kirkpatrick's approach[20,21]; the Logic Model[20]; and the Context/Input/Process/Product (CIPP) model.[20] Approaches like Ecological momentary assessment (EMA),[22] Continuous quality improvement (CQI),[22] Iterative reflection,[22] Participatory evaluation approach,[23] BEKA approach,[24] Three Cs Model (Context, Content, and Conduct),[25] theory-informed approach[26] and many other designs and approaches have been adopted by the healthcare curricula policy makers.

5. To summarize

The processes of curriculum development, implementation and evaluation form the basis of delivery of education for any educational program. The choice of approach shall influence the quality of program outcomes and hence the service to society. Hence, for improving the quality of dental education program outcomes, the policy makers, administrators and even the facilitators need to rethink and re-evaluate the current system and adopt the best approach that serves to improve quality.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jobcr.2019.02.004.

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