ATLANTIS PRESS

Advances in Social Science, Education and Humanities Research, volume 543

Proceedings of the 2021 6th International Conference on Social Sciences and Economic Development (ICSSED 2021)

The Relationship Between University Students' Curiosity and Their Satisfaction with Online Education Courses: The Mediating Role of Information Seeking and Positive Frame

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ABSTRACT
Using longitudinal data from 209 university students, we examined the role of two forms of trait curiosity (specific and diversive) as antecedents of adaptation behaviors (information seeking and positive framing) and Satisfaction with online education courses. Results suggest that specific curiosity predicts information seeking behaviors, whereas diversive curiosity promotes positive framing. Overall, the study validates the role of curiosity as a multifaceted individual difference that serves as an antecedent to satisfaction with online education courses.

Keywords: *curiosity, information seeking, positive framing, satisfaction with online education*

1. INTRODUCTION

The unexpected arrival of the Covid-19 pandemic in 2020 had necessitated the termination of many activities that needed to be completed offline, and as a result, all schools around the world had to shut down and all offline teaching had to be suspended for this reason. This is where online e-learning becomes the trend, with schools and various educational institutions scrambling to improve their e-learning systems and restart their teaching efforts. Fortunately, with the rapid development of mobile Internet and other information technologies, it is now possible to realize multi-integrated e-learning functions. Soon, the wave of e-learning immediately covered all over the world, and university students also began to conduct learning activities through the network again. However, the difference between e-learning and offline face-to-face learning is still very obvious. Although e-learning is more convenient and flexible, it lacks the immersive feeling, and practical communication and group discussion are also limited, so the learning satisfaction of college students in the e-learning process may be affected to some extent. At the same time, related studies show that a series of problems such as: high dropout rate and low course satisfaction are common in both domestic and international online classes [5][6][21][23]. Based on the current e-learning outbreak of the new crown epidemic passion, it is particularly important to study and explore the factors that affect e-learning satisfaction and analyze this factor in depth, and then discover ways to improve e-learning satisfaction. There are many factors that affect learning satisfaction, mainly including the five categories of student characteristics, teacher characteristics, curriculum characteristics, teaching activities, and teaching environment [19]. In order to refine the factors influencing online learning satisfaction, this study considers a follow-up study starting from student characteristics and capturing the factor of student curiosity in student characteristics. There are not many relevant studies on the relationship between curiosity and e-learning satisfaction in e-learning at home and abroad, so this study is even more valuable, and the relationship between curiosity and e-learning satisfaction is to be further revealed.

2. LITERATE REVIEW

Curiosity stimulates an individual's desire to explore [1][9][11], while theorists have defined curiosity as a narrower and more specific drive to want to explore things [9], and some scholars have defined curiosity as a broader and indirect motivation to inquire about things [7]. Berlyne, on the other hand, distinguishes two

different subtypes of curiosity in his study, one called specific curiosity and the other called diversive curiosity. The former is a deep exploration of something driven by curiosity, while the latter is a broad, diffuse interest in something different or novel under the influence of curiosity [1].

Litman (2008) has measured the impact of curiosity using scales developed and validated using two variables, specific and diversive curiosity. The following is what university students with specific or diversive curiosity would have performed: University students with specific curiosity don't want to take a break until they find an answer to a problem; conceptual problems motivate them to find a solution; they try harder and harder because they get especially frustrated when they can't solve problems; they make it their hobby when they encounter a problem they think they have to solve; they feel prolonged anxiety during the problem-solving process.

Students with diversive curiosity especially enjoy discovering new ideas; especially enjoy learning about things they are unfamiliar with; they are particularly fascinated by new information; when learning something new, they enjoy learning more about it and enjoy talking about abstract concepts.

These two types of curiosity combine and interact with each other to form the ultimate curiosity that drives each individual to perform a variety of actions, including online education courses learning. This study is based on the influence of the two dimensions of curiosity on satisfaction with online education courses, investigates the intrinsic relationship between these two types of curiosity and satisfaction with online education courses, and explores their specific paths.

3. RESEARCH HYPHOTHESIS

3.1. University students' specific curiosity and information seeking

To explore the relationship between specific curiosity and information seeking, it is first necessary to clarify the source of curiosity. The information gap theory posits that the uncertainty induced by the information gap [10] cause a person's state of curiosity [9].

Thus, people with highly specific curiosity tend to treat novelty as a problem to be solved or as a mistake to be corrected and will actively seek out new information to fill information gaps [9].

Existing research has found that curiosity, as for cognition,can enhance to some extent the perceived tolerance for self-frustration due to trying new things or stepping out of one's comfort zone, which motivates individuals to explore the world and challenge themselves. At the same time, it triggers information seeking, attention seeking, and cognitive processing [16].

This specific curiosity induces the individual to search for information, which is useful for discovering how to use these things [14]. Levitt et al. (2009) cite one of the important functions of curiosity is stimulating learned exploratory behavior.

Therefore, specific curiosity will motivate individual university students to try to conduct information search and continuously fill their information gaps. So the specific curiosity of university students has a positive influence on their information seeking.

Hypothesis 1: University students' specific curiosity is positively related to their information seeking behavior.

3.2. The intermediary role of information seeking

University students' specific curiosity has a positive influence on their information seeking, which in turn advances their satisfaction with online education courses. In other words, information seeking plays a mediating role between them.

University students are bound to have a certain amount of uncertainty and anxiety about this new learning style and environment from the very beginning of their exposure to online education courses. According to the uncertainty theory, the information filling effect produced by information seeking will to some extent reduce the uncertainty and anxiety of university students when they are exposed to online education courses, thus enhancing their acceptance and adaptation to e-learning, and increasing their own satisfaction with online education courses.

At the same time, information seeking fills in gaps in knowledge that may facilitate improved behavior and increased efficiency. Thus, information seeking enables individuals to respond to larger stimuli with complex behavioral programs [17]. The act of information seeking allows university students to gain a clearer understanding of course content, course objectives, and ways to improve their performance, which, through this set of behaviors, helps to improve their performance in the course and their own satisfaction with online education courses.

Hypothesis 2: University students' information seeking behavior mediates between their specific curiosity and satisfaction with online education courses.

3.3. University students' diversive curiosity and positive framing

Theorists generally agree that diversive curiosity is the driving force behind the interesting behaviors that help individuals reorganize their understanding of the world.Litman (2005) argues that diversive curiosity creates a sense of joy, interest, and excitement when people discover something new. This feeling drives

people to construct a framework, which we call a positive framing.

University students with diversive curiosity are drawn to the variety of new things around them, and they are not looking for specific information, but simply want to be able to see things in a new way. This type of construct is called positive framing. Positive framing allows university students to reimagine their environment and become more tangibly involved in online education courses, similar to the stress coping strategies that transform e-learning into a challenge [8]. When online education courses encounters new challenges or difficulties, it faces temporary discomfort, but university students with diversive curiosity see the difficulty as an experience for themselves, transform it into something positive, adapt quickly to the new thing, and do their best to complete it with enthusiasm.

Hypothesis 3: University students' diversive curiosity is positively related to their positive framing.

3.4. The intermediary role of positive framing

Students with diversive curiosity construct positive framing for themselves, approach online education courses with more enthusiasm, increase their motivation and interest in learning, and drive them to reach the stated goals of online education courses.

Diversive curiosity inspires university students to look at online education courses in a new light and in a new way, so that it spawns new ways to focus and engage in online education courses, and to perform in a new and good way. This not only increases the motivation of university students to perform in online education courses, but also allows them to innovate and try to control the rhythm and method of online education courses in the learning process. Through this series of processes, this in turn increases their satisfaction with online education courses.

Hypothesis 4: University students' positive framing mediate between their diversive curiosity and satisfaction with online education courses.

4. METHOD

4.1. Sample and procedures

We collected 211 online questionnaires to university students from different majors of each grade in Guangzhou during one week, after removing the invalid questionnaires, we obtained a total of 209 cases for testing and analysis of hypotheses for subsequent research. The questionnaire is divided into six parts, including personal information, diversive curiosity, specific curiosity, student satisfaction in online education courses, Positive framing and information seeking. In the description of the questionnaire, we have informed the respondents that the data will be used for scientific research only and their personal information will be kept confidential.

Among the 209 cases, 74 are male, accounting for 35.4%; the average age of employees was 20.8 years; Turn to major, 65 students major in science (30.7%), 27 students are major in engineering (12.7%), 42 students are major in humanistic (19.8%), 72 students are major in social science (34.0%), 5 students are major in art or P.E. (2.8%); in terms of grade, 39 students are freshmen (18.4%), 44 students are sophomores (20.8%), 63 students are juniors (29.7%), 52 students are seniors (24.5%), 12 students are masters (5.7%), 2 students are doctors (0.9%).

4.2. Measures

All variables in this study used Likert's five-point scale to measure respondents' consent to the project, where 1 means "strongly disagree" and 5 means "strongly agree".

Specific Curiosity: The measurement of specific curiosity adapted the scale of Litman, J. A. (2008), which contains 5 questions in total. Representative measurement items are “Hours on a problem because I cannot rest without answer.”, “Conceptual problems keep me awake thinking about solutions.” and “Frustrated if I cannot figure out problem, so I work even harder.”. In this study, Cronbach's coefficient on this scale was 0.79.

Diversive Curiosity: The measurement of specific curiosity adapted the scale of Litman, J. A. (2008), which contains 5 questions in total. In this study, Cronbach's coefficient on this scale was 0.82.

Information Seeking: Information seeking measure was adopted from Zhang X, Bartol K M. (2010), which contains three questions. We used Likert's five-point scale to measure the students’ behavior of information seeking, where 1 means "never" and 5 means "always". In this study, Cronbach's a coefficient of this scale was 0.76.

Positive Framing: For the measures of positive framing, we used three items developed by Ashford, S. J., & Black, J. S. (1996). Sample items are “Tried to see your situation as a challenge rather than a problem.”, and “Tried to look on the bright side of things.”. In this study, The Cronbach's coefficient of this scale was 0.80.

Satisfaction with Online Education Courses: Satisfaction with Online Education Courses was measured using five items originating from Kuo, Y., Walker, A. E., Schroder, K. E. E. & Belland, B. R. (2014). For example, “I share my experience or know-how from work with members in this team frequently” and “I share my expertise from my education or training with other team members”. The Cronbach's a coefficient of this scale was 0.89.

Control variables: In this study, I choose gender, age, major, education as my control variables.

5. RESULT

5.1. Confirmatory Factor Analyses

We first conducted confirmatory factor analyses (CFA) to ensure that our measures had satisfactory discriminant validity. A good model fit requires the values of both CFI and TLI to be greater than 0.90, and the value of RMSEA has to be lower than 0.08 (Hu & Bentler, 1999). The CFA results indicated that the hypothesized 5-factor measurement model fit the data well, supporting the discriminant validity for the measured variables. The details of the confirmatory factor analyses can be found in Table 1.

Table 1. Results of Confirmatory Factor Analyses

Model	χ^2	*df*	RMSEA	CFI	TLI
5-factor model	372.54	179	.07	.90	.89
one-factor model	986.18	189	.14	.60	.56

Note. N = 209

5.2. Descriptive Analyses

Means, standard deviations, and correlation coefficients for all variables in this study are presented in Table 2. As expected, Specific Curiosity was significantly correlated with Information Seeking, and Diversive Curiosity was significantly correlated with Positive Framing. Moreover, Information Seeking mediated between Specific Curiosity and Satisfaction with Online Education Courses, and Positive Framing acted as the mediator between Diversity Curiosity and Satisfaction with Online Education Courses.

Table 2. Means, Standard Deviations, and Correlations of the Focal Variables

Variable	Mean	SD	1	2	3	4	5	6	7
1.Gender	.65	.48							
2.Age	21.20	5.84	-.15*						
3.Education	2.78	1.20	-.06	.41**					
4.Specific Curiosity	3.21	.68	-.16*	-.11	-.05				
5.Diversive Curiosity	3.59	.68	-.11	-.14*	.01	.64**			
6.Information Seeking	3.35	.80	-.01	-.24**	-.12	.45**	.46**		
7.Positive Framing	3.69	.68	.02	-.32**	-.07	.47**	.45**	.40**	
8.Satisfaction with Online Education Courses	3.44	.83	.05	-.16*	-.04	.40**	.32**	.50**	.39**

Note. $N = 209$. Dummy variable (0 = male, 1 = female).

*$p < 0.05$; **$p < 0.01$ (two-tailed).

5.3. Hypotheses Tests

We tested our hypotheses using the PROCESS tool, a statistical software package developed by Hayes (2013). The results of these analyses are shown in Table 3.

Table 3. Results of Hypothesis Tests

	Information Seeking	Positive Framing	Satisfaction with Online Education Courses
Variable	Model1	Model 2	Model 3
Gender	.06	.09	.14
Age	-.02*	-.03**	.00
Education	-.03	.03	.03
Specific Curiosity	.31**	.31**	.25*
Diversive Curiosity	.32**	.22*	-.06
Information Seeking			.38**
Positive Framing			.21*
F	15.79	19.49	13.64
R^2	.28**	.32**	.32**

Bootstrap results for mediated effect				
	Effect	Boot SE	LL 95% CI	UL 95% CI
SC→IS→SOEC	.12	.05	.04	.25
DC→PF→SOEC	.05	.03	.01	.12

Note. *N* = 209. Unstandardized regression coefficients are reported. Bootstrap sample size = 5,000. LL = lower limit; CI = confidence interval; UL = upper limit.

*$p < 0.05$; **$p < 0.01$.

As shown in table3, we found that specific curiosity has a positive effect on information seeking (β =0 .31, p < .001, see model 1). Therefore, hypothesis 1 was supported.

To test hypothesis 2, which predicted the mediating role of information seeking in the relationships between specific curiosity and satisfaction with online education courses, we used the PROCESS tool by a bias-corrected bootstrapping procedure (5000 resamples). As shown in table3, specific curiosity is positively related to satisfaction with online education courses (β = 0.25, p < 0.05, see model 3). In addition, when specific curiosity and information seeking were simultaneously entered into model to satisfaction with online education courses, information seeking were significantly related to satisfaction with online education courses (β = 0.38, p <0 .01, see model 3). The bootstrapping analyses (5000 resamples) revealed a significant mediated effect of specific curiosity on satisfaction with online education courses through information seeking. The bias-corrected 95% confidence interval (CI) of the mediated effects did not include zero (95% CI [<0.01, 0.07]), indicating support of hypothesis 2.

In hypothesis 3, we predicted diversity curiosity has a positive effect on positive framing (β = 0.22, p <0 .05, see model 2). Table3 showed us that hypothesis 3 was right.

In hypothesis 4, we predicted positive framing to amplify the positive relationship between diversity curiosity and satisfaction with online education courses. In our analyses (Table 3, model 2&3). As we excpected, the interaction between diversity curiosity and satisfaction with online education courses was highly significantly related to positive framing. Therefore, hypothesis 4 was supported.

6. CONCLUSION

This study shows that curiosity can significantly affect the satisfaction with online education courses. Much of the previous research on curiosity has been on the impact of curiosity on the fit of corporate employees [15]. Curiosity provides a promising avenue to provide a more complete description of the motivations experienced by newcomers [20]. Based on curiosity, this study addresses satisfaction with online education courses, and reveals the positive effect of curiosity on it.

Theoretically, the findings extend to some extent the results of previous studies, many of which have

demonstrated the influence of university students' personal traits on their satisfaction with online education courses [19][22], but not specific to one particular trait. This study specifically examines curiosity and intervenes in two mediating variables, information seeking and positive framing, in which the facilitative role of curiosity on online learning satisfaction is indicated.

This study has practical implications. Curiosity plays a positive role in satisfaction with online education courses, so future online education courses can capture students' curiosity in curriculum development, enhance the explorability of the course, and constantly stimulate students' curiosity to increase their satisfaction. At the same time, students' information seeking skills and positive framing can also be developed, which will also contribute to their ultimate satisfaction with online education courses.

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