



# Evaluation and Perception of an Edpuzzle Class Compared with a Traditional Class among Oral Radiology Undergraduate Students

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## Abstract

**Objectives** Dental students are to an increasing extent presented with new digital learning technologies, especially online delivery of class content. Edpuzzle is a web-based eLearning application that allows educators to select subject-related videos and customize them by editing, cropping, voice-over recording, and adding questions directly to the video stream. Under the teacher's guidance, students log into Edpuzzle using their iPads, take the class, and answer questions. The aim of this study was to compare an Edpuzzle class with a traditional class for undergraduate oral radiology students in order to evaluate the educational effectiveness of each teaching method.

**Materials and Methods** The study sample comprised 20 fourth-year dental students who agreed to participate in the study. A traditional class developed a differential diagnosis topic with pre- and post-knowledge tests. A second differential diagnosis topic was developed for an Edpuzzle class, also with a pre- and post-knowledge test. After the two classes were given, a Google Forms feedback questionnaire was sent to the students to evaluate their perceptions and preferences regarding the two classes. The educational effectiveness of each class type was evaluated by comparing means and analyzing the feedback questionnaires.

**Statistical Analysis** The Wilcoxon signed-rank test was used to examine pre- and post-knowledge for each class, and Welch's t-test was used to test for differences in means of post-knowledge of both classes.

**Results** Students in both classes obtained significantly better scores in the posttest than they did in the pretest ( $p = 0.0001$ ). However, the differences in means of post-knowledge of both classes showed no significant differences ( $p = 0.0975$ ). The feedback questionnaire showed higher percentages of positive attitude toward Edpuzzle class.

**Conclusion** As a first-time experience, the Edpuzzle class interested most of the students. Workshops for the staff are needed to become expert in these technologies and to overcome any obstacles in implementing them for undergraduate dental students.

## Keywords

- ▶ Edpuzzle
- ▶ dental
- ▶ radiology
- ▶ blended learning
- ▶ undergraduate
- ▶ videos
- ▶ computer-aided instruction

## Introduction

In dental practice, digital radiographic images have increasingly become the modality of choice in modern diagnostic imaging.<sup>1</sup> A distinctive advantage of digital applications in the field of oral radiology is that the number of images that can be stored and transmitted on a computer file is virtually limitless compared with those that can be included in a printed textbook.<sup>2-4</sup> For this reason, computers play a larger role in oral radiology than they do in other fields of dentistry.<sup>5</sup>

With the ongoing advances in computer-assisted learning (CAL), the question arises as to how best to use this technology to teach oral radiology students. Educational researchers must assess both the efficiency and effectiveness of CAL, establish whether it performs as effectively as traditional teaching does, and identify when and how to use it.<sup>6</sup>

Implementing eLearning in a radiological science course in dental education was assessed in a short-term longitudinal study by comparing traditional face-to-face teaching of radiological science course with eLearning format accompanied with a survey to evaluate the use of eLearning that showed positive response from the students encouraging the implementation of eLearning.<sup>7-10</sup> General agreement was noticed for the challenges and role of faculty and need for collaboration.<sup>11</sup> With learning methods advancing, so must educational delivery methods, the use of new technologies can provide educators with useful tools.<sup>12</sup>

Throughout history, teachers have relied on various tools to assist them in converting information into knowledge. Different learning approaches have been developed, including reading, the flipped classroom method,<sup>13</sup> and individual or group study classes. Computers and web-based applications are considered multifunctional teaching tools that can also be used in dentistry.<sup>14</sup> From an education perspective, eLearning can change passive teacher-centered learning to "active learner-centered" learning.<sup>15</sup>

Web-based learning includes educational videos or YouTube classes, with a majority of dental students (96.7%) having reported using YouTube as a learning tool for dental procedures.<sup>16</sup> However, there are limitations to YouTube and concerns about the validity of some of its pedagogical content.<sup>16</sup> A solution for this concern is to implement a blended learning approach in which teachers combine (blend) online learning tools with their own custom modifications of these videos or by adding their own video and comments.<sup>15,17</sup>

Edpuzzle is a web-based online learning application in which teachers can select a video and customize it by editing, cropping, voice-over recording, and adding questions. Because Edpuzzle uses a cloud-based platform, the number of technological problems encountered by teachers and students may be reduced when they use an institutional server. Edpuzzle makes it possible for teachers to offer students a variety of educational resources during class to enhance their knowledge and promote a self-learning experience. Video lessons with Edpuzzle include explicit instruction elements such as eliciting frequent responses, providing practice, immediate affirmative corrective feedback, and monitoring student performance.<sup>18</sup>

Two studies<sup>19,20</sup> that examined the effectiveness of Edpuzzle reported that it was highly effective in engaging undergraduate students and could therefore be used in place of traditional teaching techniques. To our knowledge, no study has assessed the effectiveness of Edpuzzle as a tool for undergraduate oral radiology students.

The study aims to assess knowledge learning outcomes of dental students in specific oral radiology topics obtained using traditional and Edpuzzle classes. The study also aims to evaluate perceptions and satisfaction of students towards the two educational classes.

## Materials and Methods

The study sample comprised 20 fourth-year dental students (eighth semester) in the dental college of Taibah University. Participation in the study was voluntary. After being given information about the study's purpose, students were told that they would gain more extensive knowledge on the differential diagnosis topics being taught, considered to be the most challenging in oral radiology.

A traditional class was developed with pre- and post-knowledge tests to teach the differential diagnosis topic, "Odontogenic and non-odontogenic cysts." An Edpuzzle class was also developed to teach the differential diagnosis topic, "Odontogenic and non-odontogenic benign tumors," again including a pre- and post-knowledge test. After the two classes were given, a Google Forms feedback questionnaire was sent to the students to evaluate their perceptions and preferences regarding the two classes.

A pretest composed of 10 multiple-choice questions and created with Google Forms was administered before the traditional class to access the level of knowledge on this topic by this group of students. The "odontogenic and non-odontogenic cysts" lecture was taught by using a conventional teaching method, with explanations by the teacher and subsequent practice. Student knowledge was then assessed with a posttest with the same 10 multiple-choice questions.

A pretest composed of 10 multiple-choice questions and created with Google Forms was also administered before the Edpuzzle class to assess the level of information achieved by students. The "odontogenic and non-odontogenic benign tumors" lecture was delivered using Edpuzzle. Learning was assessed with a posttest with the same 10 multiple-choice questions.

After the two classes were complete, a 10-score Google Forms questionnaire was sent to the participants to evaluate their perceptions about the two learning methods. The 11th question was open-ended for any further comments or suggestions.

All data were exported into Excel 2004 (Microsoft, Excel for Mac), version 16.66.1, and then imported into Stata/IC 13.1 for Mac (64-bit Intel) (Revision 16 Dec 2016, copyright 1985-2013, StataCorp LP, macOS, Texas, United States).

The Wilcoxon signed-rank test, a nonparametric paired t-test, was used to examine pre- and post-knowledge for each class, and Welch's t-test, a nonparametric test for two independent samples with unequal variance, was used to

**Table 1** Mean grades of students in knowledge tests for the two teaching methods

Teaching Method	Knowledge	n	Mean	Median	SD	p-Value
Traditional class	Pretest	20	4.4	4	1.38	0.0001
	Posttest	20	9	10	1.38	
Edpuzzle class	Pretest	20	5.8	6	1.28	0.0001
	Posttest	20	9.6	10	0.75	

Abbreviation: SD, standard deviation.

test for differences in means between the post-knowledge of the traditional class and the post-knowledge of Edpuzzle class. Summaries and descriptive statistics were used for the presentation of the rest of the data, and the Peltier Tech Diverging statistical stacked bar chart in Excel was used to summarize the students' answers to feedback questions.

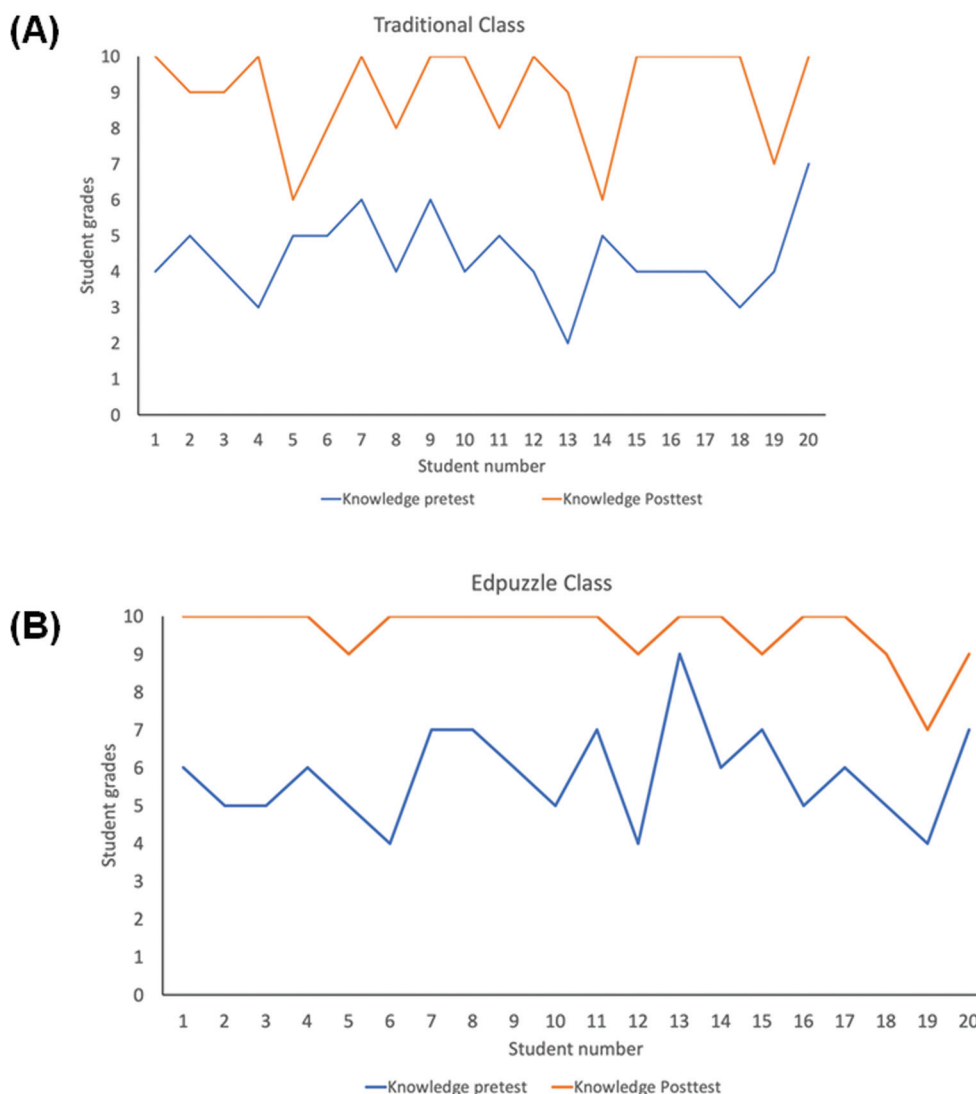
**Results**

Twenty female students participated in this study. After attending the traditional teaching class, the same group

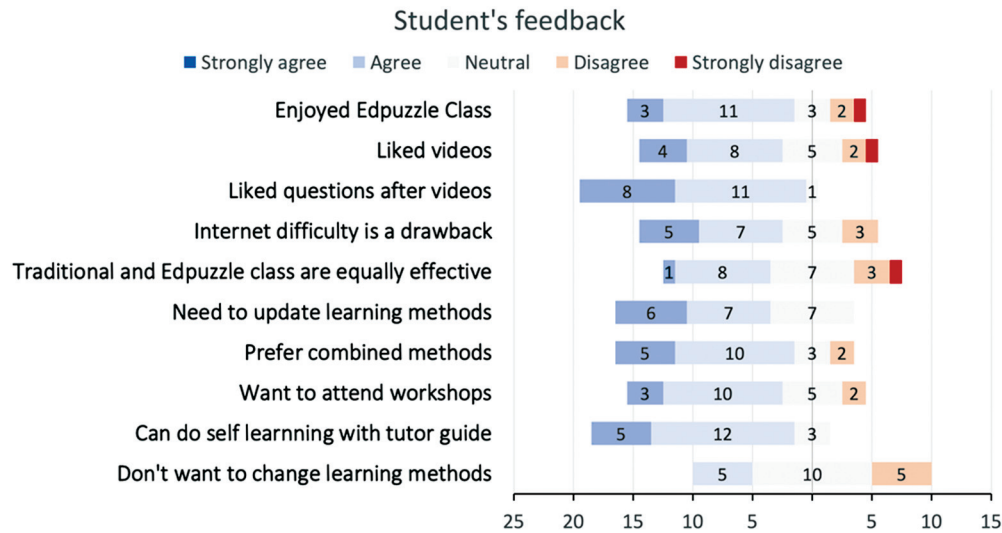
attended the Edpuzzle class 1 week later. Both classes did a pre- and post-knowledge test. **Table 1** shows the mean student scores in the pre- and post-knowledge tests for both classes.

**Fig. 1A** and **B** shows all student grades. Students had higher scores after both classes than they did before both classes, showing a significant improvement in knowledge after each type ( $p = 0.0001$ ).

Welch's t-test used to test for differences in means of post-knowledge of both classes showed no significant differences ( $p = 0.0975$ ).



**Fig. 1** (A) and (B) Pre- and posttest student grades on a continuous scale from 1 (minimum grade) to 10 (maximum grade).



**Fig. 2** Student feedback and perspectives after attending both the traditional and the Edpuzzle classes.

► **Fig. 2** shows answers to Likert-scale questions regarding course efficiency by students who attended both classes. The results were as follows: 70% of the students agreed or strongly agreed that they enjoyed the Edpuzzle class, 60% liked the videos, 95% liked the questions that accompanied each video, 60% agreed or strongly agreed that the Internet connection was not smooth and caused some difficulty, 45% agreed that both the traditional and the Edpuzzle classes were equally effective learning methods, 65% agreed that there is a need to update learning methods, 75% preferred a combined traditional class and new learning techniques, 65% indicated that they would like to attend workshops to learn new techniques, 85% agreed that they can self-learn with a tutor guide, and only 25% did not want any change in learning methods.

In the open-ended question, one student stated that new methods of teaching are more effective, especially for a subject such as oral radiology that requires numerous visual examples to retain knowledge. Two students stated that the Edpuzzle class was a great experience, and another student called for more image examples for differential diagnosis classes.

## Discussion

Traditional and Edpuzzle classes were assessed for both educational effectiveness and student perceptions and preferences on the use of digital technology to enhance learning.

The results showed a significant improvement in knowledge after both traditional and Edpuzzle classes. The mean score in the Edpuzzle class (9.6) was, however, higher than that in the traditional class (9). Although this difference was not significant ( $p = 0.0975$ ), Edpuzzle seems to have potential since it was a first-time experience and was compared with the deeply entrenched traditional model. Other studies<sup>9,21,22</sup> that estimated its educational effectiveness reported a statistically significant better performance among

students in the blended teaching group than among students in the traditional teaching group. The literature has recently reported that, in relation to student grades, the blended model is the same or better than a face-to-face model.<sup>23</sup>

The lecture topics of the two classes were comparable: the traditional class covering the differential diagnosis for odontogenic and nonodontogenic cysts and the Edpuzzle class for odontogenic and non-odontogenic benign tumors. Both subjects are believed to be challenging in oral radiology.

We evaluated student replace with perceptions and satisfaction in both classes by using a questionnaire created with Google Forms and found that most students enjoyed the Edpuzzle class (► **Fig. 2**). This finding was comparable to that reported in a study by Shelby and Fralish in 2021,<sup>20</sup> in which students stated that they really enjoyed Edpuzzles and that videos were a tremendous help for them.

Most of the students liked the videos and 40% were either neutral or did not like them. This finding was comparable to that of another study<sup>24</sup> in which 40% of the students criticized the content of the videos. In this study, 95% of students (8 students strongly agreed; 11 students agreed) liked the practice questions after the videos. These questions are an active way to recall information and thus helped students with information retention. This finding was comparable to that reported in a study<sup>13</sup> in which the most frequent suggestion by students regarding oral radiology classes was the need for more practical questions during the class.

In this, most of the students agreed that the Internet connection can cause difficulties when lost or slow, which may present an obstacle to students when this type of class is implemented. However, backup for these situations can be planned ahead of time. Similar types of obstacles were mentioned in other studies in which students stated that blended hybrid learning models that include an Internet connection were more demanding.<sup>9,25</sup>

Concerning the educational effectiveness of the classes, 45% of the students thought that Edpuzzle and traditional

classes were equally effective. In terms of grades, Welch's *t*-test ( $p = 0.0975$ ) showed an insignificant difference between the means of post-knowledge grades for the two teaching methods. However, 70% of students earned full marks after the Edpuzzle class compared with 55% of students who earned full marks after the traditional class, demonstrating more knowledge retention after the Edpuzzle class. A similar study showed that students who used an interactive CAL program had significant gains in learning over non-CAL users. However, the authors reported that the tool used to assess participants' knowledge did not necessarily measure understanding or retention, but only recall.<sup>26</sup>

Regarding students' interest in changing learning methods, 65% agreed that there is a need to update them, 75% would like to combine more than one learning method, and 65% agreed that they would like to attend a learning methods workshop. More surprising, however, was that 85% of them agreed that they can self-learn with a tutor's guidance. After the classes, 25% were happy with the traditional learning method and 25% were not happy with it; the remaining 50% felt neutral about changing learning methods. This result could be attributed to students usually being concerned only about obtaining the knowledge they need, irrespective of the learning mechanism. Other studies have shown that students feel more experienced—and therefore comfortable—with printed learning materials. Their preferred learning style will also affect their comfort levels for using a specific format. If students are most comfortable with the textbooks and computer-based tutorials that are part of didactic teaching,<sup>26–28</sup> familiarization with new learning techniques will take time and experience. Implementation of computer-based tutorials and learning techniques will also have favorable impact on professional practices of future dentists in terms of utilizing professional social media in consultation and communication with colleagues for the purpose of improving delivery of healthcare services to the large community of dental patients.<sup>29</sup>

The limitation of this study was that it was conducted among a small sample of female students. Future studies should engage larger samples of students of male and female genders. However, the study tackled an important learning method that can be utilized in teaching oral diagnostic fields which represent a very important step in optimum delivery of healthcare services to dental patients.

## Conclusion

Edpuzzle can be a powerful tool to implement in oral radiology classes, but more experience is required among students and instructors.

### Conflict of Interest

None declared.

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