

A Comparison of Dental Student-Reported Course Evaluation Scores Associated with Video and Paper Cases for a Problem-Based Learning Course on Dental Public Health

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ABSTRACT

Background. All first-year dental students at the University of Washington School of Dentistry are required to take an introductory dental public health course. This course is based on problem-based learning (PBL) principles. The goal of the course is to introduce students to dental public health sciences and encourage dental students' professional commitment to reducing oral health disparities. Historically, the course consisted of lectures and paper-based PBL cases presented in small group settings. Student feedback indicated lack of engagement with the paper cases. In response, three of the five paper cases used in 2008 and 2009 were converted to video cases and piloted in 2010 with the incoming class of first year dental students. We hypothesized that this change would result in improved student-reported course evaluation scores. **Methods.** We used data from the mandatory student course evaluations to measure changes in course satisfaction. The Student's t-test was used to compare mean student course evaluation scores for 2008/2009 (paper cases) and 2010 (video cases) (alpha level=0.05). **Results.** Compared to students who received a paper case, the mean scores for whether the course met its educational objectives were significantly higher for students receiving a video case (2008 [2.9]; 2009 [2.8]; 2010 [3.3]; p=.0001). **Conclusions.** Video cases are a useful model for pre-doctoral dental public health courses designed to link academic content with real-life scenarios.

Keywords: Dental education, educational technology, instructional films and videos, outcomes assessment, problem-based learning, public health dentistry

Problem-based learning (PBL) is a student-centered learning approach that promotes active engagement of students with course materials. All first-year dental students at the University of Washington School of Dentistry are required to enroll in an introductory dental public health course based on PBL principles. The course is designed to encourage students to think critically about the biological, behavioral, social, and community determinants of oral health disparities within a PBL environment. The course introduces students to the process of critical thinking and its application to solving oral health disparities affecting a vulnerable population (e.g., young Medicaid-enrolled children, minority adolescents, pregnant women). Students are asked to examine an access to dental care problem, develop hypotheses regarding the nature and complexity of the problem, establish a priority list of problems, and seek resources and information to develop feasible solutions.

Medical schools have increasingly used PBL curriculum to educate medical students about community and population health (1). Some dental schools have implemented PBL-based curricula, but PBL is relatively uncommon in dentistry. The benefit of adopting a PBL approach to teach public health is that it exposes students to skill-based knowledge rather than fact-based knowledge (1, 2). For example, one study compared the ability of

first-year dental students in a PBL course to generate learning needs (i.e., what they need to know) with faculty generated learning needs and found that students were successful at generating the same learning needs as faculty (2). Generating learning needs is an important step in the process of seeking and acquiring knowledge. The authors also demonstrated that PBL allows students to assume greater responsibility for their learning, a critical step in training students to become autonomous clinicians and life-long learners.

The effectiveness of video-based cases within a PBL format in medical education is well documented (3-5). Prior research in medicine has shown that the addition of a multimedia format enhances the learning experiences of medical students due to the realistic nature of the presentations (5). Video cases in a medical school ophthalmology course improved ophthalmology practice procedures (4). Medical students were able to more fully elaborate on cases when presented with video images than when the video images were not provided and students felt the video images allowed them to incorporate their own knowledge in generating differential diagnoses and treatment options (3).

Historically, the introductory dental public health course at the University of Washington involved paper cases studied within small groups consisting of 8 to 12 students. During the first small group session, students were presented with a



paragraph introducing them to a case that highlighted a public health problem in dentistry. This provided students with a broad description of the case (e.g., clinical scenario, location, characters, social and environmental context). At subsequent small group sessions, additional paragraphs of text were provided, which built upon the previous week's material, both expanding and deepening students' knowledge of the scenario. This layered approach was designed to encourage students to learn by starting from general to increasingly more specific topics of investigation. Students worked in small groups to develop hypotheses regarding the nature and complexity of their case. They were then guided by faculty facilitators - all of whom received the same training prior to the start of the course - to set objectives, seek resources and information, and generate potential solutions. In recent years, student feedback indicated lack of engagement with the traditional paper-based cases. To improve student engagement and learning outcomes, we converted the paper cases to video cases.

Few studies have examined outcomes associated with video case-based PBL courses in dental public health sciences (6). To address this critical gap in the dental literature, we hypothesized that students who learned from video-based cases would report greater satisfaction with the course materials and their time spent on learning than students who had learned from paper-based cases. This hypothesis is based on the premise that satisfied students are subsequently more likely to explore careers in public health dentistry and become public health-minded clinicians.

METHODS

Study Design and Data

This was a retrospective cohort study with historical control groups. We analyzed existing student course evaluation data from first-year dental students at the University of Washington School of Dentistry for years 2008 (n=55), 2009 (n=55), and 2010 (n=55). All dental students are required to complete anonymous course evaluations at the end of each quarter. For all three study years, all students completed a course evaluation. Survey questions were identical across the three years. The evaluations were completed online and consisted of questions on student satisfaction, involvement, and motivation to learn about the topics of the course. All responses were measured by Likert ratings (scales of 1 to 4, 1 to 5, or 1 to 6) with larger scores indicating better outcomes. There were also open-ended questions about perceptions of the course. The study based on secondary data was approved

by the University of Washington Institutional Review Board.

Video Case Development

We used a three-step process to convert paper cases to video cases. Starting with the paper cases, which were originally developed using examples from medical education (Table 1) (7), we developed a script portraying the important case elements.

Table 1. Seven Principles for Effective Case Design in Problem-Based Learning Curricula (Adapted from Dolmans et al. 1997)

Cases should incorporate knowledge of student's prior course work.
Cases should be designed with cues that engage student discussion and elaboration.
Course instructors should design cases with relevance to the student's future professional roles and responsibilities.
Cases should incorporate basic science elements into clinical problems to ensure integration of knowledge.
Cases should encourage active learning and independent exploration.
Cases should foster interest in the subject matter.
Cases should be aligned with stated course objectives.

Below is an example.

She is...frustrated because the dentist was on the other side of town. She does not have steady transportation, so she missed [her son's] first appointment, but was able to make the second although she was extremely late.

WAITING AT BUS STOP. DAY

Maria, Carla, and Kevin are waiting anxiously at the bus stop, but the bus that was supposed to arrive at 2:15 arrives at 2:30 instead.

This causes them to miss their connecting bus at 3:00 to Leavenworth. Maria is anxious about making the appointment on time.

MARIA

[IN SPANISH SUBTITLES]

Carla, call Dr. Webber and tell them we are going to be late [for Kevin's appointment] but that we are on our way right now.

Carla takes her Mother's phone and calls Dr. Webber's office.

CARLA

Hi, we have a 4 o'clock appointment today [for Kevin] and the buses are running late, so I think we're going to be a little late.

RECEPTIONIST

Well, how late will you be?

CARLA

I don't know. The next bus doesn't come for another 30 minutes. So we can get there by 4:30?

The second step included recruiting amateur actors, gathering props, scouting locations, and shooting the scenes following the script for each video. The third step was video editing. Prior to the actual editing of the scenarios, the key elements of each video were re-identified to include cues that would best portray those elements from the original paper case. This step ensured integrity of each of the original paper-based cases (7).

Data Analysis

We used the Student's t-test to compare mean course ratings for students who received a paper case (2008 and 2009) and students who received a video case (2010).

RESULTS

Fifty-five students provided student evaluations in each of the three survey years. Results from the t-tests revealed that compared to students who received a paper case, students who received a video case reported significantly greater mean scores on whether the course met its educational objectives (paper mean=2.8, video mean=3.3; p= .0001), instructors' effectiveness at teaching the subject matter (paper mean=4.2, video mean=5.0; p=.0009), organization of the course (paper mean=3.97, video mean=4.5; p=.02), and the overall rating for the course itself (paper mean=3.87, video mean=4.6; p=.0006) (Table 2).

DISCUSSION

We found that video cases improved student-reported learning outcomes compared to paper cases in an introductory dental public health course. Students who received a video case reported spending more hours on the class materials per week and a greater percentage of those hours were rated as valuable in contributing to their dental education. Additionally, students receiving a video cases reported greater effectiveness of their small group facilitators and of the course on the

whole when compared with ratings from previous years when students worked with paper cases. It appears that the video cases promoted greater feelings of student empathy for many of the characters. After viewing the video case, students commented in small group discussions that they could see "both sides of the situation." The current findings are consistent with a previously published study on improved learning outcomes associated with video cases compared to paper cases (6). The current study relied on multiple years of course evaluation data completed by all enrolled dental students. This other study focused on one year of survey data collected from students who volunteered to participate in the study, which is a limitation because of the potential for selection and recall bias.

Observational learning is a powerful pedagogical approach in teaching public health to dental

Table 2. Evaluations for Students Receiving Paper Case (2008 and 2009) Compared to Students Receiving Video Case (2010).

Question from Student Evaluations	Paper Case		Video Case
	2008 N=55 mean (SD)	2009 N=55 mean (SD)	2010 N=55 mean (SD)
This course achieved its educational objectives ¹	2.9 (0.77)	2.8 (0.76)	3.3 (0.67)
Mean number of hours per week spent on this course	3.8	4.2	4.9
Mean percentage of hours rated as valuable in advancing their education	67%	65%	80%
Instructors effectiveness in teaching the subject matter ²	4.3 (1.14)	4.2 (1.40)	5.0 (1.18)
Mean percentage of students who felt the material was entirely or almost entirely up to date ³	44%	47%	56%
Organization of course ²	4.1 (1.26)	3.6 (1.37)	4.5 (1.27)
The course as a whole was ²	4.0 (1.18)	3.7 (1.38)	4.6 (1.28)

¹ (1) Strongly disagree to (4) Strongly agree

² (1) Very Poor to (6) Excellent

³ (1) Not at All to (4) Entirely or almost entirely

students and video-based cases may be preferred to paper-based cases (8). The video-based format allowed students to observe both verbal and nonverbal communications skills (9-10). For example, the

video-based cases allowed students to see body language and hear voice fluctuations in verbal communication between actors, which may have improved the saliency of the video cases. Our results suggest greater saliency leads to greater levels of empathy, which allows students to reflect on the situation as if they were a real-life witness to the scenario and to become more adept at understanding and anticipating the consequences of their thoughts and actions. In addition, the improvements in student evaluations spanned through 2011 and 2012 (11).

There were several limitations. Dental students were not randomly assigned to paper or video cases, which may have led to history and maturation biases. We are unaware of any events during that year that would affect the outcome of the student evaluations. In a previous study, there were no significant demographic differences across dental school classes (6). The admissions process itself may impact these results in that students admitted to the School of Dentistry fluctuate in their levels of service and prior experience in public health. Future studies employing experimental controls would address these limitations.

CONCLUSION

Video cases are a promising modality of teaching dental public health to pre-doctoral dental students.

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