Online Teaching of Undergraduate Courses to Students Majoring in Anesthesiology

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Abstract

We assessed the students' online teaching satisfaction, learning pressure and psychological burden with e-learning. Online teaching was adopted for three grades of students majoring in anesthesiology in Wannan Medical College for an entire semester (from February 2020 to July 2020). The satisfaction of the students and their parents with the online teaching of undergraduate courses for the anesthesiology major was investigated through two questionnaires to explore the effectiveness of online courses.The results of the questionnaire survey showed that the online teaching platform was not only highly acceptable among undergraduates majoring in anesthesiology, but also highly supported by their parents. Besides, the higher the grade was, the higher the degree of satisfaction was, which may change the teaching mode of seniors in the future.

Keywords: Anesthesiology; Education; Online teaching; Undergraduates

Introduction

Previous studies showed that compared with in-person classroom teaching, online teaching can achieve similarly effective outcomes or even better outcomes in some respects [1-5]. E-learning is not limited by location and thus provides great flexibility and allows students to revisit content that they do not understand by rewatching teaching videos; therefore, it is suitable for students with different learning needs [6-8]. The influencing factors of online teaching effectiveness include teachers' online class design and teaching skills and students' dexterity with online learning platforms [9-12].

However, online teaching lacks face-to-face interactions between teachers and students [1]. When students were learning online, lack

of effective supervision, a good learning environment, and effective and timely communication with teachers may have impaired the learning effect, and students' psychological burden and learning pressure as well as online teaching satisfaction are still unclear. In this study, through a questionnaire survey, we investigated the satisfaction of undergraduates majoring in anesthesiology in the School of Anesthesiology, Wannan Medical College, and their parents' attitudes toward online teaching.

Materials and Methods

Subjects

The subjects of this study included freshmen (class entering in 2019), sophomores (class entering in 2018), and juniors (class entering in 2017) at the School of Anesthesiology, Wannan Medical College, as well as their parents. These students are all majoring in a 5-year program in anesthesiology, with a bachelor's degree in anesthesiology awarded upon graduation. For an entire semester (from February 2020 to July 2020), all the students majoring in anesthesiology in the School of Anesthesiology, Wannan Medical College, adopted e-learning, in which the courses for juniors (class entering in 2017) included "Internal Medicine", "Surgery", "Preventive Medicine", "Dermatology and Venereology", "Stomatology", "Neuropsychiatry", "Otorhinolaryngology Head and Neck Surgery", "Ophthalmology", "Medical Information Retrieval" and "Anesthesiologic Informatics"; the courses for sophomores (class entering in 2018) included "Pathophysiology", "Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics", "Diagnosis", "Pharmacology", "Anesthetic Pharmacology" and "Specialized English"; and the courses for freshmen (class entering in 2019) included "Organic Chemistry", "Physiology", "Introduction to Computer Science", "College English", "Introduction to Anesthesiology", "Histology and Embryology", "Introduction to Modern Chinese History" and "Career Development and Employment Guidance for College Students".

Methods

Tools: The survey was conducted through two questionnaires: "Questionnaire on Student Satisfaction with Online Teaching" and "Questionnaire on Parent Satisfaction with Online Teaching". Both were developed originally for this study. TY, XC and YH designed questions using Questionnaire Star software (Ranxing Information Technology Co.,LTD, Changsha, China), and then the questionnaires were reviewed by TM. With reference to the satisfaction surveys of other colleges in China, the present survey tools and the results of the present study were considered valid after discussion with professional statistical experts.

The "Questionnaire on Student Satisfaction with Online Teaching" contained three parts: (1) students' general information (gender and location); (2) students' online teaching platform usage, which evaluated students' usage of online teaching platforms during e-learning (five items, i.e., main tools the student uses for e-learning, dexterity in

the use of the necessary online teaching platform, number of teaching platforms used for e-learning, issues with e-learning, and online teaching platforms and teaching methods used for each course; and (3) students' online teaching usage and satisfaction, which assessed students' online teaching usage and satisfaction with various aspects (online teaching method and arrangement of each online course, online teaching effectiveness and outcome of each online course, classroom interaction during the teaching of each online course, teacher's preparation for each online course, satisfaction with and popularity of each online course, and willingness to use online teaching for other courses). The main problems encountered in learning online were explored through multiple-choice questions: Unsuitably noisy home study environment; Classes take too long, and I therefore do not have enough time to study; There are too many learning resources, and I therefore do not have enough time to complete assignments; Network congestion, which causes playback delays or forces me out of the classroom; There are too many online platforms, causing frequent switching; Other.

Online teaching satisfaction was measured with a 5-point Likert scale (very dissatisfied = 1 point; Not satisfied = 2 points; General = 3 points; Satisfied = 4 points; very satisfied = 5 points), and the higher the score was, the more satisfied the student was with online teaching.

The "Questionnaire on Parent Satisfaction with Online Teaching" contained two parts: (1) items assessing parents' views on online teaching through various aspects (parents' previous knowledge of online teaching, advantages of online teaching over conventional classroom teaching, existing problems in the development of online teaching, effect of online teaching on the financial and psychological burdens of the family, and effect of online teaching on the students' psychological burdens and learning pressure; and (2) items assessing parents' satisfaction with online teaching through the question "Do you support the development of online teaching?" (with three choices: "Support", "Do not support" and "No opinion"). The higher the support rating was, the more satisfied the parent was with online teaching.

Data collection method: The questionnaires were electronically issued to the respondents via QQ, WeChat or email and were anonymously completed online (parents completed the survey with the students' assistance) using identical instructions. All the students were encouraged to complete the questionnaire and told that they did not need to fill in private information. Each internet protocol address could only be used once, and the teacher could only see the time of the response but no information on the person. All the questionnaire items were answered objectively by the students based on their own experiences in e-learning and basic situations.

Learning method: During the online teaching period, all the courses are taught online. According to the teaching plan, teachers log on to the teaching group of each class on the online teaching platform (Rain Classroom app teaching software, WeChat or QQ software) for online teaching, and students attend lectures on the online teaching platform.

In each class's online teaching platform, counselors of the students and teachers can clearly obtain the attendance status of the students.

Students were supposed to preview the lesson before the online class by reviewing slides sent by the teachers. Each slide was to be read for at least 5 seconds. The browsing time was recorded. In class, the teacher asked questions at random from time to time. The teachers and students had a chat group to communicate to solve problems. At the end of the semester, students underwent network examination.

Statistical method: Statistical analyses of the data were performed using SPSS 13.0 software. The count data are expressed as the frequency or percentage, and measurement data are presented as the mean and standard deviation. The reliability and validity of the questionnaire were tested. A basic information table was generated using Excel (Microsoft Corp, Redmond, Washington). The primary outcome is the overall satisfaction for each online course, students selected responses to "Are you satisfied with (do you like) online teaching?". A bar graph of satisfaction for each online course was plotted by sorting the sum of the percentages of the responses of "very satisfied" and "satisfied" in descending order, and pie charts were similarly generated regarding "main problems with e-learning" for students for each class and the parents' responses to "Does online teaching increase the financial and psychological burdens of the family?", "Does online teaching increase the students' psychological burden and learning pressure?" and "Do you support the development of online teaching?"

Results

From the respondents (305 freshmen, 305 sophomores and 298 juniors majoring in anesthesiology at the School of Anesthesiology, Wannan Medical College, as well as their parents), a total of 908 valid questionnaires were collected, for a recovery rate of 100%.

Questionnaire reliability and validity

To ensure their validity of the questionnaires, their reliability and validity were tested. A reliability test was performed using the Cronbach's α coefficient as an indicator

to measure the questionnaire's internal consistency. The results showed that the α coefficient values ranged from 0.918 to 0.966, i.e., all were greater than 0.7. This indicates that the questionnaire survey results in this study have high reliability and consistency; i.e., the questionnaire has high reliability, and the collected data can be used for further data analysis. The validity of the questionnaire was evaluated using principal component analysis (PCA), and the results showed that the Kaiser-Meyer-Olkin (KMO) values for the questionnaire items ranged from 0.970 to 0.972, i.e., all greater than 0.5, and the significance value of the Bartlett test was 0.000, i.e., below 0.01, indicating high structural validity of the questionnaire.

Students' survey results

The respondents to the questionnaire survey included 305 freshmen (128 males, accounting for 42.0% of the total), 298 juniors (122 males, accounting for 40.9% of the total), and 305 sophomores (127 males, accounting for 41.6% of the total). Among the freshmen, 160 students (52.4%) were skilled at using e-learning platforms, 143 students (46.9%) were fairly skilled at using e-learning platforms, and two students (0.7%) were unskilled at using e-learning platforms; among the sophomores, 179 students (58.7%) were skilled at using e-learning platforms, 123 students (40.3%) were fairly skilled, and three students (1.0%) were unskilled; and among the juniors, 207 students (69.5%) were skilled at using e-learning platforms, 87 students (29.2%) were fairly skilled, and four students (1.3%) were unskilled. The basic information on the students is shown in table 1.

The students' satisfaction with each online course is shown in figure 1. The bar graph of satisfaction for each online course was plotted by sorting the sum of the percentages of the responses of "very satisfied" and "satisfied" in descending order, as already described in the methods section. The students' overall satisfaction with online teaching was 59.67%-92.95% (Figure 1(e)). In terms of the students' satisfaction with classroom interaction, the third-year courses "Preventive Medicine" (92.28%), "Dermatology and Venereology" (91.28%) and "Ophthalmology" (90.60%) were among the top three. In terms of the students' satisfaction with the teacher's preparation, the third-year courses

General information	Freshmen (n = 305)	Sophomores (n = 305)	Juniors (n = 298)
Gender, n (%)			
Male	128 (41.97)	127 (41.64)	122 (40.94)
Female	177 (58.03)	178 (58.03)	176 (59.06)
Region, n (%)			
Urban area	180 (59.02)	172 (56.39)	164 (55.03)
Rural area	125 (40.98)	133 (43.61)	134 (44.97)
Equipment, n (%)			
Mobile phone	193 (63.28)	200 (65.57)	199 (66.78)
Computer	95 (31.15)	93 (30.49)	75 (25.17)
Tablet	16 (5.25)	11 (3.61)	23 (7.72)
Other	1 (0.33)	1 (0.33)	1 (0.34)
Skill level in using e-learning platform, n (%)			
Skillful	160 (52.46)	179 (58.69)	207 (69.46)
Fairly skillful	143 (46.89)	123 (40.33)	87 (29.19)
Unskillful	2 (0.66)	3 (0.98)	4 (1.34)

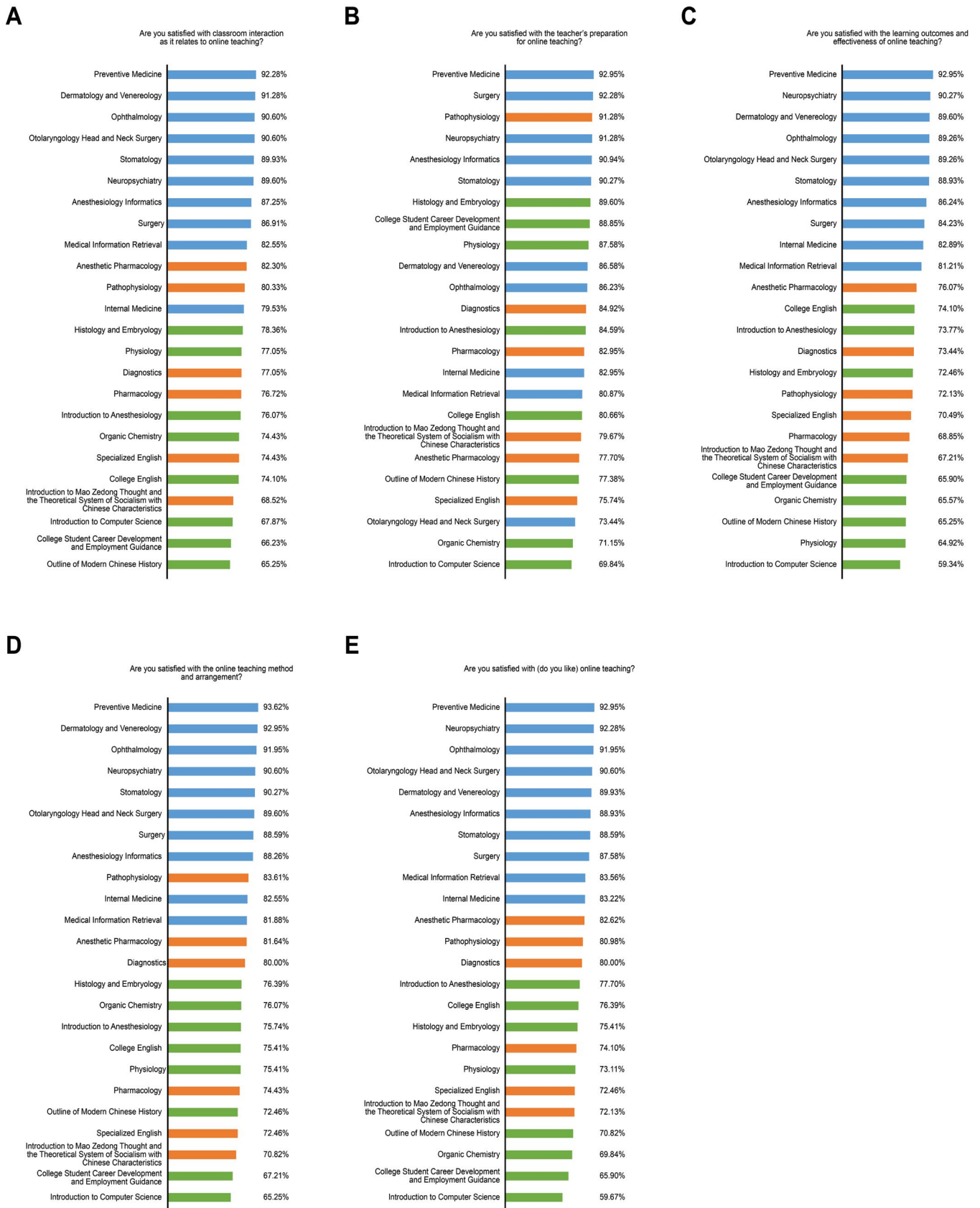**Table 1:** General information of the students.

A

Are you satisfied with classroom interaction as it relates to online teaching?

Course	%
Preventive Medicine	92.28%
Dermatology and Venereology	91.28%
Ophthalmology	90.60%
Otolaryngology Head and Neck Surgery	90.60%
Stomatology	89.93%
Neuropsychiatry	89.60%
Anesthesiology Informatics	87.25%
Surgery	86.91%
Medical Information Retrieval	82.55%
Anesthetic Pharmacology	82.30%
Pathophysiology	80.33%
Internal Medicine	79.53%
Histology and Embryology	78.36%
Physiology	77.05%
Diagnostics	77.05%
Pharmacology	76.72%
Introduction to Anesthesiology	76.07%
Organic Chemistry	74.43%
Specialized English	74.43%
College English	74.10%
Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	68.52%
Introduction to Computer Science	67.87%
College Student Career Development and Employment Guidance	66.23%
Outline of Modern Chinese History	65.25%

B

Are you satisfied with the teacher's preparation for online teaching?

Course	%
Preventive Medicine	92.95%
Surgery	92.28%
Pathophysiology	91.28%
Neuropsychiatry	91.28%
Anesthesiology Informatics	90.94%
Stomatology	90.27%
Histology and Embryology	89.60%
College Student Career Development and Employment Guidance	88.85%
Physiology	87.58%
Dermatology and Venereology	86.58%
Ophthalmology	86.23%
Diagnostics	84.92%
Introduction to Anesthesiology	84.59%
Pharmacology	82.95%
Internal Medicine	82.95%
Medical Information Retrieval	80.87%
College English	80.66%
Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	79.67%
Anesthetic Pharmacology	77.70%
Outline of Modern Chinese History	77.38%
Specialized English	75.74%
Otolaryngology Head and Neck Surgery	73.44%
Organic Chemistry	71.15%
Introduction to Computer Science	69.84%

C

Are you satisfied with the learning outcomes and effectiveness of online teaching?

Course	%
Preventive Medicine	92.95%
Neuropsychiatry	90.27%
Dermatology and Venereology	89.60%
Ophthalmology	89.26%
Otolaryngology Head and Neck Surgery	89.26%
Stomatology	88.93%
Anesthesiology Informatics	86.24%
Surgery	84.23%
Internal Medicine	82.89%
Medical Information Retrieval	81.21%
Anesthetic Pharmacology	76.07%
College English	74.10%
Introduction to Anesthesiology	73.77%
Diagnostics	73.44%
Histology and Embryology	72.46%
Pathophysiology	72.13%
Specialized English	70.49%
Pharmacology	68.85%
Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	67.21%
College Student Career Development and Employment Guidance	65.90%
Organic Chemistry	65.57%
Outline of Modern Chinese History	65.25%
Physiology	64.92%
Introduction to Computer Science	59.34%

D

Are you satisfied with the online teaching method and arrangement?

Course	%
Preventive Medicine	93.62%
Dermatology and Venereology	92.95%
Ophthalmology	91.95%
Neuropsychiatry	90.60%
Stomatology	90.27%
Otolaryngology Head and Neck Surgery	89.60%
Surgery	88.59%
Anesthesiology Informatics	88.26%
Pathophysiology	83.61%
Internal Medicine	82.55%
Medical Information Retrieval	81.88%
Anesthetic Pharmacology	81.64%
Diagnostics	80.00%
Histology and Embryology	76.39%
Organic Chemistry	76.07%
Introduction to Anesthesiology	75.74%
College English	75.41%
Physiology	75.41%
Pharmacology	74.43%
Outline of Modern Chinese History	72.46%
Specialized English	72.46%
Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	70.82%
College Student Career Development and Employment Guidance	67.21%
Introduction to Computer Science	65.25%

E

Are you satisfied with (do you like) online teaching?

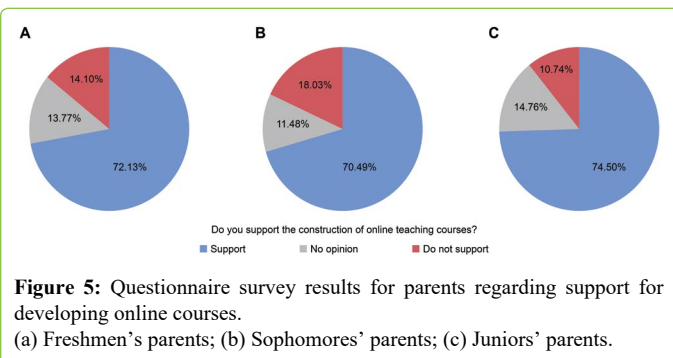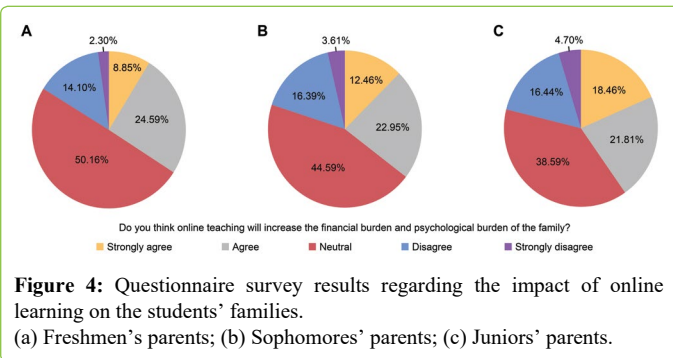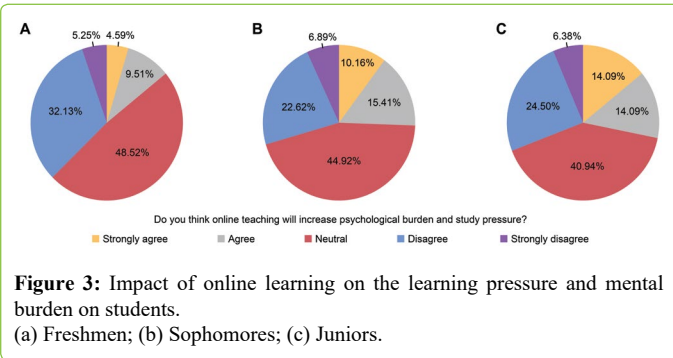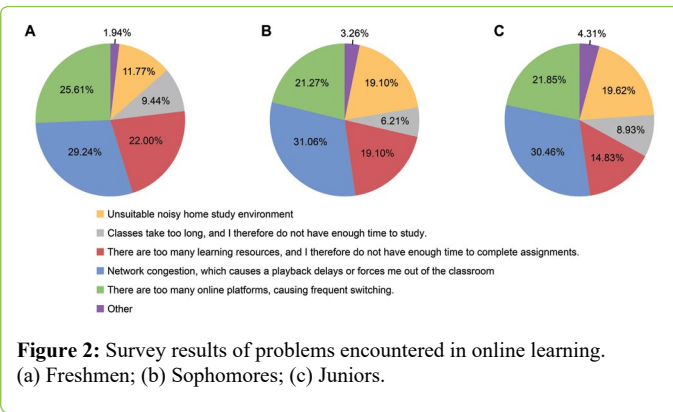| Course	%
Preventive Medicine	92.95%
Neuropsychiatry	92.28%
Ophthalmology	91.95%
Otolaryngology Head and Neck Surgery	90.60%
Dermatology and Venereology	89.93%
Anesthesiology Informatics	88.93%
Stomatology	88.59%
Surgery	87.58%
Medical Information Retrieval	83.56%
Internal Medicine	83.22%
Anesthetic Pharmacology	82.62%
Pathophysiology	80.98%
Diagnostics	80.00%
Introduction to Anesthesiology	77.70%
College English	76.39%
Histology and Embryology	75.41%
Pharmacology	74.10%
Physiology	73.11%
Specialized English	72.46%
Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	72.13%
Outline of Modern Chinese History	70.82%
Organic Chemistry	69.84%
College Student Career Development and Employment Guidance	65.90%
Introduction to Computer Science	59.67%

Figure 1: Survey results for student satisfaction with each online learning course.
(a). Are you satisfied with classroom interaction as it relates to online teaching?
(b). Are you satisfied with the teacher's preparation for online teaching?
(c). Are you satisfied with the learning outcomes and effectiveness of online teaching?
(d). Are you satisfied with the online teaching method and arrangement?
(e). Are you satisfied (do you like) with online teaching?
Blue-Junior course; Orange-Sophomore course; Green-Freshmen course.

Figure 2: Survey results of problems encountered in online learning.
(a) Freshmen; (b) Sophomores; (c) Juniors.

Figure 3: Impact of online learning on the learning pressure and mental burden on students.
(a) Freshmen; (b) Sophomores; (c) Juniors.

Figure 4: Questionnaire survey results regarding the impact of online learning on the students' families.
(a) Freshmen's parents; (b) Sophomores' parents; (c) Juniors' parents.

Figure 5: Questionnaire survey results for parents regarding support for developing online courses.
(a) Freshmen's parents; (b) Sophomores' parents; (c) Juniors' parents.

"Preventive Medicine" (92.95%) and "Ophthalmology" (92.28%) and the second-year course "Pathophysiology" (91.28%) were among the top three. In terms of the students' satisfaction with e-learning effectiveness and outcomes, the third-year courses "Preventive Medicine" (92.95%), "Neuropsychiatry" (90.27%) and "Dermatology and Venereology" (89.60%) were among the top three. In terms of the students' satisfaction with online teaching methods and arrangements, the third-year courses "Preventive Medicine" (93.62%), "Dermatology and Venereology"

(92.95%), and "Ophthalmology" (91.95%) were among the top three. In terms of the students' overall satisfaction with online teaching, the third-year courses "Preventive Medicine" (92.95%), "Neuropsychiatry" (92.28%) and the third-year course "Ophthalmology" (91.95%) were among the top three.

The survey results regarding the problems encountered in e-learning are shown in figure 2. The problems encountered by the freshmen included network congestion during online learning (29.24%), too many e-learning platforms (25.61%), and too many learning resources (22.00%); those encountered by the sophomores included network congestion during online learning (31.06%), too many e-learning platforms (21.27%), and an unsuitably noisy home environment for e-learning (19.10%); and those encountered by the juniors included network congestion during online learning (30.46%), too many e-learning platforms (21.85%), and an unsuitably noisy home environment for e-learning (19.62%).

Among the medical student respondents, 14.10% of the freshmen, 25.57% of the sophomores and 28.18% of the juniors agreed or strongly agreed that online teaching has increased the learning pressure and psychological burden on students, as shown in figure 3.

Parents' survey results

Among the parents who responded to the questionnaire survey, 305 were parents of freshmen, 305 were parents of sophomores, and 298 were parents of juniors.

Among the parent respondents, 33.44% of the parents of freshmen, 35.41% of the parents of sophomores and 40.27% of the parents of juniors agreed or strongly agreed that online teaching has increased the pressure on families, as shown in figure 4.

In terms of the development of online courses, among the parents of juniors, 74.5% supported the idea, 10.74% did not support the idea, and 14.76% offered no opinion; among the parents of sophomores, 70.49% supported the idea, 18.03% did not support the idea, and 11.48% offered no opinion; and among the parents of freshmen, 72.13% supported the idea, 14.10% did not support the idea, and 13.77% offered no opinion, as shown in figure 5.

Discussion

We found that the students' overall satisfaction with online teaching was 59.67%-92.95%. The higher the grade was, the higher the degree of satisfaction was. Juniors had the highest degree of satisfaction with each course, suggesting that the implementation of online education for seniors is successful, which may change the mode of teaching seniors in the future. The students surveyed were from rural and urban areas and used a mobile phone or computer as a learning tool. Unlike conventional classroom teaching, e-learning can isolate students at home, which is a new learning environment for students. However, the home environment can also be more fulfilling and convenient, allowing students to review course videos, without delaying their studies, when they have difficulty understanding

content. We found that during the online learming, students did not experience a high psychological burden or learning pressure with e-learning, online education did not have a dramatic impact on their families, and online education garnered high support from their parents. Thus, e-learning is suitable for students with different levels of learning experience, ability, and needs.

Students and their parents achieved 100% response rates to their surveys, making the outcomes convincing. A 100% response rate is possible and unsurprising. At the beginning of the online learning, it was the Spring Festival, a traditional festival in China, when all students were on holiday and stayed at home. A 100% response rate and high satisfaction with online education was also reported by Sandhaus et al. [13].

Traditional classroom teaching modes include literature-based learning (LBL), problem-based learning (PBL) and case-based learning (CBL). However, traditional classroom teaching modes can no longer meet the needs of modern medical education. In addition, with continuous reforms in global medical teaching and the rapid development of modern educational information technology, the use of Internet-assisted teaching modes has become the trend in global medical education and is given increasing importance by universities around the world [14,15]. The results of this study show that students' overall satisfaction with the online teaching methods ranged from 62.25 to 93.62%, that with the teachers' online-teaching preparation ranged from 69.84 to 92.95% and that with classroom interaction during online teaching ranged from 65.25 to 92.28%. Online teaching integrates rich teaching resources through online learning platforms; offers openness, resource sharing and strong interactions; and enables student autonomy in learning without time and location restrictions; thus, it has become an effective teaching method recognized in the field of medical education while meeting educational needs during the pandemic. For teachers, the new teaching environment encourages them to improve their teaching skills and allows them to think about education from different perspectives; for society, e-learning generates new topics through interactions as well as new demands. Sandhaus et al. examined the satisfaction of medical students with electronic learning; the overall satisfaction was 88.6% (including very high satisfaction at 32.9% and high satisfaction at 55.7%) [13]. Rajab et al. reported online medical education, with 76% of the participants in their study stating that they will integrate the online expertise they have gained into their practice [16]. Our results are consistent with theirs. Thus, online learning has generated high student satisfaction.

In this study, we found that factors influencing online teaching satisfaction can be the teaching methods of teachers (Figure 1(d)), classroom interaction (Figure 1(a)), teachers' lesson preparation (Figure 1(b)) and learning gains (Figure 1(c)). Network factors, such as network congestion, are the main environmental factors that affect online teaching satisfaction (Figure 2). From the analysis of students' answers to five questions (Figure 1), possible reasons for the differences in satisfaction with different courses are as follows: 1) Students may be satisfied or dissatisfied with the course itself, which is not related to the use of online teaching, or 2) students may be satisfied or dissatisfied with the teacher's teaching method. Our results show that students do not like watching prerecorded teaching content and prefer live online teaching. 3) Students may be satisfied or dissatisfied with the content of the course (hands-on vs. theory) or with the unsophisticated nature of online teaching of experimental classes; i.e., students may be dissatisfied with courses that require hands-on practice. 4) Student satisfaction can depend on whether the teacher can skillfully use the equipment required for online teaching. Due to unfamiliarity with online teaching devices and software, teachers need to spend a substantial amount of time addressing technical problems with devices and software, which affects the teaching effect.

The purpose of the survey was to investigate whether online teaching increases the mental burden and academic pressure on college students. It represents the views of college students' parents on online teaching. Our research results suggest that online teaching does not impose an additional mental burden or academic pressure (see Figure 4). This finding is consistent with the survey results on the college students' satisfaction (see Figure 1).

There are also many disadvantages to online learning. First, there are many limitations, such as Internet speed, equipment and materials. Second, the interaction between teachers and students is not in real time, making it difficult for a teacher to promptly receive students' feedback. In this study, the main problems in students' e-learning included network congestion, too many online learning platforms, excessive learning resources, and a noisy home environment unsuitable for e-learning. Finally, individuals differ in accepting and adapting to new things, which causes great difficulties for teachers, students and students' families.After analyzing the results of the present study, considering the need to develop online teaching in today's higher education, we make the following recommendations:

1. Strengthen the development of online teaching platforms

Expansion of online teaching: With continuous improvement in people's economic level and the constant development of information technology, the equipment and supporting facilities required for online teaching should be popularized and improved to reduce the impact of equipment limitations related to online teaching, making it possible for students in rural and remote areas to engage in e-learning.

Optimization of online teaching platforms: For online teaching platforms, the operation needs to be more intuitive, the content more concise, and the functional division of the courses, courseware, assignments and discussion clearer so that users, especially older teachers, can quickly become familiar with and master these systems. Online teaching platforms also need to have different sections according to the teaching content and purpose of different disciplines so that the features of the courses can be highlighted to make it easier for students to understand and master the content.

Currently, it is necessary to combine online teaching and traditional classroom teaching to take advantage of the two teaching modes. In this way, teachers can identify deficiencies and make practical improvements so that online teaching can advance, leading to familiarization with and acceptance by teachers and students and ultimately popularization.

2. Strengthen teacher-student communication and recognize students' situations

Teachers need to strengthen communication with students, e.g., create assignments and check students' completion status through online teaching platforms; increase online communication with students during class breaks; and ask, answer and discuss questions through discussion forums. These activities will allow teachers to assess, in a timely manner, students' grasp of teaching content and make prompt adjustments to teaching plans to strengthen the connections in course content and expand the content and students' acquired knowledge. During class, teachers can interact with students through pop-up windows, online voice calls, online video calls, etc., to connect theory with practice, stimulate students' enthusiasm for the class, and enable students to have fun while e-learning. Through teacher-student communication, teachers can understand students' learning and emotional needs, which facilitates the implementation and adjustment of teaching tasks, enables better outcomes from online teaching, supports students regarding the curriculum and increases online learning interest. In this way, students can arrange their study time more appropriately and adjust their plans to learn and acquire the necessary knowledge and skills more actively, thereby making progress in learning and thinking.

Limitations

First, the subjects included in this study were undergraduates majoring in anesthesiology; therefore, the conclusions cannot be extended to undergraduates in other majors. Second, a statistical analysis of students' academic achievements in online learning was not conducted; in fact, the scores from computer-based examinations adopted for online teaching cannot be compared with those from past conventional tests. In the online tests, the questions differed from those in previous years, so there was no comparability. Therefore, the effectiveness of online teaching cannot be determined. In addition, the students lived with their parents or other relatives at home, so the effect of online teaching on students' mental stress cannot be compared with other groups of people; Furthermore, while theoretically, this questionnaire could only be obtained by the students involved, we did not see the process of students filling in the form, so we cannot guarantee that all the questionnaires were completed by students themselves. Regarding the teachers, not all of them had tried online teaching before. For them, it was brand new. Third, although during the whole semester, all courses had to implement online teaching, not all of the teachers had tried online teaching before. For some teachers, online teaching was a new form of teaching. However, each course was taught by more than one teacher, and each teacher's teaching proficiency affected the students'

satisfaction with the course. Finally, this was a single-center study with a relatively small sample size; therefore, the conclusions need to be verified through a multicenter study with a large sample size.

Conclusion

The higher the grade was, the higher the degree of online teachings satisfaction was. Junior students had the highest degree of satisfaction in each course, suggesting that the implementation of online education for seniors is successful, which may change the mode of teaching seniors in the future. During the online teachings, students did not experience a high psychological burden or learning pressure with e-learning, online education did not have a dramatic impact on their families, and online education garnered strong support among their parents. Currently, the development of online teaching for undergraduates is still in the exploratory stage, and there remain many pitfalls that need to be addressed.

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