

HOW WE TEACH | *Generalizable Education Research*

An interactive online approach to small-group student presentations and discussions

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Thor D, Xiao N, Zheng M, Ma R, Yu XX. An interactive online approach to small-group student presentations and discussions. *Adv Physiol Educ* 41: 498–504, 2017; doi:10.1152/advan.00019.2017.— Student presentations had been widely implemented across content areas, including health sciences education. However, due to various limitations, small-group student presentations in the classroom may not reach their full potential for student learning. To address challenges with presentations in the classroom, we redesigned the assignment by having students present and discuss online using VoiceThread, a cloud-based presentation and discussion tool. First-year students pursuing a Doctor of Dental Surgery degree were assigned into small groups to present physiology content and to discuss that content online. This assignment was similar to traditional student classroom presentations, with the exception that the entire assignment was conducted online. The primary purpose of this exploratory study was to investigate the impact of the online format on the discussion quality. Another purpose of the study was to examine students' perceptions of using VoiceThread for presenting and learning, as well as the online interactions between the presenter and audience. Students posted a higher number of questions and comments than required by the assignment. The questions from students were also higher level questions, and the answers to these questions were more thorough compared with what we had previously observed in classroom presentations. The survey results showed that students preferred using VoiceThread for presenting, learning from other presentations, and discussing presentation content over performing this process in the classroom. Preliminary findings suggested that having dental students make presentations and hold discussions online might help address the challenges of student presentations in the classroom.

physiology; educational methodology; dental education; student presentations; online discussion

STUDENT PRESENTATIONS are an important aspect of learning. Such activity promotes critical thinking by forcing students to apply what they have learned in the classroom to information that they have gathered through research (13). Presentations allow students to communicate their understanding of concepts to their peers and foster an environment for the discussion of those concepts (2). While student presentations during class time (in-class presentations) are a great learning activity, there are challenges that hinder the presentations from reaching their full potential. Some major challenges include a lack of discussion after the presentation, being associated with few and

simple questions from the audience, leading to short answers (17), and limited class time to carry out meaningful discussion of all presentations (14). Additionally, students who are not confident enough to speak in front of others may not feel comfortable participating in the discussions. Another limitation of classroom presentation and discussion is that students absent during the discussion will miss a learning opportunity that is difficult to recreate, and all students have no means to review the discussion or provide further insight after the conclusion of the discussion (17). The presentations and discussions may be video recorded for the benefit of students; however, videos do not permit direct input from the viewers, and postpresentation discussions are normally done during class time (25).

Some instructors have used various online tools to address the challenges with classroom presentation and discussions, including using discussion forum and using video recording with time-stamped commenting capabilities. However, these two traditional approaches have limitations. Both require students to use multiple tools for one assignment, which can be cumbersome and may hinder the learning process (21). With online discussion forum, the audience needs to go back and forth between the presentations and the discussion forum to ask questions. In addition, questions posted in the discussion forum are not time stamped, making it difficult for the presenter and other audience members to see the context of the question. With video recording, students need to record their presentation using a screen casting tool and then upload it to a video-hosting platform that has a time-stamped commenting feature. This means students need to learn how to use two different tools, which might pose some learning curve for those who are not tech savvy. The screen casting approach also requires students in the same group to meet physically to record their respective portion of the presentation. If they need to re-record a specific portion of the presentation, they need to restart from the first slide.

Web 2.0 technology offers another potential solution to address some of the challenges with student presentations in the classroom. Web 2.0 technology refers to the collection of interactive web tools that allow users to not only consume information but also contribute content and interact with other users (e.g., YouTube, Facebook, and blog). From an educational point of view, the interactive features of Web 2.0 tools permit educators to combine presentations and interactive discussion around multimedia content. One such tool, among many that are currently available, is VoiceThread. VoiceThread has

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been described by its users as a powerful tool for the education of students belonging to various learning groups (5, 8). VoiceThread offers a few unique features that enable it to support interactive learning in blended and online courses (15, 20). First, unlike traditional PowerPoint slides that only allow students to passively review content, VoiceThread permits instructors and students to create multimedia presentations, make slide-by-slide narration, and invite others to watch and make text, audio, or video comments directly on the individual slides (6). Second, when making comments, students can use VoiceThread's built-in doodling tool to annotate on the slide to engage the audience. Third, since the narration can be recorded slide by slide, specific narrations and slides can be easily modified without affecting the entire presentation. This prevents students from having to modify the entire presentation or narration if later changes are necessary. Fourth, VoiceThread supports remote collaboration. Students do not have to be in the same physical location to contribute to the presentation. Finally, VoiceThread has an app for cell phone and tablets, making learning more flexible for students. Due to these potential pedagogical benefits, VoiceThread had been used widely in K–12 and higher education in a variety of ways across disciplines (5, 10, 19, 28).

Toward the conclusion of our 9-mo physiology course, we assign small-group student presentations that apply learned physiological concepts to explain pathophysiological conditions that were not discussed during lecture. When students present and discuss the presentations in class, we find that the class time is insufficient to fully discuss all presentations. Additionally, there is limited interaction between the audience and the presenters. Very few students in the audience ask the presenters questions. When the audience did ask questions, they were often lower level questions on the Bloom's taxonomy (1), an educational organization tool by which learning objectives and questions are categorized from simple knowledge-based questions to inquiries into new hypothesis. While some predoctoral dental students might have already developed the skill to engage in high-level peer interaction before attending dental school, the constraints of the classroom (i.e., limited classroom time and not being bold enough to speak in front of the whole class) make it difficult for meaningful discussions of the presentations to occur. Students also expressed a desire to review the presentations as well as the discussion multiple times at their convenience.

To address the challenges with student presentation and discussion in the classroom as noted above, we redesigned the assignment by having students make small-group presentations and discuss the presentations online with VoiceThread. We chose VoiceThread due to its ease of use (9) and interactive features outlined above. VoiceThread is also integrated with our learning management system. Students can access the tool with their learning management system login credentials. Overall, the data about VoiceThread suggest that we may be able to use this online tool to help us increase discussion during student presentations.

The purposes of this exploratory study are twofold. The first is to examine if the online format could improve the discussion of the presentation content. Specifically, we examine whether there is improvement in the number of interactions between the presenter and audience as well as the quality of the questions and answers during these interactions. Another purpose is to

examine students' perception of using VoiceThread as a presentation, discussion, and learning tool compared with in-class presentations and discussions.

MATERIALS AND METHODS

Implementation. This study was approved by the University of the Pacific's institutional review board, proposal no. 16–164. The University has an institutional license of VoiceThread, and all faculty and students can access the tool from the learning management system. Students in this study were in their first year of a 3-yr program for a Doctor of Dental Surgery degree. They had been exposed to VoiceThread in other courses, but did not have the opportunity to present using this tool. A brief guide was provided to students to help them become familiar with the program, so that they would know how to post presentations, ask questions, make comments, or respond to peers' questions/comments. One hundred and forty-two students (46 women and 96 men) taking physiology were randomly divided into 20 groups. Each group designed an 8-min presentation on 1 of 10 pathological conditions and reviewed the relevant physiology; 2 groups presented on each condition. Since this was a physiology course, students were instructed to focus on presenting and reviewing physiology. The pathophysiological conditions selected for the presentations had not been discussed during class lectures. The majority of this course was taught in the classroom.

The assignment was given to students 7 wk before the posting due date. After the completed presentations were posted, students were given 1 wk to view the presentations at their convenience and pace. Students were assigned to post at least two questions/comments on the presentation slides of their choice from three specifically assigned presentations. The goal of the assigned posting of questions and comments was to spread the comments among the 20 groups, while also giving students a choice of where to post. A general guideline for asking questions was given to students. The goal of the guideline was to reduce knowledge-based questions and increase questions that may initiate discussion and stimulate thinking. The presenting group was given 1 wk to respond to the questions and comments from their peers. If all students completed the assignment, each student would have posted two comments/questions and responded to two other comments/questions. Thus each student would have made four posts. With 142 students in the class, we expected to have a total of 568 posts for this assignment. The posting of questions and comments by the audience and the posting of responses to audience questions and comments by the presenters would be referred to collectively as the discussion from this point forward. The due date of posting presentations, comments and questions, and responses was on Mondays at 5:00 PM. A grading rubric was used to assess the quality of students' presentations and participation in the discussions. All questions and comments posted on each slide were graded individually. Points were deducted for asking knowledge-based questions and giving incomplete or incorrect answers to questions.

Data collection and analysis. Data were collected from three sources: the discussion thread posted on each presentation, the analytics data on VoiceThread, and the student survey. The analytics data gave us the number of posts (presenting and commenting/questioning/answering) for each individual presentation and the time used for each post. All posts by students were time and date stamped, enabling us to track students' access to the presentations. Students could directly post on specific slides, and the identity of the student making the post was shown. The length of each post, recorded as audio, video, or text, was monitored. The time associated with text postings was calculated based on the time it would take to read the post, as estimated by the analytics tool. Students could access the presentations at all times of the day. We monitored the number of posts at night, in the morning, during lunch, in the afternoon, and in the evening.

To compare students' perception of presentation and discussion during class time vs. online, students filled out a voluntary postas-

signment survey for one-point extra credit. The extra credit was given toward the presentation assignment. Students received the extra point, regardless of their responses to the survey questions. The survey contained Likert-scale and open-ended questions that asked students for their opinion of VoiceThread as a tool for presenting, discussing, and learning compared with live presentations and discussions in the classroom. Students selected as their preferred choice: in-class presentations, VoiceThread presentations, both (both formats are equally preferred), neither (neither format is preferred), or no comparison (lacked adequate experience to make a judgment). The open-ended questions asked for one thing students liked about VoiceThread and one thing they disliked. This assignment was presented only online, so students' reference of in-class presentations would be to their previous experience with in-class presentations from other courses and to case-based presentations in the classroom in our physiology course. Open-ended responses pertaining to the likes and dislikes of VoiceThread and improvements to the assignment were available on the survey. One hundred and twenty-six out of 142 students (88.7%) took the survey.

RESULTS

Students' presentations were PowerPoint slide-based and included audio narration recorded on a slide-by-slide basis. One student used the built-in doodling tool in VoiceThread to annotate on the slides while making audio narration to help the audience follow the presentation. While students had the option to discuss the presentation content via voice, video, or text, all students chose to discuss the content of the presentation using text. In the following sections, preliminary data on the impact of the VoiceThread online format on students' level of participation in, and quality of, the discussion, as well as their perception of this new online approach are presented.

VoiceThread's impact on the discussion of presentations. Data from the discussion threads and VoiceThread analytics tool showed that students actively participated in interactive and meaningful online discussions. Figure 1 demonstrates the interactive discussion between the presenters and the audience on presented content that was observed on many slides for all presentations. We expected a total of 568 postings for the discussion. Students made a total of 775 posts for an average of 5.46 posts per student, which were 1.46 more posts than required by the assignment (Fig. 2A). Students asked a total of 474 questions. We identified 75 questions as knowledge-based questions and 399 questions as higher level questions (84.2%). Most questions asked by students would be categorized as application- or comprehension-type questions on Bloom's taxonomy. The response to these questions were thorough and demonstrated that students had thought about and researched the answers. In many of these responses to the audience's questions, the presenters not only cited what they have learned in the lectures and literature to support their statements, but also provided links to additional external resources.

Having the small-group presentations done online also allowed more time for students to discuss the presentation content. During in-class presentations from previous years, each presentation was limited to a total of 12 min, with 8–10 min for presentation and the remaining time for a brief discussion. With VoiceThread presentations, the analytics tool showed that each group spent an average of 9 min presenting, followed by 15.7 min of discussion, for a total of 24.6 min per presentation (Fig. 2B). We were unable to track the amount of time that students spent to review the presentations and discussions.

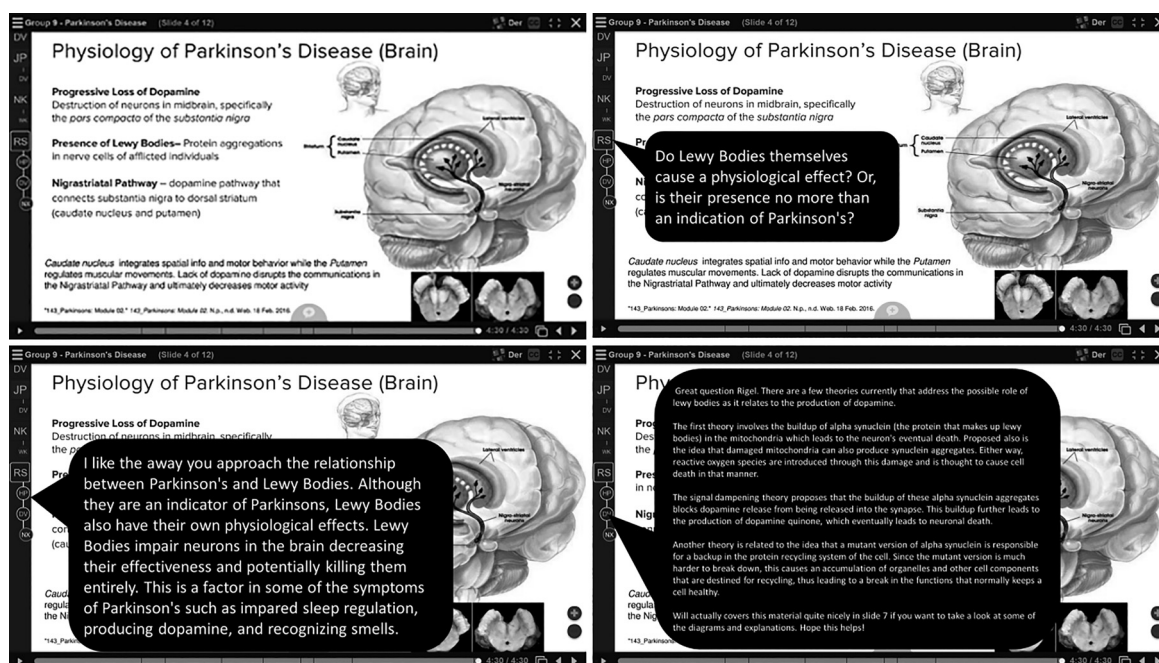


Fig. 1. Representative demonstration of a discussion between students around content presented on VoiceThread. The first slide (top left) is 1 of 12 slides designed by the presenting group on PowerPoint and posted on VoiceThread. The initials to the left of the slide represent students who had presented or commented on this slide. The program will play through the audio presentation and then proceed to play/show each comment from other individuals. For our presentations, students used audio recordings for presenting, and text as the major means of discussion. The programs estimate that the slide will take 4 min and 30 s to hear the presentation and read all of the text comments. The second slide (top right) shows a question asked by RS, which was followed by a comment by HP (bottom left). DV presented this slide and answers HP's question in the last slide (bottom right). The comment bubbles have been modified from the original VoiceThread bubbles for easier viewing of the comments.

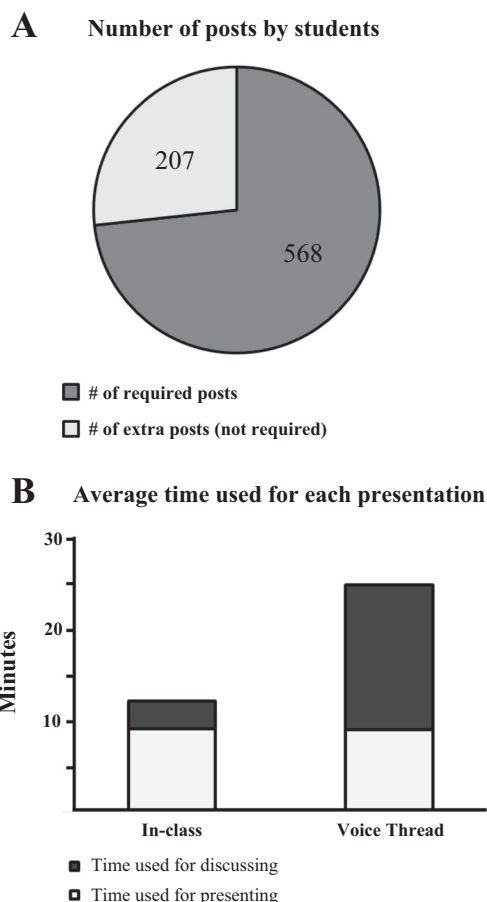


Fig. 2. A: no. of posts made by students. B: comparison of time used for presenting and discussing presentations using class time (in-class) vs. VoiceThread.

To determine the students' VoiceThread usage patterns, we analyzed the day and time that students accessed the presentations. Students posted questions and comments throughout the week, with the highest number of posts occurring during the weekend. A total of 169 posts were made on Saturday and 223 posts were made on Sunday (Fig. 3A). Students also posted questions and comments at all hours of the day (Fig. 3B).

Students' opinion on using VoiceThread for presentations and discussions. Students answered two open-ended survey questions pertaining to what they liked and disliked the most about VoiceThread. The four most common things students liked the most were enhanced flexibility (39 students), learning was easier (20 students), formulating and/or answering questions was easier (19 students), and presentations and discussions could be reviewed as needed (14 students). Students commented on the importance of learning by asking and answering questions. They commented on the value of learning through questions that were made possible by the online platform compared with their experiences with asking and answering questions in the classroom. A few selected quotes are provided below.

"Trying to find a question to ask that other people hadn't already asked made me dig deeper into the subject."

". . . We could easily spend time in answering peoples' questions more effectively and thoroughly because we had the

time to do so. In class, we usually didn't have a complete and comprehensive answer. . . "

"Posting/answering comments was helpful because it solidified the information presented for both the people presenting and the people being presented to."

"I learned the value of researching to not only answer a question, but also to ask a question . . . I found myself wanting to ask the best questions possible so both myself and the other student could mutually learn."

The four most common reasons for disliking VoiceThread were the format of VoiceThread (24 students), a lack of face-to-face interactions (11 students), too much time spent watching the presentations (6 students), and too much time presenting (6 students).

A majority of students (64.5%) reported that VoiceThread allowed their groups to have greater flexibility with designing their presentations. Students also felt it was easier (64.5%) and more comfortable (59%) to present with this program compared with in-class presentations, 15 and 11%, respectively (Table 1). Students felt they could teach better on VoiceThread (57.5%) than with live presentations in class (16%) (Fig. 4A). When asked which format was better for learning, 53% of students reported that they felt VoiceThread was a better format for learning; 25% of them reported that both formats were equally effective; and 13% felt they learned better with in-class presentations (Fig. 4B).

For the discussion part of the presentation, 75% of students also felt that they could ask more effective questions on

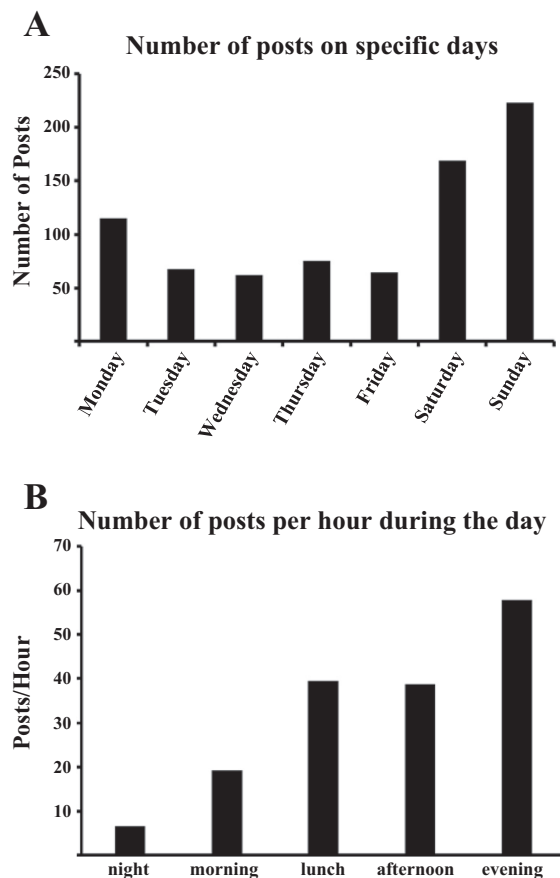


Fig. 3. No. of posts made by students online on specific days of the week (A), and the no. of posts/hour recorded at different times of the day (B).

Table 1. Survey questions asking students to compare their experience with in-class and VoiceThread presentations

| Question for Presenters | In-Class | VoiceThread | Both | Neither | No Comparison |
|---|----------|-------------|------|---------|---------------|
| Which format allowed you more flexibility in designing your presentation? | 12 | 64.5 | 18 | 1.5 | 4 |
| Which format made it easier to present? | 15 | 64.5 | 15 | 1.5 | 4 |
| Which format did you feel more comfortable to present? | 11 | 59 | 22 | 4 | 4 |
| Which format allowed you to communicate more effectively with your group members? | 23 | 31 | 38 | 4 | 4 |

Values are in %; $n = 126$ students.

VoiceThread compared with the 4% that mentioned that in-class presentations enabled them to ask more effective questions. Fourteen percent of students said both format permitted effective questions to be asked (Fig. 5A). Eighty-five percent of the students mentioned that the online format gave them more time to answer questions from the audience (Fig. 5B), and 74.8% of them felt more comfortable answering questions online compared with during class (Fig. 5C).

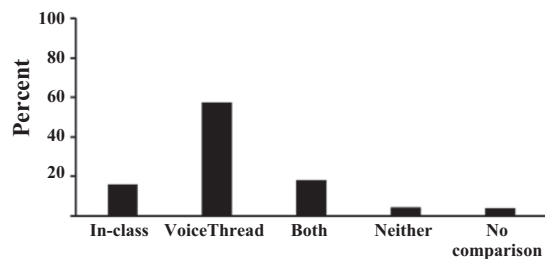
DISCUSSION

This exploratory study examined the impact of small-group online presentations and discussions with VoiceThread and students' perceived effectiveness of the online format for presentation and discussion. Data from the VoiceThread analytics tool and the survey suggest that the online format resulted in a higher level of student participation in the discussions of the presentations. The quality of the discussions also improved compared with what is normally observed during in-class presentations and discussions in our physiology course. The majority of the students favored presenting and discussing online over in-class.

Impact of VoiceThread on discussion dynamics and quality. The benefits of having students present online and view the presentations outside of class time had previously been documented. Among these were building experiences with online technology, giving time flexibility for participation, increas-

ing time for other class activity, allowing students to create more polished presentations (14, 18). Our experience with VoiceThread supported such observations. We found that the online presentations used more time per presentation than in-class presentations mostly due to the increased discussion of each presentation. Given our strict class time schedule, it would be difficult for us to allocate this amount of class time for presentations and discussions. For our assignment, more time was spent discussing the presentations than presenting content. The higher number of interactive exchanges between the presenters and the learners over presented content demonstrated a higher level of engagement in the online environment than in the classroom. Previous research has also reported a

A Which format do you feel was better for teaching?



B Which format do you feel was better for learning?

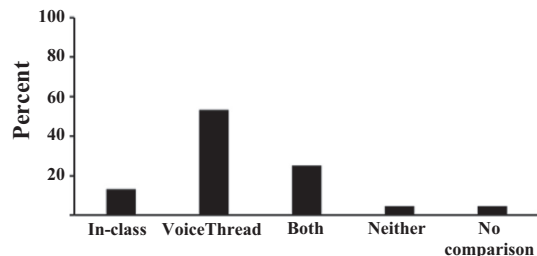
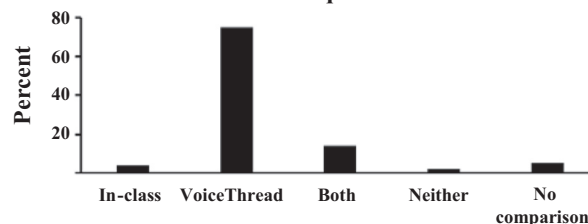
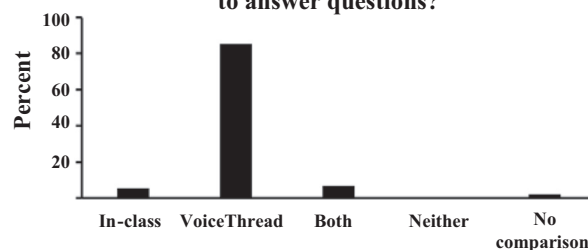


Fig. 4. Comparison of in-class and VoiceThread presentations for teaching (A) and learning (B).

A Which format allowed you to ask more effective questions?



B Which format allowed you more time to answer questions?



C Which format made you more comfortable to answer questions?

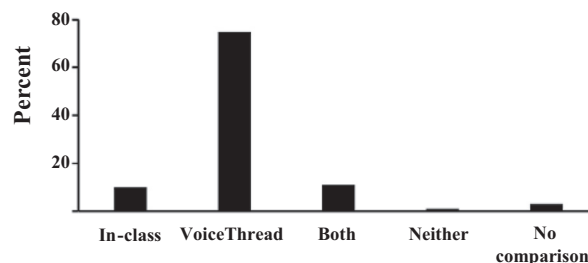


Fig. 5. Student participation in the discussion of presentations was enhanced with VoiceThread. A: students felt they could ask more effective questions. They felt they had more time to answer questions from the audience (B), and they were more comfortable with answering questions (C).

higher engagement between students with online learning compared with on-campus learning (22). Such social interactions are an important aspect of learning (16, 23).

Students' engagement in the online environment was also supported by the higher number of postings per student than the required four posts that were assigned. The flexibility of the online format gave students more time to discuss the presentation content, compared with the time used for discussions in the classroom. Our data demonstrated that the flexibility let students post at all times of the day and throughout the week. It is possible that the high postings during the weekend were in response to a 5:00 PM Monday deadline. It could also be due to the strict schedule of the dental program, which leaves students with more free time on weekends. We had designed the assignment in this way to increase the discussion. We attributed the increased discussions to the comfort students felt in participating in the online discussions, since they had more time to refine their thoughts before posting. With time flexibility, students had the option to view presentations multiple times until the content was understood, allowing better questions to be formulated and refined before posting. Since inquiry about basic content knowledge could be researched by the learner, the questions being asked were of higher cognitive domains on Bloom's taxonomy (1). The presenting group also had time to research and provided more thorough answers. Some students also cited sources of information or provided direct links to the information site when answering the questions from their peers, which may be difficult to do with in-class presentations. Such flexibility fostered more meaningful discussions about the presentation content.

We understand that the nature of our assignment asked students to formulate higher level questions and to spend more time discussing the content by asking students to post two questions/comments on other presentations. However, due to the rigor of this assignment, it would be difficult to achieve a discussion of the same quality in the classroom. As discussed earlier, the limited class time did not allow us to commit course time for this amount of discussion. In the class, not all 142 students would have sufficient time to formulate higher level questions or provided very thorough answers during the discussion. Additionally, students who were not confident enough to ask questions in front of their class of peers might not participate at all. These constraints of the classroom might explain why we often did not observe interactive and meaningful discussions of presentation content in the class, even if some of our students may have already developed the skill to ask thoughtful questions before entering dental school.

Students' perceptions of VoiceThread as presentation, discussion, and learning tool. Based on responses to our survey, more students favored using VoiceThread for presentations and discussions. The favoritism was partially related to the flexibility students felt the program provided. Students could design their group presentation at any time and location of their choice, and the group did not need to meet physically. They reported that the online format did not affect how members of the group communicated with each other. With presentation assignments, our students generally divided the presentation into different sections and assigned specific sections to one or two group members. The online platform made the collaboration process more flexible for group members.

Students favored using VoiceThread to teach. A partial explanation for the favoritism was the dynamics of presenting online. Narration of presentations was done as audio recordings using a computer. This process made it possible for the presenter to read a script and to have multiple recordings until they posted a final product. Even so, some students reported that it took a longer time to present on VoiceThread compared with presenting during class time. The longer time may relate to students' desire to post only their best effort and display their best teaching abilities. This had also been our general observation when we and other faculty members in the Biomedical Sciences Department used VoiceThread to give lectures. It was unclear whether the same efforts would have to be exerted by students to present the same quality presentation, if it was performed in front of a live audience during class time. Preferences given to VoiceThread for teaching may also reflect fears of public speaking and the comfort of speaking to a computer over a live audience. Fredricks and colleagues (12) suggested that VoiceThread can provide those students who fear public speaking with an opportunity to participate and be actively involved in the presentation and discussion process.

Students also preferred using VoiceThread for learning. This was due in part to the flexibility and capability to review presentations and discussions multiple times, which allowed for more personalized learning (27) and repetition (11). The fact that students accessed VoiceThread presentations during different days and times of day showed that they took advantage of the flexibility and interactivity of the online platform. Questions about content and the answers were posted on the presentation for all participants to view; as oppose to presenter-learner communication through private means such as emails. Public posting of questions/answers could potentially have the advantage of simulating more presenter-learner interaction (9). With such advantages, we had expected a higher number of students to favor using VoiceThread for learning. Partial explanations of this phenomenon may relate to the absence of a comprehensive exam for our assignment. A comprehensive exam would require students to review the presentations and discussions multiple times. Students may develop an appreciation of the multiple viewing capabilities by having the presentation posted online vs. presenting in the classroom. Learning during a presentation assignment also occurred during the research of content for the presentation (26). VoiceThread did not change the dynamics of this process from in-class presentations. Instead, it had the advantage of giving students more time to think and research before making their postings.

While our study showed that students generally preferred VoiceThread over in-class presentations, we also observed disadvantages with using VoiceThread for student presentations. The interactions between presenter and learner were not in real time. This created a time lag between question and response. A few students had reported that the direct interactions between presenters and audience during in-class presentations were lacking in online presentations. The lag time also required that each student revisit the presentation multiple times to view the discussion between their peers. The amount of time spent and effort on presenting and discussing could overwhelm some students, as was mentioned in the survey. Grading of the assignment was also more time consuming as oppose to having students present live during class time.

Therefore, considerations for time and point value must be made during the design of assignments.

Limitations and future directions. Although preliminary data showed that the quantity and quality of discussion were improved using VoiceThread, there are some limitations to our study that need to be addressed. First, we did not assess learning outcomes for the presentations as this was beyond the scope of this exploratory study. Some previous studies demonstrated that online discussion forums increased student performance (3, 4, 7), whereas other studies showed no correlations between student performance and online discussion (24). In our study, many students did report in the survey that learning was enhanced with VoiceThread. However, this was subjective, since their comprehension and retention of content knowledge from the presentation and discussion was not assessed. The impact of the increased time and quality of discussion on students' learning warrants a separate study. Such studies would compare students' perspectives and differences in learning outcomes between in-class and online presentations. Second, comparisons of the online presentations to in-class presentations were based on in-class presentations of similar design from previous years and case-based discussions, which required students to present a case followed by a discussion of the case. We had not assigned groups to present during class time, so comparisons of the quality of questions and answers cannot be made directly. It is possible that, given sufficient time, the quality of in-class presentations may meet or exceed that of online presentations. Third, we did not compare the effectiveness of VoiceThread with other alternative online tools, as that is not the initial purpose of this study. We used VoiceThread for this assignment due to its ease of use, interactivity, and flexibility, as previously discussed. Future studies can compare the differences between VoiceThread and other platforms, such as traditional discussion forums and video recordings. Finally, it is also important to reemphasize that our students had obtained a 4-yr degree and had possibly acquired skills and knowledge that made the discussion successful. However, challenges of having quality discussions during class presentations motivated us to explore using online tools for student presentations.

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DISCLOSURES

No conflicts of interest, financial or otherwise, are declared by the authors.

AUTHOR CONTRIBUTIONS

D.T. and N.X. conceived and designed research; D.T. and N.X. performed experiments; D.T., N.X., R.M., and X.X.Y. analyzed data; D.T., N.X., and M.Z. interpreted results of experiments; D.T., N.X., R.M., and X.X.Y. prepared figures; D.T. and N.X. drafted manuscript; D.T., N.X., and M.Z. edited and revised manuscript; D.T. and N.X. approved final version of manuscript.

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