

## Comparing Self-learning Video and Traditional Lecture in Preclinical Pediatric Dentistry Course

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### Abstract

**Objectives:** The objective of this investigation was to evaluate the effectiveness of two learning approaches: traditional lecture and self-learning video in preclinical pediatric dentistry course teaching stainless steel crown preparation and restoration of the second primary molar through assessing knowledge gained by third-year dental students.

**Methods:** A video and PowerPoint presentation of stainless steel crown preparation and restoration were produced and assessed for accuracy and validity. All female third-year dental students were randomly assigned to traditional lecture or self-learning video. Immediately after each method, students were asked to take an assessment consisting of a questionnaire, which was based on the material, and information presented and included 16-item questions (multiple choice and true/false) as an outcome measure. Data from resulting evaluations between the two groups was considered for statistical analysis using independent t-test and chi-square test.

**Results:** The mean  $\pm$  standard deviations of the total scores of lecture and video groups were  $9.09 \pm 2.114$  and  $8.50 \pm 2.041$  respectively. There was no significant difference between the two methods ( $p=0.35$ ). For the question: "Was this presentation helpful in teaching and improving your knowledge of stainless steel crown preparation and restoration?" The answer was yes in 86.96% of the lecture group and 82.61% for video group. About 73.91% of the lecture group reported that this method was somewhat effective in teaching and increasing their knowledge of stainless steel crown preparation and restoration compared to 43.48% for the video group. In addition, students would like to integrate a video in the lecture. About 60.87% of the lecture group reported that they are likely to use this method compared to 47.83% of the video group.

**Conclusions:** Traditional lecture and self-learning video approaches for teaching stainless steel crown preparation and restoration of the second primary molar tested in this study were both effective in producing high total scores for the third-year dental students.

**Keywords:** Dental Education, Live Lecture, Video Demonstration, Preclinical Pediatric Dentistry, Learning Technology

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### I. Introduction

Traditionally, attendance of lectures in the preclinical and clinical dental courses considered by the educators to be the standard of didactic approaches.<sup>1-3</sup> The same trend is applicable to medical schools where use of lecture continues to be an important educational component of their preclinical curricula.<sup>4</sup> However, thoughts about decreasing attendance of the lectures and its influence on the education of different students has raised a concern.<sup>5</sup> Dental students in their first two years usually involved in several didactic and pre-clinical training.<sup>6</sup> During pre-clinical courses, demonstration of procedures to the students is a beneficial tool as it improves understanding and confidence of the students of the procedures than didactic lectures.<sup>7,8</sup> However, some aspects decrease the value of pre-clinical demonstration such as shortage of faculty members, difficulty in visualization of the demonstration, and time restrictions.<sup>8</sup> Video demonstration of procedures may help in addressing some of these issues.<sup>8</sup>

Video has been reported as a useful tool for teaching in dentistry in several parts including preclinical procedures preparation, skills, and simulation of clinical conditions.<sup>9-11</sup> It has been reported that clinical

behavior of the students may be considerably influenced by video-based teaching.<sup>12,13</sup> Video demonstration has been incorporated into laboratory preclinical dental courses.<sup>7,14</sup> It has been reported that video offer a beneficial tool in teaching students by allowing superior visualization of laboratory procedures and permits the students to periodical review the procedures at all times.<sup>15</sup> Video may be supplement or substitute of live lectures.<sup>16</sup> It has been reported that visual approaches is suitable to develop, advance and support learning proficiencies of the students.<sup>17</sup> Students may enjoy the flexibility and suitability of learning during their own time. However, there are several potential downsides to using technology such as video demonstration which include lack of ability of the students to ask questions and may be less engaged in the learning and inspiration as well as lack of ability of the instructors to evaluate understanding of the students due to lack of interaction with the students.<sup>18</sup> Stainless steel crowns are endorsed by several associations such as the American Academy on Pediatric Dentistry and the German Society for Dental and Oral Medicine for the restoration of primary molars.<sup>19,20</sup> Stainless steel crowns showed a high success rate and were clinically effective restorations in several indications such as cervical decalcification, and/or developmental defect, when failure of other available restorative materials is likely to occur, and following pulpotomy or pulpectomy.<sup>19,20</sup> To our knowledge research related to the effectiveness, preferences, perceptions, and knowledge of students when using traditional lecture and self-learning video in pediatric dentistry is limited and no previous studies evaluated their effectiveness in teaching stainless steel crown preparation and restoration of the second primary molar. This research may help in redefining the purpose and drive of the traditional lecture and video, which would be useful to educators. Therefore, the objectives of this investigation, was to evaluate the effectiveness of two learning methods: traditional lecture and self-learning video in teaching preparation and restoration of second primary molar through assessing knowledge gained by third-year dental students. The null hypothesis tested in this investigation was there is no difference in the effectiveness of traditional lecture and self-learning video in teaching preparation and restoration of second primary molar as judged by assessing the knowledge gained by third-year dental students.

## **II. Materials And Methods**

The Ethics Committees at the College of Dentistry, King Saud University, approved the study, including the evaluation questionnaire, the self-learning video, and the lecture presentation. This study involved educating third-year dental students about stainless steel crown preparation and restoration for primary mandibular second molar, and comparing the educational effectiveness between two learning methods: traditional lecture and self-learning video in a two-group experimental design. The self-learning video, lecture presentation, and evaluation questions were produced based on reviews of the pediatric dental literature to provide informative and concise representations designed to educate third-year dental students on the procedural steps of stainless steel crown preparation and restoration for a primary mandibular second molar. A traditional lecture in the form of a PowerPoint presentation was developed to demonstrate the same systematic instructions on stainless steel crown preparation and restoration for the primary mandibular second molar as did the video. Microsoft PowerPoint from the Microsoft Office Professional Plus 2013 suite (Microsoft Corporation, Tempe, AZ, USA) was used to construct the lecture presentation. Illustrative drawings were custom designed by a digital artist based in Riyadh, Saudi Arabia to depict each step in stainless steel crown preparation and restoration. The drawings were added to the presentation for visual representation of stainless steel crown preparation and restoration. The validity and accuracy of the presentation was evaluated and assessed by a professor in pediatric dentistry and modifications were made based on the given reviews. A self-learning video of about twelve minutes was filmed at the student phantom laboratory of College of Dentistry. The video focused on providing systematic instructions on stainless steel crown preparation and restoration for the primary mandibular second molar on a plastic tooth attached to a teaching jaw model, which was mounted to a dental phantom head (Nissin Dental Products Inc., Kyoto, Japan). The video was edited using Windows Movie Maker 2016 software (Microsoft Corporation, Tempe, AZ, USA) to produce a final video with clear guidelines. In addition, written instructions to facilitate reading by the students were added to the video to describe the steps being performed in the video. The validity and accuracy of the video was evaluated and assessed by a professor in pediatric dentistry and modifications were made based on the given reviews. Coordination and calibration in the information and duration ( $\approx 12$  minutes) between the lecture presentation and video was also assessed and accomplished. Questionnaire based on the materials, information, and content demonstrated in both the video and lecture presentation was developed. First, the questionnaire cover-page provides a consent for participation in the research project by the third-year dental students. Next, 7 questions were given about demographic information, whether students have any previous information about stainless steel crown preparation and restoration, helpfulness and effectiveness of the corresponding teaching method in increasing knowledge, if likelihood students will utilize the displayed teaching methods, and if there are any changes students would like to implement to increase effectiveness of their learning. After that, a set of 10 questions (multiple choice and true/false) was given to evaluate and compare the impact of self-directed learning versus traditional learning on the gained knowledge. A professor in pediatric dentistry reviewed the survey and questions and modifications

were made based on the given reviews. In addition, the survey was pilot tested for reliability and clarity of the questionnaire by randomly selecting 10 of the target participants. Accordingly, revision of the questionnaire was performed to avoid misinterpretation of the questions. Students were asked not to put their name or any other information on the questionnaires that could identify it as theirs to maintain anonymity. For the conduction of this study, 46 third-year female dental students at the College of Dentistry, King Saud university during the academic year of 2015 were randomly divided into two groups according to the instructional strategy: a group which will view the video (n=23) and a group which will attend the lecture presentation (n=23). The groups were assigned to different classrooms, but the study was conducted for both groups at the same time and for the same duration (~12 minutes). To maintain homogeneity, no questions were allowed and no information excess of what was calibrated was given during the lecture presentation. Immediately after completion of each educational method, students were asked to take the evaluation questionnaire. After the students completed the survey, investigators collected them and placed them into two envelopes corresponding to each group.

Statistical analysis of the data from resulting evaluations was performed to evaluate and compare the difference between the scores of the two groups using independent t-test and chi-square test. All statistical analyses were set with a significance level of  $p < 0.05$ . The statistical analysis was carried out with SPSS V16.0 (Statistical Package for the Social Sciences, SPSS, Chicago, Illinois, USA).

### **III. Results**

The average ( $\pm$ SD) score of the lecture was 9.09 ( $\pm$ 2.114), and for the video was 8.50 ( $\pm$ 2.041). There was no significant difference between the two methods ( $p=0.35$ ). Frequency and percent of answers in lecture and video questionnaires to evaluate the gained knowledge are presented in Table 1. The most difficult question (the highest with wrong answers) in the lecture as well as the video was related to the first step in stainless steel crown preparation. Where the incorrect answers for the lecture group were 7 (30.43%) while the video's group incorrect answers were 15 (65.22%), which indicated that the two teaching methods partially influenced answers in this particular step. The easiest question (the highest with correct answers) in the lecture were questions number 8 and 9. Question number 8 was a multiple-choice question and it was about the beveling degree angle and the carbide bur deflection during tooth preparation. Question number 9 was in a true-false format, whether it is mandatory to keep all line angles rounded, as it will eliminate sharp corners in the preparation or not. The correct answers for these two questions were 23 (100%). The easiest questions in the video were questions number 3 and 5. Question number 3 was in a true-false form about whether occlusal reduction should be performed while maintaining existing cuspal inclines of the tooth or not. Question number 5 was a multiple-choice question and it was about the type of finish line that should be produced after proximal reduction. The correct answer was 22 (95.65%) for both questions.

All dental students participating in the study were requested to rate their knowledge about stainless steel crown preparation and restoration on the lecture and video questionnaires. For the question "Do you have any information about stainless steel crown?" before attending the lecture presentation and the video, all 23 (100%) students in each group reported having previous information about stainless steel crown preparation and restoration on both questionnaires. Seventeen (73.91%) of the third-year dental students who attended the lecture-based classroom reported that this learning method was effective in teaching and increasing their knowledge in understanding stainless steel crown preparation and restoration, while only 3 (13.04%) students reported that the lecture educational components were not quite effective, and 2 (8.70%) students reported that the method was very effective and 1 (4.35%) student did not answer this question (Figure 1). Whereas, 10 (43.48%) of the third-year dental students who attended the video-based classroom reported that this learning method was somewhat effective in teaching and increasing their knowledge of stainless steel crown preparation and restoration, 10 (43.48%) students reported that it was not an effective method, 2 (8.70%) reported that the video was a very effective method, and 1 (4.35%) student did not answer this question (Figure 1).

Fourteen (60.87%) of the third-year dental students who contributed to this study by filling-up the lecture questionnaire, and 11 (47.83%) of the students who filled the video questionnaire reported that they are somewhat likely to use this educational intervention in the future. Five (21.74%) of the students of the lecture questionnaire and 0 (0%) of the students of the video questionnaire reported that they were very likely to use the educational intervention used. Three (13.04%) of lecture group students and 11 (47.83%) of video group students reported that they were not likely to use the information provided in the educational intervention.

One of the questions was "What would you like to change in the presentation?" Fifteen (65.22%) students answered that they would not suggest any changes in the presentation provided in the lecture, while 8 (34.78%) had suggested some changes on the presentations. Among the (34.78%) who suggested changes on the presentation, 2 (8.70%) students suggested that PowerPoint slides should be explained further as they cannot read the slides while the instructor is presenting, 3 (13.04%) students reported that the presenter was quite fast, and 3 (13.04%) students wished that the presentation provided more information and multimedia, like videos. For the video group, 14 (60.87%) of the third-year students answered that they would not suggest any changes

in the video-based presentation, while 9 (39.13%) students suggested changes on the video. Among the (39.13%) who suggested changes on the video, 3 (13.04%) students suggested that it would be more effective if there was a voice-over the video, as they does not like reading, and 7 (30.43%) students reported that the video was quite fast.

#### **IV. Discussion**

Recent tools of technology have expanded the methods of teaching accessible to students.<sup>1</sup> This investigation offered stimulating data with regard to application of video in preclinical pediatric dentistry course in an educational setting. The null hypothesis was accepted in this study as there was no difference between the two learning methods of traditional lecture and self-learning video of primary tooth stainless steel crown preparation and restoration tested in this study and both were effective in producing high total scores for the third-year dental students. The evaluation of both groups showed no significant difference, which may indicate similar level of understanding gained by the students in both groups. Video can be as efficient as live demonstrations in communicating clinical knowledge and skills to medical students.<sup>21</sup> Additionally, live demonstration improves communication skills and confidence of the students.<sup>7</sup> Nevertheless, poor field of view and lack of ability to repeat sessions are considered concerns with live demonstrations.<sup>22,23</sup> However, the students' favored the live demonstrations comparing to video.<sup>24</sup> It has been reported that live and video demonstrations were similarly efficient and can be combined or alternatively used alone in teaching application of fissure sealant.<sup>25</sup> Similarly, both video and live demonstrations were effective in teaching removable partial denture and orthodontic courses.<sup>8,24</sup> However, the video offers superior visualization of the laboratory procedures<sup>8</sup> which is similar to the study in which students in the clinic stated that they have superior view on the video compared to live demonstration with the crowding of the students.<sup>23</sup>

All students who contributed to this study were third-year dental students who have had a pre-clinical pediatric dentistry course covering stainless-steel crown preparation and restoration exposing them to this topic. In this investigation, the total scores mean of the lecture was  $9.09 \pm 2.114$  and the video was  $8.50 \pm 2.041$ . These high scores may be partially due to prior experience to the didactic component of the pre-clinical pediatric dentistry course about stainless steel crown preparation and restoration. It is not known if the students retain the information gained in the pre-clinical pediatric dentistry course about stainless steel crown preparation and restoration or not. In addition, it is not known if the students will retain the information gained after their exposure to the two learning approaches: traditional lecture and self-learning video. Long-term retention of acquired knowledge from lecture and video may vary.<sup>26,27</sup> For typical lecture students often have minimal ability to applicably review, the content after the lecture is over.<sup>26,27</sup> In fact, it may be several months before dental students apply the information given in the lecture in patient care.<sup>1</sup> In the present study, the goal and outcome of the learning objectives of stainless steel crown preparation and restoration of the second primary molar was listed in both lecture and video, which may helped students in having similar scores. Awareness of the student of the learning objectives and the desired outcome consider a main contributor to developing dental motor skills.<sup>28,29</sup> In the present study, 74% students from the lecture and 43% from the video groups favored teaching they exposed to, reported that their preferred technique was effective in teaching, and increased their knowledge of the listed goal and outcome of their learning. However, 13% of the students reported that the lecture educational components were not quite effective compared to 43% of the students who attended the video-based classroom reported that this learning method was somewhat effective. While 8.7% of the students in both groups reported that, the method was very effective. It should be noted that students are comfortable and accustomed attending traditional lectures. However, sharing the outcomes of different investigation, that compare the effectiveness between video and lecture with dental students may augment self-confidence and inspire them about using videos as teaching tool. The majority of the students agreed that they would like to have and use digital video, preferably in a portable format and felt this method was more effective than paper notes to review.<sup>1</sup> In the present investigation, about 34% and 39% of the students suggested changes on the lecture and video respectively. Both groups suggested reducing the speed of the presentation, which was reported by about 13% in the lecture and 30% of the video groups. The speed of both presentation may affected answering the questionnaire.

It is estimated that preclinical dental students attend in 61% of the offered lectures to them.<sup>2</sup> The most significant reasons reported for attending by the students include showing respect and talking to the faculty, hearing and enquiring questions of their classmates, chat with their classmates, lack of inspiration to view recorded lectures, and feeling that they are receiving more for their paid tutions.<sup>2</sup> Thoughtful choices of the students are made on when and why to be present at the lectures<sup>5</sup> and making mindful judgements on how to practice technology.<sup>2</sup> A randomized crossover trial reported that recall following attending live lecture and viewing video were similar.<sup>18</sup> However, students favor live lectures but consider video suitability less engaging.<sup>18</sup> One advantage of the design in this study is keeping the lecture and video similar as possible using the same information and PowerPoint, conducting the presentation at the same time, having the same duration,

the same presenter, the same dialog in two different formats, and maintaining homogeneity as no questions were allowed and no information excess of what was calibrated was given during the lecture presentation. It is important to consider that each method has its own benefits and limits, therefore both approaches should be employed in educating undergraduate pediatric dentistry courses to advance their learning and knowledge experiences.

There are some limitations to this exploratory investigation, the most obvious is that only female students were participated as male do not go to the same section/campus and different faculty teach them making their participation in the study logistically difficult. The sample size was relatively small as this is considered a pilot study. Future study is planned to assess more male and female students. Another limitation that all data collected in this study was by self-reporting, participants may not have answered some questions properly due to incomplete information received from the educational intervention as some students reported that the presentation was fast. In addition, this study lack a pre-test to assess the baseline knowledge of the students, which may be another limitation. In addition, the students rate their awareness of value and report their knowledge, which may not reveal real value, and may be considered weakness. Furthermore, students may think they acquired and retained the information when using lecture and video methods but additional research analysis of the educational outcomes may test these assumptions and whether they are exist or just perceived.

## V. Conclusions

The conclusion from this exploratory study showed that:

1. The two learning approaches: traditional lecture and self-learning video in preclinical teaching of stainless steel crown preparation and restoration of the second primary molar tested in this study were both effective in producing high total scores for the third-year dental students.
2. About 60% of the lecture group reported that they are likely to use this method to acquire knowledge in pediatric dentistry compared to about 47% of the video group.
3. More than 80% of the students in both groups reported that the intervention was helpful in teaching and improving their knowledge of stainless steel crown preparation and restoration.
4. About 73% of the lecture group reported that this method was somewhat effective in teaching and increasing their knowledge of stainless steel crown preparation and restoration compared to about 43% for the video group.

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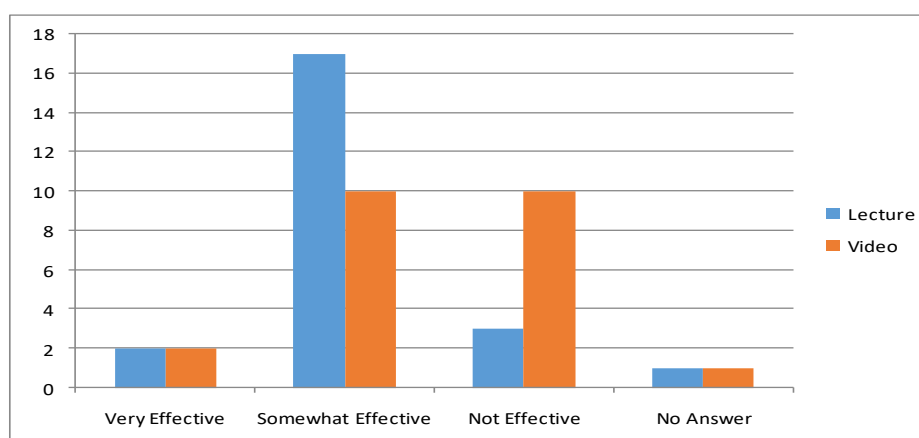
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**Table 1:** Frequency and percent of answers for the lecture and video questionnaires

Question Number	Lecture		Video	
	Correct Number (%)	Incorrect Number (%)	Correct Number (%)	Incorrect Number (%)
1	16 (69.56%)	7 (30.43%)	8 (34.78%)	15 (65.22%)
2	20 (86.96%)	3 (13.04%)	20 (86.96%)	3 (13.04%)
3	22 (95.65%)	1 (4.34%)	22 (95.65%)	1 (13.04%)
4	22 (95.65%)	1 (4.34%)	15 (65.22%)	8 (34.78%)
5	20 (86.96%)	3 (13.04%)	22 (95.65%)	1 (13.04%)
6	20 (86.96%)	3 (13.04%)	18 (78.26%)	5 (21.74%)
7	20 (86.96%)	3 (13.04%)	21(91.30%)	2 (8.70%)
8	23 (100%)	0 (0%)	20 (86.96%)	3 (13.04%)
9	23 (100%)	0 (0%)	21 (91.30%)	2 (8.70%)
10	20 (86.96%)	3 (13.04%)	20 (86.96%)	3 (13.04%)



**Figure 1:** Answer to the questions how effective the lecture and video based methods to third-year dental students