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Structural Equation Model: Influence of Student-Related Factors on English Language Learning Performance

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This paper explores the individual characteristics of students that affect their performance as learners of English. A structural equation model was constructed based on the hypotheses. Two hundred and fifty-four college students from Yanching Institute of Technology were selected as subjects for analysis. The results showed that improving students' language learning ability, cognitive style, learning motivation, and self-efficacy could improve their English-learning outcomes. Moreover, it was found that individuals' anxiety when learning had a negative effect on their motivation and learning outcomes in terms of English language learning, while self-efficacy had a positive effect on learning motivation.

Keywords: structural equation modeling, English learning, student factors, influence on performance

1. INTRODUCTION

English is now considered to be the universal language as it is the dominant language used worldwide for international communication, especially in business and politics. With increased globalization, more and more situations require communication in English (Rose et al., 2019), making English curriculum important in schools.

Students' individual differences in terms of learning efficiency have an impact on their academic outcomes as learners of English. All educators are responsible for teaching their students effectively and improving their learning ability, but there are many factors that can affect students' English-learning performance (Mansoor et al., 2015). In order to teach English better and improve students' learning outcomes, it is necessary to examine factors that affect English performance in order to understand the relationship between the influencing factors and the learning outcomes, and identify the main factors.

(Ying et al., 2016). Zhou et al. (2016) studied the effects of social anxiety, autonomy, and collaborative learning orientation on students' English performance using a structural equation model. The results showed that students' autonomy had both direct and indirect effects on language learning. Using a structural equation model, Kremmel et al. (2017) modeled the test scores of 418 EFL (English as a foreign language) learners. The results demonstrated that the measurement of phrase knowledge was superior to traditional syntactic and lexical measurement in predicting reading comprehension competence. Wang et al. (2020) used structural equation modeling to determine the relationship between learners' beliefs, anxiety, and motivation - three common learner characteristics - and learning performance. Results showed that learners' beliefs had a positive impact on autonomous online English learning, while learning anxiety

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had a negative impact on autonomous online learning. The same results were found for learning anxiety.

This current study was conducted to determine whether there is a relationship between students' individual characteristics and their English-learning outcomes. Moreover, a structural equation model was constructed based on the hypothesis. A questionnaire survey was distributed to 254 college students from Yanching Institute of Technology, and the data was analyzed to determine the validity of the hypothesis.

2. FACTORS AFFECTING STUDENTS' PERFORMANCE AS LEARNERS OF ENGLISH

With increased globalization, it has become more important to teach English in schools. Due to their individual differences and external factors, students perform differently in English classes. The goal of English teachers is to improve students' English-learning outcomes as much as possible so that they can use English to communicate effectively. Therefore, English teachers need to understand the factors that affect students' English performance so that they can adjust their teaching methods to cater for students' differences (Li, 2015).

The factors that can affect English learning performance are broadly divided into external and internal. The external factors are mainly those in the students' learning environment, and the internal factors are individual characteristics that every individual has but to different degrees (Zhang and Wang, 2022). The external factors such as the learning environment are usually oriented to the students and are generally stable, so it is difficult and costly to change them. The internal factors are those related to individuals themselves, such as study habits, which are relatively less difficult to change. As internal factors have different levels of influence on students, teachers should design individualized teaching plans (Kwong et al., 2017). Therefore, this paper seeks to determine the extent to which students' individual characteristics (i.e., internal factors) influence their English learning performance. These internal factors are: language learning ability, cognitive style, learning anxiety, self-efficacy, and motivation.

Multiple regression analysis is the traditional method used to analyze the relationship between influence factors and influence targets (Soriano et al., 2016). This method can also predict targets that will be influenced by specific factors based on the relationship; however, it assumes that the influencing factors are independent of each other and are not associated in any way (Kim et al., 2018).

The five internal factors mentioned above have an impact on students' learning of English, and some factors affect each other. Language learning ability is a student's natural aptitude for learning English. Cognitive style refers to the way that a person perceives, thinks, remembers, and solves problems (Rad et al., 2017). These two factors are objective individual characteristics of students. On the other hand, learning anxiety, self-efficacy, and learning motivation are psychological factors that may influence individual students when they are learning English. These subjective factors are more likely to influence each other. For example, if students feel anxious during the learning process, this will have a negative impact on their acquisition of knowledge. Also, if students do not receive positive feedback, their motivation to learn will decrease. Self-efficacy refers to the student's belief that he or she is capable of performing actions that will lead to the achievement of a specific goal. Students' self-efficacy is a subjective perception of their own learning capabilities. If one has a high opinion of oneself, this may increase motivation to learn, and vice versa.

Based on the foregoing discussion, this paper initially constructs a model of the influence of students' own internal factors on their English-learning performance (Kim et al., 2015), as shown in Figure 1. According to this influence model, language learning ability, cognitive style, learning anxiety, self-efficacy, and learning motivation can have an impact on English-learning performance, while learning anxiety and self-efficacy will have an impact on learning motivation. Since learning anxiety and self-efficacy can influence a student's learning motivation, multiple regression analysis, which requires the influencing factors to be independent of each other, is not appropriate for the constructed model (Xiang, 2021).

In order to accurately determine the relationship between students' internal factors and their English learning performance, this paper used a structural equation model (Chih et al., 2017). A structural conceptual model was constructed based on the hypotheses of the problem to be analyzed. The following hypotheses are proposed based on the factor influence model initially constructed in Figure 1.

① Factor A is positively correlated with target F.

② Factor B is positively correlated with target F.

③ Factor C is positively correlated with target F.

④ Factor D is positively correlated with target F.

⑤ Factor E is positively correlated with target F.

⑥ Factor C is positively correlated with factor E.

⑦ Factor D is positively correlated with factor E.

3. EXAMPLE ANALYSIS

3.1 Data Collection

By means of a questionnaire, data was collected on students' internal factors related to English learning and their English performance. The single-choice questionnaire was distributed to 254 sophomore students in Yanching Institute of Technology, with an average age of 20 years. In addition to demographic information such as age, gender, and nationality, the questionnaire items were mainly related to students' internal factors (language learning ability, cognitive style, learning anxiety, self-efficacy, and motivation), and their English performance. Since there are many detailed questions for different parts in the questionnaire, only the basic framework of the relevant part is showed in Figure 2 due to space limitation. A∼E were the five students' own

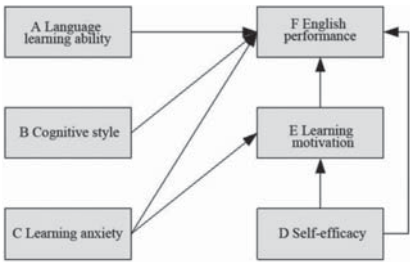

Figure 1 A model of the influence of students' own factors on English learning performance.

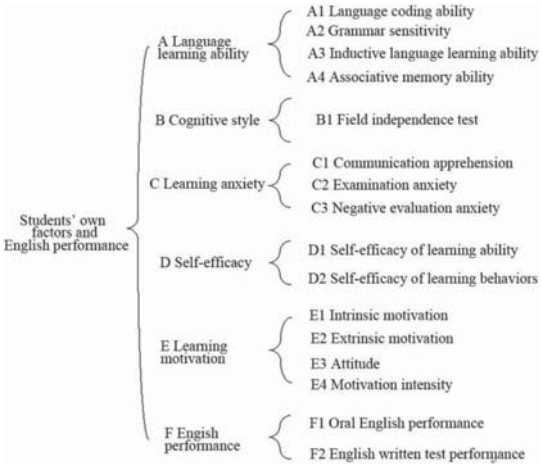

Figure 2 Basic framework of the questionnaire used to collect students' own factors.

Table 1 Results of sample analysis.

Variables	Cronbach's alpha	Kaiser-Meyer-Olkin measure of sampling adequacy	Significance (P value)	Cumulative variance contribution/%
A Language learning ability	0.847	0.915	0.000	79.95
B Cognitive style	0.856	0.759	0.001	75.26
C Learning anxiety	0.849	0.865	0.000	74.32
D Self-efficacy	0.856	0.801	0.001	71.52
E Learning motivation	0.898	0.752	0.001	78.32
F English performance	0.879	0.841	0.000	79.87

factors described in the previous content, and every factor has its dimension index. For example, "A language learning ability" included "A1 language coding ability", "A2 grammar sensitivity", "A3 inductive language learning ability", and "A4 associative memory ability". The indicator of F is the English performance, i.e., the final point of the five factors before English performance. "F1 oral English performance" and "F2 English written test performance" were two dimensional indicators of English performance. The English score collected in this questionnaire came from the score the student obtained for the Test for English Majors-Band 4 (TEM-4). The questionnaire contained several single-choice questions related A1, A2, and other sub-indicators. Limited by space, details are not displayed here.

3.2 Reliability and Validity Tests

Before using the sample data collected by the questionnaire for structural equation model analysis, the data were tested for reliability and validity to ensure that they had sufficient credibility (Liou et al., 2016). The analysis results are shown in Table 1. As shown in Table 1, the variables such as students' internal factors and English performance had sufficient validity, meaning that the data could be used for factor analysis.

3.3 Analysis Results

A structural equation model was initially constructed based on students' own internal factors and English performance according to the hypotheses mentioned in section 2, and then the model was fitted and analyzed. It was found from the relevant indexes of the structural equation model before and after the correction in Table 2, combined with the corresponding judgment criteria, that the structural equation model before the correction (Buco et al., 2018) met the criteria of fitting requirements. However, several indexes were not very satisfactory, and the relevant indexes of the corrected

Table 2 Fitting analysis results of the structural equation model before and after correction.

	x^2/df	GFI	AGFI	NFI	IFI	CFI	RMSEA
Before structural equation correction	1.223	0.921	0.874	0.922	0.981	0.987	0.027
After structural equation correction	1.112	0.925	0.926	0.987	0.985	0.989	0.021

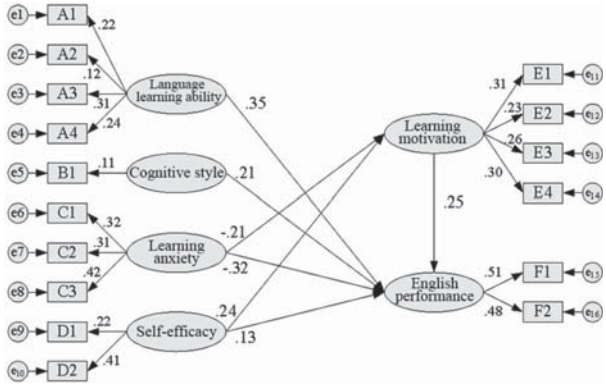

Figure 3 Modified path diagram.

Table 3 Modified hypothetical regression coefficients.

Hypothesis No.	Variable relationship	Regression coefficient	C.R.	P value	Significance
①	A ⇒ F	0.345	3.546	0.001	Significant
②	B ⇒ F	0.213	4.127	0.001	Significant
③	C ⇒ F	−0.321	3.256	0.000	Significant
④	D ⇒ F	0.125	2.158	0.002	Significant
⑤	E ⇒ F	0.247	3.471	0.001	Significant
⑥	C ⇒ E	−0.214	3.169	0.002	Significant
⑦	D ⇒ E	0.235	3.277	0.001	Significant

structural equation model showed that the new model had better fitting results.

The path diagram of the modified structural equation model is shown in Figure 3. Table 3 shows the regression coefficients of the variable relationships obtained from the path diagram of the modified structural equation model. The regression coefficients of all the seven hypotheses were statistically significant. Based on the variable relationships and their regression coefficients, the following results were obtained.

Result ①: factor A was positively correlated with target F.

Result ②: factor B was positively correlated with target F.

Result ③: factor C was negatively correlated with target F.

Result ④: factor D was positively correlated with target F.

Result ⑤: factor E was positively correlated with target F.

Result ⑥: factor C was negatively correlated with factor E.

Result ⑦: factor D was positively correlated with factor E.

4. DISCUSSION

With the increase of globalization, English, which is now the dominant language used for communication, is becoming an increasingly important subject in universities, and more attention is being paid to the way it is being taught. This paper first proposed several hypotheses about the factors that can influence students' English learning performance and then assumed that some of the influencing factors had an effect on each other. A structural equation model was constructed based on the hypotheses. Finally, a questionnaire was used to collect data on the internal factors affecting academic performance and English performance of 254 sophomore students at the Yenching Institute of Technology. The final analysis results are shown above. Seven results were obtained, and seven hypotheses were confirmed according to the regression coefficients of the paths between variables in the structural equation model.

Result ①: language learning ability is positively correlated with English language learning performance. Language learning ability enables students to better understand the pronunciation patterns of English, effectively summarize the grammatical features of similar statements, and memorize English more profoundly via association. The more profoundly they remember English features, the more flexible they can be in performing on English exams.

Result ②: Cognitive style is positively related to English learning performance. Cognitive style mainly refers to the

way students perceive learning materials in the process of English learning, which is divided into the field-independent type and the field-dependent type, and items in the questionnaire were related to the degree of students' field independence. The higher the degree of field independence, the better the students are able to eliminate external interference during the learning process and distinguish the subject from the substratum in the learning material, so that they can learn in a more focused and efficient manner.

Result ③: Learning anxiety is negatively related to English performance. Learning anxiety is an emotional factor for students, and it hampers the learning process.

Result ④: Self-efficacy is positively related to English learning performance. Self-efficacy is a manifestation of learning confidence. The higher the degree of self-efficacy, the more students are able to maintain a positive mindset when engaged in learning.

Result ⑤: Learning motivation is positively related to English learning performance. Learning motivation refers to the degree of effort in the learning process for achieving a goal. The stronger the motivation, the more goal-oriented the students will be during the learning process, and the more motivated they will be to learn.

Result ⑥: Learning anxiety is negatively related to learning motivation. Learning anxiety is an emotional barrier for students during the learning process. The higher the level of learning anxiety, the less confidence they have in reaching their learning goals, and the weaker will be their motivation to learn.

Result ⑦: The higher the self-efficacy, the more students are able to maintain a positive mindset in the learning process, and the more positive they will be about achieving their learning goals; i.e., the higher will be the motivation to learn.

5. CONCLUSION

This paper examined students' internal factors that affect English learning performance, and hypothesized the relationship between the influencing factors and English learning performance. The authors constructed a structural equation model according to the and collected relevant data from 254 college students in Yenching Institute of Technology through a questionnaire. The data were computed by means of the structural equation model to estimate the parameters of the model and obtain the path diagram to verify the hypothesis related to the variable relationships. The following results were obtained.

① Factor A was positively correlated with target F.

② Factor B was positively correlated with target F.

③ Factor C was negatively correlated with target F.

④ Factor D was positively correlated with target F.

⑤ Factor E was positively correlated with target F.

⑥ Factor C was negatively correlated with factor E.

⑦ Factor D was positively correlated with factor E.

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