

Analysis of Factors Influencing the Network Teaching Effect of College Students in a Medical School During the COVID-19 Epidemic

Liang Yu

Wannan Medical College

Long Huang (✉ longhuang19@126.com)

jiangxi normal university

Hao-ru Tang

Wannan Medical College

Die Hu

Wannan Medical College

Wen-yu Feng

Wannan Medical College

Liu-xia Shi

Wannan Medical College

Research article

Keywords: network teaching, effect, college students, COVID-19

Posted Date: August 31st, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-51827/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Version of Record: A version of this preprint was published at BMC Medical Education on July 23rd, 2021. See the published version at <https://doi.org/10.1186/s12909-021-02825-2>.

Abstract

Background: The purpose of this study is to understand the influencing factors of Chinese college students' satisfaction with online teaching and psychological pressure on learning during the novel coronavirus epidemic.

Methods: We assessed the effect of online teaching of 7084 medical students from Wannan Medical College in March 5 to April 2, 2020 using cluster sampling. The respondents were asked to complete a 7-item self-compiled online teaching satisfaction questionnaire. Chi-square test and multivariate logistic regression analysis are used.

Results: Gender is female ($OR=1.257$, 95% CI : 1.132~1.396), grades are second and third grades (second grades: $OR=1.228$, 95% CI : 1.080~1.397; third grades: $OR=1.197$, 95% CI : 1.048~1.367), normal/unfamiliar learning platform operation ($OR=3.692$, 95% CI : 3.321~4.103) were risk factors for satisfactory teaching effect. In addition, students whose school year system is four-year ($OR=0.870$, 95% CI : 0.781~0.969) and grade 4 and above ($OR=0.594$, 95% CI : 0.485~0.727) were more satisfied with the teaching effect of teachers. And, during the period of the COVID-19 epidemic, the risk factors for college students to have psychological stress were: female ($OR=1.258$, 95% CI : 1.096~1.442), from rural areas ($OR=1.511$, 95% CI : 1.312~1.740), and the academic year system is four-year system ($OR=1.191$, 95% CI : 1.028~1.380), using mobile phones and other learning tools ($OR=1.388$, 95% CI : 1.205~1.600), general/unfamiliar with learning platform operations ($OR=2.273$, 95% CI : 1.888~2.735). While the protective factors for college students' psychological stress included: grade three and four and above ($OR=0.463$, 95% CI : 0.387~0.554; $OR=0.232$, 95% CI : 0.187~0.286), and they think that the teaching effect is satisfactory ($OR=0.314$, 95% CI : 0.261~0.379).

Conclusion: This survey shows that compared with male college students, female college students were more dissatisfied with the teaching effect of teachers and had greater psychological pressure on learning. Psychological counseling should be strengthened for students in rural areas and those who were not familiar with the operating platform to relieve their psychological pressure on learning.

Background

Coronavirus disease 2019 (COVID-19) is a disease caused by SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) that causes respiratory infections [1]. The patient with COVID-19 was first discovered on December 8 in Wuhan, China. After that, it caused a pandemic in the world [2, 3]. As of April 6, 2020, about 1.1 million people were affected by COVID-19, and 63,000 people died as a result. In addition to the main transmission routes such as droplet transmission and close contact transmission, COVID-19 is also transmitted by the virus in the aerosol when the patient is in the same closed space, and the virus is also present in the stool and urine of the patient [4]. Because the transmission route of COVID-19 is respiratory tract and strong transmission intensity, the measures of "resident isolation at home" were used by China to control the spread of the epidemic. In order to ensure the safety of students during the epidemic and the continued study of students, China, Anhui Provincial Department of Education issued a notice on February 24, 2020: Various schools in Anhui Province (high schools, vocational schools, primary and secondary schools, kindergartens, etc.) postponed the start of school, and implemented online education and teaching notice on March 2, 2020 [5].

In the era of Internet development, online teaching has long been proposed. In 2015, in China, the Ministry of Education put forward the "Opinions on Strengthening the Construction and Application of Online Open Courses in Colleges and Universities" to further promote the development of online teaching [6]. Therefore, online teaching methods had been skillfully used during the epidemic. However, due to the particularity of class time, the effect of teachers' online teaching and the factors that affect students' online learning efficiency were still uncertain.

In order to understand the effect of online teaching in Chinese colleges and universities and the factors affecting the effect of online teaching during the epidemic, this study conducted a questionnaire survey on college students in a medical school. By investigating and understanding the online learning methods of a medical college student, satisfaction with online teaching and psychological pressure during the semester and other issues, it provides scientific advice for better implementation of online teaching during the epidemic and achieving better teaching effects.

Methods

Study population and sample

The target population comprised undergraduates of Wannan Medical College. The respondents in the target population were sampled by cluster sampling. We assessed the effect of online teaching of these students during the COVID-19 outbreak by using structured questionnaires. The questionnaires were anonymous to ensure the confidentiality and reliability of data. Finally, 7084 respondents that completed the questionnaires were included in the final analysis (100% response rate). They volunteered to participate in this study and signed an online informed consent form before collecting data. This study was approved by the Academic Ethics Committee of Wannan Medical College.

Instruments

The study instrument comprised a structured questionnaire packet that inquired demographic information, including gender, grade, major, online teaching platform and proficiency, among others. They were also asked to complete a 7-item self-compiled online teaching satisfaction questionnaire (see S1 File 1), which mainly measures college students' satisfaction with teaching methods, arrangements, effect, psychological pressure, access to teaching schedule information, and teacher's preparation.

Data analysis

Data were analyzed with SPSS Version 26.0. We used the chi-square test to conduct a general descriptive analysis of the influencing factors of college students' online teaching satisfaction. Statistically significant variables were screened and included in multivariate logistic regression analyses. The estimates of the strengths of associations were demonstrated by the odds ratio (OR) with a 95% confidence interval (CI). A two-tailed $P < 0.05$ was considered statistically significant.

Results

The effect of online teaching and psychological pressure in different genders, regions, length of schooling and grades

During the COVID-19 epidemic, the satisfaction of female college students with teachers' preparatory preparation were higher than that of male college students ($P < 0.05$), and the satisfaction of male college students with their pre-class preparation and teaching effects were higher than that of female college students ($P < 0.05$). There were no statistically significant difference between male and female college students in obtaining timely teaching arrangement information, teaching methods and arrangements, and satisfaction in answering questions and answers ($P > 0.05$). The psychological pressure of male college students in learning were lower than that of female college students ($P \neq 0.05$). The university students from urban areas were higher than those from rural students ($P \neq 0.05$) in preparation for their own classes, timely access to information on teaching arrangements, teaching methods and arrangements, answers to questions and answers, and satisfaction with teaching results. And there was no statistically significant difference between the two in teachers' intention to prepare before class ($P \neq 0.05$). The psychological pressure on learning from urban college students were lower than that from rural college students ($P \neq 0.05$). Undergraduates with a five-year academic system had lower psychological stress in learning than undergraduates with a four-year academic system ($P \neq 0.05$), while non-student students have to prepare for teachers, prepare for themselves, and obtain teaching in time. There were no statistically significant difference in arrangement information, teaching methods and arrangements, answers to questions and answers, and satisfaction with teaching results ($P > 0.05$). See Table 1.

Table 1

During the epidemic period, college students' online teaching effectiveness and psychological pressure were compared among the basic characteristics of students (n/%)

Item	Satisfaction with teacher's preparation	Satisfaction with students' preparation	Timely access to teaching schedule information satisfaction	Satisfaction with teaching methods and arrangements	Satisfaction with getting answers	Satisfaction with teaching effect	Psychological pressure
Gender							
Female(n = 2990)	2793(93.4)	2473(82.7)	2525(84.4)	2152(72.0)	2586(86.5)	2007(67.1)	2451(82.0)
Male(n = 4094)	3895(95.1)	3150(76.9)	3466(84.7)	2903(70.9)	3476(84.9)	2569(62.8)	3526(86.1)
χ^2	9.775	35.108	0.060	0.958	3.510	14.452	22.602
<i>P</i>	0.002	0.000	0.807	0.328	0.061	0.000	0.000
Area							
Town (n = 3533)	3345(94.7)	2892(81.9)	3038(86.0)	2584(73.1)	3092(87.5)	2354(66.6)	2863(81.0)
Rural area (n = 3551)	3343(94.1)	2731(76.9)	2953(83.2)	2471(69.6)	2970(83.6)	2222(62.6)	3114(87.7)
χ^2	0.965	26.495	10.867	10.938	21.588	12.733	59.537
<i>P</i>	0.326	0.000	0.001	0.000	0.000	0.000	0.000
Length of schooling							
Five-year(n = 4262)	4014(94.2)	3391(79.6)	3628(85.1)	3036(71.2)	3657(85.8)	2715(63.7)	3517(82.5)
Four-year(n = 2822)	2674(94.8)	2232(79.1)	2363(83.7)	2019(71.5)	2405(85.2)	1861(65.9)	2460(87.2)
χ^2	1.061	0.230	2.512	0.080	0.465	3.737	27.871
<i>P</i>	0.303	0.632	0.113	0.777	0.495	0.053	0.000
Grade							
First grade (n = 2508)	2388(95.2)	1975(78.7)	2093(83.5)	1811(72.2)	2139(85.3)	1630(65.0)	2252(89.8)
Second grade (n = 1967)	1840(93.5)	1534(78.0)	1616(82.2)	1329(67.6)	1656(84.2)	1201(61.1)	1756(89.3)
Third grade (n = 1902)	1783(93.7)	1492(78.4)	1633(85.9)	1355(71.2)	1644(86.4)	1200(63.1)	1504(79.1)
Grade 4 and above(n = 707)	677(95.8)	622(88.0)	649(91.8)	560(79.2)	623(88.1)	545(77.1)	465(65.8)
χ^2	9.911	35.885	41.894	36.065	8.075	61.053	317.743
<i>P</i>	0.019	0.000	0.000	0.000	0.044	0.000	0.000

The effect and psychological pressure of online teaching using different online teaching tools and proficiency

During the COVID-19 epidemic, college students who used computers/tablets as learning tools had higher satisfaction than those who used mobile phones as learning tools, in terms of preparation before class, timely access to teaching information arrangements, teaching methods of teachers, problems that can be solved, and teaching effects of teachers (all $P < 0.05$). However, there were no statistically significant difference in their satisfaction with teachers' pre-school preparations ($P \geq 0.05$). College students who use computers/tablets as e-learning tools have lower psychological stress in learning than those who use mobile phones as e-learning tools ($P \geq 0.05$). The satisfaction of college students with skilled operation of the learning platform were higher than that of college students with general/unfamiliar operation of the learning platform, in terms of pre-class preparation for teachers, their own pre-class preparation, timely access to teaching arrangement information, teachers' teaching methods and arrangements, questions being answered, teaching effect, etc. (all $P < 0.05$). However, the students who were proficient in the operation of the learning platform in terms of psychological pressure on learning were lower than the college students who were generally/unfamiliar with the operation of the learning platform ($P < 0.05$). (See Table 2.)

Table 2

Comparison of online teaching effects and psychological pressure among college students using different online teaching tools and proficiency during the epidemic(n/%)

Item	Satisfaction with teacher's preparation	Satisfaction with students' preparation	Timely access to teaching schedule information satisfaction	Satisfaction with teaching methods and arrangements	Satisfaction with getting answers	Satisfaction with teaching effect	Psychological pressure
Network tools used							
Computer/tablet (n = 2474)	2334(94.3)	2042(82.5)	2150(86.9)	1834(74.1)	2150(86.9)	1654(66.9)	1980(80.0)
Mobile phone and others (n = 4610)	4354(94.4)	3581(77.7)	3841(83.3)	3221(69.9)	3912(84.9)	2922(63.4)	3997(86.7)
χ^2	0.034	23.224	15.857	14.303	5.453	8.483	54.333
P	0.854	0.000	0.000	0.000	0.020	0.004	0.000
Proficiency							
Proficiency (n = 4751)	4612(97.1)	4099(86.3)	4389(92.4)	3873(81.5)	4322(91.0)	3537(74.4)	3805(80.1)
General / unskilled(n = 2333)	2076(89.0)	1524(65.3)	1602(68.7)	1182(50.7)	1740(74.6)	1039(44.5)	2172(93.1)
χ^2	194.044	419.615	674.301	728.844	340.389	612.169	200.883
P	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Influential Factors Of Teaching Effect And Harvest Satisfaction

During the COVID-19 epidemic, the gender was female ($OR = 1.257$, 95% CI : 1.132 ~ 1.396), the grades were second and third grade ($OR = 1.228$, 95% CI : 1.080 ~ 1.397; $OR = 1.197$, 95% CI : 1.048 ~ 1.367), general/unfamiliar with the operation of the learning platform ($OR = 3.692$, 95% CI : 3.321 ~ 4.103) were the risk factors for college students to think that the teaching effect was satisfactory, the school year was a four-year system ($OR = 0.870$, 95% CI : 0.781 ~ 0.969), grade 4 and above ($OR = 0.594$, 95% CI : 0.485 ~ 0.727) were the protective factors for college students to think that the teaching effect was satisfactory. (See Table 3.)

Table 3
 Analysis of influencing factors of college students' teaching effect and harvest satisfaction during the epidemic

Item	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>P</i>	<i>OR</i>	<i>95%CI</i>	
Gender Male					1.000		
Female	0.229	0.054	18.269	0.000	1.257	1.132	1.396
Length of schooling Five-year					1.000		
Four-year	-0.139	0.055	6.466	0.011	0.870	0.781	0.969
Grade First grade					1.000		
Second grade	0.206	0.066	9.817	0.002	1.228	1.080	1.397
Third grade	0.179	0.068	7.008	0.008	1.197	1.048	1.367
Grade 4 and above	-0.521	0.103	25.579	0.000	0.594	0.485	0.727
Proficiency Proficiency					1.000		
General/unskilled	1.306	0.054	586.001	0.000	3.692	3.321	4.103
Constant	-2.611	0.145	324.567	0.000			

Factors Influencing Psychological Stress

During the New Coronary Pneumonia epidemic, the risk factors for undergraduates' psychological stress were: gender is female (*OR* = 1.258, 95% *CI*: 1.096 ~ 1.442), from rural areas (*OR* = 1.511, 95% *CI*: 1.312 ~ 1.740), school year four-year system (*OR* = 1.191, 95% *CI*: 1.028 ~ 1.380), use of mobile phones and others as learning tools (*OR* = 1.388, 95% *CI*: 1.205 ~ 1.600), general/unfamiliar operation of the learning platform (*OR* = 2.273, 95% *CI*: 1.888 ~ 2.735). (See Table 4.)

Table 4
Influencing factors of college students' learning psychological pressure during the epidemic

Item	<i>B</i>	<i>S.E.</i>	<i>Wald</i>	<i>P</i>	<i>OR</i>	<i>95%CI</i>	
Gender Male					1.000		
Female	0.229	0.070	10.722	0.001	1.258	1.096	1.442
Area Town					1.000		
Rural area	0.413	0.072	32.738	0.000	1.511	1.312	1.740
Length of schooling Five-year					1.000		
Four-year	0.175	0.075	5.401	0.020	1.191	1.028	1.380
Grade First grade					1.000		
Second grade	-0.037	0.101	0.131	0.717	0.964	0.791	1.175
Third grade	-0.770	0.091	70.944	0.000	0.463	0.387	0.554
Grade 4 and above	-1.463	0.108	182.999	0.000	0.232	0.187	0.286
Network tools used Computer/tablet					1.000		
Mobile phone and others	0.328	0.072	20.571	0.000	1.388	1.205	1.600
Proficiency Proficiency					1.000		
General/unskilled	0.821	0.095	75.443	0.000	2.273	1.888	2.735
Satisfactory teaching effect					1.000		
No							
Yes	-1.158	0.095	148.004	0.000	0.314	0.261	0.379
Constant	0.265	0.250	1.120	0.290			

Discussion

Since COVID-19 outbreak, postpone the opening was selected to control the development of the epidemic of school. During the suspension period, colleges and universities had chosen online teaching. In order to understand the effect of online teaching during the epidemic, an online questionnaire survey was conducted on students in a medical school.

The result of this survey found that female college students were the risk factors that college students think they were satisfied with teaching. 1,200 students from some universities in Jiangxi, China were surveyed by Wang Xinxin [7], the results of the survey showed that the satisfaction of female students with the teaching effect of teachers were lower than that of male students, which was consistent with the results of this study. However, some studies had found that female students were more satisfied with the overall grade and teaching satisfaction than male students [8]. Female college students' dissatisfaction with the teacher's teaching effect during the epidemic may be related to the fact that female were more concerned about the teacher's various behaviors, and more critical to the teacher. And the lower satisfaction of self-learning gains in female students may be related to female's lower self-study efficacy and lower trust in their learning ability [9]. The results of this survey showed that, compared with first-year students, second-year students and third-year students were risk factors for satisfaction with teachers' teaching effectiveness and their own gains, however the students in the fourth grade and above were the protective factors compared with the first grade. Compared with first-year students, sophomores and juniors were more familiar with the learning styles during college. Moreover, freshman students have only one semester of study time in the school due to the epidemic situation. Many freshmen follow the study habits of high school. They take classes more seriously and have a more respectful attitude towards teachers. Therefore, the freshman students were more satisfied with the teacher's teaching effect and their own gains. Compared with first-year students, seniors and above students had greater self-control, and their sense of learning efficiency were higher, so their satisfaction were higher than that of first-year students [10]. And this study found that general/unfamiliar learning platform operation is a risk factor for college students to think that

teachers' teaching effects are satisfactory. Students' general/unfamiliar learning platform operation causes students' nervousness and anxiety during their studies, as well as computer anxiety. As a result, the learning ability will be lowered, and the satisfaction with teaching will be reduced [11]. The study also found that the four-year school year was a protective factor for college students to think they were satisfied with the teaching effect of teachers. Compared with five-year students, four-year students have lower learning pressure, were more comfortable with online courses, have good learning effects, so they had high satisfaction with teaching effects.

This study not only investigated the satisfaction of students with online teaching during the epidemic, but also investigated the influencing factors of psychological stress in college students' learning. The result showed that female college students were more likely to have psychological pressure on learning than male college students, the possible reason was that they have higher requirements for themselves and higher expectations for academic performance [12]. College students from rural areas were more prone to psychological stress in learning. It may be because the network in rural areas is not developed. Because of the network, students in rural areas were worried about the efficiency of online learning, and parents of rural students have high expectations for their learning, so their greater psychological stress [13, 14]. Students who used mobile phones as learning tools were more likely to have psychological pressure in learning. It may be because students using mobile phones gave lectures online when the teacher switches the mobile phone to other software, which missed some learning points, after the class, they felt anxious about not learning the content, resulting in psychological pressure. Undergraduates with general/unfamiliar learning platform operations were prone to psychological stress when learning. The possible reason was that they were unfamiliar with the operation of the learning platform, when they were learning online, they were anxious and worried due to fear of operation errors.

Moreover, the study found that senior college students and self-satisfied teaching results were the protective factors for college students' psychological stress in learning. With the increase of grades, the risk of undergraduates having psychological stress in learning was smaller, the possible reason was that the adaptability and mental endurance of senior college students had improved. However, the results of this study are inconsistent with those of Aktekin et al. [15]. University students who were satisfied with the teaching effect were less likely to have psychological pressure on learning, indicating that satisfaction with the teaching effect will cause people to have positive emotions and be full of motivation for learning. Therefore, they had less psychological pressure.

Like other studies, there are some deficiencies in this survey. First of all, this research is a cross-sectional survey, which cannot verify the relationship between cause and effect. Secondly, this survey is an online survey, and there may be some deficiencies in the quality control of the questionnaire, which will affect the research results

Conclusion

In general, during the epidemic period, female students, students of grade two and grade three, students who were not familiar with the operation of learning platform were more dissatisfied with the teaching effect, while students with four-year academic year system and grade four or above were more satisfied with the teaching effect of teachers. The risk factors for college students' psychological stress included: female, from rural areas, four-year academic year, using mobile phones and other learning tools, general/unfamiliar learning platforms. And the protective factors for college students' psychological stress included: grades were third and fourth grades and above, think that the teaching effect was satisfactory.

Declarations

Ethics approval and consent to participate

This study was approved by the Academic Ethics Committee of Wannan Medical College.

Consent for publication

All authors have read and approved the manuscript

Availability of data and materials

The datasets generated and/or analysed during the current study are found from DOI: 10.5281/zenodo.3980399

Competing interests

The authors report no conflicts of interest regarding the publication of this article.

Funding

This project was supported by grants from the Major online teaching reform research project of Anhui Province (2020zdxsjg370), the Excellent Top Talent Cultivation Project in Universities of Anhui Province (gxfx2017070), and MOE (Ministry of Education in China) Project of Humanities and Social Sciences (Grants No. 20YJC190006).

Acknowledgements

Not Applicable

Authors' contributions

Conceptualization: LY, YW.

Data curation: HT, DH.

Formal analysis: LH, LS.

Writing-original draft: LY, LH.

Writing-review & editing: LY, YW.

References

1. Moftakhar L, Seif M. The Exponentially Increasing Rate of Patients Infected with COVID-19 in Iran. *Arch Iran Med.* 2020;23(4):235–8.
2. Lou J, Tian SJ, Niu SM, et al. Coronavirus disease 2019: a bibliometric analysis and review. *Eur Rev Med Pharmacol Sci Mar.* 2020;24(6):3411–21.
3. Pan A, Liu L, Wang C, et al. Association of Public Health Interventions With the Epidemiology of the COVID-19 Outbreak in Wuhan, China. *JAMA Apr.* 2020;10(19):1–9. 323(.
4. Gasmi A, Noor S, Tippairote T, Dadar M, Menzel A, Bjørklund G. Individual risk management strategy and potential therapeutic options for the COVID-19 pandemic. *Clin Immunol Jun.* 2020;215:108409.
5. China AP. Department of Education. Important Notice (Notice of education and school teaching line). 2020; <http://jyt.ah.gov.cn/tsdw/ahsjyczx/tzgg/39850684.html>.
6. Website TCEI. Opinions of the Ministry of education on strengthening the application and management of online open courses in Colleges and Universities. The Central People's Government of the People's Republic of China. Sep. 2015;18:48–50.
7. Wang X. The Study on Student's Satisfaction with Classroom Teaching in Local University-Take some univessities in jiangxi provines as example. Gannan Normal University. 2015.
8. Schiekirka S, Raupach T. A systematic review of factors influencing student ratings in undergraduate medical education course evaluations. *Bmc Medical Education.* 2015;15(1):311.
9. Ainscough L, Foulis E, Colthorpe K, et al. Changes in Biology Self-Efficacy during a First-Year University Course. *CBE Life Sci Educ.* Summer 2016;15(2).
10. Komarraju M, Nadler D. Self-efficacy and academic achievement: Why do implicit beliefs, goals, and effort regulation matter? *Learning Individual Differences.* 2013;25:67–72.
11. Igbaria M. End-user computing effectiveness: A structural equation model. *Omega.* 1990;18(6):637–652; Wang AY, Newlin MH. Predictors of web-student performance: the role of self-efficacy and reasons for taking an on-line class. *Computers in Human Behavior.* 2002;18(2):151–163.
12. Hall M, Hanna LA, Hanna A, Hall K. Associations between Achievement Goal Orientations and Academic Performance Among Students at a U.K. Pharmacy School. *Am J Pharm Educ Jun.* 2015;25(5):64. 79(.

13. Markus HR, Kitayama S. Culture and the self: Implications for cognition, emotion, and motivation. *Psychol Rev.* 1991;98(2):224–53.
14. Xie Z. Study of the related factors of partents' expectations of childrens' personal goals. Central South University. 2008.
15. Aktekin M, Karaman T, Senol YY, et al. Anxiety, depression and stressful life events among medical students: a prospective study in Antalya. Turkey[J] *Medical Education.* 2010;35(1):12–7.