Research on the Influencing Factors of College English Learning Willingness Based on the Theory of Planned Behavior

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Abstract

Since learning willingness is one key factor affecting foreign language learning, this article constructs a theoretical model of different influencing factors affecting the learning willingness, and uses structural equation model to test some hypotheses, based on the theory of planned behavior, through exploring the relationship among Willingness of Behavior (WB), Attitude toward the Behavior (AB), Subjective Norms (SN), Perceived Behavioral Control (PBC), Behavior of students. The study found that important others and groups have the greatest influence on individual behavior; and high demand pressure can positively affect students' learning willingness; individual differences lead to differences in the learning willingness; the influence of learning attitude on behavior willingness is non-dominant. Findings highlight the importance of learning willingness in college English education, and provide theoretical guidance for the formulation of intervention measures for English learning behavior.

Keywords

The Theory of Planned Behavior, College English Learning, Learning Willingness, Behavioral Intervention

1. Introduction

While participating in globalized economic development and market competition, China has continuously deepened its participation in global governance. People with different professional backgrounds, strong skills in foreign language and understanding of international rules are badly needed, so China has been vigorously promoting national foreign language education. Among all foreign

languages, the international status of English makes English education attract much attention. Therefore, it is necessary to take further measures to improve English education and cultivate compound English language talents (grasping different specialized subjects and English at the same time).

College English courses for non-English major undergraduates are compulsory courses in higher education. The courses cover all college and university non-English majors in the country, with a wide range of students, involving nearly 16 million students every year (He, 2020). In view of the large scale of college English learners, the urgent needs of the country and the international status of English, the research on college English education has become an important topic. Learning effectiveness research has always been an important research topic in college English education (Zhao, 2021; Yang & He, 2019; Wang & Yan, 2018; Zhang, 2009). The premise of learning effectiveness is the implementation of learning behavior, and the learning willingness is considered to be one key factor affecting learning behavior (Dörnyei, 2005). Therefore, the research on college English learning willingness has far-reaching significance.

At present, academic research on college English learning willingness mainly focuses on the motivation research. The fundamental characteristics of learning motivation are dynamic and situational (Yuan & Ji, 2017). The dynamic of learning motivation directly determines the instability of learning willingness; the situational nature of learning motivation refers to internal and external environmental factors, including external cognitive factors and internal emotional factors, while the effect of English learning depends to a large extent on the cultivation and stimulation of learners' emotional factors, the core of which includes the learning willingness (Shu & Zhuang, 2008). This view just verifies the assertion that the stronger the learning willingness is, better learning effect is, and higher the success rate is. That is, the learning willingness of college English is a necessary condition for learning behavior (Chang, 2005). This is also the fundamental reason why this study chooses the learning willingness as the research object.

Academic research on college English learning willingness also focuses on the influencing factors of learning willingness. Since McCroskey and his colleagues first proposed the concept of learning willingness in 1992 (McCroskey, 1992), the causes of learning willingness have attracted widespread attention in the academic community, and its influencing factors can be summarized as teacher factors, learner factors, learning environment factors, and family factors and peer factors (Zhang & Du, 2021; Tan & Fu, 2020). Since the learning willingness is a necessary condition for the generation of learning behavior, the learner's past learning behavior, personal background, self-efficacy, influence of important others, school environment and atmosphere are the main factors affecting the learning willingness. Meanwhile, thirst for knowledge and prediction of learning effect also profoundly affect the generation of learning willingness (Fang et al., 2020; Li & Liu, 2013; Zhang et al., 2007; Liu, 2010; Wu & Zhang,

2009; Cheng & Shao, 2022).

The factors mentioned by the above scholars can stimulate or weaken learners' learning willingness, but they have the following shortcoming. First, the research on these factors is fragmented. That is, all factors were studied independently, but not organically integrated. Second, these studies did not clarify the proportion of each influencing factor on the willingness to learn, such as which factors are dominant, the strength ratio of dominant effects, and which factors are non-dominant. Third, the vast majority of researches are all stuck at analyzing the influencing factors of learning willingness, explaining and predicting behavior, but few scholars have used the influencing factors of learning willingness to conduct behavioral intervention research.

In view of the above analysis, this research, integrating the above factors, conducts a questionnaire survey, and analyzes the relationship between the generation of learning willingness and various factors, as well as the interaction between the influencing factors based on the theory of planned behavior (TPB). It attempts to find prominent factors, and provide feasible reference suggestions for the formulation of learning behavior interventions.

2. Theoretical Basis: The Theory of Planned Behavior (TPB)

Icek Ajzen, an American psychologist, formally proposed the theory of planned behavior in 1991 (Ajzen, 1991). TPB regards behavior willingness as an important indicator to understand and explain people's social behavior, and also provides an important research theoretical basis for predicting people's behavior. TPB believes that the generation of behavior comes from people's rational evaluation of the consequences of the behavior and the perception of behavior controllability. It proposes that behavior is affected by four latent variables: Willingness of Behavior (WB), Attitude toward The Behavior (AB), Subjective Norms (SN), Perceived Behavioral Control (PBC). Among them, attitude toward the behavior, subjective norm and perceived behavioral control affect willingness of behavior, and Willingness of Behavior is a necessary condition for the generation of behavior. This theory reveals the whole process from generating behavioral willingness to practical action, under the influence of self-determination motivation (Sicilia et al., 2016).

At present, TPB has been widely used in consumer behavior (Li, 2021; Liao, 2020; Jani et al., 2015; Lee, 2009), physical exercise behavior (Chen, 2019; Zhang et al., 2021, etc.), innovation and entrepreneurship behavior (Zhu & Guo, 2020; Wang & Fang, 2020, etc.), learning behavior (Fang et al., 2020; Gao et al., 2003a; Gao et al., 2003b; Wu, 2016; Tarhini et al., 2017; Persada et al., 2020; Ma et al., 2020), teaching behavior (Shi et al., 2020).

The research applied to learning behavior includes mobile learning behavior, online reading behavior, classroom activities, and communication behavior. TPB covers the internal and external factors that affect behavior, and understands, explains and predicts subject behavior from the perspective of the

relationship between behavior and willingness. College English learning behavior, as a field of behavior research, also conforms to the research logic that willingness affects behavior under this theoretical framework, which is also affected by attitude toward the behavior, subjective norm and perceived behavioral control.

3. Data Collection and Research Methodology

3.1. Data Collection

Based on the theoretical analysis, this research comprehensively studied the influence of four latent variables of AB, SN, PBC and ACC on WB of college English learning, and the relationship between ACC and AB. It adopted the method of questionnaire. In order to ensure the reliability and validity of the questionnaire, the design of 25 items mainly refers to the existing classic questionnaires. All items were measured with seven-point Likert scale anchored by "not agree at all"-"moderately agree"-"agree to a very great extent". A trial survey was conducted on 15 randomly selected students. According to the feedback of this trial survey, the structure and content of the questionnaire were repeatedly discussed and adjusted, and finally a formal questionnaire was formed.

There were 25 questions in the questionnaire. 277 copies were distributed to the undergraduates of Hefei University of Technology (a science and Engineering university in China), and 235 valid questionnaires were taken back, covering all majors and grades of this university.

3.2. Research Methodology

This article adopts the method of empirical analysis to explore the relationship among different variables, and draws a correlation in the research results. Based on the questionnaire, it uses structural equation modeling (SEM) to verify and analyze the theoretical model of the influencing factors for college English learning willingness. The advantage of SEM is that it can analyze the relationship between multiple dependent variables and independent variables at the same time, which is a commonly used statistical method to study the influencing factors of individual behavior. SEM includes the measurement model and the structural model.

The measurement model consists of latent variables and indicator variables, and its equations are shown in Formula (1) and Formula (2):

$$x = \Lambda_{\chi}\xi + \delta \tag{1}$$

$$y = \Lambda_{y}\eta + \varepsilon \tag{2}$$

Among them, x and y represent the vectors composed of exogenous observed variables and endogenous observed variables. Λ_{χ} and Λ_{y} represent the relationship matrix between the corresponding latent variables and observed variables, and ξ and η represent the vector composed of exogenous latent variables and endogenous latent variables. δ and ε are the corresponding error terms.

The structural model is a model of the causal relationship between latent variables, and its equation is shown in Formula (3):

$$\eta = B\eta + \Gamma\xi + \zeta \tag{3}$$

Among them, B represents the influence relationship between endogenous latent variables, and Γ represents the influence relationship between exogenous latent variables and endogenous latent variables. ζ is the error term of endogenous latent variables.

4. Research Hypotheses

Based on TPB, there are four dimensions: Willingness of Behavior (WB), Attitude toward the Behavior (AB), Subjective Norms (SN), Perceived Behavioral Control (PBC), which proposes that behavior is affected by these four latent variables. Among them, AB, SN and PBC affect WB, and WB is a necessary condition for the generation of behavior.

Therefore this study classifies factors, such as personal background, self-efficacy, influence of important others, school environment and atmosphere, thirst for knowledge, personal preferences, and prediction of learning effect etc., into these four dimensions. In the process of classifying, it is found that the individual ability, opportunity and resources, past learning behavior will also have an impact on the learning willingness, but they cannot be classified into the above four variables. Therefore, this study adds one variable of the Actual Control Condition (ACC) on the basis of TPB, which will be explained in the following research hypotheses.

According to TPB, in the process of college English learning, the relationship among Attitude toward the Behavior, Subjective Norms, Perceived Behavioral Control, Actual Control Conditions, Willingness of Behavior and Behavior is as follows: WB (college English learning behavioral willingness) and PBC directly affect behavior (college English learning behavior). AB, SN and PBC directly affect the subject's WB. Therefore, it is generally believed that the more positive AB, SN, and PBC are, the stronger WB is, and vice versa.

After the above analysis, we set up the following four hypotheses (Table 1):

Willingness of Behavior and Attitude toward Behavior

AB is the evaluation of the behavior subject's preference for performing a certain behavior, including the thirst for knowledge and personal preference, which

Table 1. Research hypotheses.

No.	Research Hypotheses
H1	AB in English learning positively affects students' WB.
H2	SN positively affects students' WB to learn English.
H3	PBC positively affects students' WB of learning English.
H4a	ACC positively affects students' WB of English learning.
H4b	ACC positively affects students' AB of English learning.

refers to the learner's positive or negative evaluation of the implementation of learning behavior (Hill et al., 1977). In this research, the attitude of English learning refers to the learners' liking or disliking the English learning behavior, which is the cognitive evaluation and emotional expression of English learning. WB reflects the efforts an individual voluntarily makes to perform a certain action in a specific environment, and is considered to be a necessary condition for an action.

Based on the above discussion, the research hypothesis H1 is proposed: AB in English learning positively affects students' WB.

Willingness of Behavior and Subjective Norm

SN refers to the social pressure perceived by the behavior subject when deciding whether to implement a certain behavior, including the influence of important others, school environment and atmosphere. It reflects the external pressure that learners perceive or do not perceive when deciding whether to implement learning behavior (Ajzen, 1991). The pressure of decision-making from the affiliated organization, and the pressure from other stakeholders, internal and external competitors, affect the subject's WB, such as the school's regulations, the requirements and expectations of teachers and parents, and the influence of outstanding peers around them, which all effect Confidence and willingness to learn English.

Based on the above discussion, the research hypothesis H2 is proposed: SN positively affects students' English learning willingness.

Perceived Behavioral Control and Willingness of Behavior

PBC refers to the behavior subject's perceptual judgment on the difficulty of a certain behavior, and the prediction of learning effect, that is, the learner's evaluation of the difficulty of learning behavior, which reflects the learner's ability of perceiving factors that hinder or promote the execution of learning behaviors, including self-efficacy and the degree of control (Ajzen, 1991). Self-efficacy refers to the individual's confidence in carrying out the behavior, and the degree of control refers to the individual's control over the special resources required to complete the behavior, reflecting the individual's perception of factors that hinder or promote the implementation of a behavior.

English learning is a systematic learning process that requires long-term continuous efforts. Confidence in the ability to learn and control over the required resources are necessary conditions for English learning. On the basis of firm confidence, only with strong control can we break through the difficulties and obstacles in learning and enhance the confidence and willingness to learn English.

Based on this, the research hypothesis H3 is proposed: PBC positively affects students' WB of learning English.

Actual Control Conditions and Willingness of Behavior

Learning behavior is not only affected by WB, but also restricted by individual ability, opportunity, and resources, including the learner's past learning beha-

vior, personal background, self-efficacy, etc. (Nixon, 1996). All of these are internal influencing factors. Therefore, this study added the actual control condition variable (ACC) on the basis of TPB. ACC refers to the individual ability, opportunity and resources that the behavior subject possesses when performing a certain behavior, which directly affects WB and AB in English learning.

Since the learning behavior is affected by WB and ACC, when ACC are sufficient, WB can directly arouse the behavior.

Therefore, the internal ability of learners, including the level of individual learning ability, learning pursuit, cognitive ability, willpower, and external learning opportunities and resources directly affect the attitude and willingness of English learning.

Based on this, the research hypotheses H4a and H4b are proposed.

H4a: ACC positively affects students' WB of English learning.

H4b: ACC positively affects students' AB of English learning.

Based on TPB and the above research hypotheses, AB, PBC, SN, ACC positively affect WB, and ACC positively affects AB, so the logical framework of the research is constructed as Figure 1.

5. Results

According to the questionnaire analysis, it is found that the awareness of college English learning planning behavior is not high enough. Not all of the above four hypotheses hold. SN, PBA and ACC of college English learning have a significant positive impact on WB, and ACC also has a significant positive impact on AB, but there is no significant effect between AB and WB. So hypotheses H2, H3, H4a and H4b hold, while hypothesis H1 don't.

5.1. Descriptive Statistical Analysis

Descriptive statistics were obtained from analysis of questionnaire data with SPSS26.0. From the mean of scores, SN (4.04) and ACC (4.03) ranked first and second, respectively. PBC (3.83) and AB (3.78) rank third and fourth, and WB ranks fifth, with an average value of only 2.82. In general, the mean of these factors did not exceed 4.00 or only reached about 4.00, indicating that the current awareness of college English learning planning behavior is not high enough. The specific descriptive statistics are shown in Table 2.

Table 2. Descriptive statistics of latent variables.

Latent variable	Mini.	Maxi.	Average Value	SD
AB	1.00	5.00	3.78	0.86
SN	1.00	5.00	4.04	0.62
PBC	1.00	5.00	3.83	0.71
ACC	1.00	5.00	4.03	0.69
WB	1.00	5.00	2.82	0.94
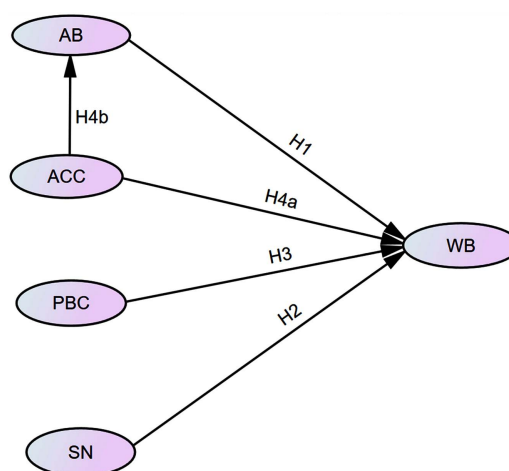
Figure 1. Theoretical model of factors influencing college English learning willingness.

5.2. Tests of Reliability and Validity

The reliability of the questionnaire data was analyzed by Cronbach's alpha, and the validity of the questionnaire data was tested by the KMO value and Bartlett's test. After running SPSS26.0, the reliability and validity test data obtained are shown in the following Table 3 and Table 4.

About the reliability, it can be seen from the table that the overall Cronbach's alpha coefficient of the college English learning plan behavior scale is 0.89, and the Cronbach's alpha coefficient of AB, PBC, ACC and WB are all greater than 0.7, which has good measurement reliability. Although the Cronbach's alpha coefficient of SN is poor, it is still within the acceptable range. Overall, the scale has good internal consistency, and the data has good reliability. As for validity, the KMO value is greater than 0.8, and the Bartlett's test is 1779.44, which is significant at the 0.000 level, indicating that the data collected by the questionnaire is valid and reliable.

Structural validity refers to the overall fitness of the model. Through the confirmatory factor analysis of AMOS, it can be seen that the calculation results of the model's fitting indicators χ^2/df, RMSEA, GFI, AGFI, and CFI are all within an acceptable range (Table 5). The overall fitness is good. So the model of college English learning planning behavior fits well.

5.3. Confirmatory Factor Analysis

This paper uses AMOS software to carry out a confirmatory analysis of college English learning planning behavior.

5.3.1. Analysis of Influence Effect of Latent Variables in Structural Model

According to the results in Table 6, SN, PBA and ACC of college English learning have a significant positive impact on WB, while ACC also has a significant positive impact on AB. However, there is no significant effect between AB and WB, so hypotheses H2, H3, H4a and H4b are true, and hypothesis H1 is not true. It shows that the more SN, PBC and ACC imposed by college English

Table 3. Reliability test (N = 235).

Variables	Number	Cronbach's alpha
AB	4	0.84
SN	4	0.64
PBC	3	0.72
ACC	3	0.88
WB	4	0.85
total	18	0.89

Table 4. Validity test (N = 235).

Criteria	Value
KMO	0.85
Bartlett's test	1779.44
Significance	0.000

Table 5. Model fitting results.

Index	Value	Results
χ^2/df	2.47	<3 acceptable
RMSEA	0.08	<0.08 acceptable
GFI	0.86	>0.8 acceptable
AGFI	0.81	>0.8 acceptable
CFI	0.89	>0.8 acceptable

Table 6. Tests of hypotheses.

hypotheses	Hypothetical relationship	Factor loadings	Standard error	C.R	p	Standardized factor loadings	Hypothetical results
H1	WB ← AB	0.129	0.074	1.756	-	0.123	unacceptable
H2	WB ← SN	0.982	0.418	2.351	*	0.446	acceptable
H3	WB ← PBC	0.201	0.091	2.209	*	0.312	acceptable
H4a	WB ← ACC	0.104	0.052	1.997	*	0.167	acceptable
H4b	AB ← ACC	0.151	0.052	2.879	**	0.255	acceptable

Note: **and * denote significance at the 1% and 5% levels, respectively.

learning are, the stronger their WB is. At the same time, the more ACC students have, the more correct their AB will be. This is consistent with the expected results.

In addition, from the perspective of the standardized path coefficient, the SN

of college English learning have the greatest impact on students' WB (the coefficient is 0.446), followed by the influence of PBC on students' WB (the coefficient is 0.312). Finally, it is the effect of ACC on AB and WB (the coefficients are 0.255 and 0.167 respectively).

5.3.2. Analysis of Relationship between Latent Variables and Observed Variables in the Measurement Model

According to the results in Table 7 below, the observed variables corresponding to behavioral attitudes are X_{11}, X_{12}, X_{13} and X_{14}. The factor loading coefficients exceeding 0.8 include X_{11} (0.90), X_{12} (0.87) and X_{13} (0.81), among which X_{11} and X_{12} is the highest, indicating that in terms of AB, students have a high degree of agreement with "Knowledge of College English learning has practical value" and "College English study can improve the comprehensive ability of English".

The observed variables corresponding to SN are X_{21}, X_{22}, X_{23} and X_{24}, among which the factor loading coefficients of X_{21} and X_{22} are relatively high, 0.71 and 0.76, respectively, indicating that the requirements of teachers and universities have a greater impact on the SN of college English learning, while the influence of peers on SN of English learning is not obvious.

The observed variables corresponding to PBC are X_{31}, X_{32} and X_{33}, and the factor loading coefficient of X_{33} is higher, reaching 0.81, which indicates that students have a high degree of recognition of "I have full confidence to cope with the obstacles and difficulties encountered in English learning". It also means that improving the self-efficacy of students can effectively break through their learning difficulties and obstacles, thereby enhancing their willingness to learn English.

The observed variables corresponding to ACC are X_{41}, X_{42} and X_{43}, and the factor loading coefficients all exceed 0.8, which are 0.82, 0.87, and 0.84, respectively, indicating that most students' investment in English learning can exceed the requirements of teachers, and are more than that in other subjects and more than what other students invest, which also shows that most students have better learning pursuit and habits for English learning, which is consistent with the academic status of English in China's education system.

The observed variables corresponding to WB are X_{51}, X_{52}, X_{53} and X_{54}, among which the factor loading coefficients of X_{52} and X_{53} are relatively high, 0.87 and 0.86 respectively, while the factor loading coefficient of X_{54} is relatively low, 0.73, indicating that in terms of WB, students have a high degree of agreement with "after understanding the possible obstacles and difficulties, I still make unremitting efforts" and "in order to improve my English performance, I am willing to invest more time and energy", and have a certain degree of agreement with "in order to pass CET 4 and CET 6, I am willing to try my best to improve my English". These show that students are willing to face difficulties in learning English, invest time and energy, and pass relevant examinations.

According to the data above, a measurement model can be constructed as following Figure 2.

Table 7. Factor loadings pertaining to the indicator variables.

indicator variables	latent variables	SD	p	Standardized factor loadings
I like English and am interested in learning English (X_{14})	AB	1.00		0.476
College English study greatly contributes to passing some exams (X_{13})	AB	1.70	***	0.814
Knowledge of college English has practical value (X_{12})	AB	1.74	***	0.869
College English study can improve the comprehensive ability of English (X_{11})	AB	1.77	***	0.897
Peers with excellent grades will help strengthen my willingness to learn English (X_{24})	SN	1.90	**	0.50
I will be affected by peer behavior (X_{23})	SN	1.00		0.25
I can follow the teacher's advice and requirements (X_{22})	SN	2.48	**	0.76
I was able to complete the school's compulsory requirements (X_{21})	SN	2.38	**	0.71
I have full confidence to cope with the obstacles and difficulties encountered in English learning (X_{33})	PBC	1.00		0.81
I am able to predict my obstacles and difficulties in English learning (X_{32})	PBC	0.54	***	0.56
I have a clear understanding of my English learning and level (X_{31})	PBC	0.44	***	0.456
My investment in English learning has far exceeded the teacher's requirements (X_{43})	ACC	0.99	***	0.84
I invest more time and energy in English than in other subjects (X_{42})	ACC	1.05	***	0.87
I put more time and energy into English study than other students (X_{41})	ACC	1.00		0.82
In order to pass the CET 4 and CET 6, I would like to do my best to improve my English (X_{54})	WB	0.98	***	0.73
After understanding the possible obstacles and difficulties, I still make unremitting efforts (X_{53})	WB	1.30	***	0.86
In order to improve my English, I am willing to invest more time and energy (X_{52})	WB	1.31	***	0.87
I can set goals according to my own English level (X_{51})	WB	1.00		0.61

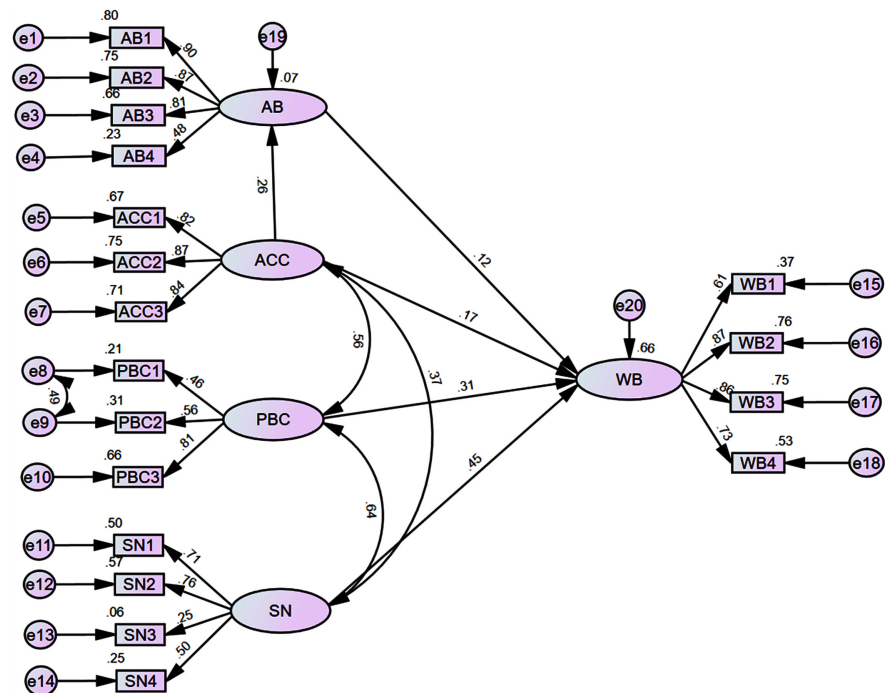Note: *** and ** denote significance at the 1‰ and 1% levels, respectively.

Figure 2. Measurement model.

6. Conclusion

This study adopted the method of questionnaire to study the influencing factors of English learning willingness of undergraduates in Hefei University of Technology. Based on the TPB model of the influencing factors of college English learning, it conducted a quantitative analysis according to the different degrees of each influencing factor. Through analysis, it found out the main factors that affect college English learning willingness, and conducted a more in-depth discussion and Analysis on their causes and influence.

SN is a prominent factor that produces WB. Through analysis, it can be found that SN has a positive impact on students' willingness to learn English. That is, important others and groups have the greatest impact on individual behavior, and the requirements of schools and teachers have a greater impact on students' willingness. The role model of peers has no obvious effect on their willingness. Therefore, high-demanding external pressure can positively affect students' willingness to learn English, and is a prominent factor affecting English learning willingness.

PBC has a dominant effect on WB. PBC positively affects WB of learning English. Students can clearly predict learning obstacles and difficulties, and "have sufficient confidence in dealing with obstacles and difficulties encountered in English learning", which means that improving students' learning perception can enhance English learning willingness.

ACC has a dominant impact on AB and WB. ACC positively affects AB and WB of students in English learning. Most students have differences in the time and energy invested in English learning due to different study habits, abilities,

and individual requirements. This shows that even if learners have the same good learning pursuit and willingness for English learning, actual individual differences will lead to great differences in WB.

AB has a non-dominant effect on WB. This study also found that the hypothesis that AB positively affects WB of English learning is not valid. That is, learners' preferences will not have an impact on WB. This is different from the research results of TPB in other fields, such as physical exercise, consumption behavior, etc. in which AB will have a positive impact on WB. Therefore, in the study of English learning willingness, different research results have been produced due to the particularity of the academic requirements of English learning. According to the analysis, the main reason is that the college English education is still a rigid academic requirement in the current higher education in China, and does not change according to the students' personal preferences, so the positive correlation of AB and WB is non-dominant.

The research on the influencing factors of college English learning willingness has a certain enlightenment effect on college English education and teaching. Through the hypotheses verification of the influencing factors, the prominent factors are positioned to provide a theoretical basis for effectively enhancing students' willingness to learn English and intervening on English learning behavior. The intervention strategies for English learning proposed in this study are as followed:

First, increase the pressure of external factors. The university can give the high requirements and provide instructional norms for students. Teachers implement precise individual interventions and provide different individual instructional norms for individuals concerning their differences.

Second, improve the training of perceptual ability. That is to cultivate students' individual awareness, and to establish a clear individual cognition and learning environment cognition, which is helpful for students to accurately predict and face difficulties.

Third, strengthen internal factor constraints. That is to cultivate students' good personal norms, including individual requirements and habits, and to pay attention to the cultivation of individual learning ability, not just the learning itself.

The results of this study also have certain limitations, such as limited samples, but it has great enlightening significance for the English education in science and engineering universities. If English learning willingness is studied from the perspective of cultivating the whole person, qualitative research should be strengthened, such as adopting the methods of follow-up observation and interviewing objects, so as to better explore the changing process of learners' willingness, and explore effective paths of learning and growth for science and engineering students.

Data Availability

The data used to support the findings of this study are included within the ar-

ticle.

Authors' Contributions

Chen Lili is mainly responsible for data collection and model building, as well as writing the full text of the paper.

Wang Shanshan is responsible for data analysis.

Zhao Qinna gave some guidance.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes, 50,* 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Chang, X. (2005). The Influence of Cognitive and Emotional Factors on University Students' Achievements in English Learning. *Psychological Science, 28,* 727-730.

Chen, L. S. (2019). Influence of Smart Phone Exercise Apps on College Students' Attitude of Exercise and Behavior Habit—From the Interpretation and Challenge of Theory of Planned Behavior. *Journal of Guangzhou Sport University, 39,* 105-107.

Cheng, G., & Shao, Y. G. (2022). Influencing Factors of Accounting Practitioners' Acceptance of Mobile Learning. *International Journal of Emerging Technologies in Learning, 17,* 90-101. https://doi.org/10.3991/ijet.v17i01.28465

Dörnyei, Z. (2005). *Teaching and Researching Motivation*. Foreign Language Teaching and Research Press.

Fang, Y., Xu, Z. R., & Xie, S. J. (2020). Research on the Influencing Factors of College Students' Autonomous Learning in the New Era Based on the Theory of Planned Behavior. *The Guide of Science & Education, 33,* 174-175.

Gao, Y. H., Cheng, Y., Zhao, Y., & Zhou, Y. (2003a). Changes in English Learning Motivation and Self-Identity of Undergraduates. *Foreign Languages and Their Teaching, 5,* 25-35.

Gao, Y. H., Zhao, Y., Cheng, Y., & Zhou, Y. (2003b). Motivation Types of Chinese College Undergraduates. *Modern Foreign Languages, 1,* 29-37.

He, L. Z. (2020). Precise Recognition and Rational Response to Changes—College English Teaching in an Era of Change. *Journal of Foreign Languages, 43,* 2-7.

Hill, R. J., Fishbein, M., & Ajzen, I. (1977). Belief, Attitude, Intention and Behavior, an Introduction to Theory and Research. *Contemporary Sociology, 6,* 244. https://doi.org/10.2307/2065853

Jani, M. A., Sari, G. I. P., Pribadi, R. C. H., Nadlifatin, R., & Persada, S. F. (2015). An Investigation of the Influential Factors on Digital Text Voting for Commercial Competition: A Case of Indonesia. *Procedia Computer Science, 72,* 285-291. https://doi.org/10.1016/j.procs.2015.12.142

Lee, M. C. (2009). Factors Influencing the Adoption of Internet Banking: An Integration of TAM and TPB with Perceived Risk and Perceived Benefit. *Electronic Commerce Research and Applications, 8,* 130-141. https://doi.org/10.1016/j.elerap.2008.11.006

Li, H., & Liu, R. D. (2013). College Students' EFL Writing Anxiety and Self-efficacy and Their Prediction on Students' Writing Performance. *Foreign Languages Research, 2,* 48-54.

Li, X. Y. (2021). Analysis on Factors Influencing Safe Food Purchase Behavior of Rural Consumers Based on Theory of Planned Behavior. *Guizhou Agricultural Sciences, 49,* 167-172.

Liao, F. (2020). Analysis on the Influencing Factors of Consumers' Wasting Food Behaviors: Based on the Theory of Planned Behaviors. *Research of Agricultural Modernization, 41,* 115-124.

Liu, Y. J. (2010). Quantitative Research and Analysis on the Correlation between College English Learners' Learning Concepts, Self-efficacy and Learning Strategies. *Foreign Language Education, 31,* 65-69.

Ma, L., Lan, Z. Z., & Tan, R. (2020). Influencing Factors of Innovation and Entrepreneurship Education Based on the Theory of Planned Behavior. *International Journal of Emerging Technologies in Learning, 15,* 190-206.
https://doi.org/10.3991/ijet.v15i13.15345

McCroskey, J. C. (1992). Reliability and Validity of the Willingness to Communicate Scale. *Communication Quarterly, 40,* 16-25.
https://doi.org/10.1080/01463379209369817

Nixon, J. (1996). Professional Identity and the Restructuring of Higher Education. *Studies in Higher Education, 21,* 5-16. https://doi.org/10.1080/03075079612331381417

Persada, S. F., Ivanovski, J., Miraja, B. A., Nadlifatin, R., Mufidah, I., Chin, J. et al. (2020). Investigating Generation Z' Intention to Use Learners' Generated Content for Learning Activity: A Theory of Planned Behavior Approach. *International Journal of Emerging Technologies in Learning, 15,* 179-194. https://doi.org/10.3991/ijet.v15i04.11665

Shi, S. Y., Ye, X. S., & Hu, M. M. (2020). Research on University Teachers' Willingness of Teaching Reform Based on the Theory of Planned Behavior: A Case Study of Universities in Henan. *Journal of Architectural Education in Institutions of Higher Learning, 29,* 181-189.

Shu, D. F., & Zhuang, Z. X. (2008). *Modern Foreign Language Teaching—Theory, Practice and Methods* (Revised ed.). Shanghai Foreign Language Education Press.

Sicilia, M., Guarini, E., Sancino, A., Andreani, M., & Ruffini, R. (2016). Publie Services Management and Co-Production in Multi-Level Governance Settings. *International Review of Administrative Sciences, 82,* 8-27.
https://doi.org/10.1177/0020852314566008

Tan, X., & Fu, Y. L. (2020). Factors Affecting Online English Learning Satisfaction and Continuous Learning Intention of College Students. *Technology Enhanced Foreign Language Education, 4,* 82-88.

Tarhini, A., Hone, K., Liu, X., & Tarhini, T. (2017). Examining the Moderating Effect of Individual-Level Cultural Values on Users' Acceptance of E-Learning in Developing Countries: A Structural Equation Modeling of an Extended Technology Acceptance Model. *Interactive Learning Environments, 25,* 306-328.
https://doi.org/10.1080/10494820.2015.1122635

Wang, M. X., & Fang, W. H. (2020). Research on the Influence Mechanism of Users Willingness to Use "Internet + Entrepreneur" Service Platform. *Science & Technology Progress and Policy, 37,* 18-27.

Wang, Y. Y., & Yan, Y. (2018). The Motivation, Attitude and Effect Analysis of English Learning for Minority College Students in Local Colleges and Universities. *Guizhou Ethnic Studies, 39,* 251-254.

Wu, T. (2016). An Empirical Study on the Correlation between Teachers' Classroom Discipline Strategies and College Students' Willingness to Communicate in English. *Foreign Language Education, 37,* 61-65.

Wu, X. Y., & Zhang, Q. Z. (2009). A Study on the Relationship between Self-Efficacy, Learning Strategies, Self-Learning Ability and Academic Achievement of English Majors. *Foreign Language Education, 3,* 43-46+62.

Yang, H. Y., & He, S. (2019). Research on the Effect of Teachers' Motivation Strategies in Improving College Students' Extracurricular English Learning Motivation. *Foreign Language World, 3,* 66-75.

Yuan, S. H., & Ji, Y. H. (2017). A Dynamic Case Study on the Development of College Students' English Classroom Learning Motivation. *Foreign Language World, 3,* 48-56.

Zhang, H., & Du, X. R. (2021). Types of College Students' English Learning Motivation and the Influence. *Contemporary Foreign Language Studies, 6,* 105-118+131.

Zhang, Q., Yan, M. X., Tang, C. M. et al. (2021). Research in Physical Exercise among Rural Adolescents Based on the Theory of Planned Behavior in Sichuan Province. *Chinese Journal of School Health, 42,* 1-5.

Zhang, S. J. (2009). Probing Empirically into the Teaching Outcome of Interaction-based College English Teaching. *Journal of Jiangxi University of Finance and Economics, 5,* 118-121.

Zhang, X. M., Lin, C. D., Shen, J. L., & Guo, D. J. (2007). A Review of Research on the Relationship between Motivation Orientation, Achievement Attribution, Self-Efficacy and Academic Achievement. *Education Science Study, 3,* 48-55.

Zhao, L. L. (2021). The Relationship between College English Learning Strategies and Learning Outcomes: The Moderating Effect of Learning Motivation. *Modern Distance Education, 9,* 26-34.

Zhu, Y. L., & Guo, C. W. (2020). A Configurational Approach to Employees Intrapreneurship Based on the Theory of Planned Behavior. *Chinese Journal of Management, 17,* 1661-1667.