Table 1 Factor analysis of the questionnaire used in this study

The KMO and Bartlett's test in the section	Variable (number of items)	Item	Factor				
			1	2	3	4	5
The role of instructors (KMO = 0.92, Bartlett test of sphericity: $\chi2(105) = 1715.70$, $p < 0.00$, total variance explained = 67.19%)	Instructor support (4)	The course goals/objectives were clearly outlined	.70				
		I knew what I was expected to accomplish each week	.79				
		The instructors provided clear instructions for assignments and quizzes	.78				
		The courses provided relevant resources	.58				
	Instructor-student interaction (7)	The feedback on the assignments was helpful		.59			
		I felt that I could ask any questions regarding the course materials to the instructors		.67			
		The instructors encouraged me to become actively involved in the course discussions		.61			
		The instructors provided me feedback on my work through comments		.72			
		I was able to interact with the instructors during the course discussions		.73			
		The instructors treated me individually		.70			
		The instructors informed me about my progress periodically		.68			
	Instructor innovation （4）	The instructors adopted different teaching methods from those in face-to-face courses			.77		
		The instructors designed new online learning activities to get us involved			.84		
		The instructors used various and innovative teaching methods in the online courses			.87		
		The instructors assigned different learning tasks in online courses			.82		
Student Approaches to Using Online Learning Technologies (KMO = 0.89, Bartlett test of sphericity: $\chi2(45) = 1626.58$, $p < 0.001$, total variance explained = 76.35%)	Deep approach to online learning technology support (6)	I find I use the online learning technologies in this course to further my research into a topic.				.88	
		I spend time using the online learning technologies in this course to develop my knowledge on key topics.				.91	
		I try to use the online learning technologies in this course to achieve a more complete understanding of key concepts.				.90	
		I find interacting with online learning technologies in this course promotes deeper understanding of key ideas.				.93	
		I try to use the online learning technologies in this course to communicate with other participants to test my ideas.				.84	
		I find using the online learning technologies in this course help me to develop my critical thinking.				.86	
	Surface approach to online learning technology (4)	I restrict my use of online learning technologies in this course to do as little as possible.					.79
		I do not use the online learning technologies in this course to enable me to achieve my goals.					.86
		I only use the online learning technologies in this course to fulfil course requirements.					.82
		I do not find using online technologies in this course helps me to understand things more deeply.					.65

Table 2. Descriptive statistics and reliabilities of the variables (N = 192).

	Instructor support	Instructor-student interaction	Instructor innovation	Deep approach	Surface approach
M	3.81	3.94*	3.75	3.51	2.60*
SD	0.72	0.57	0.76	0.97	0.85
Cronbach's α	0.80	0.88	0.90	0.96	0.82

Note. Measured on a scale from 1 (disagree) to 5 (agree), * P < 0.05.

Table 3-1. Bonferroni post hoc test: The difference among the three dimensions of instructor role

(I) Instructor role	(J) Instructor role	Mean Difference (I-J)	95% Confidence for Interval Difference		Sig.
			Lower Bound	Upper Bound	
Instructor support	**Instructor innovation**	0.07	-0.07	0.20	0.72
Instructor-student interaction	**Instructor innovation**	0.19*	0.09	0.30	< 0.001
Instructor support	**Instructor-student interaction**	-0.13*	-0.22	-0.03	0.004

Table 3-2. Paired samples test: The difference between two types of learning approach

(I) Learning approach	(J) Learning approach	Mean Difference (I-J)	95% Confidence for Interval Difference		Sig.
			Lower Bound	Upper Bound	
Deep approaches to use online learning technologies	**Surface approaches to use online learning technologies**	0.92*	0.70	1.14	< 0.001

Table 4. The correlation coefficients between instructor role and the learning approaches to use online learning technologies scales

		Instructor support	Instructor-student interaction	Instructor innovation	Deep approach	Surface approach
Instructor support	*r* (p-value)	1	0.67** (<0.001)	0.45** (<0.001)	0.59** (<0.001)	– 0.45** (<0.001)
Instructor-student interaction	*r* (p-value)		1	0.63** (<0.001)	0.61** (<0.001)	– 0.36** (<0.001)
Instructor innovation	*r* (p-value)			1	0.62** (<0.001)	– 0.24** (<0.001)
Deep approach	*r* (p-value)				1	– 0.44** (<0.001)
Surface approach						1

** P < 0.001

Table 5. Regression results of instructor role on approaches to use online learning technologies

Dependent variable	R^2	Instructor support	Instructor-student interaction	Instructor innovation
Deep approch	0.52	0.31**	0.16*	0.38**
Surface approach	0.20	– 0.37**	– 0.10	-0.01

* P < 0.05, ** P < 0.001