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THE RELATIONSHIP BETWEEN ONLINE TEACHER-STUDENT INTERACTION AND ONLINE ACADEMIC PERFORMANCE: THE MEDIATING EFFECT OF ACADEMIC OPTIMISM

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ABSTRACT

The development of technology promotes the wide use of online classroom which enables people to have more flexible and diverse way to acquire knowledge. As a result, the educational resources are shared and educational equity is promoted. However, many studies reveal that there are some disadvantages of online classroom, such as high dropout rate, difficulty in learning process evaluation and low satisfaction with courses. Consequently, the performance of online learning is not satisfactory. Therefore, it is urgent to explore the factors affecting the performance of online learning. This study uses Bandura's reciprocal determinism theory. With a questionnaire survey, this study collected data from 500 university students of five public universities in Henan province of China, to explore the following research objectives: whether there is a positive correlation between teacher-student interaction and online academic performance; whether there is a positive correlation between teacher-student interaction and academic optimism; whether there is a positive correlation between academic optimism and online academic performance; whether academic optimism plays a mediating role between online teacher-student interaction and online academic performance. The results show that: (1) The average scores of academic optimisms are of medium level; (2) There are significant positive correlations between each pair of online teacher-student interaction, academic optimism and academic performance; (3) academic optimism plays a mediating role between online teacher-student interaction and academic performance, which can explain 10% of the relationship between online teacher-student interaction and academic performance. Research shows that academic optimism has an important impact on university students, and positive psychology knowledge should be imparted to university students to help them establish correct learning values.

Keywords:
academic optimism; teacher-student interaction; online academic performance; reciprocal

INTRODUCTION

With the rapid development of information technology such as mobile internet, teaching and learning begin to break through the limitations of time, space and location, and knowledge acquisition channels become more flexible and diverse. This large-scale and open online classroom education form is spreading rapidly all over the world, and has great significance in realizing the sharing of educational resources and promoting educational equity (Yong, 2008). However, many studies have shown that there are many problems in online classes at home and abroad, such as high dropout rate, difficulty in learning process evaluation, and low satisfaction with courses (Jie, Ming & Hao, 2012). In view of the online learning, the subjective and objective performance of individual learning satisfaction and academic performance are collectively called online academic performance (Bin, 2014; Bin, En & Jing, 2013). Therefore, it is inferred that overall, learners' online academic performance is poor, and the quality of online classroom education is low. Considering the far-reaching impact of online classroom on education, it is of great practical significance to explore the factors affecting the performance of online learning.

There are many factors affecting the performance of online learning, including not only individual factors such as low learning motivation, but also social factors such as low interaction level (Hew & Cheung, 2014). Although previous studies have also explored online learning from a single or juxtaposed perspective, most of them focus on the social level--the social factors in the learning

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environment (Bryant & Bates, 2015; Toven-Lindsey, Rhoads, & Lozano, 2015) or the individual level--Individual psychology of learners (Yun, 2015). This study explores how variables at the external social level influence online academic performance through individual internal psychological variables from the perspective of intermediary relationship between variables.

THEORETICAL FRAMEWORK

In the 1960s, based on Lewin's model, Bandura put forward the theory of reciprocal determinism. Bandura pointed out that behavior, person and environment actually act as the determinants of mutual connection and interaction. Bandura defined the concept of reciprocal as the interaction between things, and determinism as the product of the influence of things (Bandura, 1986).

Bandura refuted the behaviorist's environmental determinism which he believes is a one-way determinism and should be replaced by reciprocal determinism (Bandura, 1986). According to Bandura, environment determines human behavior, and human behavior also determines environment. The environment shapes a person's cognitive structure, such as beliefs and expectations while at the same time people's cognitive structure (belief and expectation) will determine a person's behavior, and people's behavior changes the environment. In this process, the three elements, namely, environment, person and behavior have impact on one another.

The online classroom learning can be viewed from the perspective of Bandura's reciprocal determinism. Behavior, in the online classroom, refers to the learning activities of learners through the online environment; personal factors, that is, learners, also includes the cognitive structure, personality, physiological characteristics, psychological structure, age, etc.; environment, that is, the online learning environment, including computers, learning interface, learning platform, learning resource base, etc. In the interaction of online classroom, these three parties work together and a complete and effective form of online classroom interaction doesn't exist if any of the three parties is missing. That's the reason Bandura's reciprocal determinism is applied to underpin this study.

LITERATURE REVIEW

This study mainly explores the impact of teacher-student interaction and academic optimism on online academic performance. In this study, online teacher-student interaction refers to the quality of communication and interaction between learners and teachers in the process of online learning. According to Bandura's reciprocal determinism (Bandura, 1986), online teacher-student interaction, as a concrete manifestation of social interaction in learning, is an important environmental factor affecting online academic performance. Studies based on online classroom have also found that the lack of teacher-student interaction may be the main reason for the low performance of learners in online learning (Hu, 2020). However, previous studies on online interaction have found that the more social interaction, the more active learning experience learners have, the better their academic performance. However, they regard teacher-student interaction and student-student interaction (interaction between learners) as a whole and do not explore the relationship between online teacher-student interaction and academic performance or learning experience (Martin & Bolliger, 2018). There are some researchers consider the impact of teacher-student interaction on online academic performance, but it is hard to judge whether it is in a system-based learning environment because the learning background is not clearly stated (Xu, 2020). Based on this, this study examines the relationship between teacher-student interaction and online academic performance in a systematic online classroom environment, and assumes that there is a significant positive correlation between teacher-student interaction and online academic performance in online classroom (hypothesis 1).

The reason for choosing academic optimism as another independent variable is that the conceptual connotation of academic optimism belongs to the important category of positive psychology research, and high degree of academic optimism can be regarded as positive personality. Optimism is a typical positive personality trait and Luthans (2002) believes that optimism is a measured and exploited positive force and quality, a positive psychological ability, an important psychological capital of an individual, and a cultural mechanism to promote human evolution. The concept of academic optimism comes from the projection of individual optimism traits to learning and academic optimism is the concrete representation of optimistic mental state in learning. Some scholars define academic optimism as academic optimism and it is an individual's positive, optimistic and open-minded attitude experience towards learning life, which means that the individual always expects and believes that good results can occur in the learning process and can make a good adaptation and positive explanation for the adverse consequences (Li, 2020). Individuals with high academic optimism have more positive attitudes towards their own learning (Dong, 2018). Accordingly, this study proposes the hypothesis H2: academic optimism positively predicts university students' online academic performance (hypothesis 2).

In recent years, quantitative research in social sciences has emphasized that studies should not only on the direct correlation between two variables, but also should look into the deep-seated mechanism of variable correlation, that is, to find the mediating variable between two related variables (Dong, 2018). In other words, it is necessary to study whether there exists mediating variables between teacher-student interaction and online academic achievement (Dong, 2018). It can be inferred that university students with high academic optimism tend to have good learning mood and frustration tolerance, so they are more likely to achieve good academic performance. However, teacher-student interaction can help to regulate self-mood and attitude, and help students improve their expectations of learning. Therefore, this study proposes the hypothesis H3: Online teacher-student interaction can positively predict academic optimism (hypothesis 3).

According to the above analysis, online teacher-student interaction can predict students' academic optimism and online academic performance, while students' academic optimism can also predict students' online academic performance positively. The three variables are interrelated, that is, online teacher-student interaction can not only directly affect the academic performance of university students, but also affect the academic performance of university students through the mediating role of academic optimism. Based on this, this study proposes hypothesis H4: academic optimism plays an important part in mediating the interaction between online teachers and students and university students' online academic performance. That is, online teacher-student interaction can not only directly affect university students' academic performance, but also indirectly affect university students' academic performance through academic optimism.

RESEARCH OBJECTIVES

This study reveals the influence mechanism of online teacher-student interaction on online academic performance from the perspective of academic optimism, and at the same time provides help for the effective development of university Students' online learning. The study has four research objectives: (1) to find out whether there is a positive correlation between teacher-student interaction and online academic performance; (2) to find out whether there is a positive correlation between teacher-student interaction and academic optimism; (3) to find out whether there is a positive correlation between academic optimism and online academic performance; (4) to determine whether academic optimism plays a mediating role between online teacher-student interaction and online academic performance.

METHODOLOGY

Population and Sampling

Based on the population in this study and the Table for Determining Sample Size from a Given Population made by Krejcie and Morgan (1970), the calculation of the sample size in this study is: s = X2NP(1 - P) / CP(N - 1) + X2P(1 - P), and the result is s=353. Therefore, the sample size in this study is 353.

By using stratified sampling method, five public universities in Henan Province were chosen and then, taking questionnaire recovery rate into consideration, more questionnaires should be distributed than the number calculated above, so 450 questionnaires were distributed in four grades of the five universities by using the simple random sampling. At last, 392 valid questionnaires were collected, with a questionnaire recovery rate of 87.1%. Among the respondents of the 392 valid questionnaires, according to the nature of the online courses they participated, the courses can be divided into social sciences and natural sciences.

INSTRUMENTS

Teacher-student Interaction Questionnaire for Online Learning

In this study, the Teacher-student Interaction Questionnaire for Online Learning compiled by Jia Bin (2014) is adopted. The questionnaire evaluates the degree of teacher-student interaction perceived by learners in the process of online learning from seven aspects: interaction mode, interaction frequency, interaction emotion, interaction content, interaction depth, interaction time and interaction motivation. There are 21 questions in the questionnaire. Five-Point Likert Scale is used for self-assessment (1=totally inconsistent, 5=totally consistent). The higher the score, the more intensive the interaction between teachers and students will be. In this study, the consistency coefficient of the scale Coronhach'α was 0.93.

Youth Optimism Questionnaire

This study also adopts the Youth Optimism Questionnaire compiled by Professor Yu Xinxin (2012), which includes 26 items, with five dimensions: positive attitude towards life, positive attitude towards problems encountered, acceptance of reality, positive expectation and open mindedness. The internal consistency reliability coefficient of the total questionnaire is 0.916, and the retest reliability coefficient is 0.798; the internal consistency reliability coefficient of each dimension is between 0.701 and 0.797; the retest reliability coefficient is between 0.602 and 0.687, and all of them reach the significant level of 0.01. The scale is scored by Five-Point Likert Scale (1=totally inconsistent, 5=totally consistent).

Online Academic Performance

The Online Academic Performance complied by Jia Bin (2014) is adopted in this study. The questionnaire mainly measures learners' subjective and objective learning effects in online learning from five dimensions: learning satisfaction, ability and social interaction, academic achievement, personal knowledge and input-output ratio. The questionnaire contains 19 questions and Five-Point Likert Scale is used (1= completely inconsistent, 5=fully consistent). The higher the score is, the better the learners' learning effect in online learning will be. In this study, Coronhach'α of this questionnaire is 0.89.

RESULTS

This study mainly uses quantitative analysis methods. Specifically, in addition to the descriptive statistical analysis method using SPSS, CFA is carried out by using AMOS 20.0, and the items with poor reliability and validity are removed from the original questionnaire, and the observed variables of two latent variables, teacher-student interaction and academic optimism, are determined. Finally, in order to test the hypothesis of this study, the structural model is analyzed by using AMOS 20.0.
The reliability, convergence validity and discriminant validity of the potential variables of teacher-student interaction and academic optimism are tested by using Confirmatory Factor Analysis (CFA). Reliability refers to the stability, and consistency of measurement items. SMC values are used to measure the reliability of each item in the model, and Composite Reliability (CR) is used to measure the internal consistency of each dimension.

The results of the reliability and convergence validity tests of teacher-student interaction and academic optimism are shown in Table 1. The SMC values of all factors are above 0.3, and the CR values are higher than 0.65, which indicate that the measured items have good reliability. In addition, the standard load of all measurement items is above 0.5, and all of them have great significance at the level of 0.001. Meanwhile, the Average Variance Extracted (AVE) of each factor is higher than 0.5, which shows that the measured items have good convergence validity. As for the detection of discriminant validity, the correlation coefficient between AVE and other variables can be compared. If the root value of AVE is higher than the correlation coefficient, it indicates that the model has good discriminant validity.

Table 2 shows the results of the discriminant validity analysis, and the root value of AVE for each variable is higher than the corresponding correlation coefficient of 0.412, so there is a good discriminant validity among the variables.

Table 1 Reliability and Convergence Validity Analysis

		Unstd	S. E.	Z-value	P	Std	SMC	CR	AVE
teacher-student	IN1	1.000				.820	.683	.757	.536
interaction	IN2	.964	.016	53.762	***	.852	.683		
	IN3	.860	.017	49.721	***	.716	.579		
	IN4	.750	.016	45.321	***	.560	.346		
	IN5	.865	.016	53.762	***	.852	.683		
	IN6	.950	.017	49.721	***	.716	.579		
	IN7	.760	.016	45.321	***	.560	.346		
academic optimism	LO1	1.000				.689	.487	.656	.537
	LO2	1.153	.020	52.468	***	.702	.451		
	LO3	1.156	.022	55.364	***	.631	.521		
	LO4	1.135	.020	53.586	***	.545	.412		
	LO5	1.135	.023	55.564	***	.642	.328		

Table 2 Discriminant Validity Analysis

	AVE	academic optimism	teacher-student interaction
academic optimism	.732	.736	
teacher-student interaction	.536	.412	.632

Assuming that university students' academic optimism is the mediating variable between teacher-student interaction and students' academic performance, the academic optimism and teacher-student interaction in this study is the latent variable, and the academic performance of university students is the explicit variable. The mediating effect of academic optimism needs to be tested through structural equation model. According to the requirement of structural equation modeling, two latent variables have been validated and analyzed and four items are determined respectively to measure academic optimism and teacher-student interaction. The explicit variable academic performance is represented by the students' academic ranking in the class. A structural equation model consisting of three variables is established to test the relationship among teacher-student interaction, academic performance and academic optimism.

Variance maximum likelihood method is used to estimate the parameters of structural equation model, and a series of fitting indices are obtained, as shown in Table 3.

Table 3 Overall Test of Mediation Model

Model	GFI	AGFI	RMSEA	CFI	TLI
M	. 935	. 968	. 076	.955	. 937

According to the standards of good fit, RMSEA should be less than 0.08, AGFI, TLI, CFI, GFI should be higher than 0.90. As shown in Table 3, RMSEA is 0.076, and GFI, AGFI, CFI and TLI are all higher than 0.9, which indicate that the model fits well. Then the Bootstrap test is used to get the total, indirect and direct effect of each path. The point estimation, Z values and confidence intervals of the three effects are shown in Table 4.

Table 4 Effect Decomposition of Academic Optimism Mediation Model

Variable	Point Estimate	Product of Coefficients		Bootstrapping Bias—Corrected 95% CI		Percentile 95% CI	
		SE	P	Lower	Upper	Lower	Upper
Total Effects							
Self-efficacy Academic performance	.410	.013	< 0. 001 .	.312	.412	.342	.378
Indirect Effects							
Self-efficacy Academic performance	.041	.011	< 0. 001 .	.042	.061	.031	.032
Direct Effects							
Self-efficacy Academic performance	.352	.010	< 0. 001 .	.215	.351	.311	.310

It can be seen from Table 4 that when academic optimism is not included as a mediator variable, the predictive effect of independent variables on dependent variables, that is, the total effect of teacher-student interaction on university students' academic performance is 0.410, $P < 0.001$, so hypothesis H1 is confirmed. The normalized correlation coefficient of mediator variable academic optimism to independent variable teacher-student interaction is 0.378, $P < 0.001$, so it can be concluded that the research hypothesis H2 has been confirmed, which meets the conditions of mediation effect test. The effect of teacher-student interaction on academic performance is 0.352, $P < 0.001$, and the effect is also significant when academic optimism is included as an intermediary variable. This indicates that university students' academic optimism partially mediates academic performance, and the research hypothesis H3 is confirmed. The size of the mediation effect is 0.041, accounting for 10% of the total variation. That is to say, the mediation effect of academic optimism can explain 10% of the relationship between teacher-student interaction and academic performance.

CONCLUSION AND DISCUSSION

Based on the above analysis, it can be concluded that there are significant positive correlations between each pair of online teacher-student interaction, academic optimism and academic performance. Some of the findings are in accordance with the previous studies. In terms of the relationship between online teacher-student interaction and academic performance, Chaoxi (2017) found that online teacher-student interaction could improve the academic performance of students in vocational colleges. Junjie (2016) found that online teacher-student interaction could enhance the academic performance of English major students in Comprehensive English class. As for the positive correlation between academic optimism and academic performance, Hoy (2006) found that school academic optimism had a positive predictive effect on students' academic performance. Yanning, and Jinhua (2014) found that the optimistic personality of vocational college students was closely related to learning motivation and academic achievement. High optimism could predict learning motivation and academic achievement.

These studies are in accordance with the findings of this research. However, this study is different from previous studies in two aspects: firstly, the subjects of this study are different from the previous researches as in this study university students attending both social and natural science online classes are surveyed; secondly, this study finds that online teacher-student interaction can not only directly affect students' academic performance, but also indirectly affects the academic performance of university students through the mediating effect of academic optimism, that is, academic optimism partially mediates between teacher-student interaction and academic performance, which is an important finding of this study.

Besides, the findings of this study support Bandura's reciprocal determinism theory by founding out that there are significant positive correlations between each pair of online teacher-student interaction, academic optimism and academic performance, which are environment, person and behavior respectively in Bandura's reciprocal determinism theory.

In fact, in addition to the impact on academic performance, it is undoubtedly beneficial for university students to maintain an optimistic attitude towards their studies and maintain a healthy psychological state. So, in the practice of education, as administrators and teachers of universities, how do they improve students' academic optimism?

Firstly, more positive psychology knowledge and positive experience should be imparted to university students. Positive psychology researchers believe that positive personality development and emotional experience are very important for the healthy growth of individuals. In the past, university students' mental health education was mostly about preventing negative mental diseases. Focuses are always on the students who showed unhealthy mental state. Now, positive psychology knowledge needs to be imparted to university students to help them acquire strategies for cultivating

positive personality, and create positive emotional experiences such as success, happiness and belonging, so that their positive psychological state may flourish, and they are capable of coping with the difficulties encountered in learning more calmly. For university students who are facing difficulties in their studies, their learning conditions can not only be improved through additional guidance from teachers and help from classmates, but also by creating positive experiences and encouraging them to actively participate in extracurricular activities such as sports activities, literary and artistic activities besides learning, so them may get the positive experience of extracurricular activities, and eliminate the impact of negative emotions through the increase of positive emotions.
Secondly, the problem can be solved by setting up correct learning values and cultivating strong interest in learning. Compared with basic education, the learning process of higher education requires students' initiative. Under the circumstance of weakened external supervision, it is particularly important for university students to have correct learning values. Learning values are the core concepts of individual learning, which can guide individual's specific learning attitudes and methods. Some scholars pointed out that learning values refer to learners' orientation of learning goals, that is, what is the purpose of learning. If university students only regard learning as external and meaningless, they naturally cannot have a strong interest in learning and serious attitude. Once they encounter some setbacks in learning, they will immediately produce pessimism, abandonment, boredom and other negative emotions. If this negative emotion cannot be eliminated in time, university students will naturally be pessimistic about their future studies, and even full of confusion and anxiety for the whole life. University administrators and teachers, could help university students establish correct learning values through teaching, lectures, after-class discussions and other forms of activities, so that students can turn learning into their own internal needs and feel that learning is interesting and necessary.

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