



# The influencing factors of college students' independent learning behavior under online education

Wenbin Xu

Anhui Vocational and Technical College, Hefei, Anhui, 230011, China

Email: xuwenbin1987@hotmail.com

**Abstract.** The COVID-19 has brought challenges to offline education, but it also brought new opportunities to online education. Based on the investigation of college students' online independent learning behavior, the path model of the influencing factors of college students' independent learning behavior was constructed by using SPSS22.0 and AMOS24.0 software, and the influence of perceived value, self-efficacy and learner expectation on independent learning behavior were analyzed. The results showed that perceived value had a direct effect on independent learning behavior, with a value of 0.259, and accounted for 19.94% of the total effect value. The total effect value of self-efficacy on independent learning behavior was 0.684, of which the direct effect was 0.521, indicated that it had the most significant effect on independent learning behavior, and it influenced independent learning behavior by the partial mediating effect of perceived value. Learner expectation had a direct promotion effect on independent learning behavior, and perceived value and self-efficacy played a mediating role in the influence of learner expectation on independent learning behavior.

**Keywords:** Online education; Independent learning behavior; self-efficacy; Perceived value; Learner expectation.

## 1 Introduction

The COVID-19 pandemic posed a huge challenge to the education systems worldwide, forcing many countries to provisionally close educational institutions and deliver courses fully online. Education administrative departments in many countries clearly proposed that teachers and students should rely on various digital education resource service systems such as online live class, MOOC and SPOC for high-quality teaching and learning. It could be seen that COVID-19 had further promoted the reform and development of online education, and also led students from passive learning to independent learning<sup>[1-3]</sup>.

A certain ability of independent learning behavior was required for online education; otherwise, the learning effect would not be ideal. Perceived value, as an internal motivation to stimulate students' learning behavior, was an important factor to guide and motivate college students' independent learning<sup>[4]</sup>. Generally, perceived value was

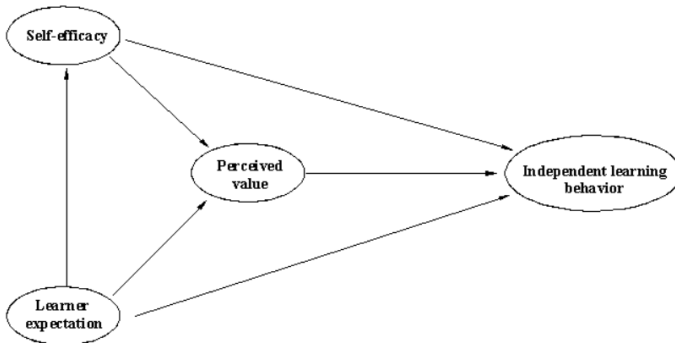
divided into internal motivation and external motivation, among which the internal motivation came from the pursuit and exploration of knowledge, while the external motivation came from the examination or job hunting<sup>[5]</sup>. Through a confirmatory factor analysis, the Online Learning Readiness Scale (OLRS) was validated in five dimensions: self-directed learning, motivation for learning, computer/Internet self-efficacy, learner control, and online communication self-efficacy. It was found that gender made no statistical differences in the five OLRs dimensions, but that higher grade (junior and senior) students exhibited significantly greater readiness in the dimensions of self-directed learning, online communication self-efficacy, motivation for learning, and learner control than did lower grade (freshman and sophomore) students<sup>[6]</sup>. Self-efficacy, as the core of the body's self-regulation system, would affect the control and regulation of individual behavior by cognitive process and motivational process<sup>[7-8]</sup>. The definition of self-efficacy was introduced based on the Ternary interaction theory of individual, behavior and expectation. Learners' subjective judgment on perceived value and learning behavior was affected by self-efficacy. Network self-efficacy was an extension and development of self-efficacy in the Internet expectation, which could evaluate and predict whether learners can successfully implement the network learning behavior<sup>[9-10]</sup>. With the development of information technology, network factors such as hardware and software resources were introduced into human learning expectation to improve the quality of learning, thus gave birth to a new type of network learning expectation. Network learning expectation and learners constituted an organic whole, with the functions of serving learning, guiding learning, motivating learning, so as to continuously guide learners to grow and progress<sup>[11]</sup>. The model of personal learning space was built based on the network expectation and it was concluded that the network learning space of college students had a positive impact on self-efficacy and learning performance by empirical analysis<sup>[12]</sup>.

There is a close relationship between perceived values, self-efficacy, learning expectation and independent learning behavior, but there are few related reports and researches. The relationship of perceived value, self-efficacy, learning expectation and independent learning behavior is analyzed by constructing structural equation model in this paper, so as to provide references for enriching the theoretical basis of online education and improve the ability of independent learning.

## 2 Research Models and Assumptions

According to the previous literatures, customer satisfaction theory and expectation confirmation theory, it was determined that the main variables of college students' independent learning behavior under online education were learner expectation, self-efficacy, perceived value and independent learning behavior. The basic theoretical model of college students' independent learning behavior under the network expectation was proposed, as shown in Fig.1. Perceived value was the direct source of motivation to produce learning behavior. The stronger the learner's perceived value was, the more active the self-learning behavior was. Self-efficacy was the degree of confidence that someone completed a certain work. The higher the self-efficacy was, the more

positive the self-learning behavior was. Meanwhile, both self-efficacy and learner expectation can cause learners to form perceived value, and then had an impact on the independent learning behavior. Therefore, the following assumptions were proposed. H1: Perceived value had a positive effect on college students' independent learning behavior; H2: Self-efficacy had a positive effect on college students' independent learning behavior; H3: Self-efficacy affected college students' independent learning behavior by perceived value; H4: Learner expectation had a positive effect on college students' independent learning behavior; H5: Learner expectation affected college students' independent learning behavior by perceived value; H6: Learner expectation affected college students' independent learning behavior by self-efficacy and perceived value.



**Fig. 1.** Path model of influencing factors of college students' independent learning

In order to detect each factor, the corresponding observation variables were determined through the induction and correction of relevant literature, and some observation variables were added, thus formed the research object of this paper, as shown in Table 1.

**Table 1.** Observation index and question items of each latent variable

Latent variables	Observation variables	Latent variables	Observation variables
Perceived value	Autonomous learning ability	Learner expectation	Learning efficiency
	Learning effectiveness		Learning resources
	Resource management capability		Learning effect
	Analytical ability		Learning strategy
	Self-evaluation ability		Learning atmosphere
Self-efficacy	General efficacy	Independent learning behavior	Set learning goals
	Learning efficacy		Implement learning plan
	Network efficacy		Grasp learning methods
	Social efficacy		Monitor learning process
	job hunting efficacy		Evaluate learning outcomes

### 3 Model Validation

The data of this paper were obtained by questionnaire survey, and students from Anhui vocational and technical college, Anhui vocational college of city management, Hefei university, City university of Hefei Anhui jianzhu university were selected as the research objects. The basic information of the research objects was shown in the Table 2. A total of 3000 questionnaires were sent out in this survey, and 2892 questionnaires were recovered. The collected questionnaires were screened according to certain criteria as follows: incomplete questionnaires and consistent answers to each option of the questionnaire were removed, and 2688 valid questionnaires were obtained.

**Table 2.** Basic information analysis

Information-1	Information-2	Quantity	Percentage
Gender	Male	1623	54.1
	Female	1377	45.9
	freshman	792	26.4
Grade	Sophomore	771	25.7
	Junior	738	24.6
	Senior	699	23.3

Survey content Likert five-level scale was designed according to the above 20 observation indicators. In order to verify the scientificity and reliability of the Likert scale and ensure the practical significance of the structural model, SPSS 22.0 was used to analyze the reliability and validity of the questionnaires, as shown in Table 3. The results show that the Cronbach's coefficients of the latent variables of perceived value, Self-efficacy, learner expectation and independent learning behavior all were greater than 0.700, indicated that the reliability of the latent variables was good. The factor load of each measurement item was greater than 0.5, the combined reliability (CR) was greater than 0.7, and the extracted mean variance (AVE) was greater than 0.5, indicated that the Likert scale had good convergence validity.

**Table 3.** Reliability and validity test of independent learning model

Latent variables	Measurement item	Factor load	CR	AVE	Cronbach's Alpha	Standardized Cronbach's Alpha
Perceived value	Autonomous learning ability	0.68	0.923	0.695	0.854	0.863
	Learning effectiveness	0.81				
	Resource management capability	0.89				
	Analytical ability	0.83				
	Self-evaluation ability	0.93				
Self-efficacy	General efficacy	0.88	0.904	0.634	0.798	0.799
	Learning efficacy	0.78				
	Network efficacy	0.75				
	Social efficacy	0.78				
	job hunting efficacy	0.83				
Learner	Learning efficiency	0.79	0.843	0.522	0.834	0.853

expectation	Learning resources	0.74				
	Learning effect	0.81				
	Learning strategy	0.70				
	Learning atmosphere	0.62				
Independent learning behavior	Set learning Goals	0.79				
	Implement learning plan	0.85				
	Grasp learning methods	0.89	0.941	0.710	0.896	0.899
	Monitor learning process	0.86				
	Evaluate learning outcomes	0.83				
Total	20	/	/	/	0.941	0.941

AMOS 24.0 was used to evaluate the fitting degree of the model, and the results were shown in Table 4. It could be seen from the table that the actual values of the fitting indexes all met the reference standard. Moreover, the structural equation model had a good path fit, as shown in Fig.2.

**Table 4.** Evaluation of fitting index of structural equation model

Fitting index	CMIN/D F	RMSE A	GFI	CFI	NFI	IFI	TLI
Fitting standard value	≤3.00	≤0.08	≥0.90	≥0.90	≥0.90	≥0.90	≥0.90
Revised model test values	2.241	0.060	0.922	0.972	0.938	0.966	0.963

The parameter estimation results of the structural equation model were shown in Table 5. The path coefficients among perceived value, self-efficacy, learner expectation and independent learning behavior were between 0.214 and 0.638, indicated that the relationship of variables had a correlation degree, and the absolute value of the critical ratio (C.R.) was greater than 1.96, reached the significance level of 0.05.

**Table 5.** Coefficient estimation of structural equation model

Influence paths	The value of Standardized parameter estimation	Non-standardized parameter estimation			
		Parameter estimates	standard error	Critical ratio	P values
Self-efficacy ←Learner expectation	0.638	0.621	0.068	9.635	***
Perceived value ←Self-efficacy	0.615	0.689	0.075	8.626	***
Perceived value ←Learner expectation	0.234	0.234	0.069	3.533	***
Independent learning behavior ←perceived value	0.265	0.275	0.072	4.234	***
Independent learning behavior ←Self-efficacy	0.521	0.640	0.091	7.184	***
Independent learning behavior ←Learner expectation	0.214	0.238	0.065	3.654	***

Notice:\*\*\*(P<0.001); \*\*(P<0.01); \*(P<0.05)

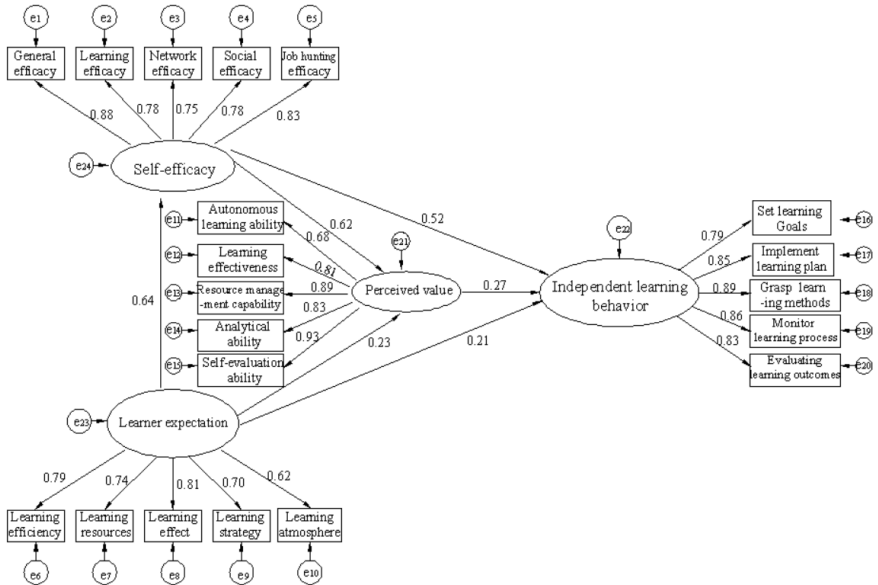


Fig. 2. Paths of structural equation model

#### 4 Effect Analysis of Influencing Factors

According to the analysis of the structure model of independent learning behavior, it could be seen that the independent learning behavior of college students was influenced by the perceived value, self-efficacy and learner expectation, and there were both direct effects and mediating effects among the variables. The effect of each structural factor was analyzed in this research, and the results were shown in Table 6. Perceived value had a direct effect on independent learning behavior, with a value of 0.259, and accounted for 19.94% of the total effect value, thus, the research hypothesis H1 was confirmed. It showed that the perceived value of learners, such as autonomous learning ability, learning effectiveness, resource management capability, analytical ability and self-evaluation ability, were important for college students to form independent learning behavior. The total effect value of Self-efficacy on independent learning behavior was 0.684, of which the direct effect was 0.521, and accounted for 39.20% of the total effect value, thus, the hypothesis H2 was confirmed. The indirect effect value of self-efficacy on independent learning behavior through perceived value was 0.163, and accounted for 12.27% of the total effect value, thus, the hypothesis H3 was proved, indicated that college students' confidence in their own abilities could promote them to trigger their perceived value and form independent learning behavior. The total effect value of learner expectation on independent learning behavior was 0.380, of which the direct effect value was 0.214, and accounted for 16.10% of the total effect value, therefore, the hypothesis H4 was confirmed. It was proved that online learning resources, software and hardware support for learning, learning strategy and learning

atmosphere had important effects on independent learning behavior. The indirect effect of learner expectation on independent learning behavior by perceived value was 0.062, and only accounted for 4.56% of the total effect value, which indicated that perceived value had a mediating effect, but not a leading role. The indirect effect of learner expectation on independent learning behavior by self-efficacy and perceived value was 0.104, and accounted for 7.83% of the total effect value, therefore, the hypothesis H6 was confirmed, indicated that a good learner expectation would promote college students to improve self-efficacy, perceived value, and motivate learners to actively invest in independent learning behavior.

**Table 6.** Effects of influencing factors of independent learning behavior

influence factors	Research hypothesis	Standardized effect value	Total effect value	Percent-age	Total Percentage
Perceived value	H1: Perceived value→Independent learning behavior	0.265	0.265	19.94	19.94
	H2: Self- efficacy→Independent learning behavior	0.521	0.684	39.20	51.47
Self-efficacy	H3: Self-efficacy→Learning motivation → Independent learning behavior	0.163		12.27	
	Learner expectation	H4: Learner expectation→Independent learning behavior			16.10
H5: Learner expectation→Perceived value→Independent learning behavior		0.214			
H6: Learner expectation→Self-efficacy→perceived value→Independent learning behavior		0.062	0.380	4.56	28.59
		0.104		7.83	
Total effect of influencing factors of independent learning behavior		--	1.329	--	100%

## 5 Conclusions

The structural equation model of college students' independent learning behavior was constructed based on large sample survey data. The relationship between perceived value, self-efficacy, learner expectation and independent learning of college students was analyzed. The results showed that the structural elements had different effects on independent learning behavior.

Self-efficacy was the most important factor affecting college students' independent learning behavior, and it could also indirectly affect independent learning by perceived value. If learners had a clear understanding of their own abilities, they would set a learning plan according to the learning objectives, adopt appropriate learning methods, monitor the learning process and evaluate the learning effect, so as to achieve the purpose of acquiring new knowledge. Learners with high self-efficacy needed external

proof from various aspects to recognize their own ability, which would stimulate their perceived value and take various learning behaviors to achieve learning goals.

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## Declarations

We declare that we do not have any commercial or associative interest that represented a conflict of interest in connection with the submitted manuscript. All data generated or analyzed during this research are included in this submitted manuscript. There are no ethical issues involved in my research. All the human participants involved in this study agree to participate in this study, and the investigation and research process will not cause any harm to the participants.

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