#### ORIGINAL RESEARCH

Kaori Morimoto, DO; Claudia Nelson, MS; Lauren Ozdowski, DO; Mary Galka, DO; Abigail Calkins, DO; Bachtuyet Le, DO

# Osteopathic Medical Students' Preferred Method of Participation in Online Lectures and Learning Activities

#### Abstract

**Introduction:** The demand for online education is on the rise as technology and a global community expand. In the context of COVID-19 pandemic, the Neuromusculoskeletal Medicine/Osteopathic Manipulative Medicine (NMM/OMM) Department at Western University of Health Sciences College of Osteopathic Medicine Pacific (COMP) and Pacific-Northwest (COMP-NW) was required to transition from a hands-on, in-person model to entirely virtual teaching. With the rapid transition, student feedback was paramount in determining the effectiveness of the virtual curriculum model and establishing evidence-based guidelines to inform future online delivery methods for the teaching of osteopathic manipulative medicine.

**Methods:** A 7-question Qualtrics survey was developed to assess the first and second-year osteopathic medical students' perception of their online curriculum participation, the preferred method of participation, barriers to participation, and how the NMM/OMM department can improve the curriculum to increase student participation. The survey was distributed electronically to the students at Western University of Health Sciences COMP and COMP-NW.

**Results:** 85 students participated in the survey. The most preferred method of participation was an anonymous online polling platform such as "Kahoot!" The most frequently reported barrier to participation was lack of confidence. The most popular suggestion about increasing student participation was to increase more anonymous polls or gamification, such as "Jeopardy," for review sessions. The logistic regression analysis showed that the following 3 student characteristics were the most decisive factors for a student to report that more participation would increase their OMM knowledge: fear of public speaking (p = 0.024), difficulty staying focused during online curriculum (p=0.041), and being a first-year osteopathic medical student (p<0.01).

**Conclusion:** Online curriculum design and delivery pose new and unique challenges to teachers and institutions worldwide. Understanding the creativity it allows, its limitations, and how to increase student engagement and participation needs to be continuously investigated as the technology and demand of online learning grow.

#### **Corresponding Author**

Kaori Morimoto, DO 25805 Barton Road, Suite 107 Loma Linda, CA 92354

(909) 478-7700

KMorimoto@llu.edu

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#### Introduction

There has been a dramatic expansion in industry and the feeling of a global community through virtual social technologies leading to a higher demand for the development of online curriculum at educational institutions. In part due to the recent pandemic, but also as an effort to be more inclusive of individuals' learning styles and time, the Neuromusculoskeletal Medicine/Osteopathic Manipulative Medicine (NMM/OMM) Department at Western University of Health Sciences College of Osteopathic Medicine of the Pacific (WesternU COMP) and COMP-Northwest (COMP-NW) looked to rapidly initiate a virtual learning curriculum for osteopathic manipulative medicine.

Osteopathic manipulative medicine (OMM) is a treatment modality that allows the provider to use hands-on, neuromusculoskeletal techniques to encourage the body's natural tendency toward optimal health. These techniques are traditionally taught in a lab setting with table trainers to assist in learning the various intricacies and complexities of these techniques. To credential students as osteopathic physicians, osteopathic medical schools must provide two years of OMM training, averaging between 200-300 hours.1 At WesternU COMP and COMP-NW, osteopathic medical students go through a rigorous training program of over 200 hours of lectures that integrate didactic knowledge with a robust hands-on curriculum in the OMM laboratory. When transitioning to a virtual curriculum model for the academic year of 2020-2021, the hands-on portion of the curriculum became condensed into a 1-month intensive course that occurred in the spring semester of 2021, and the remaining hours were provided completely virtual via live Zoom sessions and pre-recorded lectures. While learning effectiveness has been found to be comparable between in-person learning and that of a virtual didactic curriculum, it is unknown if this translates to hands-on diagnostic and therapeutic skills such as osteopathic manipulative techniques.<sup>2,3,4</sup>

When implementing a virtual curriculum at a medical institution, the goal is to keep students on their current trajectory for clinical training and graduation. Furthermore, the advent of telemedicine contributes to the need for physicians to be trained in public speaking, telecommunications etiquette, and displaying genuine empathy and rapport through virtual media.<sup>5,6</sup> However, research has shown that in the setting of a virtual curriculum,

the etiquette of participation and communication differs from that of an in-person learning environment.<sup>5</sup> Therefore, when initiating a virtual curriculum model, it is important for educators to learn what is the most appropriate and effective method for encouraging participation of students as well as identifying potential barriers to participation.<sup>5,7</sup>

Previous research in the field has concluded that students are more satisfied with an online curriculum that simulates onsite education, specifically those which utilize a diverse array of interactive opportunities.<sup>8,9</sup> Castle and colleagues found that when creating an online curriculum, students were most receptive when the online material was designed to facilitate student learning and when the interaction between the facilitator and student was maximized.8 They found that utilizing synchronous audio and visual modalities, such as live lectures via Zoom, were more engaging to students than pre-recorded material that students were unable to engage with.8 In conjunction with this, case studies and other online activities were shown to increase participation and effectively facilitate student learning.<sup>10</sup> Students have also been found to be more receptive to online learning when placed in smaller groups.<sup>11</sup> Burgess and colleagues determined that smaller, team-based groups facilitated more effective learning of material in a clinical setting.<sup>11</sup>

While research has illustrated ways in which participation can be enhanced, literature has identified an equal number of ways in which participation could be limited. The most widely-advertised barrier to participation has been students' fear of public speaking.<sup>12</sup> The effect of public speaking on heart rate and blood pressure has been well studied, and further studies have illustrated that public speaking can lead to physiological distress as evidenced by an increase in specific inflammatory markers and immune cells such as IL-1, IL-6, and CD8+ and CD56+ cells.<sup>13,14,15,16</sup> In response to this, providing ample opportunity for students to engage in public speaking among their peers in a non-judgmental learning environment has been found to be beneficial for students in helping them gain confidence and better adapt to stressful conversations.<sup>6,17</sup>

A second commonly-found barrier to participation has been that of unpreparedness. When evaluating didactic performance following a virtual learning encounter, students that did not preview the material ahead of time were shown to have a decreased performance compared Table 1. Survey Questions

- 1. What year are you?
  - OMS I
  - OMS II
- 2. What are your favorite styles of participation during the Zoom sessions? (select all that apply)
  - Volunteer to answer
  - Called on randomly to answer questions
  - Called on to answer pre-assigned questions
  - Participation via chat
  - Participation via annotation
  - Participation via anonymous polls
- Participate via review games (such as Jeopardy)3. What are the barriers to your participation? (select all
  - that apply)
  - Lack of confidenceFear to speak in public
  - Difficulty staying focused
  - Lack of engagement with the material
  - The material does not interest me
  - Not previewing the materials
  - Too many Zoom lecture hours a week
  - Others:
- What would increase your participation? (select all that apply)

to their peers that reviewed the material.<sup>18</sup> When implementing a virtual curriculum, it is crucial to take these barriers into account in order to create a model that effectively facilitates student learning, as well as gather feedback from student participants throughout the curriculum timeline to determine the success of the learning sessions.<sup>8,19,20</sup>

# Methods

A 7-question Qualtrics survey was created regarding the preferred method of participation in the online OMM lectures and learning activities for the first and second-year osteopathic medical students (OMS I and OMS II, respectively) at WesternU COMP and COMP-NW. Students were provided with multiple modes for participation in the online OMM curriculum activities offered during the 2020 academic year, and the survey questions were designed to identify the limiting factors for student participation in these learning activities. The final survey questions and answers are listed in Table 1. The survey questions were not tested for reliability and validity.

The link to the Qualtrics survey was electronically distributed to student email addresses following virtual OMM sessions. The survey data was collected between

- More open ended questions
- More polls
- More chances to annotate
- More review games
- Being called on
- More follow-along demonstrations
- More case studies
- Others:
- 5. I believe I participate at the level expected of me as a medical student during the Zoom sessions.
  - True
  - Somewhat true
  - Neither true nor false
  - Somewhat false
  - False
- 6. My OMM knowledge would improve if I participated more in the OPP Zoom sessions.
  - Strongly agree
  - Agree
  - Neither agree nor disagree
  - Disagree
  - Strongly disagree
- 7. Comments

4/27/2021 and 5/28/2021, at the end of the academic year. The survey was submitted anonymously by students with no identifying information being collected. The survey data was collected through Microsoft Teams and analyzed via Microsoft Excel and IBS SPSS 27 software.

The inclusion criteria for the statistical analysis included the following: 1) the student identified as a first or second-year osteopathic medical student, 2) the student answered a minimum of 1 question. Therefore, the sole exclusion criteria was if a survey was submitted with no answers selected for any of the 7 questions. No blank surveys were received; therefore, all submissions were included in the data analysis.

#### Results

Eighty-five WesternU COMP and COMP-NW first and second-year students participated in the survey. The academic year of the surveyed population is summarized in Figure 1. The answers to the preferred method of participation, barriers for participation, and how to improve the curriculum to increase student participation are summarized in Figures 2, 3, and 4, respectively.

The preferred methods of participation were anonymous polls (24.9%) and participating via Zoom chat (17.5%), followed by annotating the presented PowerPoint



#### Figure 2. Preferred Method of Participation



Figure 3. Barriers for Participation



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Figure 4. How to Improve Curriculum for Student Participation



Figure 5. Students' Perceived Level of Active Participation



Figure 6. Increased Participation A Benefit to OMM Knowledge



(16.2%). The most significant barriers for student participation in the online activities were lack of confidence (32.7%), fear to speak in public (17.3%), and difficulty staying focused (15.3%). A larger number of students suggested that more polls (55.4%) and more review games (12.0%) could be effective in increasing their level of engagement.

For the question about students' perceived level of active participation (question 5), 37.6% and 36.4% of students answered "true" and "somewhat true," respectively. 15.3% chose "neither true nor false," and 7.2% and 3.5% of the students reported "somewhat false" and "false," respectively. The results are summarized in Figure 5.

When asked if increased participation would benefit their OMM knowledge (question 6), 7.0% and 16.4% of the students answered "strongly agree" and "agree," respectively, and 30.6% had a neutral response. The remaining 33.0% and 13.0% of the students chose "disagree" and "strongly disagree," respectively. The results are summarized in Figure 6.

To increase the power of the statistical analysis, specific answers to questions 5 and 6 in Table 1 were grouped and re-categorized into 3 groups for further review. For question 5, the answers for "true" and "somewhat true" were grouped as "true" and "false" and "somewhat false" was collectively categorized as "false." Similarly, for question 6, the answers were categorized into "agree," "disagree," and "neither agree nor disagree."

For the logistic regression analysis, students who selected multiple answers for question 2 were reclassified into a single answer per student. The students who selected answers including "being called on" were grouped together. Similarly, students who did not select "being called on" were grouped together. For the answers to question 3 and 4 (barriers to participation, and how to increase student participation, respectively), multiple answers were reclassified as "multiple." Additionally, the answers of the students who chose "neither agree nor disagree" for question 6 were eliminated to directly compare the "agree" and "disagree" groups and the influencing factors. Significance was set to p <0.05 for all analyses.

From the 85 responses to the survey, 59 responses were analyzed using a logistics regression model to identify variables that were most strongly indicative of a student agreeing that more participation in the Zoom activities would improve their OMM knowledge. The statistically Table 2: Logistic Regression Analysis Results

	DF	Wald Chi-Square	Pr>ChiSq
Fear to Speak in Public	1	5.10	0.02
Difficulty Staying Focused	1	4.18	0.04
OMS I	1	6.73	<0.01

significant analysis results are summarized in Table 2. Students who selected fear to speak in public (p = 0.024), difficulty staying focused (p=0.041), and being a first-year osteopathic medical student (p < 0.01) were indicative of selecting that more participation would be beneficial in improving their OMM knowledge.

#### Discussion

OMM is traditionally taught through in-person, handson activities combined with didactic lectures. At WesternU COMP and COMP-NW, the curriculum includes over 200 lecture hours with more than half of those hours being dedicated to hands-on practice activities. However, mandated quarantine in 2020 required the NMM/ OMM department to deliver the didactic curriculum exclusively in a virtual setting and the table-training was severely condensed into a 1-month-long, in-person training intensive during the spring semester of 2021. As a result, large group lectures and small group activities were designed and delivered via Zoom for the majority of the 2020-2021 academic year.

The results of this study suggest that 74% of the students reported adequate participation in the online curriculum. A predominant number of students preferred to participate via anonymous polls, chat, and PowerPoint annotation. The least favorite choices were "being called on" and "called on to answer pre-assigned questions." These findings suggest that many students were hesitant about having to speak among their peers. Fear of speaking in public is a highly prevalent condition and can cause significant psychological and physiological distress.<sup>12,13,14,15,16</sup> The effect of public speaking on heart rate and blood pressure has been well studied and direct evidence supports that public speaking increases physiological distress through increased inflammatory markers and specific immune cells such as interleukins 1 and 6, and CD8+ and CD56+ cells.<sup>13,14,15,16</sup>

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A study conducted by Carroll et al provides an exciting

insight into physiologic changes secondary to the stress of public speaking in healthy individuals. In their study, 102 participants underwent a 5-minute public speaking task that consisted of 2 minutes of speech preparation to defend themselves against an alleged shoplifting or traffic violation and 3 minutes of speech delivery while being videotaped. The results showed a 19mmHg elevation in average systolic pressure, 9 beats per minute increase in heart rate, and an elevation in circulating IL-6 levels from baseline.<sup>13</sup>

While medical students during an online lecture are not being accused of criminal activity as discussed by Carroll et al, being required to talk to the camera and directly evaluated could create similar distress. These findings could explain why more students prefer answering polls, typing in the Zoom chat, and live annotating the lecture slides. To increase student participation and reduce stress, increasing these methods of participation could be implemented; however, it is also important for medical schools to provide training in public speaking and communication.<sup>6</sup> As physicians often communicate in small groups, incorporating some form of public speaking training in a small group curriculum has been found to be beneficial for professional development.<sup>17</sup>

When asked how to improve the online curriculum to garner more student participation, over 50% of the respondents selected increasing the participation option of "anonymous polls." The second most popular answer was "more review games," with 12% of students selecting this answer. Incorporating games (gamification) has become increasingly more popular in education.<sup>21</sup> At WesternU COMP and COMP-NW, the online anonymous poll platform "Kahoot!" has been used in several formal lectures as a means for anonymous polling. Ismail et al report that utilizing "Kahoot!" in medical institutions effectively increases student motivation, highlights essential concepts, and self-evaluates lecture material understanding for each student.<sup>21</sup> Additionally, at WesternU COMP and COMP-NW, Jeopardy-style review games have been incorporated in small group knowledge check sessions. While each student must answer questions over Zoom, the small group atmosphere provides a more informal setting than is created with traditional lecture activities. Also, students had the autonomy to select questions as opposed to being assigned topics. Research has indicated that these styles of review games are an effective alternative to traditional medical school quizzing ("pimping") sessions, in which the instructors assign the

questions and have students answer in front of peers.<sup>22</sup> Moreover, Jeopardy games have been associated with increased knowledge retention in the long term compared with formal lectures.<sup>23</sup>

The most frequently reported barriers to participation were lack of confidence, fear of speaking in public, and difficulty staying focused. The difficulty of staying focused during an online curriculum is a global challenge in many institutions. While some students appreciate the increased time to study resulting from less time commuting to a physical location, many students report lower learning satisfaction.<sup>24</sup> Difficulty communicating with instructors and peers, poor internet connection reliability, and difficulty staying focused for long periods of online learning have been reported.<sup>24</sup> Microsoft Canada conducted a gamified online quantitative survey where they collected over 2000 responses, as well as an on-site study including EEG monitoring, where they asked 112 participants about their attention span on tasks on the screen. They found that the average human attention span has declined from 12 seconds to 8 seconds between 2000 and 2013. However, heavy technology use appears to be training the user to become better at processing information through multiple short bursts of high attention.<sup>25</sup> This indicates that increasing student participation during long hours of online sessions could increase the frequency of bursts of intense focus and translate to improved knowledge acquisition.<sup>25</sup>

Despite these findings in current literature, 46% of our students reported that increasing their online curriculum participation would not improve their OMM knowledge acquisition, 23% reported it would be beneficial, and 31% were unsure. These findings are congruent with the fact that over 70% of the students reported they were already adequately participating in the online curriculum activities, indicating that further participation for this percentage of students could be viewed as having diminishing returns.

Logistic regression analysis was conducted to further analyze which factors contributed to the students' answers of "more participation is beneficial to their knowledge acquisition." All the answer choices were included, and 3 variables were significantly associated with students reporting that increased participation would benefit their knowledge acquisition. The 3 variables were found to be "fear of public speaking," "difficulty staying focused during the online curriculum," and "being a first-year student" (Table 2). It corresponds that students who fear public speaking and have difficulty staying focused during the online curriculum would report that increasing their participation would benefit their OMM knowledge. Increasing anonymous methods of participation such as "Kahoot!" could be highly beneficial for those students in increasing their engagement during online learning activities.

Further, research has illustrated that first year medical students have a higher level of perceived stress and anxiety in contrast with the general population.<sup>26,27</sup> About 1/4 of the first year students who participated in this survey reported extreme anxiety due to social evaluation. It was also reported that poorer coping skills strongly correlated with an increased anxiety score.<sup>27</sup> Similarly, the average Patient Health Questionnaire-4 (PHQ-4) score among first-year medical students (n= 321) was found to be higher than that of the general population (n=5030). The higher level of stress, anxiety, and depressive symptoms that first-year medical students face may drive them to feel that more participation would improve their knowledge, as signified by our results (Table 2).

#### Limitations

The most significant limitation of this study was the low response rate (14.2%), which may limit the generalizability of the survey results. We speculate that the low response rate was due to the voluntary nature of participation in the survey. To improve survey participation, granting extra credits in the NMM/OMM course upon submission of the survey may be effective in the future. Additionally, the survey lacks validity and reliability testing, which should be addressed in future studies.

There were confounding variables that may have affected the survey outcome. These include students' grades, the instructors' objective measurement of student participation, and student gender. Since this is a quality-improvement study led by OMM/NMM fellows and the faculty who are instructors of the study participants, we decided not to collect any identifying information to maintain the anonymity of the survey. The double-blinded survey will be beneficial in overcoming this limitation for future study.

## Conclusion

Online curriculum is in high demand due to the drastic expansion in the last decade of industry and the feeling of

a global community through technological social media outlets. However, due to the unique challenges associated with online curriculum in contrast with traditional in-person lectures, its curriculum design, delivery method of materials, and forms of student participation need to be examined and explored. Our study provides an insight into the preferences of osteopathic medical students for various participation methods, barriers to participation, and how to improve the online curriculum design in the setting of a medical institution. Further research is warranted to analyze effective curriculum designs and delivery methods for specific topics when teaching larger groups as well as in varying academic settings.

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