



Differences in perception of online anesthesiology between Thai medical students and teachers during the COVID-19 pandemic

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Purpose: Traditional anesthesiology learning was disrupted by the coronavirus disease 2019 pandemic and replaced by online learning. Students and teachers did not prepare well for this change. Determining the differences in perceptions can close the gap and develop more effective curricula. Our study aims to compare students' and teachers' perceptions of online anesthesiology learning.

Methods: We conducted a prospective descriptive study, a cross-sectional survey between July 2020 and January 2021 in the Anesthesiology Department, Faculty of Medicine, Khon Kaen University, Thailand. Our participants were fifth-year medical students and teachers participating in online anesthesiology. We compared the perception of the teaching process, support system, learning outcomes, satisfaction, and preference. Using an online structured questionnaire survey with a 4-point Likert scale to measure the degree of agreement with each item. We analyzed the difference between students' and teachers' perceptions by topic.

Results: We received responses from 174 students and 24 teachers. Students had a significantly higher proportion of positive perceptions than teachers on the teaching process (theoretical teaching, problem-based learning, feedback, and response system), on a support system (technological support, connectivity, and learning materials), on learning outcomes (clinical practice readiness, critical thinking, long-term memory, and enthusiasm), satisfaction score, and online learning preference ($p < 0.05$).

Conclusion: Differences in perception were high in many aspects of online anesthesiology learning. This perception gap was particularly evident in the teaching process, support system, and learning outcomes. And Thai students had more preference for online learning than teachers. Strategies to reduce the gap should focus on teachers' training and supporting online learning should be concerned.

Key Words: Anesthesiology, COVID-19, Medical students, Online learning, Perception

Introduction

The coronavirus disease 2019 (COVID-19) pandemic has greatly affected teaching in medical schools, disrupting traditional teaching strategies and forcing many courses to be taught through distance learning [1,2].

Technological advances have made online learning markedly more feasible and effective, allowing for asynchronous learning, flexibility, simultaneous study, convenient assessment, and for students to undergo self-assessment before formal class sessions [3]. A systematic review comparing online and traditional learning reported comparable examination outcomes in undergraduate med-

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ical education and did not find evidence indicating that offline learning was superior to online learning, making it a potential alternative education method in this context [4]. However, online learning requires a reliable internet connection, capable hardware, and a sufficient level of computer literacy. It also weakens the relationship between teachers and students and requires students to practice effective time management, including self-motivation [3]. Previous studies have shown that online learning has limitations in clinical and technical skill training [5]. Online case-based learning in the teaching of clinical anesthesia reported skill training limitations and showed a negative effect on students' attitudes [6]. However, the study on anesthesia case-based online learning reported higher satisfaction than conventional case-based learning [6].

While education in many Asian countries tends to be teacher-centered and focused on rote learning and didactic lecture, students require self-study, self-motivation, and a flipped classroom model in online learning [6-9]. A previous study in an Asian country found that 89% of medical students reported being less satisfied with online learning [10]. Common problems among students were connectivity, the interaction between students and teachers, feedback systems, and course materials [11]. Previous studies reported that factors affecting student satisfaction were quality with five dimensions: content, system, learner, instructor, and interaction. That should be directed toward improving interactive teaching styles, collaborative activities, proper training for online learning prior to online learning, quality of content, and a good performance online learning system [12]. At the same time, teachers reported less satisfaction with online learning than students in the Asian country [13]. Insufficiency training, higher workload, long preparation time, and technical problem were addressed as the cause of unsatisfied. Teachers require training, technology support,

and incentives to improve the satisfaction with online learning [10].

Traditional anesthesiology learning was disruptive by the COVID-19 pandemic and replaced with online anesthesiology learning [6]. Medical students and teachers did not prepare well for this change. The perception of online learning between medical students and teachers seems different [10,14,15]. We found uncertain results on the proportion of positive perceptions of online learning between students and teachers [10,14,15]. The causes of the difference in positive perception are essential to improve online learning with the concern for medical students and teachers. Positive perception toward online learning is a process of interpreting information received to create meaning. It is greatly influenced by the individual's background, experience, sociocultural context, attitudes, personality, motives, feelings, interests, and expectations [16]. Determining significant differences between students' and teachers' perceptions of online learning can close the gap between medical students and teachers and develop more effective curricula [10,14,15]. Lessons from online anesthesiology learning may expand to better understand students' and teachers' perceptions.

In Thailand, medical education requires 6 years (3 for pre-clinical studies and another 3 for clinical studies). According to our curriculum, students take anesthesiology in their fifth year. The course aims to train students in the safe administration of anesthesia, focusing on imparting knowledge and both technical and non-technical skills. Before the pandemic, fifth-year medical students at Khon Kaen University received 3 weeks of blended courses consisting of interactive lectures, case-based discussion, simulated skill training, real-world practice, and online material. However, due to the COVID-19 pandemic, our department was forced to replace these traditional methods with online learning. The interactive lectures and case-based discussions in the onsite section

of the course were replaced with interactive online learning. Students' clinical practice began 5 months after the online section due to limitations brought about by the pandemic. So, we aimed to study the difference in perception between medical students and teachers of online learning in an anesthesiology course after a disruptive traditional class from the COVID-19 pandemic. We evaluated their positive perception of the teaching process, support system, learning outcomes, satisfaction, and online preference. The result helps us to understand the effect of online anesthesiology learning on the perception of students and teachers and seek the obstacle to close the gap and increase satisfaction with online anesthesiology learning among students and teachers.

Methods

This prospective descriptive study was based on a cross-sectional online survey to compare perceptions of online anesthesiology learning between students and teachers. We conducted the study at the Anesthesiology Department, Faculty of Medicine, Khon Kaen University (Thailand), between July 1, 2020, and January 31, 2021. We obtained approval from the Khon Kaen University review board before the commencement of the study (HE631499). The study was analyzed and presented with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. Trial registration number is TCTR20210430003 (Thai Clinical Trials Registry).

We included fifth-year medical students who had participated in online anesthesiology learning and the teachers who had all taught anesthesiology via online learning at least once during the study period. The online anesthesiology learning system comprises 17 online interactive lectures, 17 topics of online learning material, two online case-based discussions, online feedback and

responding system, and an online knowledge evaluation. We excluded participants who did not respond to the online questionnaire.

1. Outcome measurement

We designed and developed a structured questionnaire based on previous studies and adjusted it for use in a Thai context [10,15]. An expert panel in the content area was consulted to improve content validity. We conducted a pilot study. We included five teachers and 10 medical students who did not participate in the study to reduce the bias. We determined the survey's reliability and made the necessary modifications based on the results. Reliability was assessed using Cronbach's α coefficient and determined to be acceptable (0.88 for the questionnaire). The 25-question questionnaire consisted of three sections (Supplements 1, 2). The first section evaluated participant characteristics, including gender, age, previous experience with online learning and the number and type of devices used for online learning. The second section evaluated recipients' perception of online learning during the anesthesiology course, focusing on the teaching process, support system, learning outcomes, and preference for online learning. We used a 4-point Likert scale to measure the degree of agreement with each item (1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree). Agree and strongly agree were considered positive perceptions. The third section consisted of three questions to evaluate participants' satisfaction using a 5-point Likert scale (1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree). We did not record the respondents' names to preserve anonymity. The questionnaire took about 10 minutes to complete. Participants were recruited using an online survey (Google Forms; Google LLC, Mountain View, USA). The first page of each questionnaire described the purpose of the study and information about participation (including the right to

withdraw). Participants filled out an electronic consent form before taking the online questionnaire. Only after agreeing to participate could potential respondents continue to the online survey. We distributed the questionnaires through the participants' university e-mails and the official department LINE group (LINE Corp., Tokyo, Japan) 5 months after the online learning. In addition, we sent out a reminder to our contacts to encourage them to fill out our survey.

2. Statistical analysis

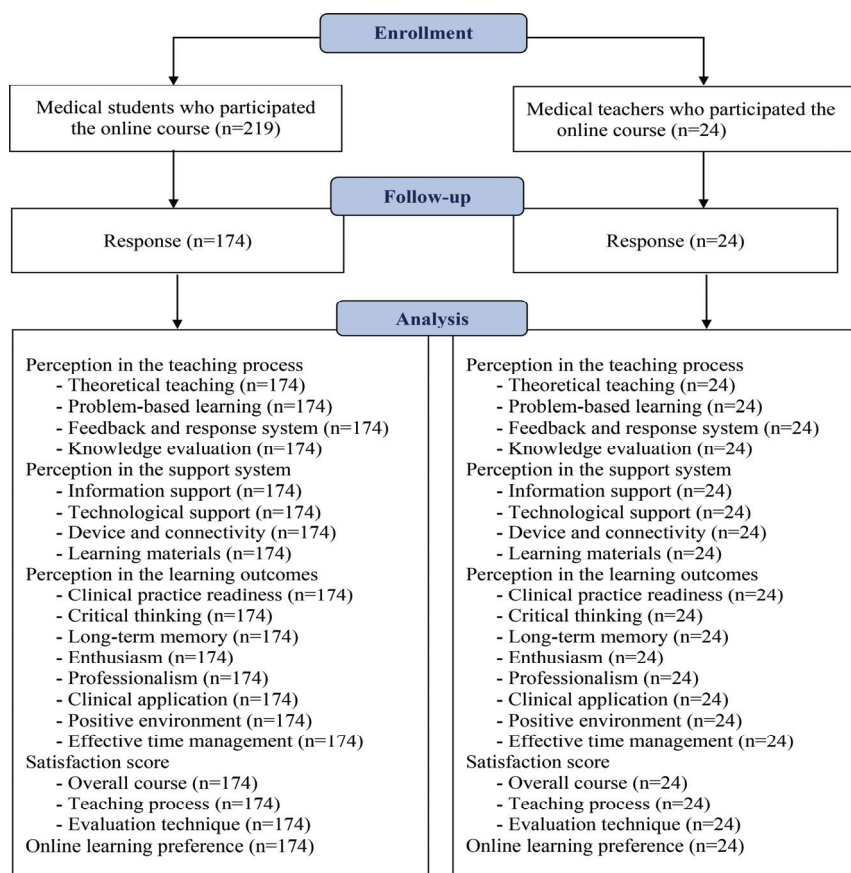
Data analysis was performed using IBM SPSS Statistics for Windows ver. 22.0 (IBM Corp, Armonk, USA). We used descriptive statistics to describe participant characteristics. We calculated the proportion using the number of participants with non-missing data. We compared students' and teachers' proportion of positive perceptions

in online learning by topic and were analyzed using Fisher's exact test or Pearson's chi-square test and presented as frequency and percentage. Differences in course satisfaction between groups were analyzed using Student t-test and reported as mean (standard deviation) and p-value. The estimated required sample size was 140 students and 23 teachers, as calculated using the formula for a finite population with a margin of error of 5%, and a confidence level of 95%. The total population consisted of 219 students and 24 teachers.

Results

Participants in online learning during the study period were 219 fifth-year medical students and 24 teachers (Fig. 1). We received questionnaire responses from 174 medical

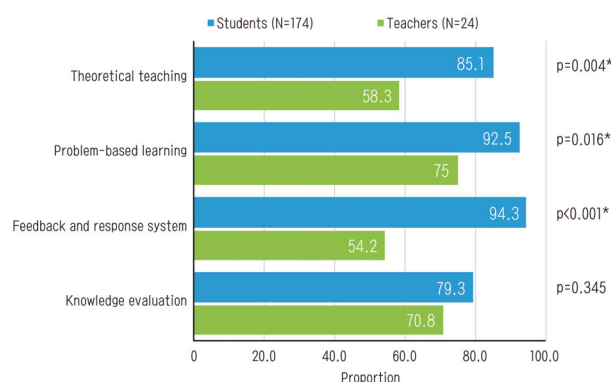
Fig. 1. Study Flow Diagram



students (79.5%) and 24 teachers (100%) who were anesthesiologists. The median (interquartile range) student age was 23 (22–23) years, and 47.1% were female. That of the teachers was 37.5 (34–46) years, and 62.5% were female. Most participants had experience with online learning (92.0% of students and 79.2% of teachers). All students used a single device during online learning (laptop computer=59.2%, tablet=23.0%, desktop computer=13.8%, smartphone=4.0%), while 83.3% of teachers used more than one device while teaching (smartphone=66.7%, laptop computer=66.7%, desktop computer=58.3%).

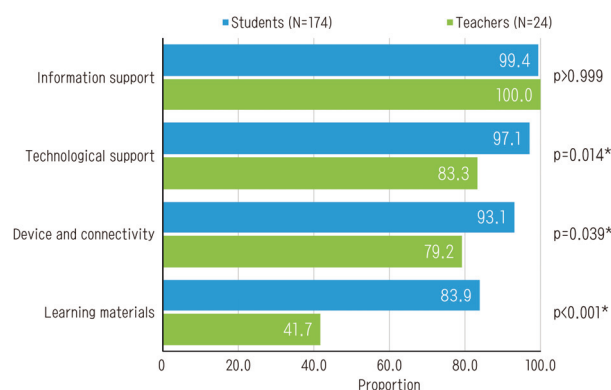
Fig. 2 compares the perception between medical students and teachers in the teaching process. Medical students had a significantly higher proportion of positive perception in theoretical teaching (85.1% versus 58.3%),

Fig. 2. The Proportion of Positive Perception in the Teaching Process between Students and Teachers



*p<0.05 (statistically significant).

Fig. 3. The Proportion of Positive Perception in the Support System between Students and Teachers



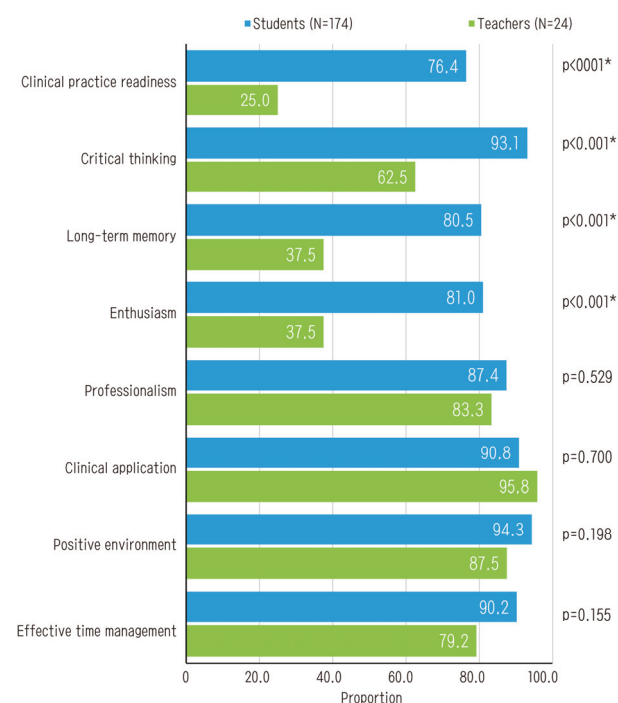
*p<0.05 (statistically significant).

problem-based learning (92.5% versus 75.0%), and feedback and response system (94.3% versus 54.2%) than teachers (p<0.05). However, the proportion of positive perception in knowledge evaluation was comparable (79.3% versus 70.8%).

Fig. 3 compares the support system's positive perception between medical students and teachers. Medical students had a higher proportion of positive perception in technological support (97.1% versus 83.3%), device and connectivity (93.1% versus 79.2%), and learning materials (83.9% versus 41.7%) with a p<0.05. However, the proportion of positive perception rate was comparable in information support (99.4% versus 100.0%).

Fig. 4 compares the proportion of positive perceptions between medical students and teachers in the learning outcomes. Medical students showed a higher proportion of positive perception in clinical practice readiness (76.4% versus 25.0%), critical thinking (93.1% versus 62.5%), long-term memory (80.5% versus 37.5%), and enthusiasm (81.0% versus 37.5%),

Fig. 4. The Proportion of Positive Perception in the Learning Outcomes between Students and Teachers



*p<0.05 (statistically significant).

Table 1. Course Satisfaction and Preference in Online Anesthesiology Learning between Students and Teachers

Topic	Student group (N=174)	Teacher group (N=24)	p-value
Satisfaction score			
Overall course	4.06±0.75	3.21±0.83	<0.001*
Teaching process	4.23±0.65	3.42±0.72	<0.001*
Evaluation technique	3.94±0.80	3.46±0.78	0.005*
Online learning preference	135 (77.6)	3 (12.5)	<0.001*

Data are presented as mean±standard deviation or number (%).

*p<0.05 (statistically significant).

(81.0% versus 37.5%) with a $p<0.05$. Their proportion of positive perception in professionalism (87.4% versus 83.3%), clinical application (90.8% versus 95.8%), positive environment (94.3% versus 87.5%), and effective time management (90.2% versus 79.2%) were comparable.

Table 1 compares satisfaction scores and preferences for online anesthesiology learning. Students' mean (standard deviation) satisfaction scores were significantly higher in the areas of the overall course, teaching process, and evaluation technique ($p<0.05$). Students' satisfaction scores ranged from 3.94–4.23, while those of the teachers ranged from 3.21–3.46. The percentage of online learning preference over onsite learning of students was significantly higher than teachers (77.6% versus 12.5%) with a $p<0.05$.

Discussion

We included 174 fifth-year medical students and 24 anesthesiology teachers in the study. Students had a higher proportion of positive perceptions than teachers for many aspects of the teaching process: theoretical teaching, problem-based learning, and feedback and response system. Students also reported a higher proportion of positive perceptions of technological support, device and connectivity, and learning materials in a support system. A higher proportion of positive perceptions of the learning outcomes on clinical practice readiness, critical thinking,

long-term memory, and enthusiasm was also found. Students' satisfaction scores were significantly higher than teachers' satisfaction scores, including a percentage of online learning preference over onsite learning.

During the COVID-19 pandemic, many medical schools have turned to online learning platforms to facilitate learning while maintaining social distancing. However, online learning can present challenges to students and teachers used to traditional forms of learning. In addition, the sudden transition from face-to-face teaching to online learning has not allowed adequate preparations to be made in many instances [10,17]. Participant characteristics may have influenced the perception gap between students and teachers in our study. Younger age and more experience with online learning in students may result in a more proportion of positive perceptions. They tend to be more adept with modern technology than teachers [2,5]. Additionally, in our study, most teachers use more than one device during teaching, which may cause a less positive perception of technology support and connectivity [14].

Students showed a high proportion of positive perceptions in every aspect of the teaching process. At the same time, teachers showed a low proportion of positive perceptions of theoretical teaching and feedback and response system. During learning, we provided both lived and recorded lectures to students, including learning materials that may be the cause of indicated highly positive perceptions of theoretical teaching. In the feedback and

response system, despite we employed real-time online feedback and a question-and-answer system to reduce the communication gap. However, in teachers' view, face-to-face feedback is better communication and allows for immediate feedback than online learning, as found in previous studies [18,19].

The percentage of positive perception in the support system was high among students and teachers except for learning materials. Our results contrast with a previous study that found that teachers felt a lack of support for technical difficulties, technology training, and information technology support [10]. Most teachers in our department were familiar with information technology, and online learning techniques were prepared for many years. However, the proportion of positive perceptions in learning materials was low among teachers. This result is similar to a previous study that reported that online learning materials resulted in higher workloads and taking longer to prepare teacher lessons [10].

The student's high proportion of positive perceptions in learning outcomes were around 80% and above. In contrast, teachers reported a low proportion of positive perception in learning outcomes, especially for clinical practice readiness, long-term memory, and enthusiasm. The results are similar to a previous study that found that teachers feel that online learning may compromise students' clinical competence and confidence [20]. The integration of online learning into existing medical curricula should result from a well-devised plan for a proportion of positive perception of learning outcomes. It is best to begin with an integrated onsite and online learning strategy that considers the benefits and burdens of blended learning before revising the curriculum [21].

Course satisfaction is a critical factor in online learning. Our students indicated high satisfaction with all items in this area. Most accepted online learning as an alternative educational tool. However, only 12.5% of teachers pre-

ferred online learning. This may have been due to the sudden transition making it difficult for teachers-but not students (who tend to be more flexible)-to adapt. Although we studied in a developing country, our satisfaction seems high. In contrast, a previous study showed that online learning satisfaction levels in students in developed countries are higher than in developing countries [5]. However, online learning satisfaction is associated with technical support, learning materials, connectivity, interactive learning, and feedback system [10,11]. Our online anesthesiology learning may meet those factors.

We found that Thai students showed a higher proportion of positive perception of online learning than Thai teachers in every aspect. Thai medical students may be ready for online anesthesiology learning, but not Thai medical teachers. Teacher preparation and support system should be a concern when beginning online learning. Previous studies in Asian countries found that teachers' limited skills in using technology were one of the major problems of online medical education. Educating teachers to transform the idea is essential for medical schools [14]. We recommend further study focused on the factors associated with the perception of online learning in Asian culture teachers aiming to increase their positive perceptions.

Our outcomes should be interpreted with caution with several limitations. Our study was performed only in a single setting, meaning that it may be limited in generalization to other populations. We only included Thai participants, who tend to be less or more familiar with online learning than some other populations. We studied their opinion on the perception of our learning platform, so it may have uncontrollable factors that affect the outcome. Further studies in other settings should be conducted to better assess the utility of online platforms as a mode of teaching. Finally, our students took the online questionnaire 5 months after finishing the course, which

may have led to recall bias.

We found differences in the proportion of perception in online anesthesiology learning between Thai students and teachers. Thai medical students indicated a higher proportion of positive perceptions in online anesthesiology learning in every aspect than teachers. This perception gap was particularly evident in the areas of teaching technique and learning outcomes. Our results also showed that students indicated higher satisfaction with online learning than teachers. Strategies to reduce the gap should focus on teachers' training and support of online learning should be a concern.

In conclusion, differences in perception were high in many aspects of online anesthesiology learning. This perception gap was particularly evident in the teaching process, support system, and learning outcomes. And Thai students had more preference for online learning than teachers. Strategies to reduce the gap should focus on teachers' training and supporting online education should be a concern.

Supplementary materials

Supplementary files are available from <https://doi.org/10.3946/kjme.2023.248>

Supplement 1. Differences in Perception of Online Anesthesiology Learning between Thai Medical Students and Teachers during the COVID-19 Pandemic.

Supplement 2. STROBE 2007 (v4) Statement: Checklist of Items That Should Be Included in Reports of Cross-sectional Studies.

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Author contributions: SD, SS, BS, and BP conceived, designed, and developed the study protocol. SD, BS, and BP designed and tested the study instrument. SD, BS, and BP supervised data collection. SD, SS, BS, and BP analyzed the data. SD, SS, BS, and BP prepared and approved the manuscript. All authors read and approved the final manuscript

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