Journal of Education and e-Learning Research
Vol. 10, No. 3, 453-462, 2023
ISSN(E) 2410-9991 / ISSN(P) 2518-0169
DOI: 10.20448/jeelr.v10i3.4885

An investigation of online teaching and lecturers' online teaching competence in Vietnam: A case study at universities of technology and education

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Abstract

The rapid digital transformation and the widespread influence of the COVID-19 pandemic have impacted higher education in Vietnam. This social setting fosters online teaching and lecturers' online teaching competencies. The aim of this study is to investigate online teaching competence at two universities of technology and education in Vietnam through a survey. Based on a review of the literature, an online teaching competence scale for lecturers was developed and its validity and reliability were evaluated using exploratory component analysis and Cronbach's alpha coefficients with data from 311 lecturers at two public universities of technology and education. The online teaching competency scale for lecturers consists of 25 items organized into five component competencies: "Understanding student learning", "online session administration", "digital content development and learning facilitation", "technology" and "online learning outcomes assessment". With the exception of "technology", the remaining component competencies were identified as good. Not only online teaching modes but also online teaching activities and productions were also deployed to maintain learning activities especially during the COVID-19 pandemic at two universities. Recommendations for developing lecturers' online teaching competence were also considered.

Keywords: Online teaching, Online teaching competence, Online teaching competence of lecturers, Online teaching competence scale for lecturers, Online teaching mode, Synchronous online teaching, Asynchronous online teaching, Blended teaching, Hybrid teaching.

Citation | Oanh, D. T. K., Tuan, N. A., Duong, P. B., Triet, N. M., & Phuc, T. Q. (2023). An investigation of online teaching and lecturers' online teaching competence in Vietnam: A case study at universities of technology and education. *Journal of Education and E-Learning Research, 10*(3), 453–462. 10.20448/jeelr.v10i3.4885
History:
Received: 12 April 2023
Revised: 16 June 2023
Accepted: 14 July 2023
Published: 9 August 2023

Publisher: Asian Online Journal Publishing Group

Funding: This research is supported by the Ministry of Education and Training, Vietnam (Grant number: CT 2022.06.SPK.09).
Institutional Review Board Statement: The Ethical Committee of the Ho Chi Minh City University of Technology and Education, Vietnam has granted approval for this study (Ref. No. 04/DHSPKT-KHCN).
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: Conducted the research and undertook the parts of abstract, introduction, literature review, online teaching competence scale for lecturers, online teaching and online teaching competence of lecturers at two universities of technology and education in Vietnam, conclusion, limitations, and recommendations, D.T.K.O.; conducted the research and analyzed the data, N.A.T.; collected the data, P.B.D., N.M.T. and T.Q.P. All authors have read and agreed to the published version of the manuscript.

Contents

Contribution of this paper to the literature
This article investigates online teaching and lecturers' online teaching competence in Vietnam which can be applied to developing an online teaching competence training program for lecturers to meet requirements in the digital transformation of higher education in Vietnam.

1. Introduction

The COVID-19 pandemic occurred at the end of January 2020 and had an impact on the socio-economic system in Vietnam. Higher education institutions in Vietnam switched from face-to-face teaching to online teaching to respond to the wide-ranging effects of COVID-19 in a flexible way and prevent disruption (Nguyen-Anh, Nguyen, Tran-Phuong, & Nguyen-Thi-Phuong, 2022).

The shift from face-to-face teaching into online teaching leads to changes in the professional activities of lecturers. Lecturers must provide multimedia presentations such as videos and digital learning materials interact with students through digital platforms and assess online learning outcomes. These activities require lecturers to be in-service trained to keep up with teaching through the internet. Online interaction and technology-related issues were the key factors influencing lecturer satisfaction during the COVID-19 pandemic. However, the main issues affecting the quality of interaction between lecturers and students were unskilled lecturers in pedagogy and technology to promote online interaction with students and design teaching materials to suit the online environment (Pham & Van Nghiem, 2022).

According to Mishra and Koehler (2008), "technology", "content" and "pedagogy" are key elements of technology-assisted teaching. Knowledge and skills of technology, pedagogy and content in online teaching help lecturers enhance their online teaching competence. Online teaching competence is a new category of professional competence for lecturers. Vietnam still needs in-depth studies on online teaching and online competence. This study aims to explore online teaching and the competencies of lecturers at two public universities of technology and education and provides meaningful insights for developing an online teaching competence training program for lecturers in Vietnam.

2. Literature Review

Online teaching refers to internet-based instruction (Sadiku et al., 2018). Lecturers use internet applications or services to communicate directly with students in teaching activities and evaluate learning outcomes. Although online teaching is similar to face-to-face teaching in terms of transferring the same learning contents, it requires its own set of skills and requirements in terms of pace and delivery (Sadiku et al., 2018). Online teaching with different types of modes such as online teaching, hybrid teaching or blended teaching is an irreversible trend of digital transformation and a comprehensive impact of the COVID-19 pandemic worldwide. Online teaching competence was discussed in the early years of the first decade of the 21st century (Dooley & Lindner, 2002; Queiroz & Mustaro, 2003; Spector & De La Teja, 2001) and it really attracted researchers' attention during and after the COVID-19 pandemic.

Queiroz and Mustaro (2003) proposed seven components of online teaching competence as follows: technology, course design, discussion organization, ground rule establishment, synchronous discussion guidance, a combination of teaching methods with learning references, feedback and cultural difference consideration. Queiroz and Mustaro (2003) also believed that online teaching required a change in the educational paradigm. The relationship between lecturers, students and knowledge is the main emphasis of teaching activities in online teaching. This educational model requires lecturers to improve their teaching methods to encourage students to study effectively in an online teaching.

Abdous (2011) identified online teaching competence as related to three stages of teaching (before, during and after). Lecturers have the ability to prepare, plan and design before teaching. Lecturers encourage students to learn actively and engage them in interactive learning activities during teaching. Lecturers give reflection, identify lessons learned, and establish a plan for course revision at the end of the teaching process.

Pedagogy, interaction, technology, instructional design, professional values and research were the six components of online teaching competence (Sapien-Aguilar et al., 2017).

Roddy et al. (2017) determined online teaching competence including communication, technology, feedback, responsiveness, learning monitoring and student support. The authors asserted that these competencies shape the effectiveness of online instructors.

Zmirli and Kirmaci (2017) established seven components of competencies and criteria corresponding to each competence based on the notion that online teaching competence is the ability to have the essential knowledge and skills to teach over online platforms. A component of competencies included engaging students and fostering presence, developing social, teaching and cognitive presence, creating a syllabus and related guidelines, looking into the best ways to foster effective communication, possessing pedagogical and technical competence and identifying individual differences.

Albrahim (2020) classified online teaching competence into six categories: pedagogy, content, design, technology, management and communication. These components of competencies serve as a protocol for ensuring that lecturers are prepared and qualified to teach online effectively.

Borah and Devarani (2022) determined the online teaching competence of agriculture faculty at universities in Northeast India such as technological competency, teaching facilitation, teaching ethics, session management, content facilitation. The meaning of these components of competencies was clearly clarified in Borah and Devarani's work.

Digital competence involves the confident, critical and responsible use of and engagement with, digital technologies for learning, at work and for participation in society (European Commission, 2018). The European framework for the digital competence of educators (Redecker, 2017) and the digital competence framework for higher education (Joint Information Systems Committee, 2017) include online teaching competencies such as "teaching and learning" and "assessment" (Redecker, 2017) or "ICT proficiency", "participation" and " development"

(Joint Information Systems Committee, 2017). These competencies have a relationship with the three main elements of online teaching: technology, content and pedagogy. Digital competencies enable lecturers to use digital technologies for continuous communication, collaboration and professional development, effectively integrating them into teaching and learning and creating a technology-assisted learning environment to engage students in online interactive learning activities.

Researchers have focused on not only identifying component competencies of online teaching competence but also developing an online teaching competence scale for lecturers. Simsek et al., (2021) created a valuable and reliable online teaching competence scale for lecturers based on data from 392 lecturers at Istanbul University, Cerrahpasa (Turkey) during the COVID-19 pandemic. All lecturers who took part in this study taught synchronous or asynchronous online courses. The identification of items of online teaching competence, exploratory factor analysis and convergence values are all included in developing the scale. The scale includes 15 items divided into four factors: pedagogy, facilitation, technology and course management.

Instructors with technological competence (7 items) have the knowledge and skills to handle the office application software (MS Office), search for information, use online teaching platforms, use multimedia, mix multimedia strategies and organize online testing. Teaching facilitation (6 items) is the ability to create effective interactions in sessions, organize and motivate students to participate in learning, promote individual and group communication during lessons, use different communication methods to approach students, show sensitivity and empathy when communicating online and promote a synchronous and asynchronous online learning environment. Teaching ethics (3 items) motivate students to study, be committed to students and the work of the school, be fair to students in teaching and assessment and respect for students' cultural differences. Session management (4 items) is the ability to encourage students to give feedback, provide detailed feedback, manage the time of study sessions, apply time management techniques, design and implement lesson plans for appropriate e-learning. Content facilitation (3 items) is the ability to provide additional resources that encourage students to go deeper into the content of the course, give assignments to students to engage them in online learning and encourage students to do simple experiments at home.

Tang, Gu, and Xu (2022) developed a reliable and valid digital competence evaluation framework for lecturers by incorporating the interplay and intersection of four types of basic knowledge and emphasizing the types of knowledge located at six key intersections. The digital competence evaluation framework for lecturers includes 44 items organized into 10 components and scored on a 5-point Likert scale.

In addition, the literature review on lecturers' online teaching competence demonstrates that this competence is not a solitary one. It is made up of components of competencies that are closely related to the three key elements of technology-assisted teaching in the classroom namely technology, pedagogy and content, as indicated in Mishra and Koehler (2008). Personal, social, pedagogical, competence, digital and course management competencies are some of the components of online teaching competence.

3. Online Teaching Competence Scale for Lecturers

The literature review on the online teaching competence of lecturers provides the scientific basis regarding components and their items for developing an online teaching competence scale for lecturers in Vietnam. This study proposed an online teaching competence scale for lecturers consisting of six components of competencies in cohesion with three key elements of technology-assisted teaching, namely "understanding student learning", "online instructional design", "digital content development and learning facilitation", " online learning outcomes assessment", " online session administration" and "technology".

Online teaching needs to be based on understanding student learning. This component of competence supports lecturers in recognizing existing cognitive levels, the difficulties of students in online learning and using teaching methods that are in line with their learning and learning preferences. Instructional design is a crucial part of the preparation stage of teaching. The ability to plan instructions for teaching and learning activities associated with significant characteristics of online education is mentioned in the context of online teaching. When it comes to the content and pedagogy of teaching online, content must be converted into digital learning materials such as multimedia presentations, digitalized references etc. Teaching methods are integrated with online teaching tools to improve students' interactions with lecturers, classmates and digital learning materials. Lecturers have to combine learning tasks with online assessment applications to identify students' performance and learning outcomes. Online learning outcomes assessment supports lecturers and students in regulating their teaching and learning strategies. "Online session administration" refers to the ability to organize online sessions and use components of a learning management system and online teaching platforms to enhance students' participation in online learning. Technology competence plays a crucial role in internet-based education.

This study not only proposes components of competencies but also expresses the items that match each component of competence. There were 37 items corresponding to six component of competencies in the proposed online teaching competence scale for lecturers in Vietnam with a 5-point Likert scale: 1 = very poor, 2 = poor, 3 = fair, 4 = good and 5 = very good. In the fourth part of this study, the validity and reliability of the proposed online teaching scale for lecturers are carefully evaluated by exploratory factor analysis (EFA) and Cronbach's alpha coefficient.

4. Online Teaching and Online Teaching Competence of Lecturers at Two Universities of Technology and Education in Vietnam

4.1. Participants and Data Collection

There were 311 lecturers teaching at two universities in Vietnam, namely Ho Chi Minh City University of Technology and Education (HMCUTE) and Hung Yen University of Technology and Education (UTEHY) in the school year 2022–2023 who participated in this survey. HCMUTE and UTEHY are assigned to be responsible for training vocational pedagogical competence and technical or technological competence for learners who want to become teachers at vocational education institutions in Vietnam. There were 133 female lecturers and 178 male lecturers participating in the survey (172 and 139 came from HCMUTE and UTEHY respectively).

A questionnaire was distributed to 350 lecturers, and 343 of them responded. After removing 32 invalid answer sheets, the valid sample was determined to be 311. IBM SPSS 22.0 software was employed to scrutinize the data. The demographic characteristics of 311 lecturers are listed in Table 1.

Table 1. Demographic characteristics of 311 lecturers.

Demographic characteristics	N	Percentage (%)
Gender	311	100
Female	133	42.8
Male	178	57.2
Higher education institutions and faculties	311	100
Ho Chi Minh city university of technology and education	172	55.3
Mechanical engineering	23	7.4
Vehicle and energy engineering	9	2.9
Chemical and food technology	14	4.5
Fashion and tourism	13	4.2
Information technology	14	4.5
High quality training	2	0.6
Electrical and electronics engineering	20	6.4
Graphic arts and media	1	0.3
Applied sciences	24	7.7
Economics	14	4.5
Political science and law	8	2.6
Foreign languages	8	2.6
Civil engineering	13	4.2
Technical education	8	2.6
International education	1	0.3
Hung Yen university of technology and education	139	44.7
Fashion	14	4.5
Mechanical engineering	25	8.0
Technical education	3	1.0
Information technology	17	5.5
Electrical and electronics engineering	43	13.8
Vehicle and energy engineering	17	5.5
Economics	20	6.4
Qualification	311	100
Bachelor	7	2.3
Master	199	64.0
Doctor	105	33.8
Online teaching time	311	100
One semester	31	10.0
Two semester	90	28.9
Three semester	97	31.2
Four semester	37	11.9
Four semester and more	56	18.0

The exploration of lecturers' online teaching competence at two public universities of technology and education in Vietnam refers to: (1) modes of online teaching that were applied before, during and after the COVID-19 pandemic period. (2) online teaching activities and products and (3) the online teaching competence of lecturers.

The questionnaire with a 6-point Likert scale was designed (0 = never use, 1 = rarely use, 2 = occasionally use, 3 = sometimes use, 4 = often use, 5 = usually use and 6 = always use) regarding the modes of online teaching used before, during and after the COVID-19 pandemic period. The value of 6 points is calculated according to the formula: value of points = (maximum value - minimum value)/number of levels = (6 - 1)/6 = 0.83. The convention of the 6-point Likert scale value in terms of using online teaching modes by lecturers is presented in Table 2.

Table 2. The convention of the 6-point Likert scale value in terms of using online teaching modes by lecturers.

Mean	1.00 - 1.83	1.84 - 2.67	2.68 - 3.51	3.52 - 4.35	4.36 - 5.19	5.20-6.0
6-point Likert scale	Never	Rarely	Occasionally	Sometimes	Often	Always

A questionnaire with a 5-point Likert scale in terms of the frequency of performing online teaching activities and products and the quality of the online teaching competence of lecturers was designed. The value of 5 points is calculated according to the formula: value of points = (maximum value - minimum value)/number of points = (5 - 1)/5 = 0.8. Table 3 presents the convention of the 5-point Likert scale value in terms of frequency and quality.

Table 3. The convention of the 5-point Likert scale in terms of frequency and quality.

Mean	1.00 - 1.80	1.81 - 2.60	2.61 - 3.40	3.41 - 4.20	4.21 - 5.00
5-point Likert scale in terms of frequency	Never	Rarely	Sometimes	Often	Always
5-point Likert scale in terms of quality	Very Poor	Poor	Fair	Good	Very good

This study examined the validity and reliability of the proposed online teaching competence scale using exploratory factor analysis (EFA) and Cronbach's alpha coefficient based on data from 311 lecturers at HCMUTE and UTEHY. The validity of six component competencies (factors) and 37 items was evaluated by exploratory factor analysis (EFA). The absolute value was determined to be 0.37 using the sample size of 311. 37 elements were collected under six categories in the initial factor analysis. The analysis was repeated by checking the items and

removing the ones that did not go under any factors or went under two factors. The items that needed to be removed sequentially as well as checking the significance value in the scale by controlling the communalities and factor load values each time. Five items from the "online instructional design" factor were not uploaded to any of the six factors in the online teaching competence scale for lecturers. So, the "online instructional design" factor and its five items were eliminated from the online teaching competence scale for lecturers. As a result, the online teaching competence scale was formed with a structure of 25 items under 5 factors including "understanding student learning", "online session administration", "digital content development and learning facilitation", " technology", "online learning outcomes assessment".

This study did not only use EFA to reduce the number of factors but it also employed Cronbach's alpha to evaluate the reliability of the factors. The total explained variance gathered under 5 factors is 59.457%, implying that these 5 factors explained 59.457% of the data variability. The eigenvalues of the factors were high (> 1), with the 5th factor (1.048). Thus, the convergence and discriminant validity of five components were proven to be valid. The Cronbach's alpha coefficient of all 5 factors was found to be .950. The reliability of the five component competencies ranged from 824 to 901. Each test coefficient including KMO (Kaiser-Meyer-Olkin), Bartlett's test of sphericity, factor loading, eigenvalues and total explained variance has a condition that must be met by the items chosen to represent the corresponding groupings of factors. The KMO coefficient was found to be 0.939 and the Bartlett's test of sphericity revealed a result of 4924.523 (Sig =0.000) indicating that the sample's adequacy was deemed statistically significant. The factor analysis results showed that the data used for factor analysis was totally adequate with KMO =0.939. The hypothesis that the correlation matrix between variables is a homogenous matrix was rejected. The variables were correlated with each other and satisfied the factor analysis conditions when the Bartlett's test of sphericity value was 4924.523 with Sig =0.000 < 0.05.

4.2. Findings and Discussion

4.2.1. Online Teaching Modes at Two Universities of Technology and Education

Online teaching modes are preferred to the methods, techniques or means through which students are taught online and immersed in interactional learning styles, including synchronous, asynchronous, hybrid and blended learning. So, online teaching can be executed in four main modes: synchronous online teaching, asynchronous online teaching, blended teaching and hybrid teaching.

Table 4. Means of online teaching modes used before, during and after - COVID-19 pandemic at HCMUTE and UTEHY.

Online teaching modes	University	N	Before COVID-19		During COVID-19		After COVID-19	
			Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
Synchronous online teaching	UTEHY	139	0.75	1.35	4.09	1.42	1.24	1.43
	HCMUTE	172	1.56	1.56	4.56	1.10	1.91	1.61
	Total	311	1.20	1.52	4.35	1.28	1.61	1.57
Asynchronous online teaching	UTEHY	139	0.85	1.27	2.68	1.83	1.24	1.47
	HCMUTE	172	1.88	1.74	3.30	1.94	2.06	1.72
	Total	311	1.42	1.63	3.02	1.92	1.70	1.67
Hybrid teaching	UTEHY	139	0.74	1.47	0.74	1.47	0.74	1.47
	HCMUTE	172	1.34	1.52	1.34	1.52	1.34	1.52
	Total	311	1.07	1.52	1.07	1.52	1.07	1.52
Blended teaching	UTEHY	139	0.78	1.27	2.91	1.84	1.43	1.42
	HCMUTE	172	1.72	1.59	3.56	1.80	2.05	1.67
	Total	311	1.30	1.53	3.27	1.84	1.77	1.59

Four online teaching modes were not implemented at two universities before the COVID-19 pandemic with the exception of "asynchronous online teaching" and "blended teaching" at HCMUTE (mean > 1.83). With the exception of "hybrid teaching", online teaching modes were carried out at two universities during the COVID-19 pandemic. Before the COVID-19 pandemic, there was a significant difference between "asynchronous online teaching" and "blended teaching" at HCMUTE and UTEHY with a Sig = 0.00 (see Table 5).

Asynchronous online teaching is used when the lecturers and students do not interact directly with the learning contents or with each other at the same time and place online in real time. The lecturer provides students with: (1) a series of lessons in the form of learning materials, including presentation slides, digitized textbooks or documents, pre-recorded or video lectures, questions or discussion situations, exercises, etc.; (2) study guides and (3) learning tasks and execution time. Students set their own learning schedule according to their own pace, ability, and timetable to study materials according to instructions and complete learning tasks within the allotted time. Students access video content, virtual libraries, posted PowerPoint and notes through a learning management system (LMS) or social media platforms. The lecturer answers questions and provides feedback to support and motivate students to complete learning tasks. Lecturers at UTEHY did not use asynchronous online teaching (mean = 0.85 < 1.00), lecturers at HCMUTE used this mode to execute learning activities for students before (mean = 1.88 > 1.83) and in the post COVID-19 pandemic (mean = 2.06).

Blended teaching is a combination of face-to-face training and asynchronous online training. Blended teaching is a form of hybrid teaching that occurs when the lecturer and students interact directly with the learning content at the same time in the real classroom in real time, combined with self-study of provided learning materials and study guides on online learning platforms such as learning management systems (LMSs) or Google Classroom (mainly before and after going to the face-to-face class) etc. In blended learning, instruction can take place in a face-to-face class, online or a combination of both. Therefore, learning activities in online learning platforms will be the basic, foundational component of face-to-face classes while learning activities in face-to-face classes (discussion, design, making protocols, etc.) are advanced, intensive learning components of online learning platforms. This online teaching mode was not executed at UTEHY (with a mean < 1.83) but it has been performed at HCMUTE (with a mean = 2.05) after the - COVID-19 pandemic.

Hybrid teaching was not carried out before, during and after the COVID-19 pandemic at HCMUTE and UTEHY as indicated in Table 5. Hybrid teaching is a combination of face-to-face teaching and synchronous online teaching. In hybrid teaching, students and lecturers interact directly with the learning contents and with each other at the same time and place (real and online). To safely adapt to the unpredictable changes of the COVID-19 pandemic, all higher education institutions were closed. So, this finding reflected precisely the status of teaching and learning during the COVID-19 pandemic in Vietnam.

If synchronous online teaching was performed at the sometimes level (mean = 4.35), asynchronous online teaching was done at the occasional level (mean = 3.02 > 2.68). Synchronous online teaching refers to a lecturer and students of the course interacting with the learning contents and with each other at the same time and place online in real time. In synchronous online teaching, the lecturer uses online teaching platforms (Google Meet, Zoom Cloud Meeting , Microsoft Team, Blackboard, myViewBoard, Google Hangouts, Skype, etc.) to stream lectures, slideshows, audio, video clips, discussion questions, learning situations, experiment simulations, etc. Depending on learning outcomes and content, the lectures analyze and explain content, organize for students to discuss and present learning results. During the COVID -19 pandemic in Vietnam, synchronous online teaching was mainly carried out in higher education institutions. The significant differences in implementing these modes at HCMUTE and UTEHY were pointed out through one-way analysis of variance with all Sig < 0.05 (see Table 5). Lecturers at HCMUTE implemented synchronous online teaching at the often level (mean = 4.56) and asynchronous online teaching at the occasional level (mean = 3.30). Lecturers at UTEHY executed these modes at the sometimes and occasional levels respectively.

Blended teaching was enforced occasionally at two universities during the pandemic with a mean = 3.27. The Sig = 0.002 showed the significant difference between implementing this mode at HCMUTE and UTEHY (see Table 5). Blended teaching was carried out at the sometimes level (mean = 3.56) at HCMUTE, the occasional level was the peak of implementing this online teaching mode at UTEHY (mean = 2.91) (see Table 4).

HCMUTE is one of the pioneering universities in Vietnam to integrate technology in teaching since 2015 through the construction of LMSs. 90% of lecturers used UTEx, FHQx and Google Classroom in 2020 (Diep, Nguyen, & Vo, 2021). Lecturers upload presentation files and learning materials on UTEx or FHQx. Students access UTEx and FHQx for self-studying before going to class. Therefore, teaching and learning activities were not interrupted during the COVID-19 pandemic at HCMUTE.

Table 5. One-way analysis of variance (ANOVA) of using online teaching modes at HCMUTE and UTEHY.

	Online teaching modes		Sum of squares	Df	Mean square	F	Sig.
Before the COVID-19 pandemic	Synchronous online teaching	Between groups	50.430	1	50.430	23.306	0.000
		Within groups	668.606	309	2.164		
		Total	719.035	310			
	Asynchronous online teaching	Between groups	82.318	1	82.318	34.397	0.000
		Within groups	739.502	309	2.393		
		Total	821.820	310			
	Hybrid teaching	Between groups	27.861	1	27.861	12.451	0.000
		Within groups	691.438	309	2.238		
		Total	719.299	310			
	Blended teaching	Between groups	68.499	1	68.499	32.330	0.000
		Within groups	654.691	309	2.119		
		Total	723.190	310			
During the COVID-19 pandemic	Synchronous online teaching	Between groups	17.537	1	17.537	11.121	0.001
		Within groups	487.261	309	1.577		
		Total	504.797	310			
	Asynchronous online teaching	Between groups	29.575	1	29.575	8.246	0.004
		Within groups	1108.310	309	3.587		
		Total	1137.884	310			
	Hybrid teaching	Between groups	27.861	1	27.861	12.451	0.000
		Within groups	691.438	309	2.238		
		Total	719.299	310			
	Blended teaching	Between groups	32.646	1	32.646	9.907	0.002
		Within groups	1018.203	309	3.295		
		Total	1050.849	310			
Post the COVID-19 pandemic	Synchronous online teaching	Between groups	35.066	1	35.066	14.948	0.000
		Within groups	724.857	309	2.346		
		Total	759.923	310			
	Asynchronous online teaching	Between groups	52.519	1	52.519	20.098	0.000
		Within groups	807.462	309	2.613		
		Total	859.981	310			
	Hybrid teaching	Between groups	27.861	1	27.861	12.451	0.000
		Within groups	691.438	309	2.238		
		Total	719.299	310			
	Blended teaching	Between groups	29.062	1	29.062	11.914	0.001
		Within groups	753.729	309	2.439		
		Total	782.791	310			

4.2.2. Online Teaching Activities and Products at Two Universities of Technology and Education

Lecturers have to design content, provide instructions and implement learning activities that are in line with the characteristics of teaching and learning in an online environment. Lecturers need to digitize learning materials in the form of multimedia presentations, audio lectures, instructional videos etc. These learning materials are online teaching products to support students' study online. On the other hand, lecturers have to execute various types of student-centered online teaching activities. In an online learning environment, students are provided with clear and consistent instructions and engage in conversations and interactions with each other through discussions or research. Moreover, ongoing feedback also plays a very important role in the regulation of students' learning.

Online teaching products were created at three levels, corresponding to always, often and sometimes (see Table 6). Lecturers always designed "multimedia presentations" with a mean = 4.49 and a low standard deviation of 0.62. There was no significant difference in creating these products between lecturers at HCMUTE and UTEHY (see Table 7).

There were three online teaching products at the often level with data spread out (SD >1). Compared with "instructional videos with academic contents" (mean = 3.77) and "instructional videos with academic contents and the lecturer" (mean = 3.74), "audio lectures" (mean = 4.04) were created more often. There were no significant differences in the implementation of these products between lecturers at HCMUTE and UTEHY.

Table 6. Products and activities of online teaching at HCMUTE and UTEHY.

Products and activities of online teaching		University	N	Mean	Std. deviation
Online teaching products	Multimedia presentations	UTEHY	139	4.43	0.58
		HCMUTE	172	4.54	0.64
		Total	311	4.49	0.62
	Audio lectures	UTEHY	139	4.04	1.06
		HCMUTE	172	4.04	1.12
		Total	311	4.04	1.09
	Instructional videos with academic contents	UTEHY	139	3.66	1.18
		HCMUTE	172	3.86	1.25
		Total	311	3.77	1.22
	Instructional videos with academic content and the lecturer	UTEHY	139	3.73	1.17
		HCMUTE	172	3.74	1.23
		Total	311	3.74	1.20
	Simulation software or virtual experiments	UTEHY	139	3.70	1.20
		HCMUTE	172	3.14	1.40
		Total	311	3.39	1.34
Online teaching activities	Provide clear and consistent instructions and navigation on LMS or online teaching platforms (Zoom, Google Meet, etc.).	UTEHY	139	4.40	0.69
		HCMUTE	172	4.37	0.75
		Total	311	4.38	0.72
	Connect with and engage students in online learning tasks.	UTEHY	139	4.35	0.59
		HCMUTE	172	4.17	0.76
		Total	311	4.25	0.69
	Organize discussions to increase interaction and deep comprehension among students.	UTEHY	139	3.64	1.06
		HCMUTE	172	3.65	1.10
		Total	311	3.64	1.08
	Provide students with ongoing feedback.	UTEHY	139	3.96	0.99
		HCMUTE	172	4.25	0.87
		Total	311	4.12	0.94
	Enable students to learn and research together.	UTEHY	139	3.37	1.32
		HCMUTE	172	3.09	1.46
		Total	311	3.22	1.41

Although "simulation software or virtual experiments" were only created at the sometimes level (mean = 3.39), the gap between the sometimes and the often was not too far apart. One-way analysis of variance (ANOVA) indicated that there was a difference in making this product between lecturers at HCMUTE and UTEHY. Lecturers at UTEHY often made "simulation software or virtual experiments" (mean = 3.70) while HCMUTE lecturers did it at the sometimes level (mean = 3.14). A lecturer at HCMUTE said, "to make these products requires time and technological skills. However, at the early stage of online teaching, almost all lecturers have to spend a lot of time recording lectures or making video lectures as well as learning to get used to online teaching. Therefore, not all lecturers have enough time and skills to make simulation software or virtual experiments".

Two activities were always performed such as providing clear and consistent instructions and navigation on LMS or online teaching platforms (Zoom, Google Meet, etc.) and connecting with and engaging students in online learning tasks regarding the implementation of online teaching activities. Organizing discussions to increase interaction and deep comprehension among students and providing them with ongoing feedback were frequently implemented. Lecturers not only perform but enable students to learn and research together at the sometimes level. UTEHY lecturers always connected with and engaged students in online learning tasks while HCMUTE lecturers only often did this activity. On the contrary, HCMUTE lecturers always provided students with ongoing feedback and UTEHY often performed this activity.

Findings in this study indicated that face-to-face teaching used to be the exclusive teaching mode in Vietnamese higher education institutions before the COVID-19 pandemic. Lecturers at HCMUTE and UTEHY executed online teaching activities and products to maintain students' learning. Lecturers organized active and experimental learning activities to enable students to study together by providing them with diversified teaching products on LMSs and online learning platforms.

Table 7. One-way analysis of variance (ANOVA) of online teaching products and activities at HCMUTE and UTEHY.

Online teaching products and activities		Sum of squares	Df	Mean square	F	Sig.
Simulation software or virtual experiments	Between groups	23.962	1	23.962	13.867	0.000
	Within groups	533.961	309	1.728		
	Total	557.923	310			
Connect with and engage students in online learning tasks.	Between groups	2.245	1	2.245	4.746	0.030
	Within groups	146.192	309	.473		
	Total	148.437	310			
Provide students with ongoing feedback.	Between groups	6.607	1	6.607	7.675	0.006
	Within groups	265.991	309	.861		
	Total	272.598	310			

4.2.3. Online Teaching Competence of Lecturers at Two Universities of Technology and Education

Overall, the online teaching competence of lecturers at two technology and education universities was evaluated at a good level with a mean = 4.06. With a standard deviation = 0.55, the data were close to the mean values. There was a significant difference in lecturers' component of competencies between the two universities. The mean value of lecturers' components of competencies at UTEHY was higher than at HCMUTE (see Table 8).

As shown in Table 8, components of the online teaching competence of lecturers were evaluated at a good level (mean = 3.75 - 4.12) with the exception of "technology" at a very good level (mean = 4.34 > 4.12).This finding is not difficult to explain because the 311 participants came from various technical majors. Most of them graduated from technical and engineering universities. So, they have basic knowledge and skills of MS Office, search engines, email and online teaching platforms (Google Meet, Zoom, Microsoft Team, etc.) and are capable of using these tools to interact with and engage students in online learning activities. There was no significant difference in technological competence among lecturers at the two universities.

Although the remaining components of competencies for online teaching competence were assessed at a good level, "understanding student learning" got the lowest mean value. It is not easy for lecturers to understand student learning by identifying their psychological traits, cognitive levels and learning preferences in an online learning environment. On the other hand, Vietnamese students often do not open the camera when studying online. This may be due to an unstable connection, an inconvenient study location or shyness. These are barriers to online study for students mentioned by Pham (2020) and Nguyen, Kieu, and Nguyen (2021) that affect student learning. "Online session administration" was the component of competence with the highest mean value at the good level. Lecturers at HCMUTE and UTEHY are good at organizing lessons according to a modular structure on LMS and online learning platforms using and managing components of LMS and online learning platforms in teaching and assessing learning outcomes, setting up time and organizing learning activities on LMS and online teaching platforms effectively.

The gap between the mean values of "digital content development and learning facilitation" (mean = 4.03) and "online learning outcomes assessment" (mean = 4.04) was narrow. These component competencies link closely together in every stage of the face-to-face and online teaching processes because content, facilitation and assessment are the crucial elements of teaching. It is possible to explore the fact that HCMUTE and UTEHY lecturers are good at developing digital contents, facilitating and assessing online teaching. This finding can be explained as follows: HCUMTE and UTEHY are not only in charge of training engineering students to become engineers but are also responsible for training engineering students to be vocational education teachers for vocational education institutions in Vietnam. Almost all lecturers are fully trained in pedagogical competence (knowledge and skills of teaching and assessing). As a result, lecturers may not have difficulty adapting to teaching and assessing learning outcomes in an online environment. There was a significant difference in "online learning outcome assessment" competence between lecturers at HCMUTE and UTEHY. This component of competence of UTEHY's lecturers reached a very good level compared with the good level of HCMUTE's lecturers. UTEHY's lecturers also achieved a higher mean value in relation to "digital content development and learning facilitation" than the mean value of HCMUTE's lecturers. Compared to UTEHY, HCMUTE has a long history of more than 60 years of training in vocational pedagogy in Vietnam. Before the COVID-19 pandemic, lecturers were constantly updated and trained on new teaching and assessment approaches. However, training activities in pedagogical competence especially online teaching competence for lecturers have been interrupted during the COVID-19 pandemic. This may affect the online teaching competence of lecturers at HCMUTE.

In addition, HCMUTE and UTEHY lecturers' online teaching competence is generally good. The training characteristics of two institutions help explain this finding: lecturers are trainers for training technical teachers and vocational education teachers in Vietnam. However, "understanding student learning" competence in online teaching is still a significant challenge for HCMUTE and UTEHY lecturers.

Table 8. Means and one-way analysis of variance (ANOVA) of online teaching competence of lecturers at HCMUTE and UTEHY.

Component competencies	University	N	Mean	Std. deviation		Sum of squares	Df	Mean square	F	Sig.
Technology	UTEHY	139	4.40	0.51	Between groups	0.83	1	0.83	2.68	0.102
	HCMUTE	172	4.29	0.59	Within groups	95.28	309	0.32		
	Total	311	4.34	0.56	Total	96.11	310			
Understanding student learning	UTEHY	139	4.01	0.67	Between groups	16.81	1	16.82	35.79	0.000
	HCMUTE	172	3.55	0.70	Within groups	145.14	309	0.47		
	Total	311	3.75	0.72	Total	161.95	310			
Digital content development and learning facilitation	UTEHY	139	4.18	0.61	Between groups	4.92	1	4.92	14.73	0.000
	HCMUTE	172	3.92	0.55	Within groups	103.25	309	0.33		
	Total	311	4.04	0.59	Total	108.17	310			
Online learning outcome assessment	UTEHY	139	4.26	0.63	Between groups	9.16	1	9.16	20.31	0.000
	HCMUTE	172	3.92	0.70	Within groups	139.26	309	0.45		
	Total	311	4.07	0.69	Total	148.42	310			
Online session administration	UTEHY	139	4.14	0.79	Between groups	0.15	1	0.15	0.27	0.603
	HCMUTE	172	4.10	0.73	Within groups	175.56	309	0.57		
	Total	311	4.12	0.75	Total	175.72	310			
Online teaching competence of lecturers	UTEHY	139	4.20	0.56	Between groups	4.71	1	4.71	16.40	0.000
	HCMUTE	172	3.95	0.52	Within groups	88.72	309	0.29		
	Total	311	4.06	0.55	Total	93.42	310			

5. Conclusion, Limitations and Recommendations

Based on data from 311 lecturers at HCMUTE and UTEHY, this study studied online teaching and lecturers' online teaching competence. Statistics show that with the exception of "technology", the other key component of lecturers' online teaching competence, including "understanding student learning", "digital content development and learning facilitation", "online learning outcomes assessment", and "online session administration" were identified as good. While "blended teaching" is still used at HCMUTE after the COVID-19 pandemic, other online teaching modes were not fully implemented at UTEHY and HCMUTE before and after the COVID-19 pandemic. With the exception of "hybrid teaching," other online teaching modes were carried out at HCMUTE and UTEHY during the COVID-19 pandemic, with "synchronous online teaching" getting the often level. Many online teaching activities and productions were deployed to help students maintain their learning activities throughout the unforgettable period in Vietnam caused by the COVID-19 pandemic.

HCMUTE is the pioneer university in technology-based teaching in Vietnam. The LMSs have been implemented since 2015 for blended teaching and learning. Lecturers and students have been trained in in-service training courses in LMS-based teaching and learning. Therefore, HCMUTE has never been interrupted in its teaching and learning activities during the COVID-19 pandemic. However, blended teaching was not identified as being implemented at HCMUTE before the COVID-19 pandemic and the online teaching competence of HCMUTE lecturers is generally lower than that of UTEHY (in terms of mean value). These findings should be investigated further in order to identify factors influencing the online teaching competence of HCMUTE lecturers.

The exploration of online teaching and the online teaching competencies of lecturers also provokes the necessity of constructing an online teaching competence training program for lecturers. The online teaching training program should be built on the components of competencies and items identified in the online teaching competence scale for lecturers in this study. This training program will support lecturers in developing the new pedagogical competence category to meet the requirements of flexible contexts in the future.

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