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Research Article

An Empirical Study on Whether Online Lesson Satisfaction Is Enhanced by the Mediating Role of Academic Performance or Whether Academic Performance Is Enhanced by the Mediating Role of Online Lesson Satisfaction

Chunhua Jin [a], Xiu Jin [b]

[a] Assistant Professor of Department of Business Administration, Honam University, Gwangju, Korea.
[b] Assistant Professor of Department of Business Administration, Honam University, Gwangju, Korea.

Abstract: In 2020, due to coronavirus, most educational institutions have been conducting remote, that is, non-face-to-face classes. Unlike face-to-face classes, non-face-to-face classes are a specific educational approach in which lectures are conducted online using software and electronic devices. Students' academic performance and online lesson satisfaction is extremely important for them. Accordingly, it is important to investigate students' academic performance and online lesson satisfaction. This research conducted an empirical study targeting Chinese university students. The focus was on their online lecture fit as a means of improving academic performance and satisfaction with online lectures. This research addressed the two key points to improve academic performance and online lecture satisfaction. We investigated whether online lecture fit enhanced academic performance through the mediating role of online lecture satisfaction. We also investigated whether online lecture fit enhanced online lecture satisfaction through the mediating effect of academic performance. According to this, the main purpose is to provide a clearer mediating process through these two points. The results of this study not only emphasize the importance of online lecture fit, but also identify the role of enhancing academic performance and online lecture satisfaction. Finally, practical implications are presented through the results of empirical analysis and future research directions are also discussed.

Keywords: Online listen satisfaction, online lecture fit, academic satisfaction, mobile devices

1. Introduction

The coronavirus that appeared in 2019 has affected many areas of society, including higher education establishments. Governments and institutions around the world have been applying various approaches to sustain educational activities during periods of disruption(Ali, 2020). Many tertiary institutions closed their classroom to avoid spread of virus, and a distance education approach was rapidly implemented accordingly. China, the country that is the focus of this study, opened 24,000 online courses, and these included 1,291 national excellence courses(Sun, Tang, & Zuo, 2020). However, opinions on how to teach and what to teach students, teachers' workload and amount of study that students should do, and the impact on the educational environment and educational equilibrium have led to much disagreement and uncertainty(Ali, 2020; Zhang, Wang, Yang, & Wang, 2020). Because of these circumstances, it is important to investigate current students' academic performance and online lecture satisfaction. Educational satisfaction plays a key role among students because it induces students' learning enjoyment and educational effectiveness(Sherry, Fulford, & Zhang, 1998; Allen, Bourhis, Burrell, & Mabry, 2002; Wang, 2003; Siritongthaworn & Krairit, 2006). Similarly, academic performance can also be seen as a key variable for students. Therefore, we focused on students' online lectures fit as a way to improve academic performance and online lesson satisfaction. According to cognitive fit theory, organizational members' goal achievement is improved when their cognitive type is suited to the information-processing requirements related to their work environment(Najmaei, 2014). Person-environment fit theory emphasizes the level of job performance can enhance when individuals recognize not only values, culture, and incentives, which are ancillary elements of the workplace, but also their personality traits and suitability across jobs(Edwards, 1996; Kieffer, Schinka, & Curtiss, 2004; Maxim, 2019). Person-environment fit also predicts work-related outcome such as achievement and satisfaction(Holland, 1959, Holland,1997; Dik & Hansen, 2011). Thus, online lecture fit may lead to academic achievement and satisfaction with online lesson. Armstrong & Seng(2000) proposed that performance and satisfaction have a positive relationship. The key point here is about which comes first. Porter and Lawler model suggests that performance leads to satisfaction. Sutermeister(1971) recommended the Porter and Lawler model and suggested that it is important to point out the direction of causality and validated in future research. Therefore, the main purpose is to verify the mediating effect of academic performance and also verify academic performance comes first. We investigate whether online lecture fit enhance academic performance through the mediating role of online lesson satisfaction and whether online lecture fit enhance online lesson satisfaction through the mediating effect of academic performance. Finally, the contribution of this research and practical implications are presented, and the future research directions are discussed.

2. Literature Review

2.1 Online lecture fit

Students may have more experience with classes conducted face-to-face. However, many educational institutions have switched to online tuition due to Covid-19. Offline lectures lead to students experiencing new ways of teaching and learning. Online classes can be generally viewed as education conducted using PCs and mobile devices. If education is conducted online, students need various mobile technologies. Mobile devices such as personal digital assistants, smart phones, and laptops/tables have become key learning tools in both outside/home learning and classrooms(Sung, Chang & Liu, 2016). Some students may be able to positively experience online classes because they are skilled at using mobile devices, and some students are expected to be less effective in class due to their low skills in using mobile devices. It suggests that technology and fitness for online classes are important for students. Technology-individual fit is defined as the level to which individuals are using focal technology or are competent in operating it(Aguirre-Urreta & Miguel, 2011). Similarly, we define online lecture fit as the degree of fitness related to online education. Online lecture fit may be predicted to be positively related to students' academic performance. The reason is that cognitive fit theory emphasizes that individual's goal fulfillment is increased when their cognitive style are suited to the environmental information processing requirements related to work(Najmaei, 2014).

2.2 Academic performance

Academic performance refers to the level to which educational goals are accomplished in relation to the system established by a school (Owan, 2012; Owan, Nwannunu, & Madukwe, 2018). It also refers to the degree of students' achievment of educational objectives and goals(Owan, Nwannunu, & Madukwe, 2018). Overall, academic performance is defined as knowledge achievement, and is typically designated by a score, assigned by a teacher. It refers to the outcome of education(Narad & Abdullah, 2016). In an educational context, they suggested that it is the educational objective to be accomplished by students. In order to make the most of the educational opportunities provided in online education environment, it is important that learners become active participants rather than passive observers in the learning process(Stansfield, McLellan, & Connolly, 2004). They suggested that to support, preserve motivation, and encourage learning, the course materials should be of interest to students. They also emphasized the course materials should be carefully structured and well-written. These conditions may promote students' enthusiasm for learning, which in turn will improve their academic performance.

2.3 Online lesson satisfaction

Educational satisfaction can be seen as students' cognitive and subjective evaluation of school life using their own standards related to various specific school life domains(Demirbatir, 2015). Educational satisfaction is defined as students' favorable sentiment toward their expectation that they may acquire recognition, achievement, and achieve from learning, which are different from their sensibility and value system(Cho & You, 2018). According to these concepts, online lesson satisfaction is therefore defined as overall preference for online lecture related education, or continuous preference for online education. learning satisfaction is a key factor for students. High satisfaction may lead to continuous commitment to learning. However, dissatisfaction may lead to loss of enthusiasm for learning. The latter phenomenon is highly likely to lead to negative consequences such as neglecting studies or leaving school altogether. The reasons are that satisfaction may drive affective commitment to an organization(Matzler & Renzl, 2007), loyalty(Naumann, Jackson Jr, & Rosenbaum, 2001), organizational citizenship behavior and it is negatively associated with turnover intentions(Ulndag, Khan, & Guden, 2011).

2.4 The relationship between online lecture fit and academic performance

Traditional person-environment fit theory relates to an individual's personal characteristics aligning well with their working environment, with good alignment leading to positive work outcomes and experiences(Pervin, 1968; Duffy, Douglass, Gensmer, England, & Kim, 2019). According to personal-environmental fit theory, an individual's performance and well-being are determined by the relationship between that individual and their environment(Aldridge & Gore, 2016). Cognitive fit theory stresses a good matches between the decision requirements of tasks and the representations of tasks for producing optimal performance(Lum, Fiore, Rosen, & Salas, 2008). Person-environment fit theory also highlights that a lack of fit or incongruence may lead to stress and other negative performance(Adkins & Premeaux, 2019). According to these theory, positive person-environment fit leads to better performance(Chilton, 2002). Based on this theory, students will be able to have a positive attitude toward online lesson and education if they are suited to the online education environment, which will result in better academic performance. Therefore, the following hypothesis was established in this study.

H1: Online lecture fit will have a positive influence on academic performance.

2.5 The relationship between academic performance and online lesson satisfaction

Perceived job performance is a key essential predictive element of organizational members' organizational identification(Peng, Lee, & Lu, 2020), and this can in turn lead to higher Satisfaction(Brady & Rosenberg, 2002; Shimazu, Schaufeli, Kamiyama, & Kawakami, 2015; Biswakarma, 2017). A Hhgh level of students' academic performance can increse self-esteem, and a high level of self-esteem can lead to better achievement(Yu, Chan, Cheng, Sung, & Hau, 2006). Higher achievement may promote positive attitudes(Véronneau, Vitaro, Brendgen, Dishion, & Tremblay, 2010), and self-esteem is positively correlated to job satisfaction(Sharma & Manani, 2012). Academic performance also improves soft skills(problem solving, collaboration, communication, and critical thinking) development and increases learning experience satisfaction(Razali, Shahbodin, Hussin, & Bakar, 2015). Therefore, the perception of students' high academic performance may promote a positive sense of achievement and self-esteem, which is expected to lead to satisfaction with the online lesson experience. Therefore, the following hypothesis was established in this study.

H2: Academic performance will have a positive influence on online lesson satisfaction.

2.6 The mediating effect of academic performance

The theory of how online education compatibility affects academic performance has earlier been explained. Person-environment fit theory states that a lack of fit or incongruence may drive stress and other negative performance(Adkins & Premeaux, 2019). On the contrary, an individuals' performance and well-being are determined by the relationship between themselves and their environment(Aldridge & Gore, 2016). High level of fitness can be viewed as a key variable that can lead to high performance. It is expected that students' performance can be improved if they achieve high online education fit. Perceived job performance is a key essential predictor higher Satisfaction(Brady & Rosenberg, 2002; Shimazu, Schaufeli, Kamiyama, & Kawakami, 2015; Biswakarma, 2017). High performance can lead to a sense of accomplishment and it improves self-esteem(Yu, Chan, Cheng, Sung, & Hau, 2006). In addition, a high level of self-esteem can eventually lead to satisfaction(Sharma & Manani, 2012). This process means that online lecture fit is expected to affect online lesson satisfaction through academic performance. It suggests academic performance will have a mediating effect on the relationship between online lecture fit and online lesson satisfaction. Therefore, the following hypothesis was established in this study.

H3: Academic performance will mediate the relationship between online lecture fit and online lesson satisfaction.

H4: Academic performance will lead to online lesson satisfaction rather than online lesson satisfaction will lead to academic performance.

3. Methodology

3.1 Sample and procedures

A survey was conducted among Chinese university students in July 2020. A total of 290 students responded. The respondents comprised 130 males (44.8%) and 160 females (55.2%). In terms of grade, 110 (37.9%) were in grade one, 25 (8.6%) were in grade two, 31 (10.7%) were in grade three, 95 (32.8%) were in grade four, and 29 (10.0%) were "others.". Regarding where online lectures were taken, 206 (71.0%) responded in their homes, 75 (25.9%) in their schools, 1 (0.3%) in a coffee shop, 5 (1.7%) in libraries, and 3 (1.1%) in other places.

3.2 Measures

This research used measurement tools that have already been validated in previous studies. Technology-individual fit is defined as the degree to which individuals are using the focal technology or are competent in operating it(Aguirre-Urreta & Miguel, 2011). According to this notion, we defined online lecture fit as the degree of fitness related to online education. Online lecture fit was measured with seven items developed by Lin(2012). The sample items included "This online course provides good functions to help me complete my learning tasks." and "By using this online course, it fit swell the way that I can up grade the efficiency of my study." All ratings were completed on Likert 7 point scale (1=strongly disagree to 7=strongly agree). Academic performance is defined as knowledge achievement and is designated by a score, assigned by teacher, and it refers to the outcome of education(Narad & Abdullah, 2016). We used an instrument developed by Eom, Wen, & Ashill(2006), which included a total of three items. The sample items included "I feel that I learn more in online courses than in face-to-face courses." and "I feel that I learned as much from this course as I might have from a face-to-face version of the course." All ratings were completed on Likert 7 point scale (1=strongly disagree to 7=strongly agree). Educational satisfaction refers to students' cognitive and subjective evaluation of school life using their own standards related to various specific school life domains(Demirbatir, 2015). In this regard, online lesson satisfaction is defined as overall preference for online lectures and related education. A total of four items were measured by referring to the items

developed by Kwan & Walker(2003) and Mossholder, Settoon, & Henagan(2005). The sample items included "All in all, I am satisfied with online course" and "I would like to continue listening to a good online lectures." All ratings were completed on Likert 7 point scale (1=strongly disagree to 7=strongly agree).

4. Results

For verifying the validity of all latent variables, confirmatory factor analysis was conducted. The result showed that $X^2(p)$=120.422(.000), X^2 /df = 2.867, RMSEA = .080, NFI = .963, IFI = .976, TLI = .961, CFI = .975, PNFI = .613, and PGFI = .503. These results satisfy the acceptable standard of (Page, Hooke, & Morrison, 2007; Osman, Purwana, & Saptono, 2017). The results of average variance extraction(AVE) showed that online lecture fit=.673, academic performance=.650, and online lesson satisfaction=.844. All the values were higher that .5. The results of composite reliability(C.R) showed that online lecture fit=.898, academic performance=.741, and online lesson satisfaction=.866. Thus, all values can be seen as acceptable fit according to Lee, Cheung, & Chen(2005). Table 1 shows the results of the model fitness of confirmatory factor analysis and convergent validity.

Table.1. The Model fitness of confirmatory factor analysis and convergent validity

Model fitness of confirmatory factor analysis		
Absolute fit indexes	$X^2(p)$	120.422(.000)
	X^2/df	2.867
	RMSEA	.080
Incremental fit indexes	TLI	.961
	NFI	.963
	CFI	.975
	IFI	.976
Parsimony adjusted indexes	PNFI	.613
	PGFI	.503
Convergent validity		
Variable	AVE	C.R
Online lecture fit	.673	.898
Academic performance	.650	.741
Online lesson satisfaction	.844	.866

The results of reliability analysis showed that online lecture fit=.921, academic performance=.881, and online lesson satisfaction=.957. All variables of Cronbach's Alpha were above .70 and they satisfy the acceptable values of Nunnally(1978). The results of correlation analysis showed that online lecture fit is positively related to academic performance(r=.474, p<.001) and online lecture satisfaction(r=.398, p<.001). Academic performance is also

positively related to online lecture satisfaction(r=.671, p<.001). Table 2 is the results of descriptive statistics, reliability, and correlation analysis.

Table.2. The results of descriptive statistics, reliability, and correlation analysis

	Mean	**Standard deviation**	**1**	**2**	**3**
1	5.317	.988	(.921)		
2	4.554	1.264	.474***	(.881)	
3	4.639	1.521	.398***	.671***	(.957)

1=Online lecture fit 2=Academic performance, 3=Online lesson satisfaction, ( )=reliability

***:p<.001, **:p<.01, *:p<.05

This research conducted path analysis to verify the hypotheses. The results showed that online lecture fit had a positive influence on academic performance(Estimate=.871, p<.001). Thus, the hypothesis 1 is supported. Academic performance had a positive influence on online lesson satisfaction(Estimate=.782, p<.001). Therefore, hypothesis 2 is supported. To verify an indirect effect, we checked by bootstrapping. It showed that the lower bound was .266 and the upper bound was .448. It was confirmed that 0 is not included in the two bounds. The indirect effect is significant. Academic performance had a significant mediating effect(Estimate=.356) on the relationship between online lecture fit and online lesson satisfaction. Thus, hypothesis 3 was supported. Table 3 shows the result of path analysis(Mediating effect of academic performance).

Table.3. The result of path analysis(Mediating effect of academic performance)

Path			**Estimate**	**S.E.**	**C.R.**	***p***
Online lecture fit	**→**	**Academic performance**	.871	.116	7.486	***
Academic performance	**→**	**Online lesson satisfaction**	.782	.064	12.285	***

Mediating effects	**Indirect effect**	**Lower bounds**	**Upper Bounds**
Online lecture fit → Academic performance → Online lesson satisfaction	.356	.266	.448

Absolute fit indexes	$X^2(p)$=168.773(.000), X^2/df=3.591, RMSEA=.095, GFI=.912
Incremental fit indexes	NFI=.948, IFI=.962, TLI=.946, CFI=.962
Parsimony adjusted indexes	PNFI=.675, PGFI=.549

In order to verify which comes first, we investigated the mediating effect of online lecture satisfaction. The results showed that online lecture fit had a positive influence on online lecture satisfaction(Estimate=.785, p<.001). Online lecture satisfaction had a positive influence on academic performance(Estimate=.583, p<.001). To verify the indirect effect, we checked by bootstrapping. It showed that the lower bound was .184 and the upper bound was .396. It was confirmed that 0 is not included in the two bounds. The indirect effect is also significant. Online lesson satisfaction had a significant mediating effect(Estimate=.280) on the relationship between online lecture fit and academic performance. Table 4 shows the result of path analysis(Mediating effect of Online lesson satisfaction). However, by comparing the fitness of the mediating effect model of the two variables, it can be confirmed that the mediating effect model of academic performance is more suitable. Thus, we consider that hypothesis 4 is acceptable. Table 5 shows the goodness-of-fit index comparison for structural equation model. Model 1 is the fit of the structural equation model for the mediating effect of academic performance. Model 2 is the fit of the structural equation model for the mediating effect of online lesson satisfaction.

Table.4. Table 4. The results of path analysis(Mediating effect of online lesson satisfaction)

Path			**Estimate**	**S.E.**	**C.R.**	***p***
Online lecture fit	→	**Academic performance**	.785	.125	6.266	***
Academic performance	→	**Online lesson satisfaction**	.583	.048	12.261	***
Mediating effects			**Indirect effect**	**Lower bounds**	**Upper Bounds**	
Online lecture fit → Academic performance → Online lesson satisfaction			.280	.184	.396	
Absolute fit indexes			$X^2(p)$=208.238(.000), X^2/df=4.338, RMSEA=.107, GFI=.884			
Incremental fit indexes			NFI=.936, IFI=.950, TLI=.931, CFI=.950			
Parsimony adjusted indexes			PNFI=.681, PGFI=.544			

5. Conclusion

5.1 Conclusion and research implications

This research measured students' academic performance and the level of satisfaction with online lesson in an online learning environment. The focus was on online lecture fit as a way of improving academic performance and

satisfaction with online lesson. The conclusions and implications are summarized as follows. First, it was found that online lecture fit had a significant influence on students' academic performance. In this regard, it is necessary to check the level of online lecture fit in schools. In addition, students with a low level of suitability need support from their institutions. For example, universities should teach and support ways to use mobile devices and stimulate students' academic passion. Second, it was found that academic performance had a significant positive impact on online lesson satisfaction. The improvement in performance suggests that online lesson satisfaction can be improved. Therefore, the higher the performance, the higher the students satisfaction with online lesson or online education should be experienced. Third, this research verified that online lecture fit leads to online lecture satisfaction through academic performance. In this regard, the mediating effect of academic performance was verified. This mediating process emphasizes that it can play a key role in the relationship between these two variables. Therefore, schools should focus on suitability for students and provide support or educational programs for performance improvement. Furthermore, good online communication between institution staff(profess or teacher) and students should be conducted. Fourth, it was verified through the mediating effect of these two variables to whether performance leads to satisfaction and whether satisfaction leads to performance. The empirical analysis results showed that the mediating effect of both variables were all significant. However, the mediating effect model of performance was more suitable. Hochwarter, Perrewe, Ferris, & Brymer (1999) and Zielke(2008) suggested that performance leads to satisfaction. And Sutermeister(1971) recommended the Porter and Lawler model and suggested that it is important to point out the direction of causality and validate it in future research. The results of this research contributed to confirming this. Fifth, Rhee, Kim, & Jin(2019) highlighted the importance of mobile information sharing and task instruction. Therefore, there is a need to increase the skills used for mobile devices. In addition, a positive attitude can improve performance(Hahm, 2017). It is important to lead to a positive attitude toward this by improving the skills for using mobile devices. Sixth, the use of mobile devices(Kim & Lee, 2017; Hwang, Kim, Lee, & Jung, 2017), mobile app(Quan, Zhang, & Qing, 2019), and information system(Mndzebele, 2013) are important in various industries. Therefore, It should create a convenient online education environment for students through these technologies. Seventh, it is important to increase students' self-efficacy(Chae & Hahm, 2018). Self-efficacy has been studied as a variable that can improve performance. Thus, students' high self-efficacy may improve their academic performance.

5.2 Limitations and future directions

The limitations and directions of future research are summarized as follows. First, this research focused only on online lecture fit as a way to improve academic performance and online lecture satisfaction. Future research should focus on various fitness as ways to improve academic performance and online lecture satisfaction. For example, it is important to identify the role of fitness by focusing on teacher-student fit and school-student fit. Moreover, the effect of these variables should be verified. Second, this research only investigated the effect of online lecture fit. We did not review ways to increase the influence of online lecture fit on academic performance. In future studies, it will be necessary to verify the influence of online lecture fit and the interaction of other variables on academic performance. For example, students will need to test the interplay between online lecture fit and their self-efficacy or learning ability. Furthermore, there will be a need to clarify the moderating role of these variables. Third, factors that reduce academic performance and satisfaction with online lectures were not reviewed in this research. Academic performance and online lecture satisfaction are key factors for students. Therefore, it will be important to explore the variables that cause such results in consideration of situations where performance or satisfaction is low. Fourth, in confirmatory factor analysis of this research, online lecture fit was composed of 6 factors and online lecture satisfaction was composed of 3 factors. In future research, it is necessary to check whether online lecture fit is composed seven factors and online lesson satisfaction is composed four factors.

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