Research on Influencing Factors of Students' Learning Behavior in Online Education Platform Based on Big Data Model

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Abstract. With the continuous development of the Internet and new media technology, online education is easily accepted by students with its flexible learning methods, rich curriculum resources and low learning costs. In recent years, the online education platform has been very active and has rapidly spread and penetrated across the country. Based on the big data model, this paper constructs a model of online education learning willingness and learning behavior. The correlation between the structural factors of the model is empirically studied by using the statistical method of structural equation model. It is concluded that performance expectation, effort expectation, social influence and promotion conditions have positive effects on learners' online learning behavior.

Keywords: Online education · Big data model · Learning behavior · Influence factor

1 Introduction

In recent years, the rapid development of education informatization has promoted the rapid development of online education. Online education can basically effectively supplement the shortcomings of offline education, but also successfully explore large-scale online teaching mode, so that online education can quickly enter schools and families. Giving full play to the advantages of online education, improving the lifelong learning system and building a learning society are also our development goals. With the gradual and widespread application of "Internet + ", cloud computing, big data, Internet of Things and other new technologies and the normalization of epidemic prevention and control in China, the number of online education users has shown a rapid growth trend. At present, the number of online education users in China has reached 400 million, accounting for 38% of the total number of Internet users. Online education, with its convenient and flexible learning methods and rich and diverse teaching resources, has profoundly changed the traditional education mode, and also changed the learning habits and learning behaviors of learners to acquire knowledge and skills. Compared with traditional face-to-face teaching, online learning does not need to rearrange and plan the time. Learners can participate in online learning at their own convenient time and place. Online learning also makes it possible for like-minded learners in different places to form virtual learning communities.

However, the reality is not optimistic. The study found that some learners are not willing to use the online education platform or even never participate in online activities or long-term diving. Many advantages of the online education platform have not been effectively played, and the learning effect of learners has not reached the ideal expectation. Therefore, studying the influencing factors of online education platform learners' learning behavior is of great significance to optimize the online education platform service content, improve the online education platform teaching quality, and improve the online education learning effect.

Online education based on information technology has built a new educational situation for learners. In this situation, online education platform outputs information knowledge as information technology medium, and learners acquire information knowledge through online education platform, so as to achieve the goal of completing learning tasks and improving themselves. For learners, the learning intention and learning behavior of online education platform are the focus of attention. In academia, the integrated model of technology acceptance and use is one of the most influential models to explain the acceptance of information technology [1]. The model believes that the user's information technology use behavior is determined by the user's use intention and promotion conditions, and the use intention is determined by the three variables of performance expectation, effort expectation and social impact. Therefore, the study of online education platform scholars' learning willingness and learning behavior can be analyzed with the help of big data model, which has important theoretical and practical significance.

2 Model of Learner Learning Influencing Factors Based on Big Data Model

2.1 Overview of Big Data Model

The scholar Wenke et al. proposed the big data model to explain the behavior characteristics of individuals or organizations when using information technology. The model integrates eight theoretical models, including technology acceptance model and planned behavior theory integration model, rational behavior theory, PC use model, planned behavior theory, motivation model, innovation diffusion theory and social cognition theory. Four main factors affecting user acceptance motivation are extracted, including performance expectation, social impact, promotion conditions and four regulatory variables, as shown in Fig. 1.

The model involves sociology, behavioral science, psychology, information systems and other disciplines. In order to build a scientific and effective theoretical model, Wenke et al. spent nearly six months, conducted in-depth surveys across three regions, rigorously measured and tested more than 20 variables in eight theoretical models, and finally determined the basic theoretical framework of the big data model. The model test results show that the big data model is better than the original eight theoretical models [2]. Some empirical research results show that the big data model can explain the variance of 70% of the intention to use, and is a very good measurement tool.
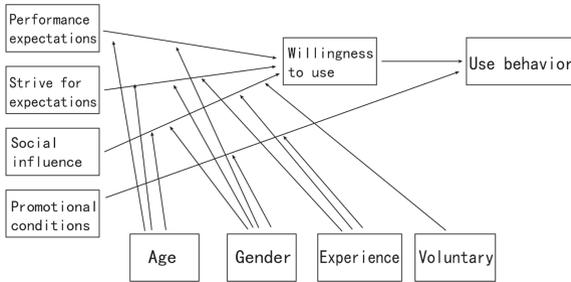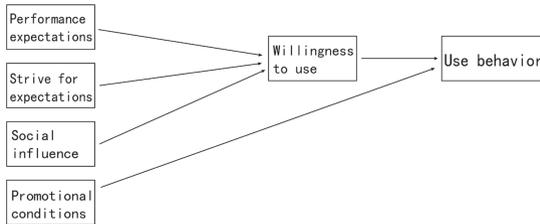
Fig. 1. Big data model

Fig. 2. Big data model of online education learning behavior

2.2 Big Data Model Construction of Online Education Learning Behavior

According to the big data model, the four core variables that affect the learning behavior of learners on the online education platform are the factors that affect learners' use of the online education platform, namely: performance expectation factor, effort expectation factor, surrounding influence factor and promotion condition factor. In addition, the original big data model set four adjustment variables: age, gender, experience and voluntariness. Considering that this study mainly focuses on the learners who take part in the national postgraduate examination and use the online education platform for online learning as the research object, the age and gender are relatively concentrated, the Internet and mobile Internet have become very popular, the functional design of the online education platform is relatively easy to operate and use, and the learners will not be affected by their lack of online learning experience, And online education platforms are voluntary enrollment by learners [3]. Therefore, this study does not consider the regulatory role of the four regulatory variables of age, gender, experience and voluntariness in the original big data model, and does not serve as the construction category of the learning behavior model, but only makes general descriptive statistical analysis. The conceptual model of this study is shown in Fig. 2.

2.3 Research Hypothesis

In the big data model of online education learning behavior, the four core variables that affect learners' online learning behavior are important factors that affect learners' use of online education platform. Performance expectation refers to the degree to which

individuals believe that the use of online education platform can help them achieve better performance in learning, mainly reflecting the relevance of individual use of online education platform and learning effect. In the context of online education, learners' performance expectations are mainly reflected in the effects that learners expect to achieve through online course learning, including learning platform information system and course content quality. Previous studies have found that the quality of information systems can significantly affect users' use intentions. The analysis of online learning platform also shows that learners' perception of the quality of online learning platform system will affect their intention to use [4]. Therefore, in the process of online learning, if learners perceive that the recording quality of the course video is high, the content of the course is reasonably organized, and the supporting materials of the course are complete, and can help learners learn, live or work, then learners' willingness to participate in learning will be strengthened. Based on this, this study proposes the research hypothesis: H1: expected performance has a positive impact on learners' willingness to learn.

Effort expectation refers to whether the online education platform and course content are easy to use or master. In the context of online education, efforts are expected to reflect the learners' difficulty in learning the learning system and curriculum. Previous studies have confirmed that self-efficacy and perceived ease of use can significantly affect users' intention to use online learning. Although self-efficacy and perceived ease of use are conceptually different from effort expectations, they can still be used to understand learners' perception of the difficulty of online learning systems and course learning tasks. In the process of using online learning, if learners perceive that the education platform is easy to operate and use, and the course content is easy to understand and master, then learners' learning confidence will be strengthened, and learners will be more willing to learn online courses. Based on this, this study proposes the research hypothesis: H2: effort expectation has a positive impact on learners' willingness to learn.

Social impact refers to the degree to which learners are aware of whether others think they should use online learning, which reflects whether learners use online education platform for learning will be affected by others or platform environment. Huang Geng confirmed through empirical research that social impact has a positive impact on the willingness to use OER. In the context of this study, learners' learning behavior of online courses is easily affected by the surrounding environment and other students [5]. When the surrounding environment and other students have a positive effect on online course learning, it will improve learners' learning willingness to a certain extent. In view of this, this study proposes the research hypothesis: H3: social impact has a positive impact on learners' willingness to learn.

Promotional conditions refer to the extent to which learners believe that the existing organizational and technical structure can support the use of online education platform, and the extent to which learners feel that online education platform constrains their own behavior. Zhang Haijing's research confirmed that the promotion conditions are the influencing factors of information technology acceptance under the network learning environment. In the context of this study, if objective conditions can support learners to carry out online learning activities easily and learners can use online education platform to learn without obstacles, then learners will have a higher willingness to learn

and tend to take more online learning behaviors. In view of this, this study proposes the research hypothesis: H4: facilitation conditions have a positive impact on learners' learning behavior.

3 Research Scheme Design and Data Analysis

3.1 Questionnaire Design and Variable Measurement

The variables involved in this study were measured using mature scales developed at home and abroad, with good reliability and validity. In order to ensure that the subjects can accurately understand the measurement items, the wording of the measurement items has been slightly modified in combination with the research scenario of this study. The questionnaire is divided into two parts. The first part is the measurement items of core variables, and the second part is the basic demographic information. The core variables include expected performance, effort performance, social impact, promotion conditions, learning willingness, and learning behavior. Among them, the measurement items of expected performance, effort performance, social impact and promotion conditions refer to the scale of Wang Qianyong's research, and the scale of Wenke's research on learning willingness and learning behavior is used for reference. The insignificant items are deleted, and finally form the quantitative data of the research. So the measurement items are all measured with Liket five-point scale.

3.2 Questionnaire Design and Variable Measurement

The survey object of this questionnaire is the learners who have registered for the National Higher Education Self-study Examination and have used the online education platform for online learning assistance. With the help of the professional questionnaire survey platform "Questionnaire Star", the online questionnaire survey is carried out. In the specific survey link and survey process, this study focuses on the control of the individual situation of the survey object to a certain extent. In this study, a total of 436 questionnaires were distributed and 436 were recovered. The consistency of 436 questionnaires was tested, and 39 invalid questionnaires were eliminated. Finally, 397 valid questionnaires were determined for this survey, with the effective rate of 91%. After statistical analysis of the effective questionnaires, the basic information of the respondents are shown in Table 1. It can be seen from Table 1 that among the 397 valid samples, there are 122 male learners, accounting for 31%; There are 275 female learners, accounting for 70%, indicating that more women participate in online learning; In terms of age distribution, the proportion of learners aged 19–29 years old is 70%, indicating that online learning learners are mainly young [6]. In terms of educational level, college graduates and undergraduate graduates mainly account for 36% and 30% respectively; In terms of major selection, 70% of learners choose humanities and social sciences major courses for study, while only 30% of learners choose natural science major courses for study, which shows that natural science majors do not attract more learners for various reasons.

Table 1. Descriptive statistics of respondents

Indicator category	Features	Frequency	Proportion%
Gender	Male	122	30.7
	Female	275	69.3
Age	Under 18	2	0.5
	19–29 years old	273	68.7
	30–39 years old	98	24.7
	Over 40	24	6.1
Grade	Freshman	19	4.8
	Sophomore	15	3.8
	Junior	21	5.3
	Junior college graduation	143	36
	Bachelor degree	114	28.7
	Undergraduate	26	6.5
	Other	59	14.9
Major	Social science	277	69.8
	Natural science	120	30.2

4   An Empirical Analysis of the Impact of Learners' Learning Behavior

4.1   Analysis and Test of Reliability and Validity of the Scale

This study analyzed the reliability of the questionnaire through SPSS, and the results showed that the Cronbach's values of H1 performance expectation, H2 effort expectation, H3 social impact, H4 promotion conditions, H5 learning willingness and learning behavior were 0.76–0.93, as shown in Table 2, all greater than 0.7, indicating that the sample survey had good reliability, and the scale and questionnaire used met the research requirements. At the same time, the KMO value of the overall data is 0.963, the approximate chi-square value of Bartlett's sphere test is 7654.231, the degree of freedom is 276, and the probability of significance is $p = 0.00 < 0.01$. The results show that there is a correlation between the questionnaire variables, and factor analysis can be performed.

4.2   Structural Equation Analysis

With the help of software Amos 20.0, this study builds a structural equation model based on the research hypothesis to verify the fitting degree of the model. The results are shown in Table 3. From Table 3, we can see that CMIN/DF is 3.255, RMSEA is 0.075, and RMR is 0.055, indicating that the actual sample data can be adapted to the hypothetical model. In addition, the GFI and RFI values in the hypothetical model are slightly less

Table 2. Cronbach's Alpha coefficient

Latent variable	Cronbach's Alpha	Item
Performance expectations	0.76	3
Strive for expectations	0.82	4
Social influence	0.89	5
Facilitating conditions	0.75	6
Willingness to learn	0.92	4
Learning behavior	0.93	4

Table 3. Model fitness test results

Statistical inspection index	Standards	Model	Fit
CMIN/DF	< 2	3.255	Accept
RMSEA	< 0.08	0.075	Good
RMR	< 0.05	0.055	Accept
GFI	< 0.08	0.848	Accept
AGFI	> 0.8	0.811	Accept
NFI	> 0.9	0.900	Accept
RFI	> 0.9	0.885	Accept
IFI	> 0.9	0.928	Good
TLI	> 0.9	0.918	Good
CFI	> 0.9	0.928	Good

than 0.9, and the NFI, IFI, TLI and CFI values are all greater than 0.9. These research results show that the overall fitting effect of the hypothetical model is good, and the fitness reaches an acceptable level.

4.3 Hypothesis Test

C.R. (Construction Reliability) is a method used to evaluate the comprehensive reliability, which is often better than any internal consistency reliability, and the standard is more than 0.7. S.E. (Standard error) is the standard error. The standard deviation of statistics is generally called the standard error. The estimation of regression coefficient is actually the mean estimation. This study examines the significance and path coefficient of the direct causal relationship between variables. The data analysis results of structural equation model are shown in Table 4. It can be seen from Table 4 that performance expectation (B = 0.754, P < 0.001), effort expectation (B = 0.471, P < 0.001) and social impact (B = 0.572, P < 0.001) have significant positive effects on willingness to learn, and the assumptions of H1, H2 and H3 are valid. Promotional conditions have a

Table 4. Test results of direct relationship between variables

hypothesis	Estimate	Std.Estimate	S.E.	C.R.	Conclusion
H1: willingness to learn ← performance expectation	0.431	0.755	0.088	4.420	Support
H2: willingness to learn ← expectation of effort	0.256	0.451	0.046	5.538	Support
H3: willingness to learn ← social response	0.408	0.529	0.095	4.325	Support
H4: learning behavior ← promotion conditions	0.498	0.491	0.087	5.712	Support
H5: learning behavior ← learning willingness	0.676	0.445	0.124	5.315	Support

significant positive effect on learning behavior (B = 0.492, P < 0.001). Assuming that H4 is tenable, learning intention has a significant positive effect on learning behavior (B = 0.448, P < 0.001), and H5 is tenable. The impact relationship between the four structural variables of the model used in this study is tested. The greater the path coefficient of each variable, the higher the importance in the causal relationship [7]. Since the path coefficients of performance expectation, effort expectation and social impact are 0.754, 0.471 and 0.572, respectively, it shows that the degree of influence of the three factors on learning willingness is in order of performance expectation, social impact and effort expectation [8]. The path coefficients of learning intention and promotion condition are 0.448 and 0.492 respectively, indicating that the degree of influence of the two factors on learning behavior is promotion condition and learning intention in turn.

5   Conclusions

This study constructs a learning behavior model based on the theoretical model of technology acceptance and use integration. It not only analyzes the influencing factors of learners' learning willingness on the online education platform, but also analyzes the influence of learning willingness and promotion conditions on learning behavior. This is of positive significance for deepening and expanding the research that affects learners' learning behavior [9]. The results show that learners' performance expectations, effort expectations and the surrounding learning environment have a positive and significant impact on learners' learning willingness, while learners' learning willingness and promotion conditions are the factors that affect learners' learning behavior.

Expected performance has a direct and significant positive impact on learners' willingness to learn. Performance expectations reflect the degree or expectation of learners to improve learning efficiency and enhance their own abilities by learning the course resources provided by online education platform and constantly internalizing course knowledge. The online education platform should provide learners with as much high-quality course content as possible, and provide corresponding learning materials to meet

their learning needs; In terms of curriculum content design, we should follow the needs of social development, work and life closely, and improve the teaching quality.

Effort expectation has a direct and significant positive impact on learners' willingness to learn. In the context of online education, learners need to complete certain learning tasks in addition to mastering the skills outside the learning platform system. Whether learners master the learning platform technology and complete the two tasks of course learning at the same time is a concrete manifestation of the difficulty of online education learning platform. Therefore, it is necessary for the online education platform to provide learners with skills training, learning operation manuals, and explanation or explanation of the difficulty of the course learning plan and content, which can effectively reduce learners' cognitive load, enhance learning confidence, and improve learning willingness.

Social impact has a direct and significant positive impact on learners' willingness to learn. Specifically, whether learners are willing to use online education platform for learning is affected by other learners and learning environment from online education platform. Therefore, the online education platform should be friendly enough in terms of function design and page, encourage learners to interact and communicate with each other through the online education platform, encourage learners to actively analyze learning experience and share success joy with others, create a good learning atmosphere, and enhance online learning willingness.

Promotional conditions have a direct and significant positive impact on learners' learning behavior. When various learning conditions are conducive to online learning activities, learners tend to adopt learning behaviors rather than evasive learning attitudes towards online courses. Convenient login learning methods can effectively improve learning willingness. The system configuration of online education platform should maintain the highest possible standard, provide servers with higher performance, improve the stability and response time of system operation, innovate convenient learning methods on PC and mobile APP, provide online answering and other functions, create favorable conditions for learners to carry out learning activities anytime and anywhere, stimulate learning interest and promote learning.

Learning intention has a direct and significant positive impact on learners' learning behavior. Specifically, if learners have a high willingness to learn, they will take positive learning behaviors, while if learners have a low willingness to learn, they are more likely to take behaviors such as avoiding learning or not learning [10]. Therefore, the online education platform should actively meet the various learning needs of learners. Continuously improve the service quality and teaching quality of the platform, create a positive learning atmosphere, and improve learner satisfaction. Through the improvement of curriculum design and system functions, more learning behaviors will be generated.

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