An Analysis of the Learning Effects and Differences of College Students Using English Vocabulary APP

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Abstract: With the gradual popularization of mobile learning, it has become a trend for college students to use learning applications (APPs) for learning, but the learning effect has always been a concern. Since college students have different learning purposes, strategies, skills, and habits, responses to these differences have been an urgent problem. This paper takes college students using an English vocabulary APP to study as the survey object. It sets up the influencing factors model of the English vocabulary learning effect based on UTAUT2. Then, we analyzed the factors influencing the learning effect of using an English vocabulary APP and studied its mechanism. The results show that on the one hand, the influence degree of influencing factors is habit, facilitation condition, price value, effort expectancy, and performance expectancy from high to low, and all the above factors have a significant positive impact on the learning effect of college students using English vocabulary APP. On the other hand, gender, grade, and major have a moderating effect on English vocabulary learning, and there are differences among different genders, grades, and majors. Finally, suggestions are put forward from the perspective of APP construction and students’ differences to enhance and improve the learning effect of English vocabulary.

Keywords: UTAUT2; online learning; learning effect; English vocabulary; difference analysis

1. Introduction

With the popularity of smartphones and other mobile devices, the promotion of 4G and 5G, the development of information technology, and the coverage of wireless networks, the Internet has increasingly penetrated various industries, the combination of mobile communication technology and modern education technology promotes mobile learning more and more attention. Also, the worldwide pandemic of novel coronavirus disease (COVID-19) has contributed to online learning instead of face-to-face education. Mobile learning, a trendy multidisciplinary research field globally, refers to a learning method in which learners can independently obtain learning resources anytime and anywhere and carry out two-way communication with teachers using mobile Internet and mobile terminal devices [1]. English has always been regarded as an essential subject integrating importance and practicality for future development. Vocabulary learning is the foundation and core of English language learning, and it is also the top priority for learners. English vocabulary learning through mobile learning has become an indispensable part of online learning for college students, occupying students’ learning time and space with irresistible momentum [2]. Applications (APPs) are the main form of mobile learning, and the use of mobile English vocabulary APPs for learning is a positive way for people to respond.

English vocabulary learning with APP can realize students’ vocabulary learning at any time and anywhere and can constantly wake up the vocabulary content that has been forgotten or will be forgotten through fragmented learning and uninterrupted review. However, due to differences in mobile learning methods (such as APP differences, mobile device differences, etc.), individual differences among students (such as learning habits
differences, learning methods differences, etc.), and the limitations of mobile learning itself (such as visual exhaustion, distractibility, spelling ability reducing, etc.), there are uneven differences in students’ learning effects. Therefore, to find out the specific reasons for the difference in the effect of mobile English vocabulary learning and improve the learning effect of students’ mobile English vocabulary learning, it is vitally important to study the influencing factors on the effect of students’ mobile English vocabulary learning. The study on the effect of mobile learning on English vocabulary can explore the influencing factors of the learning effect from the two dimensions of APP construction and students’ differences and deeply study the influencing mechanism of the learning effect. The study helps students change their APP learning behavior and improve their learning effect based on their own needs. It also provides improvement plans for the usefulness of APP content settings and the ease of APP construction.

2. Theoretical Background

2.1. Research on the Effect of Mobile English Vocabulary Learning

Vocabulary theory points out that vocabulary comes first in learning and applying language and is more indispensable in language than grammar and vocabulary. Verhallen and Schoonen et al. (1998) studied the relationship between vocabulary and language learning from vocabulary size from the perspective of breadth. Later, this paper studied the influence of vocabulary presentation on the learning effect from the perspective of depth [3,4]. With modern teaching technology, more and more people use mobile devices for vocabulary learning, and mobile learning has become a trend. Scholars have started the research on mobile learning of English vocabulary. Some studied the influencing factors of accepting mobile learning behavior [5,6]. As the outcome variable of learning, the learning effect is also the expectation variable generated by the technology acceptance behavior. However, scholars focus more on adopting learning methods in the current literature, and there are few studies on the effect of mobile learning on English vocabulary, especially from the perspective of difference.

In articles involving differences, scholars generally consider the differences in learners’ goals, experiences, existing knowledge, and abilities and build personalized learning systems based on these differences. This paper proposes a personalized multi-agent e-learning system that presents adaptive tests and personalized recommendations, adding adaptability and interactivity to the learning environment [7]. Some scholars also consider the rules of students’ memory when analyzing differences in ability; this study presents a personalized mobile English vocabulary learning system that recommends appropriate English vocabulary for learning according to individual learner vocabulary ability and memory cycle [8]. Although these studies consider a wide range of differences, they ignore the regulatory role of fundamental differences, namely gender, grade, and major. As a result, the model lacks the explanatory power of students’ fundamental differences.

2.2. Research on UTAUT2

User Acceptance of Information Technology (UTAUT), proposed by Venkatesh and other scholars in 2003, is the basic theory to explain and predict people’s acceptance of information technology [9]. It mainly analyzes the influence of performance expectancy, efforts expectancy, social influence, and facilitating conditions on users’ willingness to use and behavior while setting up gender, experience, age, and voluntary use as four moderating variables. These moderating variables help solve the inconsistency and weak explanatory power of previous models [10] and explain the user behavior of different groups. This model is mainly used to study users’ behavioral intention and use behavior for various new technologies or applications of technologies.

The Extended Unified Theory of Acceptance and Use of Technology (UTAUT2) adds three new variables: hedonic motivation, price value, and habit on UTAUT (as defined in Table 1), and the moderating variables change into gender, age, and experience [11]. Studies have shown that compared with UTAUT, UTAUT2 has improved explanatory
power on behavior intention and use behavior. Moreover, it has the highest explanatory power for individual technology acceptance and usage behavior among existing technology acceptance models [12,13]. In existing studies, researchers mostly use the UTAUT2 model to explain mobile e-commerce [14], mobile learning [15–18], application service APP [19,20], information technology [21–23], and the willingness and behavior of new technologies in the context of the Internet. However, few people use this model to analyze the effect of mobile learning. Mobile learning is essential in mobile technology based on access to learning benefits. Students themselves have expectations of learning effect, and technical conditions, learning cost, process fun, and habit cultivation will affect students learning effect. Therefore, the UTAUT2 model applies to mobile learning research, and variables in the model can fully explain the influencing mechanism of the mobile learning effect of English vocabulary.

Table 1. Definition of study variables.

| Variable                  | UTAUT                  | UTAUT2                  | Definition in This Paper                                                                 |
|---------------------------|------------------------|-------------------------|------------------------------------------------------------------------------------------|
| Performance Expectancy (PE) | The degree to which you feel the use of technology has helped your job | The extent to which consumers benefit from using the system in a particular activity | College students can improve their learning effectiveness by using English vocabulary APP |
| Effort Expectancy (EE)     | The degree of personal effort to use technology                     | The level of effort required by consumers to use technology | College students are easy to use English vocabulary APPs to learn the degree |
| Social Conditions (SC)     | The degree to which an individual feels influenced by the group around them | Consumers feel the influence of the group around them | Not concern |
| Facilitating Conditions (FC)| An individual’s perceived organizational support for the use of technology | The level of resources and support available to consumers using the technology | The degree of available resources felt by college students using the APP |
| Hedonic Motivation (HM)    | Not concern             | The pleasure consumers derive from using technology | The degree of pleasure that college students feel when learning English vocabulary APP |
| Price Value (PV)           | Not concern             | The tradeoff between the perceived value of the consumer’s use of the system and the actual monetary expenditure | The tradeoff between perceived benefit and actual monetary expenditure when college students use English vocabulary APP learning |
| Habit (HB)                 | Not concern             | The degree to which consumers have developed preferences for the specific stability of behavior in practice | The degree to which college students develop learning habits in the process of English vocabulary APP learning |

3. Research Model and Hypotheses

3.1. Model Specification

Based on the UTAUT2 model and from the perspective of willingness to use English vocabulary APP, this study builds a model of influencing factors of English vocabulary APP learning effect as there is no social influence on the learning effect of college students using English vocabulary APP. Therefore, this study deletes social influence variables from the original model. Meanwhile, taking college students as the object of investigation, age has little influence. In contrast, the grade difference between college students impacts English learning, so the age variable is replaced by grade. Furthermore, as college students’ English experience on vocabulary learning is not evident, whether students are majoring in English has a moderating effect on English vocabulary learning, so the experience variable is replaced by a major. Therefore, this paper will analyze the differences in the learning effects of English vocabulary APP from three aspects: gender, grade, and major. Considering that our research topic is the learning effect if students can acquire more learning resources
and spend less time adapting to the application method of APP. The more stable the APP environment, the more interesting the learning process, the more free resources, the more quickly learning habit be formed, and the better learning effect will be achieved when using vocabulary APP. Therefore, behavioral intention is replaced by the learning effect in this paper. The influencing factor model of English vocabulary APP learning effect on college students is finally obtained, as shown in Figure 1.

![Figure 1](image)

**Figure 1.** The learning effect model of college students using an English vocabulary APP.

### 3.2. Model Hypothesis

In the research model, the factors influencing the effect of mobile vocabulary learning include performance expectancy, effort expectancy, facilitation condition, hedonic motivation, price value, habit, and moderating variables of gender, grade, and major (Table 1).

For mobile learning Apps, the development of high-quality and reliable platform internal resources is a principal factor in transforming learning achievements into efficiency [24]. It is always an urgent job to improve existing mobile learning platform technology, simplify platform operation mode and provide rich content [25]. Therefore, based on the original hypothesis of Venkatesh (2012), the following hypotheses are proposed:

**H1.** Performance expectancy has a significant positive effect on English vocabulary APP learning.

**H2.** Effort expectancy has a significant positive effect on English vocabulary APP learning.

**H3.** Facilitation conditions have a significant positive effect on English vocabulary APP learning.

Mobile learning should have rich learning resources and incorporate fun design. Fun directly affects users’ satisfaction with resources [26], thus affecting the learning effect and perceived learning effect. The more fun students have in APP learning, the more relaxed they will be in learning and the better their learning effect will be. H4 is put forward:

**H4.** Hedonic motivation has a significant positive effect on English vocabulary APP learning.

Learners all hope to obtain many English video resources, English learning materials, and exciting experiences in the APP conveniently and efficiently without any cost [27]. H5 is put forward:

**H5.** Price value has a significant positive impact on the learning effect of the English vocabulary APP.

Mobile learning is a kind of autonomous learning behavior, and the flexibility of autonomous learning will affect users’ learning effect [28]. Habit formation is the final result of autonomous learning, so the habit formed by continuous autonomous learning contributes to improving the learning effect. H6 is put forward:

**H6.** Habits have a significant positive impact on the learning effect of English vocabulary APP.

The “people-oriented” view of students in pedagogy holds that students are unique people and different degrees differ from students. Therefore, gender differences, grade
differences, and major differences will all lead to differences in students’ learning effects. The hypothesis is put forward:

**H7.** The influence of each variable on the learning effect of English vocabulary APP is moderated by gender.

**H8.** The influence of each variable on the learning effect of the English vocabulary APP is adjusted by grade.

**H9.** The influence of the respective variables on the learning effect of the English vocabulary APP is regulated by majors.

### 4. Research Design

This paper adopts the questionnaire method for research, draws on the existing UTAUT2 maturity scale, and combines the actual situation to make a questionnaire on the effect of college students’ English vocabulary APP learning. The questionnaire consists of three parts: The first part investigates the basic information of college students, including gender, grade, and major. The second part investigates the use of English vocabulary APPs. The third part is the formal question item on the learning effect of the English vocabulary APP, including seven variables and 21 questions (Table 2). Likert scale five is adopted, and the weighted average of all observed variables is taken as the value of potential variables. “Strongly disagree,” “disagree,” “generally,” “agree,” and “strongly agree” were expressed on a scale of 1–5. This study used a random sampling method to survey college students of different grades, and questionnaires were distributed on the Questionnaire Star platform. 302 questionnaires were collected, 296 of which were effective, with an effective rate of 98%.

| Variable | Items                                                                 | References                                      |
|----------|-----------------------------------------------------------------------|------------------------------------------------|
| PE       | Using English vocabulary APP can expand my English vocabulary         | Venkatesh (2012) [11]                          |
|          | Using English vocabulary APP can improve my efficiency in memorizing words | Li Kyoung (2014) [29]                         |
|          | Using English vocabulary APP can make good use of my scattered time   |                                                 |
| EE       | APP will respond quickly and not be too slow when I use English vocabulary APP to learn | Venkatesh (2012) [11]                          |
|          | Learning English vocabulary APP is easy for me in operation           | Tianyue Sun (2015) [30]                        |
|          | The way of memorizing English vocabulary APP is easy for me to adapt to|                                                 |
| FC       | National policies support mobile English learning, prompting me to use an English vocabulary APP to learn | Venkatesh (2012) [11]                          |
|          | The rapid development of the mobile Internet urges me to use English vocabulary APPs to learn | Li Kyoung (2014) [29]                         |
|          | When I encounter problems in learning English vocabulary APP, I can get help conveniently |                                                 |
| HM       | Using English vocabulary APP to learn is interesting                  | Venkatesh (2012) [11]                          |
|          | Using English vocabulary APP is great for me to learn                 | San Martin (2012) [31]                         |
|          | The learning process of using the English vocabulary APP is gratifying |                                                 |
| PV       | The price-setting of paid content in the English vocabulary APP is reasonable | Venkatesh (2012) [11]                          |
|          | Extra English learning materials on the APP are worth paying for      |                                                 |
|          | Using English vocabulary APP can reduce my learning cost              |                                                 |
| HB       | It comes naturally to me to use English vocabulary APP for daily learning | Venkatesh (2012) [11]                          |
|          | Using English vocabulary APP to study has become my habit             |                                                 |
|          | Using English vocabulary APP is a must for me                        |                                                 |
| LE       | I can gain more knowledge through the English vocabulary APP mobile learning | Mahdi (2017) [32]                             |
|          | The mobile learning method of the English vocabulary APP can make me remember vocabulary more firmly | Alyoussef I Y (2021) [33]                     |
|          | The mobile learning method of the English vocabulary APP can make me remember vocabulary faster |                                                 |
5. Analysis and Hypothesis Testing

5.1. Data Analysis

This study investigated 296 students, majoring English, E-commerce and other majors, 143 boys and 153 girls, accounting for close to 1:1. As for grade distribution, junior college student number 73, undergraduate number 174, master student number 35, doctoral student number 14, while the main investigation object is undergraduate. As for majors, 102 English majors, and 194 non-English majors (Table 3).

Table 3. Descriptive statistical analysis.

| Grade       | Junior (73) | Undergraduate (174) | Master (35) | Doctor (14) | X² (df) |
|-------------|-------------|---------------------|-------------|-------------|---------|
| Gender      | Male        | 59 (80.8%)          | 68 (39.1%)  | 13 (37.1%)  | 3 (21.4%) | 42.635  |
|             | Female      | 14 (19.2%)          | 106 (60.9%) | 22 (78.6%)  | 11 (51.7%)| (3)     |
| Major       | English     | 45 (61.6%)          | 41 (23.6%)  | 11 (31.4%)  | 5 (35.7%) | 32.237  |
|             | Non-English | 28 (38.4%)          | 133 (76.4%) | 24 (68.8%)  | 9 (64.3%) | (3)     |

SPSS22.0 (v26, IBM, Armonk, NY, USA) was used for the reliability and validity analysis of variables in the model. The results (Table 4) showed that the scale’s total clone Bach α coefficient was 0.951, and the KMO value of the exact scale obtained by factor analysis was 0.945. Cronbach’s Alpha values of each potential variable were all greater than the critical value of 0.6, indicating that the measurement indexes of each potential variable were consistent and had good and stable notification reliability. KMO = 0.951 > 0.8, Bartlett spherical test significance probability value \( p = 0.000 < 0.05 \), indicating that the scale is suitable for factor analysis. Exploratory factor analysis was conducted on the questionnaire by the principal component analysis method. The total explanatory variation of the seven factors reached 62.758%, indicating that the scale structure validity was good.

Table 4. Correlation analysis of each variable.

| PE  | EE  | FC  | HM  | PV  | HB  | LE  | Cronbach’s Alpha | KMO |
|-----|-----|-----|-----|-----|-----|-----|------------------|-----|
| PE  | 1   | 0.631 ** | 0.000 | 0.667 ** | 0.000 | 0.604 ** | 0.000 | 0.508 ** | 0.000 | 0.597 ** | 0.000 | 0.592 ** | 0.000 | 0.796 | 0.704 |
| EE  | 1   | 0.672 ** | 0.000 | 0.627 ** | 0.000 | 0.557 ** | 0.000 | 0.592 ** | 0.000 | 0.610 ** | 0.000 | 0.840 | 0.726 |
| FC  | 1   | 0.745 ** | 0.000 | 0.540 ** | 0.000 | 0.645 ** | 0.000 | 0.655 ** | 0.000 | 0.834 | 0.716 |
| HM  | 1   | 0.585 ** | 0.000 | 0.696 ** | 0.000 | 0.657 ** | 0.000 | 0.841 | 0.718 |
| PV  | 1   | 0.395 ** | 0.000 | 0.595 ** | 0.000 | 0.866 | 0.620 |
| HB  | 1   | 0.847 ** | 0.000 | 0.802 | 0.703 |
| LF  | 1   | 0.815 | 0.714 |

** Correlation is significant at the 0.01 level (2-tailed).

5.2. Hypothesis Testing

Pearson correlation analysis was conducted for seven factors, and the results showed that correlation coefficients of all factors were above 0.5, showing a significant positive correlation. \( p = 0.000 < 0.005 \) in bilateral test, indicating obvious significance.

After correlation analysis, regression analysis was used to test the research model and verify the hypothesis. The correlation analysis results (Table 5) showed a specific correlation among all variables. Since the independent variables’ variance inflation factor (VIF) was less than 5, the multiple collinearities between the variables were not significant. The variance analysis of the regression model of learning effect variables shows that the F statistic value is 74.562 and the significance \( p = 0.000 \), indicating that the regression model
of learning effect variables has a particular statistical significance. The adjusted R2 of the model is 0.555, indicating that the regression model has an excellent fitting degree.

Table 5. Regression analysis of variables.

| Model   | Unstandardized Coefficients | Standardized Coefficients | t   | Sig. | Collinearity Statistics |
|---------|----------------------------|---------------------------|-----|-----|-------------------------|
|         | B                          | Standard Error            | Beta|      | Tolerance               | VIF    |
| (Constant) | 0.179                       | 0.154                      | 1.163 | 0.246 |                          |        |
| PE      | 0.036                       | 0.046                      | 0.034 | 0.777 | 0.438                   | 0.466  | 2.147 |
| EE      | 0.079                       | 0.045                      | 0.079 | 1.778 | 0.077                   | 0.445  | 2.248 |
| FC      | 0.114                       | 0.052                      | 0.11  | 2.173 | 0.031                   | 0.338  | 2.959 |
| HM      | −0.005                      | 0.048                      | −0.006| −0.11 | 0.912                   | 0.346  | 2.894 |
| PV      | 0.08                        | 0.039                      | 0.082 | 2.075 | 0.039                   | 0.554  | 1.805 |
| HB      | 0.667                       | 0.046                      | 0.664 | 14.601| 0                  | 0.421  | 2.376 |

Dependent Variable: Learning Effect.

Further analysis shows that performance expectancy, effort expectancy, facilitation condition, price value, and habit have a significant positive impact on the learning effect of English vocabulary APP learning. The hedonic motivation of college students’ English vocabulary APP learning has no significant influence on the effect of mobile learning. Therefore, H1, H2, H3, H5, and H6 are assumed to be true while H4 is not.

Since gender and major are dichotomous variables, an independent sample T-test is adopted, and the test results are shown in Table 6. Among them, boys perform better than girls in terms of hedonic motivation, price value, habit, and learning effect of English vocabulary APP learning, indicating that gender has a particular adjustment effect on each variable, H7 is true. On the other hand, in terms of performance expectation, effort expectation, facilitation condition, hedonic motivation, habit, and learning effect, English majors perform better than non-English majors, indicating that the major has a particular regulating effect on each variable and H8 is true.

Table 6. Gender and major differences in various variables.

| Gender | M    | SD   | t    | p    | Major     | M    | SD   | t    | p    |
|--------|------|------|------|------|-----------|------|------|------|------|
| PE     | Male | 4.233| 0.582| 0.929| 0.054| PE      | 4.262| 0.511| 1.366| 0.003|
| Female | 4.177| 0.470|      |      |           | 4.174| 0.533|      |      |
| EE     | Male | 4.313| 0.568| 1.311| 0.191| EE      | 4.304| 0.502|      | 0.792| 0.029|
| Female | 4.229| 0.533|      |      |           | 4.251| 0.576|      |      |
| FC     | Male | 4.224| 0.554| 1.390| 0.166| FC      | 4.249| 0.485|      | 1.610| 0.058|
| Female | 4.137| 0.523|      |      |           | 4.143| 0.563|      |      |
| HM     | Male | 4.206| 0.548| 1.623| 0.006| HM      | 4.220| 0.524|      | 1.519| 0.030|
| Female | 4.096| 0.608|      |      |           | 4.112| 0.608|      |      |
| PV     | Male | 4.296| 0.568| 2.231| 0.026| PV      | 4.233| 0.591|      | 0.277| 0.082|
| Female | 4.148| 0.570|      |      |           | 4.213| 0.564|      |      |
| HB     | Male | 4.231| 0.531| 2.242| 0.026| HB      | 4.206| 0.488|      | 1.116| 0.066|
| Female | 4.087| 0.568|      |      |           | 4.131| 0.586|      |      |
| LE     | Male | 4.280| 0.549| 1.501| 0.034| LE      | 4.317| 0.486|      | 1.967| 0.050|
| Female | 4.183| 0.561|      |      |           | 4.184| 0.586|      |      |

Since grade has four variables, a one-way ANOVA analysis was conducted on the seven influencing factors of junior college students, undergraduates, master’s students, and doctoral students (Table 7). In terms of performance expectancy, facilitation conditions, hedonic motivation, price value, habit and learning effect, junior college, undergraduate, master’s, and doctoral exists an obvious difference in the performance expectations, score as follows: junior college students > doctoral students > master students > undergraduates. In facilitation conditions, price value, learning effect, the score is junior college students > undergraduates > master students > doctoral student. On hedonic motivation, habit scores are as follows: junior college students > master students > undergraduates> doctoral students. Therefore there was no significant difference among groups. H9 is true.
Table 7. The difference of major in different variables.

|       | Junior | Undergraduate | Master | Doctor | \( F(3, 292) \) | \( p \) |
|-------|--------|---------------|--------|--------|----------------|------|
| PE    | 4.416  | 0.444         | 4.108  | 0.544  | 4.229          | 0.410 | 4.238          | 0.659 | 6.240          | 0.000 |
| EE    | 4.362  | 0.490         | 4.255  | 0.567  | 4.219          | 0.517 | 4.095          | 0.697 | 1.288          | 0.279 |
| FC    | 4.356  | 0.489         | 4.128  | 0.548  | 4.115          | 0.457 | 4.049          | 0.702 | 3.672          | 0.013 |
| HM    | 4.325  | 0.462         | 4.086  | 0.603  | 4.125          | 0.583 | 4.073          | 0.730 | 3.057          | 0.029 |
| PV    | 4.402  | 0.527         | 4.167  | 0.580  | 4.143          | 0.466 | 4.119          | 0.780 | 3.391          | 0.018 |
| HB    | 4.310  | 0.425         | 4.109  | 0.584  | 4.169          | 0.559 | 4.067          | 0.663 | 2.650          | 0.049 |
| LE    | 4.389  | 0.472         | 4.191  | 0.570  | 4.178          | 0.567 | 4.143          | 0.664 | 2.696          | 0.046 |

5.3. Research Results

Table 8 shows the results of the empirical study. The factors that significantly positively impact the learning effect of English vocabulary APP are performance expectancy, effort expectancy, facilitation condition, price value, and habit. On the other hand, hedonic motivation has no significant positive effect on learning. Furthermore, the learning effect of college students is related to the improvement of their learning expectation, objective promotion factors, price value, and habit formation by using English vocabulary APP, and it has little to do with the fun in the learning process of APP.

Table 8. Hypothesis test results.

| Number | Hypothesis | Results |
|--------|------------|---------|
| H1     | Performance expectancy has a significant positive effect on English vocabulary APP learning | True    |
| H2     | Effort expectancy has a significant positive effect on English vocabulary APP learning | True    |
| H3     | Facilitation conditions have a significant positive effect on English vocabulary APP learning | True    |
| H4     | Hedonic motivation has a significant positive effect on English vocabulary APP learning | False   |
| H5     | Price value has a significant positive impact on the learning effect of English vocabulary APP | True    |
| H6     | Habits have a significant positive impact on the learning effect of English vocabulary APP | True    |
| H7     | The influence of each variable on the learning effect of English vocabulary APP is moderated by gender | True    |
| H8     | The influence of each variable on the learning effect of English vocabulary APP is adjusted by grade | True    |
| H9     | The influence of each variable on the learning effect of English vocabulary APP is regulated by specialty | True    |

6. Conclusions and Recommendations

6.1. Conclusions

Based on the UTAUT2 model and through questionnaire survey and regression analysis, this paper studies the influencing factors of college students’ English vocabulary APP mobile learning effect and draws the following conclusions:

1. Performance expectancy, effort expectancy, facilitation condition, price value, and habit significantly impact the learning effect of college students’ English vocabulary mobile learning. In contrast, hedonic motivation has a positive but insignificant correlation with the learning effect, indicating that contemporary college students are more willing to choose professional, practical, and cost-effective vocabulary learning APPs for mobile learning than the fun in the learning process and hope that such software can help them develop a good habit of vocabulary learning. In addition, the standardization effect analysis shows that the effect of influencing students’ English vocabulary learning is habit > facilitation condition > price value > performance expectancy > hedonic motivation, indicating that habit formation has the most significant impact on students’ vocabulary learning. In contrast, hedonic motivation has the most negligible impact on students’ vocabulary learning.

2. Gender, grade, and major have significant differences in the moderating performance of most influencing factors. In terms of gender, male students perform better than female students in various influencing factors, indicating that male students adapt to the learning mode of English vocabulary APP faster and learn vocabulary better.
In terms of majors, students in English majors have better performance than non-English majors in various influencing factors, which means that students in English majors have higher requirements and more vital purpose in vocabulary learning and better learning effect when using an APP. Finally, in grade, junior college students, undergraduate students, master’s students, and doctoral students have significant differences in various influencing factors. However, junior college students generally have better performance, indicating that junior college students have the best learning effect in English vocabulary APP learning mode compared with other grades.

6.2. Recommendations

Given the above research conclusions, in order to improve the learning effect of college students using English vocabulary APPs, this paper puts forward the following suggestions:

1. From the perspective of influencing factors, the factors influencing the learning effect of APP learning are habit, facilitation condition, price value, effort expectancy, performance expectancy, and hedonic motivation from high to low. Therefore, the first step to improving the learning effect of college students using English vocabulary APPs is to promote the formation of students’ learning habits so that the use of APP for vocabulary learning becomes a subconscious behavior of college students so that students can learn voluntarily, independently and continuously. Second, the facilitation condition is the macro support for the vocabulary learning effect. The national policy support for APP learning, the promotion of APP by science and technology, and the assistance of intelligent electronic equipment can effectively eliminate the problems students may encounter when learning with APP and remove the obstacles in their learning process to improve student’s learning efficiency. Thirdly, since most college students are not economically independent, students often balance the weight of price and the value of learning content. Therefore, the price setting of APP content should adhere to the principle of “maximum cost performance,” set reasonable and acceptable prices, and provide free and open learning content for students as much as possible. Besides, to improve the effect of college students’ English vocabulary learning, attention should also be paid to students’ effort Expectancy and performance Expectancy. The ultimate purpose of students’ application of APP learning is to learn more vocabulary easily and quickly to improve their English learning performance. Therefore, APP construction should improve the comprehensiveness, applicability, professionalism, and expansibility of vocabulary and improve the security, fluency, stability, and simplicity of the system. As college students have a vital learning purpose and high learning expectations, improving their English vocabulary learning effect can reduce their attention to hedonic motivation and reduce unnecessary content entertainment and process entertainment. In conclusion, when improving the effect of college students’ English vocabulary learning, we should distinguish the influence intensity of each factor, clarify the optimization problem of the improvement plan, and properly arrange the attention and optimization proportion of each factor.

2. From the perspective of APP construction, to improve the intelligence of APPs, we should improve the APP’s construction from learning content and the APP system. First of all, students’ sound learning effects can be summarized as “learn more,” “learn more efficiently,” and “forget more slowly.” To expand students’ learning content, the content setting of the App should, on the one hand, reserve vocabulary learning resources of different disciplines, different functions, and different levels as much as possible to meet the personalized needs of students. Then, due to the interference of the mobile learning mode itself, students will be distracted from learning to a large extent, so it is necessary to reduce the enjoyment of learning content which shows hedonic motivation is unnecessary, such as reducing the recreational learning mode on the platform. On the other hand, the content presentation of APPs should reflect the comprehensiveness and expansibility of the content, such as adding vocabulary deformation and polysemy (comprehensiveness) and increasing synonyms, antonyms,
fixed collocations, situational sentences, etc. (extensibility). In addition, to improve students’ learning efficiency, attention should be paid to the presentation form of learning content and operational difficulties. Therefore, the platform should adopt diversified presentation forms of content, such as picture memory, audio memory, association memory, homophonic memory, etc. and reduce the difficulty of the APP’s technical operation to reduce the time for students to adapt APP. Furthermore, in order to slow down students’ forgetting speed, the platform should not only increase the vocabulary repetition, but also follow the principle of the forgetting curve and the memory role in arranging the frequency, quantity, and difficulty of students’ retrospective projects, such as reminding students to review the words that may be forgotten or will be forgotten once a week or twice a week. Lastly, to better adapt to the stage progress of students, the system should adjust learning plans and frequency for students with their English level improving in time, for example, by recommending another more difficult vocabulary book or increasing the difficulty of practical practice tasks.

3. From the perspective of the differences caused by individual students to improve the humanized, APP should pay attention to the uniqueness and difference of students and teach students according to their aptitude. In terms of gender differences, APP can connect the vocabulary content of different themes according to the differences of interests between males and females. For example, the vocabulary can be combined with basketball and games to improve the learning efficiency of male students, while the vocabulary can be combined with makeup and shopping to improve the learning effect of female students. Anyway, males perform better than girls, so more attention could be supposed to improve males’ learning effect with males’ interests. On the other hand, considering the physiological responses caused by gender differences, APP can cooperate with female physiological apps, such as Meipomelo APP, which girls commonly use to record their menstrual period. When arranging vocabulary learning, lexicon memory intensity can be adjusted according to the authorized menstrual cycle of female students, and students can be reminded to pay attention to rest to provide more humanized services. As for grade differences and according to different grade students’ learning needs and learning ability, APP should provide or push open, targeted learning resources in learning content and task arrangements, such as pushing vocabulary materials related to junior college students and undergraduates, such as CET-4, CET-6 exams and academic qualification promotion, and pushing professional information related to scientific research for master students and doctoral students. As for differences in major, APP should not only provide students with general learning content regardless of majors, for example, College English, but also match learning resources to students’ majors, such as pushing business English learning materials for students majoring in E-commerce. Eventually, learning content should be presented to learners most simply and conveniently so that students can improve their learning effect using English vocabulary APP.

Although instructive implications can be drawn from this study, there are still some limitations in this study. On the one hand, the quality of the sample data collected by the questionnaire method is greatly affected by the number of samples. So, if more samples were collected instead of the 300 samples in this study, the reliability and validity of the study would be higher. It can also better reflect the differences in English vocabulary learning effects. On the other hand, the research objects of this paper are college students who use English vocabulary learning APPs. The narrow selection of research objects makes the conclusions of this research only applicable to English learners and cannot be extended to learners of other subjects such as mathematics and geography. Based on this, we will extend it to other learning APPs through further research and provide corresponding guidance for improving the learning efficiency of learners in other disciplines.
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