A Systematic Review on the Most Effective Method Teaching Dentistry to Dental Students Compared to Video Based Learning

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Abstract

BACKGROUND: In the recent years, the use of assessment or adjunct tools as a part of teaching has become more widespread across medical and dental schools. Educators have sought different methods of teaching in the dental curriculum. The present curriculum has changed from teacher-centred approaches to more student learner approaches. Lectures, discussions, computer assisted learning, audiovisual source, video based learning, demonstration and role play are different teaching methods employed in educational institutions. Of which, video based learning is a major contributor in dental education. But still there is no clear summary for the evidence for the most effective method of teaching. The aim of this study was to assess the most effective method of teaching dentistry to dental students when compared to video based education. SEARCH METHODOLOGY: The database search yielded 40 articles out of which only 28 articles were selected after title exclusion. Full texts were obtained for the remaining 14 articles. 10 articles were selected based on the inclusion criteria and 4 articles were excluded based on the abstract. The finally selected 10 articles were subjected to data extraction. Results: Overall the studies included in this systematic review, there appears to be no difference in the effectiveness of the teaching method over the others. But video based teaching has proved better outcome as an adjunct with the other teaching methods. Keywords: video based learning, teaching methods, dental students, systematic review


1. Introduction

“Education is a learning process which deals with unknown outcomes, with circumstances which require a complex synthesis of knowledge, skills and experience to solve problem” [1]. The process of education is guided by the educational theory [2]. Educational theories are broadly classified into normative and descriptive theories. The normative theories focus on the norms, goals and conditions surrounding the educational concept [3]. The descriptive theory on the other hand describes the teaching methods (pedagogy) and also the outcomes of a curriculum [4].

2. Teaching Methods

Pedagogy is the study of the process of teaching. The commonly used pedagogy techniques include:

2.1. Problem Based Learning

Problem based learning and case methods have recently become an approach to bridge theory and practice in medical, dental, legal and business [5]. In problem based learning, a case is employed to prompt the students (as a group) to identify and develop new areas of learning, whether the case is solved or not. Problem based learning has been extensively implemented in medical curricula, but to only a limited extent in dental education. Problem based learning has its origins in healthcare education in the 1960’s at McMaster University in Canada where it was applied in the medical sciences curriculum. A systematic review of the effects of problem based learning in medical school on the performance of doctors after graduation showed clear positive effects on physician competence [6]. This method improves the problem-solving and clinical reasoning skills in both medical and dental education [7]. Problem based learning (PBL) tutorials help students to integrate preclinical and clinical knowledge and skills in clinical dentistry.

2.2. Lecture Tutorials

Lecturing is the most widely used method of teaching in all levels of education [8]. Bligh has reported that lectures are effective but not more effective than other methods of teaching. With the advent of technology, pre recorded lectures have become common in medical education. Similarly lectures are the principal mode of instruction in dental education [9].
2.3. Peer Review

Peer review is a traditional method where one student reviews and comments on the work of his/her peers [10]. Many studies have evaluated the role of peer review in medical education. Cowen and David have reported that peer review was a valuable substitute to conventional lectures [11]. In dentistry, Milligrom reported that peer review was relatively modest in improving performances in 1998, Poorterman proposed the Dutch approach of peer review to ensure quality in the clinical cases treated by undergraduate students. In 2003 ADEA (American dental education association) advised extensive use of peer review in the undergraduate curriculum.

2.4. Process Oriented Guide Inquiry Learning (POGIL)

A process oriented guided inquiry learning classroom or lab consists of students working in small groups on specially designed inquiry materials. These supply the students with that or information followed by leading questions that are designed to guide team toward arriving at their own valid conclusions. In POGIL, the instructor serves as a facilitator to assist groups in the learning process and does not answer questions that students should be able to answer on their own [12]. Although POGIL, has been used most extensively in small classes, it has been adapted for classes as large as several hundred with much success [13], POGIL has not been researched in dentistry. However, POGIL based curriculum is currently being used in medical science subjects [14].

2.5. Peer Led Team Learning (PLTL)

This method engages six to eight students in learning any of the undergraduate disciples guided by a peer leader. Peer leads are drawn from pool of students who have done well in the course previously. Students obtain an experience of leadership and ultimately gain confidence in this method. In medicine, PLTL has been compared to recent pedagogy like process oriented guided inquiry learning (POGIL) and problem based learning (PBL) reported to be more associated with traditional instructions [15]. PLTL emphasises the social aspects of learning developed by Vygotsky [16] in which the peers are often better catalysis for learning the superiors [17].

2.6. Computer Assisted Learning (CAL)

The introduction of computers as an educational tool in dentistry and the provision of CAL is having an impact not only on how dentists are trained but also on the skills they will need to acquire in the future to keep pace with the new technology. The program in the computer guides the student through an interactive document that integrates text, 2D as well as 3D images, video, sound, animation and individual interactions some of them are built on the principle of the problem based learning (PBL).

2.7. Role Play

Although educational theory provides a sound rationale for using this form of simulation, there is little published evidence for its effectiveness. Prior experiences of students involved in role play may influence the way in which they engage in this method [18]. Role play is widely used as an educational method for learning about communication in medical education and that it provided opportunities for observation, rehearsal and discussion, realistic roles and alignment of roles with other aspect of the curriculum. Johnson reported that role play improved the clinical judgment skills of undergraduates.

2.8. Evidence Based Dentistry

Evidence-based dentistry (EBD) uses current scientific evidence to guide decision-making in dentistry. It is an approach to oral health that requires the application and examination of relevant scientific data related to the patient's oral and medical health.

It forms an important asset to make the dental care professional, and to practice modern dentistry and to educate the dental care professional. It is a process, which expresses a clinical problem as a question, employs a systematic framework to locate and evaluate relevant research and integrates that formation with clinical experience to guide clinical decision.

STRUCTURED QUESTION

“Which is the most effective method of teaching general dentistry for undergraduate students compared to video based education?”

3. Pico Analysis

P-POPULATION
Dental students who have enrolled in dental schools

I-INTERVENTION
Different teaching methods

C-COMPARISON /CONTROL
Video based education

O-OUTCOME
Primary outcome-marks, scores
Secondary outcome-time management, self confidence, reinforcement.

3.1. Selection of Studies

The review process consists of two phases. In the first phase titles and abstract of the search were initially screened for relevance and the full text of relevant abstract were obtained and accessed.. The articles that were obtained after first step of review process using the following inclusion and exclusion criteria were screened in second phase and relevant and suitable articles were isolated for further processing and data extraction.

3.2. Inclusion Criteria

The articles discussing the following parameters were included for the systematic review

1) Students who have enrolled for dentistry
2) Teaching methods in dental schools
3) Teaching method POGIL
4) Teaching method lecture tutorials
5) Teaching method peer review
6) Teaching method peer led team learning
7) Teaching method evidence based dentistry
8) Randomised Control Trial studies,
9) Survey studies
10) Teaching method CAL
11) Conventional teaching methods
12) Video based learning.

3.3. Exclusion Criteria

Articles and manuscripts discussing the following parameters were excluded:
1) Review
2) Non english articles
3) Animal study
4) Case report
5) OSCE-Objective Structured Clinical Examination.

3.4. Results

The database search yielded 42 articles out of which 28 articles were discarded after reading the title. Full texts were obtained for the remaining 14 articles 10 articles were selected based on the inclusion criteria and 4 articles were excluded. The finally selected 6 articles were subjected to data extraction.

3.5. Data Extraction

The data from the finally included studied were tabulated and the following informations were extracted.

### 4. Materials and Methods

**SOURCES USED:-**

An electronic search was conducted for articles written in English listed in pub med.

**SEARCH METHODOLOGY**

The search methodology applied was a combination of Mesh terms and suitable keywords.

**P-POPULATION:**

Dental student, dental students, humans, adults, adolescent, undergraduate dental students, head and neck anatomy, dental materials, dental material, biochemistry, microbiology, pathology, pharmacology, dental histology, oral medicine, oral surgery, prosthodontics, endodontic, esthetic dentistry, restorative dentistry, conservative dentistry, oral pathology, public health dentistry, implant dental, preclinical prosthetic, preclinical conservative dentistry, orthodontics, pedodontics, community dentistry.

**I-INTERVENTION**

Teaching methods, method teaching, teaching methods, methods teaching, peer review, computer assisted learning, peer led team learning, lectures, lecture notes, process oriented guided inquiry, problem based learning, evidence based dentistry, dentistry, evidence based, evidence based practice, role playing, role playing, mind mapping,

**C-COMPARISON**

Video based discussion, video based training, video based demonstration, and video based learning.

**O-Outcome**

Scores marks, marks exam, self confidence, learning capacity, time management, reinforcement.
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5. Results

All the included studies were reported according to CEBM (Centre For Evidence Based Medicine) levels of evidence. For difference in the outcome, a meta analysis could not be performed because the data showed significant heterogeneity. No conclusion can be made about the different teaching methods, but studies have shown that using video based, computer based additional aids other than traditional methods have increased students performance. Overall the number of studies included is very small, thus warranting the need for more studies in this area and the exploration in different teaching methods.

6. Discussion

This systematic review assessed the efficacy of different teaching methods for dental students as compared to video based methods. 10 studies met the inclusion criteria of the different outcomes evaluated, no one study considered all possible outcomes.

Over the past decades, there have been many criticisms of introducing different teaching methods into the educational system [19]. However, if it is properly implemented, the method and medium of instruction can greatly influence the quality of learning by the students [19,20,21]. Demirjian has stated in his study that with the development of personal computers and useful software for education, it is possible to easily copy the teaching material on CD or flash drives and deliver it to students as a training pack. In this manner, trainees become involved in their learning and may constantly refer back to complicated procedures and renew their knowledge repeatedly. Studies have identified many benefits to such methodologies. The results of this study found no significant relationship between exposure to the instructional VCD and the level of stress among the dental student has suggested that using teaching supplements improves the comprehension of students.

Trigwell K has advocated that critical appraisal is considered one of the integral parts of evidence-based learning (EBL). Convincing arguments have been made to promote EBL as the principal method of teaching in medical schools. In their study, Shin et al. found that EBL leads to improved knowledge in students even ten years after leaving medical school, while Norman and Shannon found significant improvements in the knowledge of undergraduate students trained in critical appraisal skills.

The method and medium of instruction employed in the initial teaching methodology can greatly influence the quality of learning by the student.

Video demonstration enhances the learning from a lecture and is considered to be one of the most standardised modes of instruction. This study thus suggests that CABLE is a valid teaching methodology that can be incorporated into dental curricula.

Instructional videotapes can aid in teaching fabrication of complete denture and are as effective as the traditional teaching system [15]. The instructional multimedia was as effective as the traditional learning system, although traditional learning group performed significantly better than the test group in terms of anterior teeth set up. There was no significant difference between pre- and post-test outcomes, indicating that similar learning took place using the interactive CD and/or lecture format. However, students preferred CAI to lecture format. This study demonstrated no differences in student learning outcomes between lecture and CAI [18]. However, study results indicate that students preferred the interactive instructional program because of its convenience and ease of navigation. Results of this study support the notion that, in dental education, CAI has the potential of being as equally successful a tool as linear instruction. Readily available tools were used to produce this program, indicating that the same approach can be used to include other content areas.

Based on these objective and subjective data, merging CAI and traditional laboratory teaching may best enhance student learning needs. There were no statistically significant differences between faculty grades on wax carving and students’ self-assessments of their own wax carvings based on the teaching modality they experienced as determined.

Based on the results of this study and student feedback, Tooth Morphology, in combination with interactive class meetings, has replaced the traditional dental anatomy lectures. This study showed that Tooth Morphology is statistically equivalent to the traditional dental anatomy lecture in its ability to teach dental anatomy, as measured by exams.

Health professionals and dentists in particular, are required to interact with patients on a very intimate level within minutes of meeting. It is essential, therefore, that dental students are provided with skills-based communication training based on the most recent research literature. The results were similar to this study and no differences were found between the two groups.

A comparison of the mean knowledge score of both groups showed that virtual learning was more effective than traditional learning. The study by Sandell and et al necessitated that students have the ability to use a computer and the internet, therefore we assessed students competencies by a form that consisted of relevant questions. This assessment ensured each student’s ability in using the program. Despite the difficulties encountered in designing the virtual learning environment, the study was conducted successfully. Based on the findings of this study the virtual learning was more effective than lecture-based training [20].

Dental students who reviewed the CAI preferred using it and would recommend it to others before exposing their FMS. Computer technology in dental education is becoming more common, till date a little information has been reported regarding the clinical effectiveness of CAI. Students who received an interactive CAI CD before exposing their initial full series of radiographs made more errors than those students who did not receive the CAI CD. However, those students who received the CAI CD preferred reviewing the CD and recommended the CAI CD to others.

7. Conclusion

This pragmatic approach for analysing the studies and interpreting the results revealed that there is evidence to show video based teaching methods does have positive impact on the performance of dental students.
This systematic review could serve a platform for future research analysing for different method of teaching for dental students. Though this study demonstrated little difference in students learning outcomes between different teaching methods and video based education. It is hoped that different teaching methods will be developed in the field of dentistry and the advantage of this approach may include greater student faculty interactions, reinforcement of the knowledge and self confidence. Blended learning with different teaching methods into dental education appears to be an important development and provided courses if appropriately designed they can be instrumental in encouraging effective learning. They are added benefit of easy access anytime and anywhere when compared to the traditional method of teaching.

References