

Assessing Chinese anatomists' perceptions and attitudes toward blended learning through faculty development training programs

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Backgrounds: Due to the COVID-19 pandemic, the faculty development program has partially shifted to online formats over the past two years and has concentrated on professional training related to blended learning. The training outcomes directly relate to the trainees' perceptions and acceptability of blended learning. The views of teachers regarding the blended learning strategy were assessed to ascertain the efficacy of faculty training programs.

Methods: Anatomical teachers were chosen as an example since they constitute a sizable portion of medical science educators. Chinese anatomists were invited to participate in a survey on their attitude and readiness for blended learning.

Results: A total of 297 responses were received, covering all the provinces in mainland China. The survey results demonstrated that learning flexibility was ranked highest among all aspects of blended learning by Chinese anatomists. Meanwhile, the most crucial factor affecting the anatomists' perception was a connected learning community, which accounted for 14.77% of the total variance. Further analysis showed that the anatomists' attitudes toward blending learning differed significantly based on job titles, guidance from mentors, and support from in-service institutes. Lecturers were more involved in the connected learning community than teachers with other job titles. Generally, anatomists who received more institutional support showed superior learning management skills.

Conclusion: This survey revealed that Chinese anatomists regarded learning flexibility, a connected learning community, and learning management as valuable features of online/blended learning. Support from mentors/institutes would contribute to positive attitudes toward blended learning, thereby predicting better training outcomes. The observed characteristics of Chinese anatomists regarding blended learning will help make faculty training programs more successful by facilitating an understanding of teaching strategies in the future.

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45 *Keywords:* faculty development, blended learning, anatomy education.

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1. Introduction

Medical education has undergone a gradual transformation, evolving into a distinct and autonomous discipline. Previously, the prevailing assumption was that proficient healthcare professionals could effectively engage in teaching once they specialized in their respective fields and joined academic institutions. However, the implementation of faculty development programs has demonstrated significant potential in enhancing the pedagogical effectiveness of medical educators, thereby yielding improved learning outcomes for students. These comprehensive faculty development activities aim to equip participants with the requisite knowledge, skills, and competencies to excel as teachers, leaders, and researchers. Over the past decade, the critical importance of faculty development has garnered widespread recognition, prompting numerous medical schools and affiliated hospitals to establish sustainable training frameworks that facilitate the systematic design and implementation of tailored faculty development programs (Bligh, 2005; Hueppchen et al., 2011; McLean et al., 2008). Despite these efforts, faculty development remains a challenging endeavor that necessitates various forms of support, including visionary institutional leadership, adequate allocation of resources, and recognition for teaching efforts (McLean et al., 2008).

Faculty development is an effective method for augmenting the expertise of faculty members across various disciplines. Within authentic environments, faculty development encompasses cultivating innovative teaching approaches, improved course structures, strengthened teacher-student relationships, and the recognition and reward of exceptional

teaching performance (Trowbridge et al., 2011). In this particular context, the term “faculty development” primarily refers to the concept of “instructional development” (Camblin and Steger, 2000). The main objectives of faculty development in professional health education are to enhance faculty competency within their respective positions, such as patient care for clinicians, healthcare management for administrators, and teaching effectiveness for medical educators (Camblin and Steger, 2000; Steinert et al., 2003; Brinkley-Etzkorn, 2018). The effectiveness has been consistently reaffirmed through repeated investigations into educators’ perspectives on professional training (Avramidis and Norwich, 2002; van Aalderen - Smeets and Walma van der Molen, 2015). Consequently, faculty development has gradually been incorporated as part of the medical education framework. Almost all medical schools provide a diverse range of flexible faculty training programs, which aim to foster an environment that dramatically promotes faculty teaching excellence to the ultimate advantage of medical students (Burgess et al., 2019; Crown et al., 2011; Pan et al., 2020).

Unfortunately, the unexpected COVID-19 pandemic posed a challenge. The faculty development work arrangements were abruptly disturbed (Buckley, 2020; Eltayar et al., 2020; Kachra and Ma, 2020). During the past two years, university teaching staff around the world have attempted to adapt to the new situation: online-only education or blended online and offline learning implemented for a specific period to continue normal teaching activities as much as possible (Cheng et al., 2021). The demand for training on effectively delivering online or blended courses increased significantly. During the COVID-19 pandemic, the faculty

development program enhanced the abilities of university faculty to provide effective online teaching using various digital strategies (Swaminathan et al., 2021).

What is the most effective form of professional training for teachers in online/blended learning? Before addressing this issue, the acceptance of blended learning among teachers is well worth considering, as it directly influences the efficacy of the training. Despite the frequent use of the term “blended learning”, there remains ambiguity regarding its precise definition. There is a general consensus that blended learning is the combination of face-to-face and online instruction or learning (Hrastinski, 2019). Unfortunately, despite their inherent interconnectedness, blended learning researchers often overlook the teaching and learning aspects. In university education, educators should embrace the dual roles of teacher and learner, gaining comprehensive experience of both facets of blended learning. To illustrate, anatomists represent a significant population of medical educators and can serve as an exemplar. Anatomical educators constantly strive to improve their instructional methods. However, due to the reliance on hands-on experience and dissection in anatomy, online learning has raised concerns about learning outcomes, thereby impeding the progress of blended learning before the COVID-19 epidemic (Harmon et al., 2021). Additionally, Chinese anatomy education, like that in other countries, faces numerous challenges, including reduced course hours, a scarcity of donated bodies, and an increasingly imbalanced teacher-student ratio (Pan et al., 2020). To address these issues effectively, blended learning or online courses present viable solutions as they offer unrestricted access to learning materials

In the current educational landscape, a pivotal aspect to consider is the effective practical professional training of faculty members to facilitate the transition from traditional education to blended learning. Based on the intrinsic interconnectedness between cognition and behaviors, the effectiveness of teacher training is contingent upon the perceptions of academic staff regarding blended learning. This study focused on Chinese anatomy educators as the target group and aimed to examine their perspectives on blended learning, while also investigating potential variations in these perspectives based on factors such as gender, age, years of teaching experience, and institutional support. By conducting a comprehensive analysis of responses obtained from a survey administered to anatomical educators, this study contributes to the broader discourse on enhancing the efficacy of blended anatomy education delivery.

2. Materials and methods

2.1. Survey participants and context

The survey instrument was designed to collect information on the attitudes of Chinese anatomy educators toward blended learning. The survey included the following aspects: the demographic data of the respondents, their experience as anatomical educators, their professional training as both teachers and researchers, and their readiness toward blended learning. These questions were derived from the previous literature and slightly modified (Tang and Chaw, 2013). A Likert scale was used with a 1-6 rating scale, ranging from “1=strongly disagree” to “6=strongly agree”. The questionnaire contained 59 questions and required 8 to 10 minutes to complete. The survey instrument items were developed in Chinese (see Appendix 1 for the

English translation). The survey was piloted with seven faculty members from the institution of the first author to ensure its clarity and then revised based on the feedback.

A convenience sampling was made of the anatomy departments in mainland China: the majority of the directors of the anatomy departments in mainland China's medical schools were in a messaging group ($n=500$) in the WeChat application (Tencent Holdings Ltd., Shenzhen, China), a popular social media mobile application (Gan and Wang, 2015). Invitations to participate in the survey were delivered via a group-level link. The questionnaire was implemented on the SoJump (Ranxing, Changsha, China) online platform. Participation in the survey was voluntary. The survey was conducted in October 2021. During the four days of the 36th Annual Academic Conference of the Chinese Society for Anatomy Sciences (CSAS) — the national anatomists' organization, the link to the questionnaire remained active. The study was conducted with approval from the Research Ethics Committee of Jinan University (No. JNUKY-2021-038). A consent form and the questionnaire invitation link were sent to the participants simultaneously. The recipients would be defaulted as giving consent to the study and answering the survey.

2.2. Data analysis

All the statistical analyses were performed using the SPSS statistical package version 26.0 (IBM Corp., Armonk, NY). The data obtained from the questionnaires were analyzed using Cronbach's α test to determine the internal consistency of the responses. Exploratory factor analyses were employed to identify the factors that reflected the respondents' attitudes toward blended learning. Nonparametric tests (Kruskal-Wallis tests) were used to assess the associations between the items in the blended learning readiness questionnaires and the medical educators'

demographic characteristics and teaching/training experience of the medical educators. The results of the statistical analyses are presented as the means \pm SD or medians and are considered statistically significant when $P < 0.05$.

3. Results

3.1. Survey data of the anatomists' acceptance of blended learning is representative

In this survey, 297 anatomists participated and completed the online questionnaire. These respondents were geographically distributed across all provinces in mainland China, making their responses representative of Chinese anatomy educators. The respondents' demographic information was summarized in Table 1, which served as control variables in this study. The anatomists who took part in the survey exhibited the following characteristics: the number of male anatomists (n=167/56.2%) slightly exceeded the number of female anatomists (n=130/43.8%); a majority of the anatomists (n=131/44.1%) were within the age range of 41 and 50; and the majority had extensive teaching experience, with an average anatomy teaching experience of 17.72 ± 9.62 years. Nearly 80% of the respondents reported having received formal training in teaching, and at the start of their careers, they received guidance from senior mentors. Next, the anatomy teachers were asked to provide their responses to questions about their attitudes toward blended learning, based on their perceptions and perspectives as learners. The Cronbach's α of the 34 items modified from Tang et al. (Tang and Chaw, 2013) was 0.93, showing a high reliability of the survey instrument.

3.2. Anatomists' priorities for blended learning: flexibility, community, and management

First, the responses of the anatomists about their attitudes toward blended learning showed that they highly valued learning flexibility, as indicated by the highest scores were assigned to Item 1: “unlimited access to lecture materials”, along with Items 2 and 4: “can choose where and when to study”, and Item 3: “study at one’s own pace” (Table 2). The second highest scores were observed for items related to connected learning with a community-centered learning environment, such as Item 26: “study better via classroom activities”, Item 27: “study better when being guided personally”, Item 24: “prefer to receive feedback quickly in classroom lectures”, Item 25: “study more effectively when collaborating with others in the classroom”. Meanwhile, the respondents did not resist online learning (Item 7). They exhibited favorable views toward related technologies: “I believe the Web is a useful platform for learning” (Item 19), and “I think we should use technologies in learning” (Item 22). The majority of the responses were left-skewed (skewness < 0), indicating that the surveyed educators were generally favorable toward the statements in the questionnaire (Table 2).

Next, a total of six factors pertaining to the anatomists’ attitudes toward blended learning were identified by the principal factor analysis: connected learning (14.77%), learning control (13.50%), learning flexibility (12.23%), online interaction (11.76%), mastery of related technology (9.65%) and negative attitude toward online learning (7.31%, Table 3). These factors reflected the most differential characteristics of the surveyed respondents. It is worth noting that certain questionnaire responses showed relatively negative attitudes toward online learning and were ranked as having the lowest reliability among the principal factors. Although all six factors collectively accounted for 69.2% of the variance, they comprise an effective index for evaluating noticeable differences among the perceptions of the surveyed anatomists.

A descriptive analysis was further performed based on the identified factors derived from the data (Table 4). The results align with the statistical characteristics of the factors, such as learning flexibility ($n=6$, 5.05 ± 0.90), connected learning ($n=7$, 4.46 ± 0.63), mastery of online learning technology ($n=3$, 4.39 ± 0.99), and learning management ($n=6$, 4.32 ± 1.00). These factors are ranked in descending order based on their scores.

3.3. Anatomists' blended learning preferences were mainly associated with the support received from their institutes and job titles

A nonparametric analysis was performed to explore the demographic characteristics and working experience that could influence the anatomists' perceptions of blended learning. The results demonstrated that ages, gender, and working years had minimal influence on the anatomists' attitudes. However, significant associations were found between their job titles, the support received from mentors and institutions, and their attitudes toward blended learning. In particular, the responses showed statistically significant differences when grouped by the different levels of support (Table 5).

Given the importance of institutional support to the anatomists, its underlying mechanism was investigated. Firstly, the support levels were re-coded as low (Likert scales=1 and 2), medium (Likert scales=3 and 4), and high (Likert scales=5 and 6). The results of Kruskal–Wallis tests indicated that the anatomists' attitudes significantly differed across the various support levels. The following aspects were positively related to a high level of support from their in-service institutes: a stronger preference for online learning (Table 5), better learning control (Items 16-18), and proficiency in internet technology (Items 19-21). Moreover, when anatomists preferred interacting with others, they were more likely to receive support from their institutions,

thereby constructing an appropriate learning community environment (Items 23, 26, and 29). Lecturers were particularly active in the connected learning community when anatomists were divided by their job titles. They preferred to engaging with mentors, colleagues, and students both online and in person, demonstrating strong communicative abilities and easy connections with mentors. Anatomists who received guidance from mentors tended to exhibit greater awareness of learning control. Lastly, the correlation between the factors derived from anatomists' attitudes and their job titles, mentor guidance, and received support were analyzed (Table 6). The statistically significant differences were more pronounced when considering different levels of support. Aspects significantly related to a high level of support included increased learning flexibility, improved learning control, and mastery of online learning technology (Table 6). Notably, the negative attitude toward online learning remained relatively consistent across different job titles, mentor guidance, and institutional support.

4. Discussion

The COVID-19 pandemic has exacerbated the ongoing challenges in education, including faculty development (Ahmed et al., 2020; Gallagher and Schleyer, 2020; Rose, 2020). The abrupt shifts and sudden changes in teaching and assessment modalities have underscored the critical and immediate need for medical educators to enhance their pedagogical skills in online/blended learning, often exceeding their preparedness. This is a time calling for introspection, collaborative learning, and continuous adaption to the evolving landscape. In this regard, faculty development is pivotal in assisting educators in navigating uncertainty and embracing change, facilitating the adaptation of educational curricula to online platforms, and promoting more efficient education of future health professionals (Steinert et al., 2021).

The need for professional training in online/blended learning is increasingly urgent for anatomists working in innovative teaching environments. A parallel study has revealed a shift from predominantly face-to-face teaching to a blended learning format has occurred in anatomy education across China since the onset of the COVID-19 pandemic. Blended learning has emerged as a viable solution for educational institutes confronted with sudden changes and seeking sustainable development in the future. Moreover, almost all medical schools in mainland China have prioritized faculty professional training on online/blended learning (submitted manuscript). Evaluating faculty training and development effectiveness can be achieved by soliciting feedback from faculty members, as their self-perceived usefulness encourages active engagement in subsequent educational practices. Furthermore, learning is contextually dependent and necessitates appropriate opportunities for the application of acquired knowledge. Participants can gain relevant practice in authentic environments immediately after training. Therefore, the effectiveness of training is primarily associated with the anatomists' perceptions of and perspectives on online/blended learning training.

Chinese anatomists highly valued learning flexibility as the most critical factor (Tables 2 and 4). The superiority of an online/blended learning framework lies in its ability to provide learners with unlimited access to learning material and facilitate global communication between instructors and learners through web technology (Naidu, 2019). This feature provides learners exceptional convenience and the freedom to study without limitation. As educators, the Chinese anatomists viewed online learning not merely as a supplement to traditional teaching but as a valuable aspect in its own right. This finding greatly strengthens our confidence in developing a more open and flexible online/blended learning environment for future teaching (Oliver, 1999). However, despite learning flexibility being highly valued, the most important factor identified by

the anatomists was connected learning (Table 3). This result implies that they are enthusiastic about fostering an atmosphere of community-based learning. Such an environment involves purposeful connection between instructors and learners in the classroom or a virtual learning setting (instructional link), learners' active participation in panel discussions or studying as team members under instructors' guidance (community integration), and learners' actively engaging in research projects in collaboration with scientists (community participation) (Zhu and Baylen, 2005). This preference for community-based learning stems from its effectiveness in promoting outcome-based education, encouraging peer-to-peer learner interactions, and providing firsthand experiences through pedagogically oriented activities (Chang, 2012).

The anatomists in this study also valued the importance of learning management in the context of online/blended learning. Learning management refers to possessing good self-control abilities, and are vital for achieving better outcomes in blended learning. This result reminds the faculty members to design pedagogical approaches that foster internal motivation and lead to improved learning outcomes for learners (Weaver et al., 2008). The results also suggested that anatomists who effectively manage their online technology and hold positive perceptions toward online/blended learning are likely to play a more active and positive role in delivering online/blended learning (Table 4). This finding aligns with a previous report that highlighted the positive impact of formally structured faculty training activities, which resulted in high participant satisfaction positive changes in attitudes toward teaching, increased knowledge and skills, and observable differences in teaching behaviors (Steinert et al., 2016). These results evaluated the training programs using the Kirkpatrick levels of educational outcomes, emphasizing the importance of strengthening healthcare professional training to enhance teaching effectiveness and positively impact students (Pirayani et al., 2018; Steinert et al., 2006).

Further exploration is needed to understand the main driving forces that influence the perspectives of Chinese anatomists toward blended learning. This understanding holds significance for the development of administrative policies and anatomist-specific training for faculty development at medical schools. The primary factor influencing anatomists' perspectives toward online/blended learning was the support they received from mentors and in-service medical schools, and their job titles (Table 5). We delved deeper into the reasons underlying this support as the predominant factor and found that the anatomists' self-management abilities and features played an important role. In other words, as Chinese anatomists became more adept at blended learning, they were better able to access various forms of support, leading to improved learning outcomes. Another valuable source of support was recognition of the learning community, where anatomists with an interest in education or team study came together (DuFour, 2004; Shea, 2006). These findings indicated that our medical schools and administration should strengthen various forms of support to ensure faculty members' dedication and commitment to education. In addition to support from institutions, this study highlights the value of mentorship from supportive co-teachers in facilitating faculty development (Jackevicius et al., 2014; Vitale, 2010). Teaching skills were largely socially constructed through observation, co-teaching experience, and feedback from senior teachers, contributing to reflective observation. However, this process is not easily attained through online learning, which explains why anatomy teachers emphasized the significance of connected learning. The results suggest that establishing an authentic or virtual connected learning community would be a sustainable approach for faculty training programs, maximizing faculty development's efficacy.

What cannot be dismissed is the presence of negative attitudes toward online learning, which ranked sixth among the factors related to blended learning. These comments suggest that face-to-

face education is irreplaceable in medical education, especially for anatomy education, which benefits from hands-on laboratory modalities, delivery formats, and assessments. These provide valuable references for determining the most effective anatomical practice for continuous development. There is no doubt that face-to-face classes have a predominantly stable teaching format.

Limitations

There are several limitations to consider regarding the survey and its results. Firstly, the survey results may not be generalizable to all anatomists in China due to potential selection bias. Secondly, the survey was designed using a cross-sectional method. We previously performed a study among Chinese anatomy educators about online teaching in April 2020 (Cheng et al., 2021). Although the teaching staff's perception of blended learning might have changed in the two years following the COVID-19 pandemic, it is challenging to assess anatomists' attitudes toward online/blended learning longitudinally, because these two surveys did not exactly use similar questions. Thirdly, the survey data were analyzed quantitatively. Thus, an analytical interpretation of qualitative data, such as focus groups, is missing from this study. Qualitative analysis could have provided a deeper understanding of the experiences of anatomy teachers regarding the “support” received at universities in China. Lastly, the survey did not delve into the specific blended learning models implemented by anatomists, such as the materials and platforms they used or the amount of time dedicated to blended teaching activities. These details could have provided valuable insights into the practical aspects of blended learning in anatomy education.

4. Conclusion

Over the last two years, the COVID-19 pandemic has greatly impacted and altered faculty development, especially in training programs related to online/blended learning. Findings from this survey conducted among anatomists across mainland China shed light on the perspectives of Chinese anatomists regarding online/blended learning. The results indicated that anatomists perceive learning flexibility, a connected learning community, and effective learning management as valuable features of online/blended learning. Notably, support from mentors and institutes emerges as a significant factor contributing to positive attitudes toward online/blended learning, which predicts better training outcomes. The specific types of support required may vary based on the anatomists' proficiency in learning management ability and the particular features of the learning environment.

Financial Disclosure Statements

None of the authors has any potential conflict of interest.

Ethical statement

The study was conducted with ethics approval from the Research Ethics Committee of Jinan University (No. JNUKY-2021-038).

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Table 1(on next page)

Table 1 Control variables used in this study

Table 1. Control variables used in this study

Variables	Values <i>n</i> (%)
Gender	
<i>Male</i>	167 (56.2%)
<i>Female</i>	130 (43.8%)
Age	
<i>21-30</i>	13 (4.4%)
<i>31-40</i>	81 (27.3%)
<i>41-50</i>	131 (44.1%)
<i>51-60</i>	66 (22.2%)
<i>>60</i>	6 (2.0%)
Teaching years	
<i><10</i>	72 (24.2%)
<i>11-20</i>	113 (38.1%)
<i>21-30</i>	73 (24.6%)
<i>>30</i>	39 (13.1%)
Job titles	
<i>Assistant professor</i>	18 (6.1%)
<i>Lecturer</i>	84 (28.3%)
<i>Associate professor</i>	97 (32.6%)
<i>Professor</i>	98 (33.0%)
Professional training on education	
<i>Formal</i>	237 (79.8%)
<i>Informal</i>	56 (18.9%)
<i>Not confirmed</i>	4 (1.3%)
Support from mentor	
<i>Yes</i>	230 (56.2%)
<i>No</i>	67 (56.2%)
Support from in-service institutes	
<i>Low</i>	34 (11.4%)
<i>Medium</i>	125 (42.1%)
<i>High</i>	138 (46.5%)

Notes: *n*, number. *n* = 297/100%.

Table 2(on next page)

Table_2-clean

1 **Table 2.** Descriptive characteristics of the anatomists' attitudes towards blended learning

Questions	Median	SD	Quartiles			Skewness
			Q ¹	Q ²	Q ³	
1. I would like unlimited access to lecture materials.	6	1.07	5	6	6	-1.52
2. I would like to decide where I want to study.	6	1.07	5	6	6	-1.38
3. I like to study at my own pace.	6	1.14	4	6	6	-1.26
4. I would like to decide when I want to study.	5	1.08	4	5	6	-1.27
5. I believe face-to-face learning is more effective than online learning.	5	1.09	4	5	6	-1.13
6. I am comfortable with self-directed learning.	5	1.14	4	5	6	-0.85
7. I do not resist having my lessons online.	5	1.14	4	5	6	-0.97
8. I like online learning as it provides richer instructional content.	5	1.25	4	5	6	-0.78
15. I can study over and over again online.	5	1.21	4	5	6	-0.98
19. I believe the Web is a useful platform for learning.	5	1.16	4	5	6	-0.77
22. I think we should use technologies in learning.	5	1.10	4	5	6	-0.67
23. I have a sense of community when I meet other students in the classroom.	5	1.10	4	5	6	-0.68
24. I like the fast feedback when I meet my lecturer in person.	5	1.01	4	5	6	-0.99
25. I find learning through collaboration with others face-to-face is more effective.	5	0.94	4	5	6	-0.94
26. I learn better through lecturer-directed classroom-based activities.	5	0.94	4	5	6	-1.01
27. I learn better when someone guides me personally.	5	1.04	4	5	6	-1.09
29. I am comfortable in using Web technologies to exchange knowledge with others.	5	1.14	4	5	6	-0.43
30. I would like to interact with my lecturer online.	5	1.21	4	5	6	-0.47
31. I would like to interact with other students outside of the classroom.	5	1.11	4	5	5	-0.56
9. I would like lecture time in the classroom to be reduced.	4	1.46	3	4	5	-0.26
11. I get bored when studying online.	4	1.40	2	4	4	-0.08
13. I am more likely to miss assignment due dates in an online learning environment.	4	1.45	3	4	4.5	-0.11
14. I organize my time better when studying online.	4	1.27	3	4	5	-0.19
16. Online learning motivates me to prepare well for my studies.	4	1.20	3	4	5	-0.27
17. Online learning encourages me to make plans.	4	1.21	3	4	5	-0.26

18. Online learning makes me more responsible for my studies.	4	1.22	3	4	5	-0.19
20. I am familiar with Web technologies.	4	1.17	3	4	5	-0.21
21. I find Web technologies easy to use.	4	1.14	4	4	5	-0.35
28. I feel isolated in an online learning environment.	4	1.45	3	4	5	-0.22
32. I find it easy to communicate with others online.	4	1.14	4	4	5	-0.21
33. I appreciate easy online access to my lecturer.	4	1.20	4	4	5	-0.42
34. I can collaborate well with a virtual team in doing assignments.	4	1.29	3	4	5	-0.34
10. I would like to have my classes online rather than in the classroom.	3	1.48	2	3	4	0.26
12. I find it very difficult to study online.	3	1.41	2	3	4	0.31

Notes: The survey data is gained from total 297 anatomists ($n = 297$). Q¹: quartile at the 25th; Q²: quartile at the 50th; Q³: quartile at the 75th. Likert scales are 1-6 for the questionnaire items.

Table 3(on next page)

Table 3 Summary of principal factor analysis of the questionnaire answered by the anatomists about their attitudes towards blended learning

1 **Table 3.** Summary of principal factor analysis of the questionnaire answered by the anatomists about their attitudes towards blended learning

Questions	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
24. I like the fast feedback when I meet my lecturer in person.	0.85					
26. I learn better through lecturer-directed classroom-based activities.	0.83					
25. I find learning through collaboration with others face-to-face is more effective.	0.82					
27. I learn better when someone guides me personally.	0.81					
5. I believe face-to-face learning is more effective than online learning.	0.57					
23. I have a sense of community when I meet other students in the classroom.	0.54					
31. I would like to interact with other students outside of the classroom.	0.46					
17. Online learning encourages me to make plans.		0.85				
16. Online learning motivates me to prepare well for my studies.		0.84				
18. Online learning makes me more responsible for my studies.		0.81				
14. I organize my time better when studying online.		0.64				
15. I can study over and over again online.		0.61				
19. I believe the Web is a useful platform for learning.		0.48				
3. I like to study at my own pace.			0.85			
4. I would like to decide when I want to study.			0.85			
2. I would like to decide where I want to study.			0.83			
1. I would like unlimited access to lecture materials.			0.64			
6. I am comfortable with self-directed learning.			0.56			
7. I do not resist having my lessons online.			0.47			
9. I would like lecture time in the classroom to be reduced.				0.68		
33. I appreciate easy online access to my lecturer.				0.64		
30. I would like to interact with my lecturer online.				0.61		
34. I can collaborate well with a virtual team in doing assignments.				0.61		
32. I find it easy to communicate with others online.				0.61		
10. I would like to have my classes online rather than in the classroom.				0.583		
29. I am comfortable in using Web technologies to exchange knowledge with				0.57		

others.

8. I like online learning as it provides richer instructional content.	0.44					
20. I am familiar with Web technologies.					0.81	
21. I find Web technologies easy to use.					0.79	
22. I think we should use technologies in learning.					0.50	
12. I find it very difficult to study online.						0.87
11. I get bored when studying online.						0.76
13. I am more likely to miss assignment due dates in an online learning environment.						0.76
28. I feel isolated in an online learning environment.						0.50
Reliability	0.72	0.91	0.90	0.88	0.84	0.75
% of Variance	14.77	13.50	12.23	11.76	9.65	7.31
Key Factors						Negative attitude towards online learning
	Connected learning	Learning control	Learning flexibility	Online interaction	Mastery of related technology	

- 2 Notes: Extraction methods: Principal Component Analysis. Rotation methods: Varimax Kaiser normalization (KMO = 0.92). Rotation converged in 31 iterations.
- 3 $n = 297$. The number of factors were determined by the eigenvalues extracted greater than 1. Reliability is the Cronbach α of each factor, “% of the variance” is
- 4 the percentage of the variance that the factor can explain of the data set.

Table 4(on next page)

Table_4-clean

Table 4. Descriptive data of the identified factors

Factors	<i>n</i>	Average sum value	Mean	SD	Median	Skewness
1. Connected learning	7	31.21	4.46	0.63	5	-0.93
2. Learning control	6	25.92	4.32	1.00	4	-0.47
3. Learning flexibility	6	33.53	5.05	0.90	5	-1.28
4. Online interaction	8	33.53	4.19	0.94	4	-0.28
5. Mastery of the online learning related technology	3	13.17	4.39	0.99	4	-0.32
6. Negative attitude towards online learning	4	14.41	3.60	1.08	4	-0.07

Notes: *n*, numbers of the related items of the survey. Average sum value, average sum value of the factor. Mean, mean of the total items of the factor. Median, the middle value of the answers to total items of the factor. Likert scales are 1-6 for the questionnaire items.

Table 5(on next page)

Table_5-clean

Table 5. Descriptive statistics and correlative analysis of the anatomists' attitudes toward blended learning significantly related to job titles, guidance from mentors and the different levels of support from the institutes

Questions	Job titles				Guidance from mentors						Supports from institutes				
	Assistant professor <i>n</i> = 18	Lecturer <i>n</i> = 84	Associate professor <i>n</i> = 97	Professor <i>n</i> = 98	<i>H</i>	<i>P</i>	Yes <i>n</i> = 230	No <i>n</i> = 67	<i>H</i>	<i>P</i>	Low <i>n</i> = 34	Medium <i>n</i> = 125	High <i>n</i> = 138	<i>H</i>	<i>P</i>
					<i>df</i> =3				<i>df</i> =1					<i>df</i> =2	
6.I am comfortable with self-directed learning.	4	5	5	5	1.04	0.79	5	5	1.34	0.25	4.5	5	5	10.72	0.01
7.I do not resist having my lessons online.	5.5	5	5	5	2.03	0.57	5	5	2.34	0.13	4.5	5	5	13.52	<0.0
8.I like online learning as it provides richer instructional content.	4.5	5	5	5	2.45	0.48	5	4	2.72	0.10	4	4	5	11.27	<0.0
16.Online learning motivates me to prepare well for my studies.	4	5	4	4	5.14	0.16	4	4	3.98	0.05	4	4	4	7.50	0.02
17.Online learning encourages me to	4	4	4	4	2.13	0.55	4	4	5.47	0.02	4	4	4	6.06	0.05

make plans.															
18. Online learning makes me more responsible for my studies.	4	4	4	4	0.33	0.96	4	4	3.14	0.08	4	4	4	6.95	0.03
19. I believe the Web is a useful platform for learning.	5	5	5	5	0.64	0.89	5	5	1.91	0.17	5	5	5	7.72	0.02
20. I am familiar with Web technologies.	4	4	4	4	6.54	0.09	4	4	0.78	0.38	4	4	4	10.03	0.01
21. I find Web technologies easy to use.	4	4	4	4	4.69	0.20	4	4	1.56	0.21	4	4	4	6.86	0.03
23. I have a sense of community when I meet other students in the classroom.	4.5	5	5	5	1.83	0.61	5	5	3.36	0.07	4	5	5	6.74	0.03
26. I learn better through lecture-directed classroom-based activities.	5	5	5	5	1.63	0.65	5	5	0.01	0.93	5	5	5	6.54	0.04
29. I am comfortable in using Web technologies to	4	5	5	5	1.54	0.67	5	4	1.39	0.24	5	4	5	10.63	0.01

exchange

knowledge with

others.

30. I would like to interact with my lecturer online.	4	5	5	4	12.1 5	0.01	5	4	1.44	0.23	5	4	5	4.60	0.10
31. I would like to interact with other students outside of the classroom.	4	5	5	4	9.56	0.02	5	5	0.07	0.79	5	4	5	2.82	0.24
32. I find it easy to communicate with others online.	4	5	4	4	9.62	0.02	4	4	1.79	0.18	4	4	4	5.75	0.06
33. I appreciate easy online access to my lecturer.	4	5	4	4	15.8 9	0.01	4	4	4.70	0.03	4	4	4.5	2.30	0.32

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5 Note: The data reported are the medians of the item in each group, using nonparametric method (H : H values of Kruskal-Wallis H tests). The red colored values

6 show the statistical significant difference.

Table 6(on next page)

Table_6-clean

1 **Table 6.** Descriptive statistics of the factors related to job titles, guidance from mentors and the different levels of support received

Questions	Job titles				Guidance from mentors				Supports from institutes						
	Assistant professor <i>n</i> = 18	Lecturer <i>n</i> = 84	Associate professor <i>n</i> = 97	Professor <i>n</i> = 98	<i>H</i>	<i>P</i>	Yes <i>n</i> = 230	No <i>n</i> = 67	<i>H</i>	<i>P</i>	Low <i>n</i> = 34	Medium <i>n</i> = 125	High <i>n</i> = 138	<i>H</i>	<i>P</i>
					<i>df</i> =3				<i>df</i> =1					<i>df</i> =2	
1. Connected learning	4	5	5	5	5.01	0.17	5	5	0.54	0.46	5	5	5	3.35	0.19
2. Learning control	4	5	4	4	2.12	0.55	4	4	2.57	0.11	4	4	5	7.12	0.03
3. Learning flexibility	5	6	5	5	1.33	0.72	5	5	0.00	0.98	5	5	6	10.27	0.01
4. Online interaction	4	4	4	4	8.10	0.04	4	4	5.19	0.02	4	4	4	5.56	0.06
5. Mastery of the online learning-related technology	4	5	4	4	6.44	0.09	4	4	0.81	0.37	4	4	5	9.51	0.01
6. Negative attitude toward online learning	3	3	4	4	3.00	0.39	4	3.5	0.00	0.95	4	3	4	0.56	0.76

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4 Note: The data reported are medians of the item in each group, using nonparametric method (Kruskal-Wallis H tests). The red colored values show the

5 statistically significant difference.

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