Perceptions of medical students and teachers to online medical education: online surveys in Eastern China

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Abstract

Background: Due to the quarantine measures during the outbreak of COVID-19, medical schools in China had to shift to online education overnight. Researchers wanted to find out the underlying problems and issues worth exploring of online medical education in China so as to enlighten future improvement.

Methods: Researchers distributed structured and self-administered surveys on “Wechat” and “Wenjuanxing”. 3 online surveys were given out to the medical students on Feb. 17, Feb. 24 and Mar. 20 and 1 online survey was distributed to the medical teachers on Mar. 20 in Eastern China.

Results: 76.42% of the students were satisfied with online medical education and it hardly changed after a month. At first, the biggest challenge of learning online was the lagging platform. But as time passed by, it became the learning motivation. Most students thought it suitable to teach theoretical content online and inappropriate to teach practical classes online. The opinions of PBL, CBL and TBL online were divided. Only 36.27% courses had quiz. 12.40% courses were live-stream and 51.91% course teachers answered questions online. About four fifths parents would remind their children to study online. 69.27% of teachers chose to change or use more learning platforms online. 80.61% of parents would remind their children to study online. Most student thought it necessary to re-teach after online education while most teachers did not think so.

Conclusion: Generally speaking, the infrastructure in eastern China can meet the requirement of online medical education. Students were not sure whether online PBL, CBL and TBL education could fulfill the goal of the course. Lack of learning motivation was the biggest problem of learning online if the lagging platform issue was fixed. Teachers in China were not skilled enough to teach online. Online medical education efficacy evaluation of teachers and students was entirely different.

1. Background

Fast development of computer and Internet technology has facilitated the revolution of medical education. Nowadays, more and more medical schools around the globe choose to use online teaching websites to set courses as a complementary tool of helping students to study. The Ministry of Education in China initiated the education informatization plan 2.0 in 2018 which stepped up the transition of education pedagogy. The covid-19 pandemic and the quarantine measures taken by Chinese government in 2020, all of a sudden, accelerated the transformation. All universities including medical schools were forced to use online teaching tools overnight. The transition of teaching methods, though very painful for some of the Chinese medical schools, has succeeded and even popularized after the containment of the virus.

Faced with this dramatic shift to online medical education, researchers of different countries conducted surveys from various perspective. New findings such as a significant difference between students' and lecturers' opinion on optimal amount of online learning[1] was helpful for the improvement of online education. Although the pandemic boost the development of online medical education and numerous

medical lecturers in China have mastered basic methods and tools of promoting online education, the study focusing on online teaching still lack attention. The author conducted 3 massive surveys among medical students and 1 survey among medical teachers in order to understand the bigger picture of online medical education in eastern China. The eastern part of China is a comparatively developed region in the country. For example, the GDP per capita of Jiangsu Province, from which most respondents come, reached \$19,000 in 2020 when the nation just passed \$10,000[2]. Thus the results may be better than the average level of the nation. The aim of the conducted 4 surveys was try to find out issues that matter among students and teachers of online medical education which may enlighten future studies in China or other developing countries.

2. Methods

2.1 Participants

All methods were carried out in accordance with relevant guidelines and regulations. All experimental protocols of the study was approved by the Board of Academic and Teaching Affairs of Nanjing Medical University and conducted by Institute of Medical Education of NMU. All respondents were college students and teachers who were over 18 years old and the informed consent was obtained from all subjects. Surveys were distributed and collected on the survey system of NMU on the cellphone app named Wehcat and the questionnaire website named Wenjuanxing(www.wjx.cn) from February 17 to march 20,2020. At that time, face-to-face classes was completely replaced by online education. Institute of Medical Education conducted the survey for students on February 17(the first day), February 25(the first week) and March 20(the first month). The survey for teachers was also conducted on March 20. Respondents come from eastern China provinces including Jiangsu, Shanghai, Zhejiang, Shandong and so on. The numbers of student participants in the 3 surveys were 2378,995 and 8058 and the number of teacher participants was 575. The questionnaires were totally conducted online by the researcher.

2.2 Questionnaire

Four structured and self-administered questionnaires were developed consisting of questions that mainly covered:(1)rate of satisfaction for online education; (2)major problems and obstacles of online teaching and learning; (3)assessment of online teaching and learning and comparison to face-to-face classes; (4)follow-up measures that need to be taken.(5)other critical issues related with online medical education.

2.3 Data analysis

Participants were given five options when rating the level of satisfaction:highly satisfied, satisfied, average, unsatisfied and very unsatisfied. The percentage of satisfaction would only count “highly satisfied” and “satisfied” in as numerator while taking the number of total responses as denominator. For the numerical measurement of respondents, the author defined highly satisfied as 5, satisfied as 4, average as 3, unsatisfied as 2 and very unsatisfied as 1, respectively.

3. Results

3.1 Survey for the students on February 17

Researchers collected 2378 surveys from 6636 distributed questionnaires, giving a 35.83% response rate. 99.75% of the surveyed students participated online learning. 96.04% of students were satisfied with teaching management. 93.81% of students were satisfied with pedagogy. 93.01% of students were satisfied with education sources. 92.76% of students were satisfied with online interaction. 76.42% of students were satisfied with online teaching effects.(Table 1) 30.68% of the students used Chaoxing learning platform (www.chaoxing.com) making Chaoxing the most welcomed platform.

Table 1
percentage of satisfaction of online medical education

question	Highly satisfied	satisfied	average	unsatisfied	Very unsatisfied
Were courses arranged properly?	80.76%	15.28%	3.37%	0.42%	0.17%
Did teachers make teaching objectives clear?	74.23%	19.58%	5.31%	0.72%	0.17%
Are you satisfied with learning resource?	72.08%	20.93%	5.64%	1.05%	0.29%
Are you satisfied with learning interaction?	73.77%	18.99%	5.94%	0.88%	0.42%
Are you satisfied with learning efficacy?	48.25%	28.17%	16.34%	4.84%	2.40%

3.2 Survey for the students of clinical medicine on February 24

After mastering basic situation of online learning, researchers of IME conducted a survey for students studying clinical medicine in eastern China. 995 surveys were collected. Among the surveyed students,1.91% of students neither had good WIFI connections or cellphone connections which made it hard for them to study online. Before the massive shift to online learning,32% of students never used online learning sources before who were unfamiliar with online teaching resource such as MOOC. 40% of students watched learning videos on the most popular video website called Bilibili(www.bilibili.com) to assist them learning online. When it came to the most worrisome aspect, 57.39% of students worried that the content were hard to be taught online(Table 2). With respect to the real problems happened during online learning, 69.35% of students encountered network connection pressure(Table 3).

Table 2
Most worrisome aspect for students of clinical
medicine studying online

aspect	percentage
Content were hard to be taught online	57.39%
Internet connection	34.27%
Cannot concentrate	30.38%
More assignment	30.55%
Lack of online resource	29.15%
Teaching interaction	28.44%
Online exams	24.92%
Feedback	23.52%
Teachers' technology skills	18.59%
others	4.92%

Table 3
challenges encountered when learning online

Problems	percentage
Lagging learning platforms	69.35%
Lack of interaction	49.45%
Disordered arrangement	32.56%
Lack of learning resource	28.84%
Dislike online learning	21.51%
Lack of feedback	8.04%
Others	7.34%

Students who were scheduled to be trained in the hospitals have to watch videos and read case reports online due to the quarantine measures. They thought that online learning was necessary, but it was not suitable for every type of learning. For the students, online learning seemed to be more suitable for theoretical content rather than practical training(Table 4). Opinions on the efficacy of online PBL, CBL and TBL were divided. A mixture of online and in-person teaching incorporated into these effective learning methods would be a direction in the future[3].

Table 4
whether online teaching could meet different learning needs

options	Cannot	Can	Not sure
Theory of clinical medicine	12.06%	73.47%	14.47%
Preparation before class	7.84%	81.71%	10.45%
Test before class	9.15%	77.49%	13.37%
Case-based learning	32.96%	33.27%	33.77%
Problem-based learning	34.67%	36.98%	28.34%
Team-based learning	38.09%	29.65%	32.26%
Inquiry	45.63%	23.42%	30.95%
Physical examination	54.17%	18.39%	27.44%
Writing case history	25.13%	47.74%	27.14%
Clinical skills practice	53.37%	18.59%	28.04%

3.2 Survey for the students on March 20

After a month of online learning, researchers distributed 9486 surveys and collected 8058 responses, giving a 84.95% response rate. The results showed that 98.85% of students had internet connections and 98.46% of students had online learning equipment. 62.42% of students like to learn on the laptop. Most parents (40.74%) would supervise their children's online learning from time to time while 39.87% of parents often did that. Only 19.39% of parents wouldn't check it at all.

When it comes to the curriculum, the results showed that students learned 8.63 courses online on average, including 7.31 compulsory courses and 1.32 elective courses. Their opinions on courses online are shown in Table 5.

Table 5
perceptions on online learning

aspect	Compulsory courses		Elective courses		In total	
	number	percentage	number	percentage	number	percentage
Strict requirements	4.94	67.58%	0.79	59.85%	5.73	66.40%
Abundant resource	5.67	77.56%	0.93	70.45%	6.60	76.48%
Complete video clips	5.01	68.54%	1.03	78.03%	6.04	69.99%
Good interaction	4.53	61.97%	0.47	35.61%	5.00	57.94%
Homework	5.85	80.03%	0.89	67.42%	6.74	78.1%
Quiz	2.62	35.84%	0.51	38.64%	3.13	36.27%
Live-stream teaching	1.00	13.68%	0.07	5.3%	1.07	12.40%
Answering students' questions	4.23	57.87%	0.25	18.94%	4.48	51.91%
Learning effect	4.87	66.62%	0.86	65.15%	5.73	66.40%
Satisfaction	5.62	76.88%	0.94	71.21%	6.56	76.01%

Most students thought that online learning cannot meet their needs to master the knowledge of compulsory courses. Face-to-face classes explaining difficult parts may be necessary for compulsory courses. Elective courses did not need this (Table 6).

Table 6
Do you need face-to-face classes after online learning

Course type	Yes, re-teach from A to Z	Yes, explain some difficult parts	No	Others
Core compulsory courses	29.58%	61.51%	6.73%	2.18%
Rest of the compulsory courses	10.34%	57.83%	29.34%	2.49%
Elective courses	7.83%	24.66%	62.44%	5.06%

After a month of online teaching, the biggest problem was learning motivation (Table 7). The result was similar compared with other massive surveys in China[4].

Table 7
the biggest challenge of learning online

Option	Percentage
Learning motivation	19.27%
Inertia	16.33%
Lagging platform	13.31%
Online learning resource	12.45%
Network connection	8.84%
Self-learning ability	8.20%
Question answered	7.57%
Interaction	5.61%
Family environment	5.45%
Others	2.97%

3.4 Survey for the teachers on March 20

After the first month of online teaching, researchers also distributed surveys to teachers and collected 575 responses. The results showed that 66.73% of teachers taught 1 course online and only 2.93% of teachers taught more than 3 courses. The investigation showed that 96.52% of teachers would use computer to teach and 42.26% of teachers would use cellphone to teach. Computer and cellphone was the main teaching equipment in eastern China instead of pad and other gadgets. The teaching platform was chosen by 62.96% teachers as the main communication software. Besides this, more than 90% of teachers responded that they had told students the teaching objective, offered learning resource, given assignments and interacted with the students.

69.27% of the surveyed teachers chose to change or use more learning platforms online during the quarantine. Speaking of the reason of switching platforms, the major reason seemed to have connection with the teaching platform(Table 8).

Table 8
The reason of changing or adding teaching platforms

Reason	percentage
Easy to use	30.12%
School's requirement	25.04%
More functions	23.42%
Dysfunction of the original platform	20.03%
Monitoring students' learning	10.55%
Support more terminals	9.89%
others	14.52%

When asked whether it's necessary to re-teach the class face-to-face after the online education, the answer seemed to differ from that of the students dramatically. 2.39% of teachers thought that the courses they are undertaking need to be re-taught from top to bottom. 44.22% of teachers said that they only need to focus on explaining part of the chapter content or arrange Q&A classes. 49.91% of teachers thought that there was no need to teach the lesson face-to-face again.

4. Findings And Future Direction

4.1 changing major obstacles

The progression of online medical education revealed by the investigation seemed to be better and more smooth than what the researchers imagined. Infrastructure including learning equipment and internet connection was one of the major challenges in developing countries[5]. However, that challenge was not the main obstacle for medical students learning online in eastern China as time went by. The operation of online learning websites and apps took great pressure at first because the whole country started online education overnight which generated numerous complaints. Thanks to the high work efficiency of the platform companies, the learning motivation of students, however, replaced the platform trouble becoming the biggest challenge for students learning online. Therefore, for other developing countries, the construction of infrastructure is vital for the promotion of online medical education, especially the software construction such as the teaching platforms. Medical education on the internet may not be popularized in most developing countries, but infrastructure construction should be done ahead of the transition. For the developed countries in which online medical education has already become mainstream, learning motivation of the students should be taken seriously. Students' motivation were all

likely to be affected by their environment[6]. An effective supervision system on the Internet or the help from parents at home is worth exploring.

4.2 different perception between teachers and students

Researchers found interesting results after compare the results of students' surveys with teachers' surveys. The first one is the need for in-person classes to re-teach. Most student thought it necessary to have the in-person classes again, especially for the compulsory courses while nearly half of the teachers thought that there was no need to explain the knowledge to the students again face-to-face after online education. The reason that may cause this sharp difference might derived from insufficient online education assessment system and lack of the concept of formative evaluation. According to the research, only one third of the online classes had quiz. Most Chinese college teachers still implement the policy of conclusive evaluation which means that the final is the only test deciding a student's performance in the whole semester. This teaching strategy brought online will lead to a wrong evaluation result from the teacher. Some researcher in developing countries thought that assessment via relatively unfamiliar methods and environments is challenging to both the students and examiners[7]. However, studies have shown that medical students find online formative assessments helpful for their learning[8]. The real reason leading to the different perception of online education effect is complex for sure. More related research should be done to find out more.

The second one is satisfaction of online interaction. Online learning might not compete with offline learning in terms of interactive knowledge building between teacher and students[9]. According to the survey, 94.26% of teachers said that they interacted with the students online while nearly half of the students thought online interaction was not enough. Students in one-to-one online meetings often seem relaxed and open and that might be one of the solution.[10] That might be the solution. With the development of 5G and other technologies, new forms of online teaching are springing out, but teachers in China did not get used to them. Most teachers chose to let the students watch videos instead of teaching them in person online. According to the research, only 12% of the courses were taken through live-stream. On the internet, teachers could not perceive whether the students got it by detecting expressions on the students' face. Hence, faculty training is of vital importance[11].

4.3 suitability of different content taught online

According to the survey for the students, the form of online medical education was suitable for theoretical teaching, preparation for the class and class test. Uploading learning materials online will assist most students to better understand the content. When it came to new mode of classes such as TBL, PBL and CBL, the opinions divided. Communicating and collaborating were feasible on the internet but they were not sure whether they could achieve the goal of the class. When talking about applying current education form to practical courses such as physical examination and clinical skills practice, most students were against the idea. Watching videos and reading requirements can not help the students in terms of practical skills. Medical simulation technologies such as VR and in-site training may be indispensable for the clinical students. These areas especially simulation technologies are worth exploring for the early-stage medical education.

5. Limitations

One of the strength of this study is its large sample size of 11431 medical student in total and 575 teacher from different disciplines. The variety of students and teachers minimized the potential response bias. Furthermore, the surveys spanned over a month which made it possible to observe the changes during the online medical education. However, the study had its limitations. The first one is that most responded students and teachers were from eastern China - a comparatively developed region in this country. Thus, the status quo of the online education in eastern China may vary from that of western China. The second limitation is that the survey was conducted when medical education was totally delivered online. When asked about the differences between online and face-to-face classes, students and teachers had to recall what it was like before in the in-person classes. This reason may skew the result to some extent.

6. Conclusions

Infrastructure construction including both hardware and software is the prerequisite for online medical education which needs attention especially in developing countries. Online medical education in eastern China can basically meet the needs of learning at home. However, many issues relating online education need to be resolved. The first one is the construction of online education assessment system. A scientific mechanism monitoring online students can not only boost students learning motivation when studying alone, but also give teachers feedback so that they can understand the efficacy of the class. The second one is teachers' training. In developed countries such as Italy, teachers' limited skills to use technology was one of the major weakness of online medical education[12]. China was no exception. Numerous teachers in China still could not utilize different kinds of online education tools in a proficient way. The majority's concept of online education was limited to watching videos and assignments online. Educating teachers to transform the idea is essential for medical schools in China. The last issue worth exploring was the newly developed medical education technologies such as VR. Current form of online education is not suitable for practical courses according to the clinical students. Emerging technology, though may act as a servant of a disruptor sometimes[13], is a promising way of teaching practical courses online.

Declarations

Ethics approval and consent to participate

Ethical approval for this study was obtained from the Board of Academic and Teaching Affairs of Nanjing Medical University. The work was carried out in accordance with the Declaration of Helsinki. Participants took the survey anonymously so the personal information was protected. A consent declaration was presented before the survey and informed consent was obtained from all subjects. Once starting the survey, participants can withdraw consent by closing the app or website and no data will be collected. As no identifiable data is collected, participants will not be able to withdraw consent following

completion of the survey, unless they have chosen to contact distributors or Nanjing Medical University at the end of the survey.

Consent for publication

Not applicable

Availability of data and materials

Results of surveys were provided in supplementary files. The raw data are available from the corresponding author on reasonable request. Please contact the corresponding author or the first author and state the purpose if you need the raw data.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

YW distributed surveys, analyzed data and was a major contributor in writing the manuscript. RY designed the surveys and submit the request of approval from the university.

YL analyzed data.

WQ distributed part of the surveys. All authors read and approved the final manuscript.

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