

PAPER

A Research into Factors that Influence College Students' Enthusiasm for Learning in an Online Learning Environment

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ABSTRACT

Institutions of higher learning in China actively promote the deep integration of information technology (IT) with education and teaching by using big data technology to collect and analyze data on education and teaching activities as well as students' behaviors, to provide feedback. The objective is to support and promote personalized learning and targeted teaching in the online learning environment. The data on students' learning effectiveness are collected timely and accurately during online teaching. Based on these data, teaching and learning activities are adjusted periodically to enhance the learning enthusiasm of college students and further achieve the goal of high-quality online teaching. In this study, an influencing factor index system for college students' learning enthusiasm in the online learning environment was established based on existing literature. The relationships of learning enthusiasm with learning needs, motivation, attitude, and interest were measured through structural equation modeling. Next, the hierarchy of 17 factors influencing college students' learning enthusiasm was analyzed using interpretive structural modeling. The results reveal that the influencing factor index system for college students' learning enthusiasm in the online learning environment is highly scientific and reasonable. Learning needs, motivation, and attitude have an evident promoting effect on learning enthusiasm. Four factors, namely, numbered B5, C4, D1, and D3, are the direct factors affecting learning enthusiasm. Moreover, three factors, namely, numbered A4, B3, and C3, are the fundamental reasons that affect learning enthusiasm. The research results have significant reference values in identifying the causes of the change in learning enthusiasm induced by the online learning environment and proposing pertinent measures to enhance college students' learning enthusiasm.

KEYWORDS

structural equation modeling (SEM), interpretive structural modeling (ISM), online learning environment, college students, learning enthusiasm

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1 INTRODUCTION

China has ushered in the era of the national network. With the lightweight development and multi-functionalization of related electronic equipment, the number of Internet users in China is increasing annually. The development mode of education has entered a period of transformation from traditional to smart education. The new era represents new opportunities and challenges. Thus, opportunities should be grasped to effectively apply information technology to teaching management and scientific research, and online education and learning resources must be developed. The development concepts of "Internet + Education" and highly intelligent online education systems have been introduced one after another. Moreover, the online learning model has been recognized by learners. Thus, schools should keep up with the trend of the times, provide an online teaching environment and resources, and enhance the vitality of the times for online teaching. Under the big background of educational informatization and vigorous national support, transforming the traditional teaching mode to wisdom teaching is an irresistible trend. The recommendation of personalized learning resources enables students to avoid wasting time, find suitable learning resources quickly, meet learning needs, form learning habits, and obtain a better learning experience. With the prosperity and development of the online education industry, online learning platforms have become widely used. In addition, the number of online learning resources has soared, with several resources covering an increasingly wider range of fields. On the one hand, online learning platforms bring convenience to learners by allowing them to easily find the courses they want to study through the Internet, which not only brings them additional learning opportunities but also exposes some problems. As online learning methods are introduced at present, students have many learning resources to choose from. Undoubtedly, these platforms not only provide learners with additional choices but also bring several troubles. Faced with many learning resources, finding the resources they want quickly is difficult for learners, which not only wastes their time but also gives them a poor learning experience. Therefore, the active learning of college students in the online learning environment has become an important issue to be further considered.

Thus, "individuals learn proactively," and learning enthusiasm is a very extensive concept. Generally, learning enthusiasm is a teaching concept instead of a single learning concept. Active learning advocates for students to actively participate in the learning process through instructive teaching methods in a student-centered way. Learning enthusiasm emphasizes students' subjective initiative and also values the teaching and guiding role of teachers. Learning enthusiasm should include two aspects: "students learn voluntarily and actively" and "teachers should promote students' active learning by building a good learning environment and implementing teaching". These aspects will help to improve students' learning enthusiasm to some extent. The corresponding countermeasures and suggestions are specific to each influencing factor and can be given by systematically grasping the evaluation results of the change in college students' learning enthusiasm and its influencing factors. In addition, efforts should be made to cultivate the active learning psychology, positive learning state, and strong learning adaptability of college students; keep steady growth of their learning enthusiasm; and facilitate them to proactively learn new knowledge and migrate it to other scenarios. This case can deepen the knowledge exchange in online learning, enhance learners' deep understanding of course content, and exercise their critical thinking ability, thereby stimulating learners to realize effective online learning.

2 LITERATURE REVIEW

The COVID-19 outbreak has made online learning a rigid demand. Hence, online learning has become one of the most important ways for learners to carry out learning activities and establish interaction and collaboration to build knowledge. Owing to the spatial-temporal separation of online learning and the lack of face-to-face teacher-student and student-student communication and interaction, the enthusiasm for online learning has evident individual differences. This case affects the efficiency of online learning. Therefore, analyzing learners' learning enthusiasm in the online environment remains one of the problems to be solved urgently in online learning. With regard to the research literature on the influencing factors of learning enthusiasm, Oblinger [1] thought that information technology has a significant impact on learners and learning and that highly advanced information technology can encourage individuals to use technology and teaching methods to promote learning enthusiasm. Palmer et al. [2] deemed that project-based learning is a well-known method of engineering design education, and learners' learning enthusiasm can be enhanced by the personalized marking of highly complex group work activities. Burgess et al. [3] summarized the current literature on the effectiveness of distance learning methods from the perspectives of employees' reactions, learning, behavior, and organizational results.

Ravenscroft et al. [4] investigated a large-scale teacher-level curriculum redesign project and found that students' enthusiasm for the learning process will be highly evident under the mixed teaching mode. Jopp [5] proved that authentic assessment may improve students' participation, deepen their understanding, improve their creativity, and reduce plagiarism. Mooney et al. [6] held that the learning enthusiasm of learners can be improved by establishing a community-based learning hierarchy. McGill et al. [7] investigated the learning enthusiasm conditions for continuing e-learning activities with universities. The author considered that factors such as educational institutions, developers, teachers, students, and technical issues are correlated with learners' learning enthusiasm. Hargis et al. [8] introduced teachers' views on the iPad's deployment in colleges and universities nationwide within the first month. The results showed that the large-scale deployment of iPad mobile learning devices is related to teachers' high participation in formal and informal professional development activities and the active use of student-centered teaching methods. Akiva et al. [9] found that the knowledge-sharing mode and project incentive structure need to be changed to realize the supporting community of cross-project learning and development. Schechter et al. [10] thought that the demands of the structured learning environment affect, to some extent, the learners' learning enthusiasm. Samusenkov et al. [11] analyzed the influence of typical autonomous learning modes on learners' learning enthusiasm. Sun [12] thought that students could improve their interest in college English reading and writing, improve their initiative in writing, and strengthen their ability to identify mistakes and appreciate English articles through the exchange of reading and evaluation. Qin et al. [13] discussed the satisfaction and willingness to continue using online teaching closely related to college students' enthusiasm for online learning according to a large-scale online teaching survey and found that variables such as perceived usefulness, perceived ease of use, and external environment were related to online teaching satisfaction and willingness to continue using online teaching. Jiang et al. [14] found that teaching significantly affects students' scientific achievements, and this influence is completely mediated by students' learning enthusiasm. Shia et al. [15] pointed out that problem-based learning has a positive impact on students' learning enthusiasm, making it a popular learning method.

Generally speaking, the concept of learning enthusiasm has rarely been investigated in China and abroad. In addition, in most existing studies, the connotation of learning enthusiasm has been just mentioned lightly, so the concept of learning enthusiasm remains unclear. Based on the interpretation of the concept of learning enthusiasm by scholars at home and abroad, college students' learning enthusiasm is defined in this research as their positive psychological traits in learning psychology and learning behavior during learning activities. Students can be further stimulated to acquire knowledge consciously and actively by using structural equation modeling (SEM) and interpretive structural modeling (ISM) models to analyze the influencing factors of college students' learning enthusiasm in the online learning environment. Moreover, the factors that affect their initiative in the process of learning professional knowledge can be eliminated, helping college students master highly scientific learning methods and change from passively accepting knowledge in the past to actively learning and exploring the rules of professional knowledge, and changing their online learning status.

3 METHODOLOGY

3.1 Model introduction

Structural equation modeling establishes a structural equation that reflects the causal relationship between observable and latent variables. The equation consists of two parts: the measurement equation and the structural equation model. The measurement equation and structural equation can be expressed as in (1) and (2).

$$X = \Lambda_x \xi + \delta, Y = \Lambda_y \eta + \varepsilon \quad (1)$$

$$\eta = \gamma \xi + \beta \eta + \zeta \quad (2)$$

In (1) and (2), X represents a vector consisting of exogenous indexes. Y stands for a vector consisting of endogenous indexes. δ and ε are the measurement errors of X and Y , respectively. Λ_x denotes the relationship between index Y and latent variable ξ . Λ_y characterizes the relationship between index Y and latent variable η . ξ is an exogenous latent variable. η is an endogenous latent variable. γ and β denote the structural coefficient matrices regarding the mutual influence between exogenous latent variable ξ and endogenous latent variable η , respectively. ζ is a residual term.

Meanwhile, ISM is a mature operation method, which mainly analyzes the influencing factors of the research object from the qualitative aspect and obtains the corresponding results with the help of computer operations. The ISM model mainly includes three major steps.

The first step involves construction of the system factor table. The factors of the studied system are collected and processed to establish a detailed statement S of system factors, as shown in (3).

$$S = \{S_1, S_2, S_3, \dots, S_n\} \quad (3)$$

$\{S_1, S_2, S_3, \dots, S_n\}$ represents the n factors of the system.

Then, an adjacency matrix A is generated, as shown in (4).

$$A = (a_{ij})_{n \times n} \quad (4)$$

In (4), if S_i has a direct influence on S_j , then the value of a_{ij} is 1. If not, then the value of a_{ij} is 0. The reachability matrix M is then continuously calculated, which is generated by the adjacency matrix iteratively and calculated following the Boolean operation rule, shown as (5).

$$M = (A + I)^r \quad (5)$$

In (5), I is the unit matrix of the same order as A , hence, r needs to be calculated in one step according to Eq. (6).

$$(A + I) \neq (A + I)^2 \neq (A + I)^3 \neq \dots \neq (A + I)^r = (A + I)^{r+1} \quad (6)$$

Then, the system factors are continuously divided into three different regions, namely, reachability, antecedent, and common sets. The reachability set $R(S_i)$ refers to the set of all system factors affected by the factor S_i . The antecedent set $A(S_i)$ indicates the set of factors that affect the factor S_i in the system. The common set $C(S_i)$ is the intersection of the reachability and antecedent sets, as shown in Eq. (7).

$$C(S_i) = R(S_i) \cap A(S_i) \quad (7)$$

Next, levels are divided. Specifically, the system factors are divided into different levels, and the level of each factor is determined. To begin with, the first-layer factors of the set are found. When $C(S_i) = R(S_i)$, S_i is determined as the first-layer factor. The first-layer factors are then removed, and the levels of the remaining factors are solved by parity of reasoning until the levels of all factors are determined. The factor set at each layer is expressed by L_1, L_2, \dots, L_l in a descending order, where L_1 represents the top layer. According to the results of level division and the mutual influence of factors in the adjacency and reachability matrices, the factors are distributed from the upper to lower layer and connected with arrows; the bypassing connection between factors is removed, and the hierarchical structural relationship between them is embodied.

3.2 Data source

In the SEM model, Daskalovska et al. [16], Duta et al. [17], and Krapp [18] believed that learning enthusiasm includes many psychological components, among which the most basic care learning needs, motivation, attitude, and interest. Learning enthusiasm is subject to many factors, with which students' learning enthusiasm changes greatly, so this is a dynamic psychological structure. According to the research conclusions of the existing research literature, a total of four measurement questions (numbered A1, A2, A3, and A4) were set for learning needs, five (B1, B2, B3, B4, and B5) for learning motivation, four (C1, C2, C3, and C4) for learning attitude, and four (D1, D2, D3, and D4) for learning interest. In addition, four measurement questions (Y1, Y2, Y3, and Y4) were set for the learning initiative, according to Palmer (2011). Undergraduate students from eight universities in Zhejiang Province, Shanghai Province, Jiangsu Province, and Shandong Province were invited to conduct a questionnaire survey. In the autumn semester of 2022–2023, the author's research group went to these eight universities to distribute paper questionnaires, and 3368 questionnaires were collected. After eliminating invalid questionnaires, 2835 valid questionnaires were obtained. Each variable was depicted using the dimensions in Likert's seven-point scale, which were divided through the personal experiences of

such undergraduates. According to the investigation intention of undergraduates, the questions doubted by any undergraduate were explained to smoothly complete the questionnaire survey and data collection.

In the ISM model, eight senior professors from these eight universities (one professor from each university) were invited to hold an offline meeting. Four, five, four, and four measurement questions in the four aspects—learning needs, motivation, attitude, and interest—were set, respectively, with a total of 17 influencing factors for the eight professors to discuss. Based on their own experience and knowledge, the eight professors fully agreed with the system factors set out by the author after discussion. After three rounds of discussion, they scored the proposed factor set and judged the relationship among the factors. Those showing a direct relationship were given a score of “1,” and those without any direct relationship were given a score of “0.” Moreover, the original adjacent matrix of the ISM model in this research was obtained.

Table 1. Influencing factor set of learning enthusiasm

Variable Name	Index Number	Specific Measurement Content
Learning need	A1	Want to grasp the knowledge learned and use it to analyze specific problems
	A2	Eager to get the affirmation and praise of others, learning will be more voluntary
	A3	Face the risk of learning failure, but will actively respond and correct
	A4	Teachers will give appropriate guidance and help to students whose curiosity is not stable enough
Learning motivation	B1	Do you pay attention to the teacher in class and answer questions actively
	B2	Can you complete the task and hand in the homework on time?
	B3	Whether to participate in extracurricular learning activities, whether to feel happy and enthusiastic in the learning process
	B4	Can you keep working hard without rewards or supervision?
	B5	Can you learn consciously and actively and not give up difficult problems easily?
Learning attitude	C1	Believes that learning is important and will actively interact with teachers in the classroom
	C2	Understand the importance of learning and understand the meaning of learning
	C3	Enthusiasm for learning, with strong will quality
	C4	Being able to actively overcome difficulties or various other distractions
Learning interest	D1	A high degree of confidence in one's academic competence
	D2	explore and practice the relevant content of this discipline consciously and actively
	D3	Maintains strong appeal and motivation for courses that require practice or hands-on
	D4	Maintain concentration and reduce learning fatigue
Learning enthusiasm	Y1	Do you feel happy in the learning process
	Y2	Satisfied with the course design and learning results
	Y3	Satisfied with teamwork in learning
	Y4	Active learning is to increase knowledge and skills

4 RESULTS

4.1 Structural equation modeling results

Table 2 shows that all the common indexes met the judgment criteria, indicating an excellent fitting effect of the SEM model established in this research.

Table 2. Common indexes of SEM model fitting

Common Index	χ^2/df	RMSEA	CFI	NFI	NNFI
Judging standard	<3	<0.08	>0.9	>0.9	>0.9
Value	2.312	0.075	0.943	0.904	0.933

Table 3. Summary of model regression coefficients

Independent Variable	→	Dependent Variable	Normalized Regression Coefficient	SE	z (CR Value)	p
Learning need	→	Learning enthusiasm	0.243	0.146	3.035	0.002
Learning motivation	→	Learning enthusiasm	0.308	0.111	3.928	0.000
Learning attitude	→	Learning enthusiasm	0.119	0.064	1.813	0.070
Learning interest	→	Learning enthusiasm	0.076	0.096	1.095	0.274

Table 3 shows the following:

- (1) Learning needs play a very evident role in promoting learning enthusiasm. The main reason is that learning needs can be expressed as the distance between learners' current learning level and their expected level, which is the subjective embodiment of the objective needs for their learning by the social living environment and education in learners' minds. Psychological research proves that learning needs are the basic needs that people are born with. The objective social living environment is the source of students' learning needs. Of course, the differences between the times and the objective environment in which students live have different needs for them. Moreover, the values, attitudes toward life, and hobbies vary from student to student, so their learning needs show significant individual differences from content to level. Learning needs are mainly manifested by the needs of cognition and self-improvement. Cognitive needs mean that students want to master what they have learned and use the knowledge to analyze and solve related problems. Some college students have a strong desire for knowledge, but most of them are unstable, and individual differences among different subjects are apparent. If teachers can provide students with an unstable thirst for knowledge, appropriate guidance, and help so that they can feel happy in their studies, then the thirst for knowledge will be their internal motivation. The need for self-improvement, which differs from the cognitive need, regards the learning enthusiasm gained in learning as a tool in a higher position.
- (2) Learning motivation can promote enthusiasm learning. Learning motivation is the internal psychological motivation that drives students to engage in, maintain, and promote learning activities to achieve a certain goal. According to the source of learning motivation, learning motivation can be divided into

direct and indirect motivation. Direct motivation mostly comes from students' interest in what they have learned or learning results, whereas indirect motivation is related to the learning purpose, significance, and individual future. The former is easily influenced by the environment or some accidental factors, whereas the latter is stable and lasting. In students' learning processes, learning motivation greatly promotes the development of learning activities, which directly affects students' enthusiasm for learning. By observing these phenomena, teachers can know students' learning motivation comprehensively. Then, teachers can arouse the correct learning motivations of students, fully mobilize their enthusiasm, and improve the learning effect through different forms of education.

- (3) Learning attitude has a very evident promoting effect on learning enthusiasm. Generally speaking, learning attitude refers to a positive or negative attitude formed by students' differences in learning views or learning experiences. After formation, the learning attitude always lasts for a period, so it is relatively stable. Learning attitudes include three psychological components: cognition, emotion, and behavior. A good learning attitude is important for students to have enthusiasm for the learning process. If a student has a good learning attitude, then they must know the importance and significance of learning, have clear goals, a keen interest in learning, and a strong desire for knowledge. In addition, the student is able to constantly experience happy emotions in learning, is serious about learning, diligent and studious, down-to-earth, fully devoted to learning, and passionate about learning with a tenacious will. Moreover, the student is able to actively overcome difficulties or other distractions when learning and persist in completing the determined learning tasks or goals.
- (4) Learning interest can promote learning enthusiasm, but insignificantly. This conclusion seems different from the existing research literature, but the potential reasons can be dug up through deep thinking. Several research documents prove that learning interest, as one of the most practical and positive psychological components of learning enthusiasm, is an effective catalyst to promote learning activities. For students, a strong interest in learning can keep their concentration, reduce their fatigue during learning, improve their learning efficiency, and facilitate them in achieving better learning results. However, students are not highly immersed in learning when studying online without face-to-face communication. When college students have a strong interest in a course, with the extension of online teaching time, their interest in learning may be further attenuated, resulting in a decline in their learning interest and a failure to maintain a high level of learning enthusiasm. Learning interest has a strong attraction and impetus for students' online learning but often lacks persistence. This conclusion also encourages Chinese university professors to use different teaching methods (project-based teaching, game teaching methods, VR simulation teaching, etc.) and other combinations to improve the attraction of online courses and keep college students' interest in online courses for as long as possible.

4.2 Interpretive structural modeling results

Based on (3)–(7), Table 4 is generated by MATLAB programming. A schematic diagram of hierarchical relations is created to intuitively understand the hierarchical connections among different influencing factors, as depicted in Figure 1.

Table 4. Reachability set and antecedent set and their intersection

	Reachable Set R	Antecedent Set Q	Intersection $A = R \cap Q$
A1	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
A2	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
A3	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
A4	1,2,3,4,5,6,8,9,10,11,13,14,15,16,17	4	4
B1	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
B2	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
B3	1,2,3,5,6,7,8,9,10,11,13,14,15,16,17	7	7
B4	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
B5	9	1,2,3,4,5,6,7,8,9,10,11,12,15,17	9
C1	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
C2	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
C3	1,2,3,5,6,8,9,10,11,12,13,14,15,16,17	12	12
C4	13	1,2,3,4,5,6,7,8,10,11,12,13,15,17	13
D1	14	1,2,3,4,5,6,7,8,10,11,12,14,15,17	14
D2	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17
D3	16	1,2,3,4,5,6,7,8,10,11,12,15,16,17	16
D4	1,2,3,5,6,8,9,10,11,13,14,15,16,17	1,2,3,4,5,6,7,8,10,11,12,15,17	1,2,3,5,6,8,10,11,15,17

Note: The number represents a factor, for example, 2 represents the second factor.

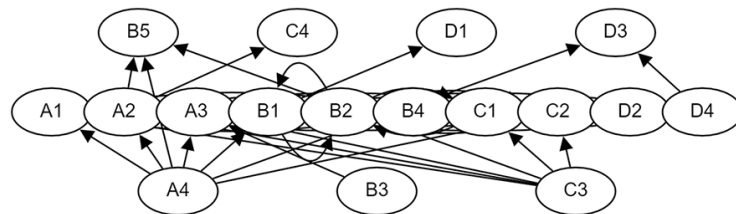


Fig. 1. Reachability set and antecedent set and their intersection

Figure 1 shows the following:

- (1) The top layer indicates the ultimate goal of the system, and each of the lower layers indicates the reason for the previous layer. Among them, the direct reasons influencing learning initiative are whether students can learn consciously and proactively and not give up difficult problems easily (B5), be able to proactively overcome difficulties or other distractions (C4), have high confidence in their learning competence (D1), and keep strong attraction and impetus for courses needing manual operations (D3). The four factors reflect that learners should adopt more proactive learning styles and construct knowledge through online learning. Considering the lack of face-to-face teaching in online learning, a more proactive process of meaning construction and social interaction is required. Students cannot simply put knowledge and experience into their minds directly and mechanically through teaching activities. However, instead,

constant communication and interaction between teachers and students are required in the actual teaching process. In addition, students can be guided by teachers so that they can effectively use their original cognitive basis and complete the construction of new knowledge.

- (2) The bottom layer represents the initial reason in the system, and each of the upper layers displays the results of the next layer. Among them, teachers can give appropriate guidance and help to students with an unstable thirst for knowledge (A4). Whether students participate in extracurricular learning activities and whether they are happy and enthusiastic in the learning process (B3) and whether they are full of enthusiasm for learning with tenacious will (C3) are the fundamental reasons that affect their learning enthusiasm. These three factors show that learners' learning enthusiasm in online learning needs teachers' perfect teaching guidance and learners' learning enthusiasm and persistence. These three aspects are closely related to the theory of self-efficacy. If a person can foresee that their actions will bring an achievable positive result, then they will stick to their actions. When they are sure about a certain ability, they will have a high level of self-efficacy and actively implement this behavior in combination with reality. After students gain certain knowledge capabilities, the influence related to self-efficacy becomes the decisive factor for learning behaviors. Therefore, these three aspects also fully explain that teachers need to consider additional factors that are highly correlated with learners' self-efficacy in online learning.

5 CONCLUSIONS

The concept of "Internet + Education" and the emergence of highly intelligent online education systems have been successfully introduced, leading to the recognition of the online learning mode by learners. Hence, universities should keep up with the trend of the times and provide online teaching environments and resources to enhance the vitality of online teaching and the times. However, online learning has some special conditions, such as home isolation and cross-media discomfort, which reduce the effectiveness of teacher-student and student-student interactions. This leads to learners' low learning enthusiasm and seriously affects the efficiency and effect of online learning. In this research, the relationships of learning enthusiasm with four aspects—learning needs, motivation, attitude, and interest—were measured through the SEM method. The hierarchy of 17 factors influencing college students' learning enthusiasm was also analyzed through ISM. The results show that learning needs, motivation, and attitude have evident promoting effects on learning enthusiasm; four factors, numbered B5, C4, D1, and D3, are the direct reasons that affect learning enthusiasm; and three factors, numbered A4, B3, and C3, are the fundamental reasons that affect learning enthusiasm. The influencing factors of college students' learning enthusiasm in the online learning environment can be systematically mined by combining SEM and ISM models. The scope of survey objects can be continuously expanded, the diversified teaching methods mobilizing classroom enthusiasm can be adopted for effect evaluation, and the new-type teaching models can be integrated to enhance college students' learning enthusiasm for specialized courses.

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