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Research on the Influencing Factors and Mechanisms of College Students' Online Learning Behavior in Newly-Established Local Undergraduate Institutions in Hebei Province

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Abstract

To explore the influencing factors and mechanisms of college students' online learning behavior in newly-established local undergraduate institutions in Hebei Province, this study revised relevant scales and conducted pre-surveys and formal surveys among students from five universities. Using SPSS and Mplus softwares, the study examined the influencing factors and mechanisms of college students' online learning behavior in these institutions. The results revealed that teacher-student trust and student agency played mediating roles in the relationship between learning-oriented teachers and college students' online learning behavior. Additionally, teacher-student trust and student agency jointly served as a chain mediating effect in the relationship between learning-oriented teachers and college students' online learning behavior. The study constructed and tested a model of the mechanism by which learning-oriented teachers influence college students' online learning behavior through teacher-student trust and student agency, and provided suggestions for the management of college students' online learning education.

Key Words: College students' online learning behavior, teacher-student trust, student initiative, mechanisms of action.

I. Introduction

In recent years, massive open online courses have gained momentum in domestic and international universities, leading to a continuous rise in online learning [1]. The "National Medium- and Long-Term Education Reform and Development Plan (2010-2020)" clearly states that "information technology has a revolutionary impact on educational development and must be highly valued." The informatization construction of higher education institutions has entered the "Internet Plus" phase. To achieve "Internet Plus

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Education," it is necessary to engage in comprehensive thinking and planning, promote campus governance with an Internet mindset, advance the modernization of educational management, and drive innovation and transformation in higher education teaching.

Local newly established undergraduate colleges are formed by upgrading or merging one or several vocational colleges. These institutions usually have distinct local characteristics and are designed to cultivate locally needed practical talents based on the economic development characteristics of the region. In Hebei Province, there are a total of 61 undergraduate colleges, with 41 of them being newly established local undergraduate colleges. It is evident that these newly established local undergraduate colleges have become an important part of China's higher education system. However, compared to mature higher education institutions, these schools still face certain gaps in terms of educational experience and student management. Therefore, it is crucial to address the pressing issue of how to build an effective online learning environment, provide online learning support, and enhance the efficiency of online learning. In light of this, this study employs qualitative and quantitative research methods to uncover the influencing factors and mechanisms of college students' online learning behavior, aiming to provide empirical foundations for research on college students' online learning behavior.

II. Literature Review

（I）Research Status

Using keywords such as "online learning" or "online learning behavior," a literature search was conducted to retrieve relevant publications from the past decade. The recent literature related to "online learning behavior" can be categorized into four main sections: connotations, characteristics, influencing factors, and models.

1. Connotations of Online Learning Behavior

Dr. Peng Wenhui and his colleagues have defined "online learning behavior" as the remote teaching activities conducted by the learning subject in the environment established by today's Internet technology, which involves a new interactive system and encompasses a vast amount of learning resources [2]. Among numerous related studies, the authoritative definition has been summed up by Dr. Peng Wenhui's related research. According to his research, online learning behavior is a bidirectional interactive process between learners, aiming at achieve a certain goal, and the external environment that occurs in the background established by today's Internet technology, which includes a new interactive system and encompasses a vast amount of learning resources. The control of online learning activities is subjectively conducted by the learning subject and is often

influenced by the psychological, physiological conditions of the knowledge recipient, and external factors. Online learning behavior exhibits characteristics of high skill, specialization, virtuality, autonomy, and globalization.

2. Characteristics of Online Learning Behavior

Regarding the characteristics of online learning behavior, scholars have placed particular emphasis on the distinct features of online education compared to traditional educational models. Scholars like Zhao Hong et al. have focused on the psychological regulation, skill development, and learning patterns demonstrated by online learners. They often conduct empirical research by selecting random samples to analyze various characteristics manifested in the aforementioned aspects and summarize their findings.[3]Through comparative analysis and behavioral summaries, scholars gain insights into the demands of both developers and users, providing valuable references for further improving technology and services to enhance the learning experience and effectiveness of online learners.

3. Factors influencing online learning behavior

Through literature review and synthesis, it has been found that factors influencing online learning behavior can be categorized into two types: internal factors related to the learners themselves, and external factors resulting from external changes. Internal factors include attitudes, strategies, satisfaction, behavioral persistence, and psychological regulation. External factors encompass technological support, constraints related to time and space, and the ease of operating the online learning system.

4. Models of online learning behavior

Representative models include: Dr. Peng Wenhui's model, based on the theory of reasoned action, which establishes a model with nine latent factor variables. The model was developed through a survey distributed to students from multiple universities, and it concludes that "planned behavior has a positive influence on students' online learning behavior, instrumental orientation significantly affects students' online learning behavior, students' online learning behavior in fact manifests as skill-based learning, and the development and design of online learning tools and resources have a significant impact on students' online learning behavior"[4].Scholar Zhou Yan and others, based on the reference and analysis of the Theory of Reasoned Action (TRA) and the Technology Acceptance Model (TAM), independently established a model of online learning behavior. The analysis yields conclusions such as "the usability and availability of online learning tools and resources significantly affect students' attitudes and satisfaction toward online learning, the strength of learning motivation and self-efficacy significantly influence students'

willingness to engage in online learning, and students' inclination towards online learning is a manifestation influenced by both their own psychological factors and external environmental conditions"[5].

(II) Research Review

Research on college students' online learning behavior has shown a trend of interdisciplinary integration. As a cross-disciplinary topic, this research has attracted the attention of scholars from various disciplines, including anthropology, management, education, psychology, and others. It has also led to the emergence of studies with similar themes, such as "study adaptation in online learning spaces,""effective learning behavior of students in online learning environments,""factors influencing student engagement in online learning spaces," and "interactive behaviors." The diverse theoretical foundations and research perspectives from different disciplines continuously enrich the study of college students' online learning behavior, providing a strong theoretical basis and research inspiration for this study.

Regarding the influencing factors, most studies indicate that support, innovation, teaching behaviors of instructors, trust between instructors and students, and an organizational culture that encourages openness and experimentation have a positive impact on college students' online learning behavior. Although there is limited research directly targeting students from newly established local undergraduate institutions, the research findings and methodologies provide valuable references for this study.

III. Research Design

(I) Factors Influencing Study

This study initially conducted in-depth interviews with 32 students and teachers from local undergraduate colleges in Hebei Province. The data collected from the interviews were processed using open coding, axial coding, and selective coding methods to explore the structure of school teachers, teacher-student trust, and student initiative that influence college students' online learning behavior.

Based on the three-level coding of the interview data, this study identified the specific components of college students' online learning, including learning-oriented teachers, student initiative, and teacher-student trust. Learning-oriented teachers were categorized into teacher expertise, cognitive support, autonomy support, and emotional support. Student initiative encompassed learning attitude, information literacy, learning strategies, and learning motivation. Teacher-student trust included cognition-based trust, relationship-based trust, and identification-based trust.

(II) Hypothesis Model

Based on the literature review and the study of influencing factors, this study proposes the following hypothesis model and research hypotheses. ·

Figure 1 Research Hypothesis Model

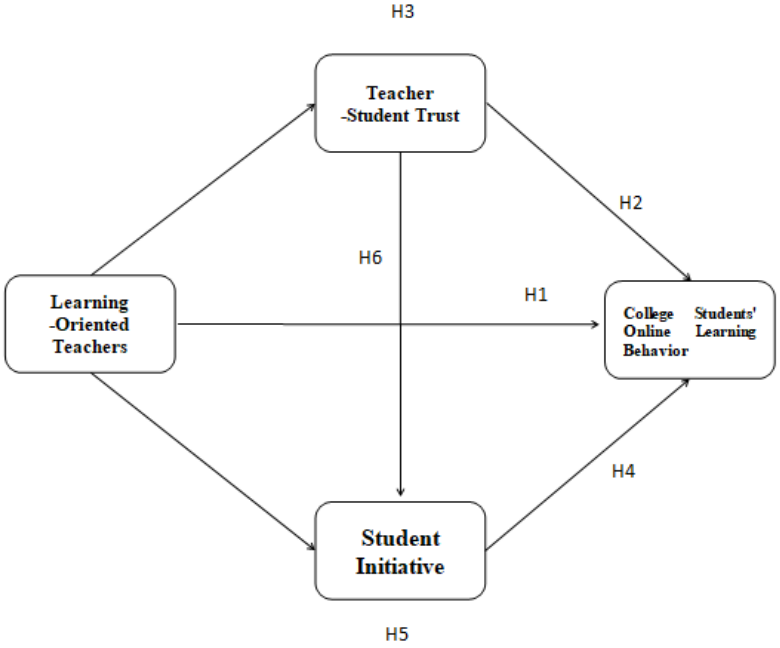

Table 1 Research Hypotheses

Number	Hypothesis Contents
Hypothesis 1	Learning-oriented teachers significantly and positively influence college students' online learning behavior.
Hypothesis 2	Trust between teachers and students significantly and positively influences college students' online learning behavior.
Hypothesis 3	Trust between teachers and students partially mediates the relationship between learning-oriented teachers and college students' online learning behavior.
Hypothesis 4	Student initiative significantly and positively influences college students' online learning behavior.
Hypothesis 5	Student initiative partially mediates the relationship between learning-oriented teachers and college students' online learning behavior.
Hypothesis 6	Both teacher-student trust and student initiative play a chain mediating role in the relationship between learning-oriented teachers and college students' online learning behavior.

(III) Research Tools

1.The Design of Scales

The main variables of this study are college students' online learning behavior, learning-oriented teachers, teacher-student trust, and student initiative. Except for teacher-student trust, the measurement scales for university students' online learning behavior, learning-oriented teachers, and student initiative are not yet well-established and require revisions based on the specific context of Chinese colleges. Therefore, the researcher will incorporate coding materials from the interview data and modify existing scales that have strong relevance.

All items in the scales will be scored on a five-point Likert scale, with "1" representing "completely does not apply" and "5" representing "strongly applies."

2. Scales for College Students' Online Learning Behavior

The dimensions of college students' online learning behavior were derived from several widely used learning behavior measurement tools both domestically and internationally. These include the Learning Behavior Scale by McDermott et al., the Attitude/Motivation Test Scale by Gardner et al., and the E-learning Online Learning Behavior Scale developed by Professor He Li'an from Taiwan. Discussions were then held with an expert in educational technology to further refine and supplement the basic elements of online learning behavior. Based on the expert's guidance, the researcher preliminarily established the structure of the scale, which consists of four parts: cognitive aspects of online learning behavior (5 items), motivational aspects of online learning (4 items), affective aspects of online learning behavior (12 items), and volitional aspects of online learning behavior (5 items).

3. The scales for learning-oriented teachers

In this study, learning-oriented teachers refer to school teachers who consciously engage in guiding, supporting, managing, and supervising behaviors to promote college students' online learning behavior. Based on a review of previous literature, mature survey questionnaires validated by previous researchers were examined. The teacher support aspect encompasses the research perspectives of Ozkan and Koseler (2009) [12], Doo and Hun (2009) [13], and Chai Xiaoyun et al. [9]. This scale includes teacher expertise (3 items), teacher cognitive support (4 items), teacher autonomy support (4 items), and teacher affective support (4 items).

4. Trust Scales between Teachers and Students

Trust between Teachers and Students in this study mainly refers to cognitive trust, relationship-based trust, and identity-based trust. Although there are multiple scales related to trust between teachers

and students, the measurement of cognitive trust and relationship-based trust primarily drew upon the work of McAllister[10] in measuring affective trust and cognitive trust, which has been widely applied in China. The measurement of identity-based trust was primarily based on the scale developed by Hoy and Tschannen-Moran [11], with certain additions and modifications based on interview data. This scale includes cognitive trust (5 items), relationship-based trust (6 items), and identity-based trust (6 items).

5. Scales of Student Initiative

The five dimensions of learning adaptability, as classified by Wang Lixing, are learning attitude, learning methods, learning environment, information literacy, and physical and mental health. The learning attitude factor consists of learning concepts, planning, and enthusiasm for learning. Learning methods are further divided into reading notes, learning techniques, and habits. The factors of information literacy include information awareness, information skills, and information knowledge. The learning environment factor encompasses daily environment, online environment, and interpersonal relationships [14]. Qiu Huanqing used three items, namely, "Even without a teacher's requirement, I will actively learn online courses,""I become interested in content that attracts attention and continue learning," and "I can strive toward a goal until it is accomplished," to measure students' learning motivation [16]. Through a review of student initiative theory, the four dimensions of student initiative have been determined as learning attitude, learning motivation, information literacy, and learning methods. Existing relevant scales have been revised and integrated. Based on the coding of interview data in this study, the following preliminary scales have been established: learning attitude (3 items), learning motivation (3 items), information literacy (4 items), and learning methods (3 items).

(IV) Data Analysis

Through a preliminary survey with a small sample, item analysis was conducted on the data. The critical ratio (CR) value of each item was calculated to differentiate the high-score group (top 27%) from the low-score group (bottom 27%) based on the total test score. Then, the average significant differences between the high and low groups were examined for each item. The research results revealed significant differences in all items of the scale. Next, the correlation between item scores and dimensions was calculated, and all correlation coefficients exceeded 0.3, resulting in the retention of all items in the scale. The reliability of the initial questionnaire was assessed, and the Cronbach's Alpha coefficients for each dimension exceeded the standard of 0.7, indicating good internal consistency reliability of the variables.

Exploratory factor analysis was conducted using SPSS 25.0 to assess the scale, including the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity. The results showed that all KMO values exceeded 0.7, and Bartlett's test was significant (Sig.<0.001), indicating that the questionnaire data met the prerequisites for factor analysis. Principal component analysis was used for factor extraction, considering factors with characteristic root greater than 1. Orthogonal varimax rotation was applied to the factor analysis. The results showed that the total explanatory power of the factors exceeded 50%, indicating good representativeness of the selected factors. The factor loadings for each measurement item were all greater than 0.5, and the cross-loadings were all less than 0.4, indicating that each item was primarily associated with its corresponding factor, demonstrating good structural validity of the scale. After analyzing the reliability and validity of the initial questionnaire, the final version of the questionnaire was determined.

In the formal survey of this study, a total of 823 questionnaires were collected, and 718 valid questionnaires were obtained, resulting in an effective response rate of 87.24%. Mplus 8.0 software was used to validate the reliability and validity of the scale through confirmatory factor analysis. Structural equation modeling was employed to explore the relationship between school teachers and college students' online learning behavior, and the mediating effects of teacher-student trust and student initiative were examined using path analysis and Bootstrap analysis.

IV. Research Results

(I) Data Processing for the Formal Survey

Based on the valid sample of 718 responses, a frequency analysis was conducted for demographic items. The results are summarized as follows:

Table 2 Frequency Analysis

		Frequency	Percentage
Gender	Male	295	41.1%
	Female	423	58.9%
Grade	Freshmen	194	27.0%
	Sophomore	252	35.1%
	Junior	165	23.0%
	Senior	107	14.9%
Major Category	Science and Engineering	302	42.1%
	Arts and Sports	158	22.0%

	Liberal Arts and History	258	35.9%
Performance	Excellent student	187	26.0%
	Average student	381	53.1%
	Underachieving student	150	20.9%

1.Reliability

Upon examination, the reliability of each dimension was found to be above 0.8, indicating that the variables in this questionnaire have good reliability, meeting the requirements of the study.

2.Confirmatory factor analysis

Using Mplus 8.0, a confirmatory factor analysis was conducted to validate the measurement model. The fit indices for the confirmatory factor analysis of learning-oriented teachers, teacher-student trust, student initiative, and college students' online learning behavior are as follows: X2/DF values were below 3, meeting the standard; TLI and CFI values were above 0.9, indicating good fit; SRMR was below 0.08, and RMSEA was below 0.08, all fit indices meeting the general criteria for good fit. Therefore, it can be concluded that the model shows a good fit.

Through examining the convergent validity, standardized factor loadings for all measurement indicators were above 0.6, composite reliabilities (CR) were above 0.7, and average variance extracted (AVE) values were above 0.5, indicating satisfactory convergent validity for each variable.

(II) Relevant Analysis

Table 3 Correlation

	Average Value	Standard deviation	Learning-oriented teachers	Teacher-student trust	Student initiative	College students' online learning behavior
Learning-oriented teachers	3.66	0.78	1			
Teacher-student trust	3.57	0.85	.500**	1		
Student initiative	3.61	0.85	.542**	.405**	1	
College students' online learning behavior	3.65	0.85	.502**	.355**	.418**	1

**. At the 0.01 level (two-tailed), the correlation is significant.

From the analysis results shown in the table above, it can be observed that there is a significant positive correlation between each pair of variables.

(III) Hypothesis testing based on structural equation modeling

Using structural equation modeling techniques and Mplus 8.0 software, the study hypotheses regarding the effects of learning-oriented teachers, teacher-student trust, student agency, and college students' online learning behavior were examined.

Figure 2 Structural model diagram

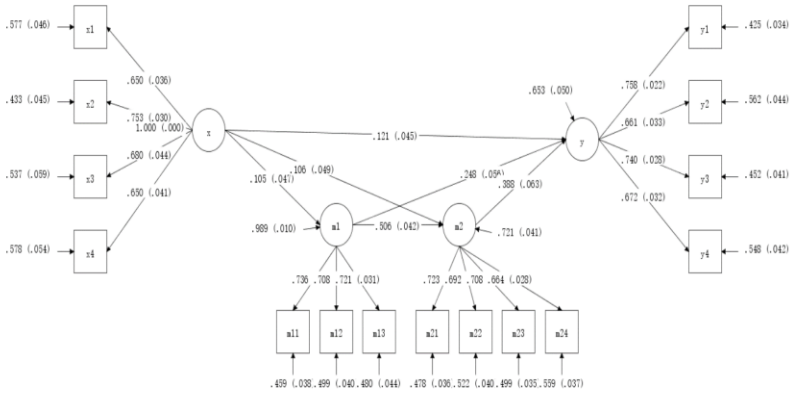

Table 4 Fit indices results

	χ^2	df	χ^2/df	RMSEA	CFI	TLI	SRMR
Fit Result	138.389	84	1.647	0.03	0.983	0.979	0.027
Judgment Standard	-	-	<5	<0.08	>0.9	>0.9	<0.08

From the abovetable, it can be seen that X2/DF is 1.647, which is less than the criterion of 5. TLI and CFI both exceed the criterion of 0.9. SRMR is 0.027, which is less than 0.08, and RMSEA is 0.03, which is also less than 0.08. All fit indices meet the general research standards, indicating that this model has a good fit.

Table 5 Hypothesis Testing Results

Path			STD.Estimate	S.E.	Est./S.E.	P-Value
College students' online learning behavior	←	Learning-oriented teachers	0.121	0.045	2.686	0.007
	←	Teacher-student trust	0.248	0.056	4.466	0.000

	←	Student Initiative	0.388	0.063	6.142	0.000
Teacher-student trust	←	Learning-oriented teachers	0.105	0.047	2.256	0.024
Student Initiative	←	Learning-oriented teachers	0.106	0.049	2.176	0.030
	←	Teacher-student trust	0.506	0.042	12.139	0.000

From the analysis results, it can be observed that learning-oriented teachers have a significant positive impact on college students' online learning behavior (β=0.121, p<0.05), supporting hypothesis H1. Trust between teachers and students has a significant positive impact on college students' online learning behavior (β=0.248, p<0.05), supporting hypothesis H2. Student initiative has a significant positive impact on college students' online learning behavior (β=0.388, p<0.05), supporting hypothesis H4.

Mediation Effect Testing:

Using the bootstrap method with 1,500 resamples, the 95% fiducial interval intervals were examined to determine whether they included 0, indicating the significance of the mediation effects. The results are summarized as follows:

Table 6 Mediation Effect Testing:

	Estimate	S.E.	Est./S.E.	P-Value	Lower 2.5%	Upper 2.5%
Learning-oriented teacher -- Teacher-student trust -- College students' online learning behavior	0.031	0.016	1.939	0.052	0.005	0.072
Learning-oriented teacher -- Student initiative -- College students' online learning behavior	0.049	0.025	1.997	0.046	0.007	0.105
Learning-oriented teacher -- Teacher-student trust -- Student initiative -- College students' online learning behavior	0.025	0.013	1.966	0.049	0.004	0.057
The total indirect effects	0.105	0.035	3.005	0.003	0.045	0.182
Total effects	0.248	0.061	4.056	0.000	0.132	0.378

From theabovetable , it can be observed that the learning-oriented teacher has an indirect effect on college students' online learning behavior through teacher-student trust, with a value of 0.031. The 95% fiducial interval does not include 0, indicating that hypothesis H3

is supported. Similarly, the learning-oriented teacher has an indirect effect on college students' online learning behavior through student initiative, with a value of 0.049. The 95% fiducial interval does not include 0, supporting hypothesis H5. Additionally, the learning-oriented teacher has an indirect effect on college students' online learning behavior through both teacher-student trust and student initiative, with an indirect effect value of 0.025. The 95% fiducial interval does not include 0, confirming hypothesis H6.

V. Research Discussion and Recommendations

(I) Pay attention to the indirect influence of school teachers through support

The research on school teachers suggests that their influence on students' online learning behavior is primarily manifested through creating a favorable learning atmosphere and providing learning support, thereby exerting an indirect impact. The quantitative findings of this study also indicate that learning-oriented teachers directly impact college students' online learning behavior by 58%, while the remaining 42% of the influence is achieved through fostering trust between teachers and students and stimulating student initiative, thus producing an indirect effect. Currently, it seems self-evident in practice that teachers affect college students' online learning behavior through trust or student initiative. However, newly established local undergraduate institutions in China have their own characteristics, and there are few teachers who focus on implementing sustainable strategies for influencing students' online learning behavior through "second-order effects" such as student attitudes, abilities, and classroom atmosphere. In educational reforms, students are often seen as the objects of reform rather than active agents contributing to the success of the reforms. These factors hinder students' enthusiasm in online learning behavior and may even lead to perfunctory, and other similar behaviors.

Therefore, school teachers should not overlook the indirect impact of influencing college students' online behavior through trust between teachers and students and student initiative. It is important to focus on cultivating an open, trusting, and supportive environment that encourages students to engage in innovative and exploratory online learning, accept new learning challenges, and believe in their ability to continuously improve their learning methods.

(II) Recognizing the role of counselors and academic advisors

In addition to subject teachers, counselors and academic advisors also play a crucial role in closely interacting with college students. How they understand, respond to, and implement the school's or teachers' requirements for online learning, as well as their communication,

coordination, and support in front of students, have a significant impact on college students' online learning behavior. Their understanding of students' online learning needs and learning styles, as well as the specific guidance, supervision, and support they provide during this process, are of great importance to college students' online learning behavior.

Both in China and Western countries, there has been limited research on counselors and academic advisors, and they have not received sufficient attention. Most of the research on student learning guidance primarily focuses on subject teachers, with little research and attention given to the role positioning of counselors and academic advisors, their relationship with subject teachers, student management methods, competency characteristics, and evaluation systems. As the managers, leaders, and directors of college students' online learning behavior, counselors responsible for daily student affairs and ideological education, as well as academic advisors responsible for academic guidance, play an important role in the effectiveness of online learning.

Considering the significant impact of counselors and academic advisors' professional competence on college students' online learning behavior and the lack of sufficient attention to these roles in theoretical research and practice, future studies on school management should pay more attention to the role of these teachers in student education. It is important to establish corresponding standards, clarify their professional role expectations, and provide more targeted development assistance to facilitate the effective performance of these teachers' roles.

(III) Skilled at strengthening trust between teachers and students through multiple channels

A significant amount of research in the field of college students' online learning behavior emphasizes the importance of a trusting cultural atmosphere within the classroom. This is because collaboration and sharing, which are integral to college students' online learning process, involve interpersonal interactions. Furthermore, online learning among college students also involves the explicit sharing of tacit knowledge between teachers and students and the transformation of valuable personal resources into competitive advantages for the class, placing higher demands on interpersonal trust. It can be argued, to some extent, that college students' online learning behavior is dependent on relationships. When interpersonal relationships are characterized by uncertainty, mistrust, insecurity, or tension, it greatly hinders college students' online learning behavior. Conversely, a harmonious, trusting, caring, and supportive interpersonal atmosphere influences students' internal motivation and attitudes toward learning, thus promoting college students' online learning

behavior.Therefore, scholars have proposed the concept of "relational resilience," emphasizing that a close, trusting relationship between teachers and the class is a valuable organizational resource that can provide intellectual and emotional support for students when facing challenging environments.

(IV) Focus on the acquired malleable characteristics of student initiative

Research has found that college students exhibit relatively weak initiative in their online learning behavior. Most students rely on external driving force rather than intrinsic motivation in their online learning behavior. In other words, students' self-directed awareness in online learning is insufficient, and they lack the initiative to actively plan their online learning and exert personal influence within the class. However, the manifestation of student initiative is a result of complex interactions between individuals and class organizations. This implies that student initiative is a synthesis of stability and acquired malleability.

Research results indicate that student initiative plays a significant mediating role between learning-oriented teachers and online learning behavior. This suggests that while some aspects of student initiative may be related to relatively stable personal traits, teachers can still play a role in stimulating student initiative. Therefore, on one hand, teachers should pay attention to certain stable and enduring traits in student initiative, such as optimism, extroversion, and effective communication, and consciously cultivate these traits in education and management practices. On the other hand, it is important to recognize the significant influence of the external environment on student initiative. Teachers should focus on providing personalized care and support, encouraging students to question, expose shortcomings, express personal opinions in online learning behavior, providing opportunities for students to have a greater impact in class online learning activities, and promoting a transformation in their attitudes towards learning.

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