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# Exploring Teachers' Acceptance of Online Teaching: Post-COVID-19 Evidence from China's Higher Education institutions

Keyi Yang[a], Chengchun Li[a], Yan Chen[a], and Min Wu[b]
[a] Changshu Institute of Technology, China; [b] Wuxi Sunan International Airport Group Co., Ltd., China

## Abstract

This study examines whether lecturers with experience in using online teaching techniques are willing to adopt the online teaching mode in the post-COVID-19 era and whether this experience can enhance teaching performance. Using the Technology Acceptance Model (TAM), we collected primary data from higher education institutions in China through questionnaires and constructed relevant variables for empirical analysis. Our results indicate a positive and significant relationship between the use of online teaching techniques and the willingness to adopt online teaching mode. However, we find no significant effect of these techniques on teaching performance. Our findings offer valuable insights for policymakers seeking to enhance online education.

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# Introduction

Online teaching, a fusion of network technology and education, was first introduced by Hunan University in 1998, and was accepted by other universities in China in the 2010s (China Daily, 2019). This novel educational approach has garnered the attention of Chinese education authorities since 2019. To enhance teaching quality in universities, a policy known as the "First-class Course Construction Plan"[1] has been initiated, aiming to create 10,000 national first-class courses and 10,000 provincial-level first-class courses (Dai & Yang, 2022). One of the goals of implementing this policy is to promote massive open online courses (MOOCs) and online education among Chinese universities (Ministry of Education of the People's Republic of China, 2022). The COVID-19 outbreak has posed unprecedented challenges to China's education system[2] and hastened the implementation of online teaching policy. In order to ensure the health and safety of students, almost all the schools were forced to suspend classroom-based teaching and switch to online education and more than 1,450 Chinese colleges and universities started to use online teaching mode in 2020 (Huang, 2020).

Previous studies (Dai & Yang, 2022; Zhou et al., 2022) highlight the advantages and challenges of online teaching. Online teaching provides flexibility and convenience. It allows students to study anytime and anywhere, benefiting those with special needs. It also offers abundant resources, improving teaching efficiency and quality. However, technical issues and the need for higher technical skills can hinder learning. This raises questions: Do lecturers accept online teaching in the post-COVID-19 era? Does it affect teaching performance in Chinese universities?

The Technology Acceptance Model (TAM), developed by Davis et al. (1989), examines user acceptance of technology through perceived usefulness—the benefits derived—and perceived ease of use—the subjective difficulty of use. These perceptions are influenced by external factors. Perceived usefulness directly affects the intention to adopt the technology, which is also influenced by perceived ease of use. Over more than 30 years, TAM has evolved significantly, becoming influential in both information technology and educational research. This study applies the TAM to examine the acceptance of online technology education among higher education lecturers and investigate how online teaching technology relates to lecturers' intentions to adopt new teaching technology and its impact on teaching performance. Based on the TAM framework, this study tests (i) the relationship between lecturers' experience of using online teaching technology and the willingness of lecturers to use online teaching mode in the future and (ii) the effect of lecturers' experience of using online teaching technology on lecturers' teaching performance.

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[1] First-class Course Construction Plan aims to update undergraduate courses in different disciplines in Chinese universities for addressing the problems in the curriculum construction including the lag in the renewal of teaching content, the weakness of teaching team, unreasonable structure, poor students' active participation and unreasonable curriculum evaluation mechanism (He & Dong, 2021).

[2] China's education system includes basic education with nine-year compulsory schooling, a reformed higher education system comprising public and private institutions, and a vocational and adult education system that involves diverse and socially-participative schooling models, which is designed upon traditional classroom-based teaching modes.

The contribution of our study is twofold. First, we emphasise the importance of the experience of using online teaching techniques to the willingness to use online teaching mode in higher education in China. To the best of our knowledge, only one recent study by Yang (2020) investigates the teachers' willingness to support online learning. This study used survey data from 15,438 primary and secondary school teachers in China during the early stage of the pandemic period in 2020. Given that the complexity and professionality of higher education are essentially different from those of elementary education, this study adds to existing literature by focusing on the willingness to use the online teaching mode of lecturers in higher education in China.

Second, we use the framework of the TAM to construct the empirical strategy to test the influence of the use of online teaching techniques on teaching performance and the willingness to use online teaching mode in the post-COVID-19 era. TAM has been widely used in previous research that investigates the content of e-learning or online teaching (Waheed & Jam, 2010; Mailizar et al., 2021a). For instance, Akram et al. (2021) use the TAM to explore the adoption rate of information and communications technologies in practices and challenges of online teaching encountered by Pakistani universities during the COVID-19 pandemic. Watson et al. (2023) emphasize the importance of faculty readiness and student engagement in the transition from traditional to digital pedagogies. The prevalence of TAM is due to its simplicity which is more appropriate for investigating personal use of e-learning rather than the complexity of online teaching in institutional contexts (Ajibade, 2018). To address this limitation, we follow previous studies such as Martin (2012) and Abdullah & Ward (2016) to include the experience of online teaching along with a set of external factors and educators' characteristics in the regression.

Our empirical results suggest a positive and significant relationship between the use of online teaching techniques and the willingness to use online teaching mode. However, we do not find any significant effect of the use of online teaching techniques on teaching performance. Our findings are valuable for policymakers seeking factors to improve online education and provide a reasonable guideline for educators to decide whether to choose to use online teaching in the future.

## Literature

Previous studies (e.g., Dumford & Miller, 2018; Davis et al., 2019; Zhu, 2020; Moise et al., 2021) have well documented the advantages of online teaching. For example, Dai and Yang (2022) highlight that the main advantage of online teaching lies in its flexibility and convenience. Students can study at any time and place without being affected by geographical location and time constraints. This is particularly beneficial for students with special needs, such as those with poor family conditions, and those with physical disabilities. In addition, online teaching can also offer more learning resources including online courses, teaching videos and interactive discussions. This allows students to choose and master knowledge more independently. Furthermore, online teaching is expected to improve teaching efficiency and quality. Through online education platforms, teachers can more conveniently manage courses, assignments, and exams, while also better tracking students' learning situation and progress. In addition, online education can also incorporate various teaching methods and technologies, such as multimedia teaching, virtual experiments and artificial intelligence assistance. However, online teaching mode faces certain challenges. For instance, technical issues where students may not have sufficient equipment and

network conditions for online learning can lead to difficulties and obstacles in the learning process. Also, online teaching necessitates teachers to have higher technical skills and teaching experience in order to effectively carry out remote teaching and management (Svihus, 2023; Zhou et al., 2022). Watson et al. (2023) highlight the importance of addressing common barriers and leveraging facilitators to enhance the teaching and learning experience in both online and traditional classroom settings, emphasising the need for tailored instructional strategies due to differences in preferences between students and faculty. Therefore, it is worthwhile to answer the following questions. Do lecturers accept the use of online teaching mode in the post-COVID-19 era? Does the use of online teaching techniques affect teaching performance in universities in China?

Prior studies have investigated the adoption of online teaching in higher education in China during the COVID-19 period. For example, Huang (2020) uses questionnaires answered by 56 lecturers and 432 students from two universities in China and identifies that the challenges of online teaching encountered during the pandemic period are the lecturers' unfamiliarity with internet-based technologies and online teaching tools and the issues of lecturer-student interaction. Su et al. (2021) find that a few popular teaching tools and platforms such as WeChat and MOOCs were successfully exploited in education during the pandemic period while various challenges including internet streaming quality and coverage need to be addressed. Using questionnaire data from the website of RainClassroom (a Chinese online teaching platform), Zhu (2020) provides empirical evidence that the teaching performance of online teaching is essentially equal to that of traditional classroom-based teaching.

However, the problem with online teaching is that the student focus and class participation decrease with time which should be addressed by adjusted teaching methods (Zhu, 2020). Leveraging a sample of 367 students from 29 universities in China, Ding et al. (2022) examine the relationship between the use of online teaching and students' innovation capacities. Their empirical results suggest that online teaching strategy is positively and significantly associated with the students' ambidextrous innovation capacities, suggesting the success of the shift from traditional classroom-based teaching to online teaching in China during the COVID-19 period. Zheng et al. (2020) conduct a detailed survey on online teaching in Chinese universities during the COVID-19 pandemic. According to their survey, in the first half of 2020, in response to the sudden outbreak of the epidemic, 1,454 universities in China launched online teaching in response to the sudden outbreak of the epidemic. A total of 1.03 million lecturers offered 1.07 million online courses, amounting to 12.26 million course sessions. Zheng et al. (2020) find that more than three-quarters of university lecturers are willing to accept an "online + offline" hybrid teaching model after the pandemic, while 45.9% of lecturers are willing to continue with online teaching, and only 23.1% are unwilling to use online teaching, indicating that the online teaching mode has been accepted by most lecturers. More importantly, Zheng et al. (2020) point out that there is a significant difference in attitudes towards online teaching between teachers who had conducted online teaching before the pandemic and those who had not. Most lecturers with online teaching experience before the pandemic held a positive attitude towards online teaching, whereas 90.2% of teachers who had not conducted online teaching were unwilling to adopt the "online + offline" hybrid teaching model. Additionally, lecturers with pre-pandemic online teaching experience offered suggestions for improvements in teaching techniques, such as enhancing the

functionality and stability of the online teaching platform, increasing network speed and stability, and improving online technical support services (Zheng et al., 2020). Motivated by Zheng et al. (2020)'s findings, this study employs the TAM framework to empirically test the relationship between lecturers' pre-COVID-19 online teaching experience and their willingness to use online teaching in the future, using more recent data.

Regarding the relevance of the TAM in explaining the determinants of online teaching or learning, previous studies have provided some insights. For example, using data for questionnaire data for Allama Iqbal Open University, Waheed & Jam (2010) use the TAM framework to investigate the determinants of the intention to implement e-learning technology and find that perceived ease of use, perceived usefulness, facilitating conditions and computer efficacy have positive and significant effects on teacher's intention to accept online teaching. Mailizar et al. (2021a) confirm that the TAM can effectively identify the factors that affect secondary school teachers' willingness to use online teaching. lshurideh et al. (2023) explore the correlation between teaching methods and university students' propensity for online learning amid the COVID-19 pandemic, utilising the TAM to highlight the impact of social media content, interactivity, and repurchase intention on educational adaptation and innovation in the digital age. In addition, the frequency and convenience of using online teaching techniques as well as online teaching experience are found to be important factors as proxies for the TAM dimensions. Frequency refers to the regularity of engagements with online educational activities, such as attending virtual classes, completing assignments, or participating in online discussions, while convenience denotes the ease and accessibility of these activities, allowing students to engage with them at their preferred time and location (Martin et al., 2016). Instructors with online teaching experience encounter fewer barriers and employ a broader range of communication channels and instructional activities, which enhances their teaching effectiveness. Despite varying experiences, all groups recognize similar benefits for instructors and challenges for students (Bailey & Lee, 2020). These dimensions align with TAM's concepts of perceived usefulness and ease of use. Perceived usefulness reflects the belief that technology enhances performance, corresponding to online teaching's advantages like flexibility and resource access. Ease of use mirrors the convenience of online teaching, emphasizing accessibility. This alignment indicates that lecturers' or students' perceptions of frequency and convenience are crucial for their acceptance and adoption of online teaching or learning platforms, supported by TAM-based research (Mailizar et al., 2021b).

A few studies have examined the impact of new technology on teaching performance using the TAM framework. For instance, Scherer et al. (2015) find that teaching performance improves with the use of information and communication technology (ICT), mediated by teachers' perceived usefulness of ICT for teaching and learning. Sulistiyani et al. (2022) examine the determinants of teaching performance associated with the use of Learning Management Systems (LMS). Their study indicates that the TAM can explain and predict teachers' acceptance and effective utilization of LMS, which in turn positively and significantly impacts their instructional performance. Additionally, Saeed (2015) investigates the impact of computer technology on the teaching performance of English language teachers in Sudan, finding that most English teachers have a positive attitude towards the use of computer technology, believing it can improve their teaching performance. Batane and Ngwako (2017) focus on the relationship between technology use by pre-service teachers and their teaching performance, finding that the use of technology can

effectively enhance teaching performance. However, a potential drawback in these studies is the lack of explicit discussion on how teaching performance is measured. Previous studies have well documented suitable indicators for measuring teaching performance. For instance, Brooks (2005) and Trigwell (2011) suggest that teaching performance should be measured by student evaluation, peer in-class evaluation, and teaching portfolios. Proper measurements of teaching quality, according to Brooks (2005), include four main categories: program characteristics, program effectiveness, student satisfaction, and student outcomes. Mardikyan and Badur (2011) use student course evaluations to measure teaching performance, focusing on students' ratings of overall teaching effectiveness and their willingness to take another course with the same instructor.

Additionally, Yee & Abdullah (2021) discuss the evolution of the Unified Theory of Acceptance and Use of Technology (UTAUT) and its application in educational research, comparing it with TAM's simplicity and reliability, which supports its use in this study. However, TAM2 and TAM3 were developed to address the limitations of the original TAM by including additional factors that influence technology acceptance. TAM2, introduced by Venkatesh and Davis (2000), extends TAM by incorporating social influence processes such as subjective norm, voluntariness, and image, as well as cognitive instrumental processes like job relevance, output quality, result demonstrability, and perceived ease of use. This model offers a more comprehensive explanation of user intentions and usage behaviour, particularly in organisational settings.TAM3, proposed by Venkatesh and Bala (2008), further refines TAM2 by integrating constructs such as perceived enjoyment and objective usability. It also emphasises the effects of interventions and includes moderators like experience and voluntariness, providing a deeper understanding of technology acceptance.

In our study, we chose TAM due to its established validity and simplicity, which are suitable for exploring the basic acceptance and use of online teaching technologies. Our focus on the core determinants of technology acceptance (perceived usefulness and perceived ease of use) and their direct impact on lecturers' intentions and teaching performance makes the original TAM a straightforward yet effective framework without the added complexity of TAM2 and TAM3. Figure 1 illustrates the research structure using the TAM framework[3]. Specifically, we utilise the TAM to empirically investigate the effects of lectures' online teaching experience (i.e., the use of online teaching techniques) on their willingness to use online teaching mode and teaching performance. Two main hypotheses are shown as follows:

H1: Lectures' online teaching experience mode is positively correlated to their willingness to use online teaching mode.

H2: Lectures' online teaching experience is positively correlated to their teaching performance.

[3] This study focuses on the relationship between online teaching experience and both the willingness to use online teaching and teaching performance. Although teaching performance may influence the willingness to use online teaching (Moses et al., 2013; Lai et al., 2018), and a connection likely exists between the actual use of new technology and perceived usefulness/perceived ease of use, these aspects can be explored in future research.

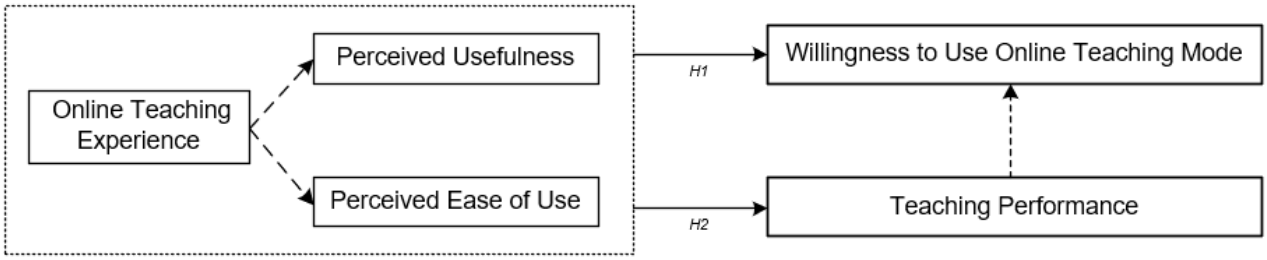


**Figure 1.**

*Research structure and hypotheses.*

# Method

## Questionnaire and Sample

Following the majority of prior studies (e.g., Huang, 2020; Han & Sa, 2021; Mailizar et al., 2021a) we use an online questionnaire to collect the data for empirical analysis since such an approach is easily administered. The questionnaire aims to answer the research questions of whether lecturers with experience in using online teaching techniques are willing to adopt the online teaching mode in the future and whether this experience can enhance teaching performance.

The questionnaire, available online from July 2023 to September 2023, includes 15 scale questions and is designed for lectures in colleges and universities in China[4]. Most participants were contacted through two popular messaging Apps in China, namely QQ and WeChat. All the participants completed the questionnaire anonymously. We received over 400 responses to the questionnaire. All participants are formal university teachers who have taught online during the pandemic[5]. We excluded responses from participants who held administrative or management positions without any teaching duty. Finally, our sample is constructed upon 336 valid responses to the questionnaire.

## Variables

Based on the answers from the questionnaire, we conduct ordered/dummy variables for empirical estimations. The details of each variable are summarised in Table 1

The dependent variables are the willingness to use online teaching mode and teaching performance. We construct an ordinal variable with a range from 0 to 3 to measure the level of willingness to use online teaching mode in the post-COVID-19 era: 0 = unwilling to use online teaching mode, 1 = less likely to use, 2 = probably to use, and 3 = very likely to use. Among all the responses, 12.2% of the participants decided not to use online teaching mode any longer. 26.19 % of the participants stated that they would be very likely to use online teaching mode in the future. 30.95% and 30.65% of the lecturers chose “less likely to use” and “probably to use”.

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[4] Ethical approval for this study was obtained from the Research Ethics Committee of Changshu Institute of Technology. The written informed consent was sending to the questionnaire participants before they completed the questionnaire.

[5] The first question of the questionnaire is to identify whether the participant has online teaching experience during the COVID-19 period.

Regarding teaching performance, the participants were requested to choose an answer as per the results during the pandemic period from the teaching evaluation system of their own universities[6]. We code this variable based on the teaching performance reported by the respondent: 0 = poor, 1 = moderate, 2 = good, and 3 = excellent. 11 respondents (3.27%) indicated his/her teaching performance was poor. 104, 129 and 92 of the lecturers chose "moderate", "good" and "excellent" respectively.

The main explanatory variable is online teaching experience which measures the effect of the use of online teaching techniques. Also, this variable can be regarded as a proxy for external factors and an indirect measure of "perceived usefulness" and "perceived ease of use" in the TAM. We created a dummy variable coded as 1 if the respondent had online teaching experience before the COVID-19 period, and 0 otherwise. In our dataset, 25.3% of the lecturers had online teaching experience. It should be noted that this variable measures the effect of respondents' voluntary use of online teaching techniques, not forced use. During the COVID-19 pandemic, the Ministry of Education of China prohibited in-person classes, so all respondents taught online.

Among control variables, frequency and convenience as additional measures to capture the effects of perceived usefulness and perceived ease of use. Also, we add a set of additional variables namely, preparation time, teaching experience, academic title, educational background, gender, university rank and institution location to avoid omitted variable bias.

**Regression Model**

To test the effect of the use of online teaching techniques on the willingness to use online teaching mode and teaching performance, we specify the model as follows:

$$Willingness = \beta_1 OnlineTeaching + \beta_2 X + \beta_0 + \mu_i + \epsilon \qquad (1)$$

$$Performance = \beta_1 OnlineTeaching + \beta_2 X + \beta_0 + \mu_i + \epsilon \qquad (2)$$

where $Willingness$ and $Performance$, the dependent variables, stand for the willingness to use online teaching mode and teaching performance respectively; $OnlineTeaching$ denotes the experience of using online teaching techniques; $X$ represents aforementioned control variables; $\beta$s are the parameters of each explanatory variable needed to be estimated; $\mu_i$ are dummy variables measuring the location fixed effects; and $\epsilon$ is the random error term.

We conduct empirical analysis using three different empirical methods, namely ordered logit, ordered probit and Tobit models. Given that the dependent variable is ordinal, equations 1 and 2 are equivalent to a linear probability model (LPM) if the estimation is conducted by ordinary least squares (OLS). The main issue of an LPM is that, when explanatory variables are continuous, the classical assumption of OLS cannot hold, as a large value of the explanatory variable, the LPM regards the actual probability (for instance, Willingness may exceed 3 or become negative). Thus even though the estimation of an LPM is straightforward, it only can be treated as a linear

[6] Chinese universities generally measure lecturers' teaching performance through student evaluation and peer evaluation. Both evaluations are conducted through various methods such as structured questionnaire surveys, group discussions, and personal interviews.

approximation to a regression model where the dependent variable is the probability of that an ordinal outcome equals 3.

**Table 1.**

*Variables*

| Variable | Definition | Questions in the questionnaire | Measure |
|---|---|---|---|
| willingness to use online teaching mode | The level of willingness to use online teaching mode in the post-COVID-19 era | Are you willing to use online teaching in the future, based on your teaching experience during the COVID-19 period? | 0=unwilling to use online teaching mode,1 = less likely to use, 2 = probably to use, and 3 = very likely to use |
| Teaching performance | Teaching performance during the COVID-19 period from the teaching evaluation system of respondents' universities | What was your average teaching performance during the COVID-19 period? Please answer the question based on the results from the university's teaching evaluation system. | 0 = poor, 1 = moderate, 2 -= good, and 3 = excellent |
| Online teaching experience | Online teaching experience before the COVID-19 period | Did you use any kind of online teaching technique or online teaching experience before the COVID-19 period? | 0 = no experience, and 1 = having experience |
| Frequency | The frequency of online teaching before the COVID-19 period | How frequently did you use online teaching before the COVID-19 period? | 0 = never used, 1 = used occasionally, and 2 = used frequently |
| Convenience | The convenience of using online teaching | Do you find online teaching techniques convenient to use? | 0 = very inconvenient, 1 = inconvenient, 2 = neutrality, 3 = convenient, and 4 = very convenient |
| Preparation time | Changes in the length of preparation time using online teaching compared to that using traditional classroom-based teaching | Do you spend more time preparing your courses when using online teaching compared to traditional classroom-based teaching | 0 = longer, 1 = almost no change, and 2 = shorter |
| Teaching experience | Years of teaching experience | How long have you been teaching at university? | 0 = less than 5 years, 1 = 5-10 years, 2 = 11-20 years, 3 = 21-30 years, and 4 = over 30 years |
| Academic rank | The level of academic rank | What is your current academic rank? | 0 = teaching assistant or below, 1 = lecturer, 2 = associated professor, 3 = professor |
| Education background | The highest education degree held by the respondent | What is your highest education qualification? | 0 = Bachelor's degree or lower, 1 = Master's degree, 2 = PhD degree |
| Administration | To measure whether the respondent has an administrative position | Do you have an administrative position now? | 0 = do not have an administrative position, and 1 = have an administrative position |
| Gender | To measure the respondent's gender | What is your gender? | 0 = male, and 1 = female |

| | | | |
|---|---|---|---|
| University rank | To measure the rank of the university/college where the participant works | What is the rank of the university/college that you work at? | 0 = Junior colleges; 1 = Non first-class universities; 2 = First-class universities in Project 211, and 3 = First-class universities in Project 985 |
| Location | The location of the university/college where the participant works | Which province is your institution located in? | Participants are from 13 different provinces in China. We create dummy variables to capture the location-fixed effects. |

# Empirical Results

### Main Results

Table 2 reports the summary statistics of all the variables and pairwise correlation coefficients which suggest that there is no serious problem of multicollinearity among the explanatory variables.

We test the relationship between the use of online teaching techniques and the willingness to use online teaching mode and report the empirical results in Table 3. Our empirical strategy is that we include the main explanatory variable (i.e., online teaching experience) only and then add all the control variables into the regression. In order to check the consistency of the results, we use three different empirical methods, namely ordered logit, ordered probit and Tobit models. For example, we use ordered logit estimation to examine the effect of online teaching experience per se on the willingness to use online teaching mode and report the results in column 1 of Table 3 and we include all the control variables in column 2. As one of the aims of this study is to test the importance of the use of online teaching techniques to the willingness to use online teaching mode, we primarily focus on the significance and the sign of the coefficient of online teaching experience.

**Table 2.**

*Summary Statistic*

| Variable | Mean | Std. Dev. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. willingness to use online teaching mode | 1.71 | 0.98 | 1 | | | | | | | | | | | |
| 2. Teaching performance | 1.89 | 0.84 | 0.11** | 1 | | | | | | | | | | |
| 3. Online teaching experience | 0.25 | 0.43 | 0.15*** | 0.02 | 1 | | | | | | | | | |
| 4. Frequency | 1.11 | 0.77 | 0.11 | 0.05 | 0.83*** | 1 | | | | | | | | |
| 5. Convenience | 2.07 | 1.58 | 0.07 | -0.06 | -0.06 | -0.02 | 1 | | | | | | | |
| 6. Preparation time | 1.16 | 0.66 | 0.08 | 0.01 | 0.04 | 0.06 | -0.14*** | 1 | | | | | | |
| 7. Teaching experience | 2.11 | 1.43 | 0.06 | 0.07 | 0.16*** | 0.15*** | -0.07 | 0.03 | 1 | | | | | |
| 8. Academic rank | 1.34 | 1.09 | 0.11** | 0.09* | -0.11** | -0.15*** | -0.02 | 0.02 | 0.02 | 1 | | | | |
| 9. Education background | 1.53 | 0.64 | 0.01 | 0.04 | -0.06 | -0.06 | 0.08 | 0.03 | 0.13** | 0.14*** | 1 | | | |
| 10. Administration | 0.28 | 0.45 | 0.01 | 0.14** | 0.07 | 0.06 | -0.04 | 0.04 | -0.11* | -0.18*** | -0.09* | 1 | | |
| 11. Gender | 0.55 | 0.49 | -0.15*** | -0.05 | 0.16*** | 0.13** | -0.01 | -0.13** | 0.09 | 0.02 | -0.08 | -0.17*** | 1 | |
| 12. University rank | 2.16 | 1.43 | 0.07 | 0.01 | 0.03 | 0.06 | 0.08 | -0.03 | -0.02 | -0.15*** | 0.11** | 0.159*** | 0.08 | 1 |

In column 1 of Table 3, the estimated results, obtained using ordered logit, suggest that online teaching experience has a positive and statistically significant effect on the willingness to use online teaching mode at the 1% level. In column 2, online teaching experience records a positive coefficient at the 1% significant level after we include all the control variables. These support our hypothesis H1 and indicate that lecturers who have experience using online teaching techniques before the COVID-19 era are more likely to use online teaching techniques in the future, implying that the TAM is appropriate to explain how individuals adopt new technology in modern Chinese higher education institutions. Among control variables, both teaching experience and university rank have negative and significant influences on the dependent variable, suggesting that lecturers with more teaching experience and lecturers from universities with higher ranking are less likely to continue to use online teaching mode after the COVID-19 era. Education background, administration and subject are positively and significantly associated with the willingness to use online teaching mode. These findings reveal that lecturers who hold a higher level of academic degree, who have an administration position and female lecturers are more likely to use online teaching mode in the future.

We use ordered probit (columns 3 and 4) and Tobit (columns 5 and 6) to test the association between online teaching experience and the willingness to use online teaching mode with the same model specification in columns 1 and 2. The results are essentially unchanged, in terms of the sign and statistical significance of the variable coefficients.

**Table 3.**

*Main Results: The Relationship between the Use of Online Teaching Techniques and the Willingness to Use Online Teaching Mode*

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | Ordered logit | | Ordered probit | | Tobit | |
| Online teaching experience | 1.2961*** | 1.9797*** | 0.7344*** | 1.1633*** | 0.4590*** | 0.6511*** |
| | (0.2690) | (0.5229) | (0.1466) | (0.2838) | (0.0942) | (0.1555) |
| Frequency | | -0.4114 | | -0.2457 | | -0.1350* |
| | | (0.2708) | | (0.1529) | | (0.0809) |
| Convenience | | -0.1315 | | -0.0673 | | -0.0336 |
| | | (0.0842) | | (0.0460) | | (0.0248) |
| Preparation time | | 0.0280 | | 0.0314 | | 0.0213 |
| | | (0.1837) | | (0.1019) | | (0.0544) |
| Teaching experience | | -0.3087*** | | -0.1881*** | | -0.1009*** |
| | | (0.0802) | | (0.0461) | | (0.0249) |
| Academic rank | | -0.0913 | | -0.0732 | | -0.0540 |
| | | (0.1184) | | (0.0656) | | (0.0366) |
| Education background | | 0.4401** | | 0.2792*** | | 0.1577*** |
| | | (0.1773) | | (0.0991) | | (0.0584) |
| Administration | | 0.6380** | | 0.3610** | | 0.1767* |
| | | (0.3109) | | (0.1715) | | (0.0907) |
| Gender | | 0.5002** | | 0.3151** | | 0.1605** |
| | | (0.2485) | | (0.1380) | | (0.0757) |
| University rank | | -0.1652* | | -0.0860* | | -0.0413 |
| | | (0.0946) | | (0.0518) | | (0.0274) |
| Location dummies | No | Yes | No | Yes | No | Yes |
| N | 336 | 336 | 336 | 336 | 336 | 336 |
| Pseudo $R^2$ | 0.0404 | 0.1126 | 0.0406 | 0.1150 | 0.0369 | 0.1016 |

*Note:* Dependent variable is the willingness to use online teaching mode. Estimations are by ordered probit model (columns 1 and 2), ordered logit model (columns 3 and 4), and Tobit model (columns 5 and 6). Robust standard errors are reported below estimates (in parentheses). ***Statistical significance at 1% level (p-value < 0.01). **Statistical significance at 5% level (p-value < 0.05). *Statistical significance at 10% level (p-value < 0.1).

Table 4 presents the estimated results for the relationship between online teaching experience and teaching performance. The results suggest that online teaching experience exerts an insignificant impact on teaching performance. These do not support our hypothesis H2. Among

the control variables, academic titles and administration positively and significantly correlate to the dependent variable while the rest of the variables appear to be insignificant.

**Table 4.**

*Main Results: The Relationship between the Use of Online Teaching Techniques and Teaching Performance*

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | Ordered logit | | Ordered probit | | Tobit | |
| Online teaching experience | 0.0899 | -0.4044 | 0.0446 | -0.2910 | 0.0390 | -0.2385 |
| | (0.2454) | (0.4668) | (0.1411) | (0.2637) | (0.1122) | (0.2005) |
| Frequency | | 0.3361 | | 0.2151 | | 0.1742 |
| | | (0.2498) | | (0.1439) | | (0.1097) |
| Convenience | | -0.0745 | | -0.0349 | | -0.0249 |
| | | (0.0722) | | (0.0398) | | (0.0294) |
| Preparation time | | -0.0759 | | -0.0597 | | -0.0493 |
| | | (0.1809) | | (0.0985) | | (0.0747) |
| Teaching experience | | 0.1059 | | 0.0627 | | 0.0513 |
| | | (0.0818) | | (0.0454) | | (0.0338) |
| Academic rank | | 0.2113** | | 0.1156* | | 0.0875* |
| | | (0.1071) | | (0.0621) | | (0.0463) |
| Education background | | 0.1299 | | 0.0613 | | 0.0386 |
| | | (0.1685) | | (0.0940) | | (0.0716) |
| Administration | | 0.6007** | | 0.3528** | | 0.2592** |
| | | (0.2748) | | (0.1541) | | (0.1134) |
| Gender | | -0.1763 | | -0.0928 | | -0.0682 |
| | | (0.2370) | | (0.1319) | | (0.0981) |
| University rank | | -0.0055 | | -0.0067 | | -0.0042 |
| | | (0.0821) | | (0.0465) | | (0.0344) |
| Location dummies | No | Yes | No | Yes | No | Yes |
| N | 336 | 336 | 336 | 336 | 336 | 336 |
| Pseudo $R^2$ | 0.0002 | 0.0414 | 0.0001 | 0.0402 | 0.0001 | 0.0373 |

*Note:* Dependent variable is teaching performance. Estimations are by ordered probit model (columns 1 and 2), ordered logit model (columns 3 and 4), and Tobit model (columns 5 and 6). Robust standard errors are reported below estimates (in parentheses). ***Statistical significance at 1% level (p-value < 0.01). **Statistical significance at 5% level (p-value < 0.05). *Statistical significance at 10% level (p-value < 0.1).

**Robustness Check**

In order to check the consistency of the main results, we use the willingness to publish e-textbooks and student attention as the alternative measures of the willingness to use online teaching mode and teaching performance to conduct the robustness tests. The results, reported in Tables 5 and 6, are essentially unchanged. There is a positive and significant relationship between the use of online teaching techniques and the willingness to publish e-textbooks and an insignificant association between the use of online teaching techniques and student attention.

**Table 5.**

*Robustness Check: The Relationship between the Use of Online Teaching Techniques and the Willingness to Publiseh E-Textbooks*

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | Ordered logit | | Ordered probit | | Tobit | |
| Online teaching experience | 0.6457** | 0.9774** | 0.3879*** | 0.5967** | 0.4360*** | 0.6066** |
| | (0.2580) | (0.4835) | (0.1454) | (0.2586) | (0.1568) | (0.2462) |
| Frequency | | -0.0112 | | -0.0510 | | -0.0542 |
| | | (0.2531) | | (0.1405) | | (0.1318) |
| Convenience | | 0.0725 | | 0.0544 | | 0.0671* |
| | | (0.0684) | | (0.0394) | | (0.0376) |
| Preparation time | | 0.1134 | | 0.0786 | | 0.0878 |
| | | (0.1618) | | (0.0918) | | (0.0894) |
| Teaching experience | | 0.1029 | | 0.0474 | | 0.0396 |
| | | (0.0790) | | (0.0439) | | (0.0422) |
| Academic rank | | 0.3387*** | | 0.1903*** | | 0.1673*** |
| | | (0.1100) | | (0.0606) | | (0.0554) |
| Education background | | -0.0899 | | -0.0799 | | -0.0896 |
| | | (0.1803) | | (0.1010) | | (0.0991) |
| Administration | | -0.0593 | | -0.0296 | | -0.0166 |
| | | (0.2532) | | (0.1412) | | (0.1346) |
| Gender | | -0.8841*** | | -0.4727*** | | -0.4394*** |
| | | (0.2354) | | (0.1358) | | (0.1262) |
| University rank | | 0.1435* | | 0.0841* | | 0.0860** |
| | | (0.0749) | | (0.0431) | | (0.0410) |
| Location dummies | No | Yes | No | Yes | No | Yes |
| N | 336 | 336 | 336 | 336 | 336 | 336 |
| Pseudo $R^2$ | 0.0084 | 0.0585 | 0.0092 | 0.0558 | 0.0097 | 0.0518 |

*Note:* Dependent variable is the willingness to publish e-textbooks. Estimations are by ordered probit model (columns 1 and 2), ordered logit model (columns 3 and 4), and Tobit model (columns

5 and 6). Robust standard errors are reported below estimates (in parentheses). ***Statistical significance at 1% level (p-value < 0.01). **Statistical significance at 5% level (p-value < 0.05). *Statistical significance at 10% level (p-value < 0.1).

**Table 6.**

*Robustness Check: The Relationship between the Use of Online Teaching Techniques and Student Attention*

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| | Ordered logit | | Ordered probit | | Tobit | |
| Online teaching experience | 0.2603 | 0.7451 | 0.1441 | 0.3836 | 0.2030 | 0.4426 |
| | (0.2564) | (0.4884) | (0.1464) | (0.2742) | (0.1696) | (0.2765) |
| Frequency | | 0.0450 | | 0.0253 | | 0.0302 |
| | | (0.0788) | | (0.0438) | | (0.0457) |
| Convenience | | -0.1964 | | -0.1421 | | -0.1750* |
| | | (0.1550) | | (0.0888) | | (0.0925) |
| Preparation time | | 0.1352* | | 0.0737* | | 0.0786* |
| | | (0.0778) | | (0.0446) | | (0.0464) |
| Teaching experience | | -0.0216 | | -0.0070 | | -0.0052 |
| | | (0.0850) | | (0.0470) | | (0.0497) |
| Academic rank | | -0.1894** | | -0.1136** | | -0.1089* |
| | | (0.0957) | | (0.0568) | | (0.0614) |
| Education background | | -0.3189 | | -0.2027* | | -0.2185** |
| | | (0.1997) | | (0.1097) | | (0.1096) |
| Administration | | -0.7088** | | -0.4404*** | | -0.4804*** |
| | | (0.2765) | | (0.1549) | | (0.1627) |
| Gender | | -0.7843*** | | -0.4923*** | | -0.5515*** |
| | | (0.2366) | | (0.1306) | | (0.1386) |
| University rank | | 0.1352* | | 0.0737* | | 0.0786* |
| | | (0.0778) | | (0.0446) | | (0.0464) |
| Location dummies | No | Yes | No | Yes | No | Yes |
| N | 336 | 336 | 336 | 336 | 336 | 336 |
| Pseudo $R^2$ | 0.0014 | 0.0572 | 0.0012 | 0.0588 | 0.0016 | 0.0524 |

*Note:* Dependent variable is student attention. Estimations are by ordered probit model (columns 1 and 2), ordered logit model (columns 3 and 4), and Tobit model (columns 5 and 6). Robust standard errors are reported below estimates (in parentheses). ***Statistical significance at 1% level (p-value < 0.01). **Statistical significance at 5% level (p-value < 0.05). *Statistical significance at 10% level (p-value < 0.1).

## Discussion

We have investigated the influence of the use of online teaching techniques on teaching performance and the acceptance of online teaching in the post-COVID-19 era. Previous studies highlight a significant shift in university lecturers' attitudes towards online teaching during the COVID-19 pandemic, revealing widespread acceptance of the "online + offline" hybrid teaching model in China. There is a clear contrast between lecturers with prior online teaching experience and those without, indicating that familiarity with online teaching greatly influences their acceptance. Experienced lecturers not only adapted more easily but also suggested improvements for online teaching techniques. These findings inspire further empirical research using the TAM framework to examine the long-term effects of pre-pandemic online teaching experience on the future adoption of online teaching mode. Thus, using the TAM, we collect primary data from higher education institutions in China through questionnaires and construct relevant variables to empirically examine the relationship. Our empirical analysis reveals a statistically significant positive correlation between prior online teaching experience and future adoption of online teaching methods, even after accounting for all control variables ($p < 0.01$). This finding suggests that faculty members with pre-COVID-19 experience in online instruction are more inclined to utilise digital teaching tools in the future. Such a result lends support to the applicability of the TAM in elucidating technology adoption patterns within contemporary Chinese higher education institutions. The TAM has been extensively utilised in studies related to e-learning and online teaching, our application specifically targets the higher education sector in China during the post-pandemic period. This targeted approach enables us to provide novel insights into the determinants of technology adoption and the effectiveness of online teaching in a rapidly evolving educational environment. By demonstrating the applicability of TAM in this context, our study not only validates the model's relevance but also highlights the unique considerations and strategies necessary for effectively integrating online teaching methods in higher education. This contribution is particularly valuable as it offers evidence-based recommendations for policymakers and educational institutions aiming to enhance the adoption and efficacy of online teaching techniques in a post-pandemic world.

Existing literature highlights the role of the TAM in explaining the impact of technology use on teaching performance. Several studies demonstrate that the perceived usefulness and ease of use of technological tools positively influence teaching performance. However, our empirical results exhibit an insignificant influence of pre-COVID-19 experience in online teaching on teaching performance. This may be because online teaching is still in its early stages in China, and some lecturers lack systematic online education training. Consequently, lecturers are unable to leverage the advantages of online teaching, which fails to effectively enhance their teaching performance.

Based on the TAM, a key policy implication is that increasing the willingness to use online teaching requires improving the ease of use and usefulness of online teaching techniques. China implemented a large scale of online teaching during the COVID-19 period from 2020 to 2022 and such an implementation has improved lecturers’ experience of online teaching via various aspects such as the consensus of online education and learning ability (Yang, 2020). This national-level online education practice may have increased the overall ease of use of online teaching. Thus, it is necessary to continue to promote online teaching in the future of teaching practice. This

national-level practice aligns with efforts in countries like South Korea, which had a seamless transition to online teaching due to prior investment in educational technology (Kim & Lee, 2020).

With regard to the usefulness of online teaching, education authorities and universities should pay attention to learning assessments and teaching feedback on online teaching during the epidemic period. The teaching strategy of the higher industry needs to integrate both online teaching and classroom-based teaching. Chinese government should learn from successful Western experiences, such as Finland's integration of hybrid teaching models using robust digital infrastructure to maintain educational continuity (Palonen et al., 2020), to explore hybrid teaching modes and relevant management strategies.

In addition, policymakers need to focus on the development of external factors of online teaching. A full chain management service system can be established to avoid the problem that online teaching is just a replication of classroom-based teaching. This approach is crucial, as seen in India’s Digital India initiative, which aims to enhance digital education despite challenges like the digital divide (Chakraborty et al., 2020). New paradigms with different teaching strategies suited for online teaching by strengthening the training of online teaching technology and teaching methods, improving the proficiency of lecturers and students’ use of various online teaching platforms and software, and achieving deep integration of online and classroom-based teachings. From a practical perspective, online teaching relies on information technology. Therefore, online teaching platforms and wireless networks need to be improved to increase the perceived ease of usefulness of online teaching.

## Conclusion

In conclusion, our study underscores the potential of online teaching techniques to shape the future of education positively. By addressing the identified limitations and continuing to refine online teaching strategies, educational institutions can better navigate the post-pandemic landscape and leverage technology to enhance learning outcomes.

Our study makes two significant contributions to the existing body of literature on online teaching in higher education. First, our research underscores the pivotal role of hands-on experience with online teaching techniques in enhancing the willingness to adopt online teaching modes among lecturers in higher education institutions in China. Previous research has primarily focused on the willingness of primary and secondary school teachers to support online learning during the early stages of the COVID-19 pandemic. However, our study uniquely addresses the context of higher education, which is inherently more complex and demands a higher level of professional expertise. By focusing on lecturers in higher education, we fill a crucial gap in the literature and provide nuanced insights into the factors that influence their readiness to embrace online teaching. This distinction is critical as it recognises the unique challenges and requirements of higher education, thereby contributing to a more comprehensive understanding of technology adoption in this sector. Second, we employ the TAM to formulate an empirical strategy that examines the impact of online teaching techniques on both teaching performance and the willingness to use online teaching modes in the post-COVID-19 era.

This study has three main limitations, which provide promising avenues for future research. First, our dataset contains 336 observations and focuses on lecturer characteristics. Expanding the

sample size and including more variables to control for industry-level and organisational-level factors would be beneficial. Second, our results show an insignificant effect of using online teaching techniques on teaching performance, and our empirical analysis does not explain the underlying reasons. Future research could explore the reasons behind this finding and investigate how to enhance teaching performance through online teaching. Third, this study does not explicitly test the effects of online teaching experience on perceived usefulness and perceived ease of use. Future research could thoroughly investigate these effects.

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