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Retraction

Retracted: The Application of English Vocabulary Education Informatization under 5G and Cloud Computing Environment

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] F. Zhang, "The Application of English Vocabulary Education Informatization under 5G and Cloud Computing Environment," *Mathematical Problems in Engineering*, vol. 2022, Article ID 9717449, 7 pages, 2022.

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Research Article

The Application of English Vocabulary Education Informatization under 5G and Cloud Computing Environment

Fangli Zhang

Public Foreign Language Teaching and Research Department, Luoyang Normal University, Luoyang, Henan 471934, China

Correspondence should be addressed to Fangli Zhang; zhangfangli@lynu.edu.cn

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In the 5G and cloud computing environment, autonomous learning based on smart mobile devices has a significant effect on improving students' vocabulary and vocabulary use. This paper adopts a combination of vocabulary testing and interviews, and by building an autonomous English vocabulary learning platform based on 5G and cloud computing technology, learners can learn and use vocabulary in real natural contexts anytime, anywhere through smart mobile devices. Experimental results show that real-time interaction and collaboration with teachers and other learners during the learning process greatly improve the efficiency and quality of their vocabulary learning.

1. Introduction

As the most basic unit of language communication, vocabulary is used in the actual communication activities of listening, speaking, reading, writing, and translating. "Without grammar, only a little information can be conveyed; without vocabulary, nothing can be conveyed. Therefore, the acquisition of vocabulary directly determines the success of language communication [1]. However, due to the long-standing influence of the fill-in-the-blank English teaching mode of teachers speaking and students memorizing, our students' English vocabulary acquisition is not as effective as it should be either they cannot remember, or even if they do, they soon forget; they remember a lot of words, but they cannot express them [2–4]. The development of science and technology promotes the development of web and mobile technology services, while injecting fresh energy into students' independent learning.

In the English entity recognition task, the key point is to distinguish the type of entity, because English words have more obvious boundary information compared to Chinese. The error in Chinese word separation predisposes the Chinese NER to adopt a character-based approach different from the English NER [5]. In terms of practical experience, this character-based NER system is faster and more effective. However, character-based NER also has some drawbacks due to its elimination of the use of lexical information, and the benefits that lexical boundaries can bring to entity boundaries are self-evident [6]. We can use this to improve the performance of Chinese NER. In [7], a Chinese NER based on the lexical enhancement method is proposed for the first time to construct the model LatticeLSTM, which determines the position of the lattice by the first and last characters of a lexicon and successfully fuses lexical information into the LSTM. Reference [8] introduced a lexicon-based global semantic graph neural network (LGN) that treats each character as a node and the matched lexical information forms an edge [9].

Semantic parsing is reduced to the generation of a query graph, forming a staged search problem. The final candidate answer is obtained directly by eliminating the wrong options [10]. Ahed et al. [11] first extract the relevant subgraphs of question entities in the knowledge graph, later take each entity node and each relationship edge within the subgraph as an alternative answer, then obtain the representation vector of questions and alternative answers based on the set rules and templates, and feed them into the logistic regression model for ranking to select the best answer among the alternative answers [12]. Chandra et al. [13] proposed a BERT-based parsing algorithm framework to implement the special structure of grammars in complex problems. Du et al. [14] proposed a neural attention-based model to dynamically represent the problem according to the different focuses of various aspects of the current answer. Ali et al. [15] proposed a segmented convolutional neural networks (PCNNs) model with multiple example learning, which treats distance-supervised relation extraction as a multi-instance problem and employs convolutional structures and segmented maximal pooling to automatically learn the relevant features.

With the construction of 5G networks, the renewal of cell phones, the development of app software, and the widespread use of "cloud computing", there is an opportunity to solve this problem. As long as they have smart mobile devices, learners can learn vocabulary anytime, anywhere, and anywhere through multimedia short messages and WAP browsing. In order to understand this new way of vocabulary learning, this study investigates the effect of independent English vocabulary learning in 5G and cloud computing environments in our school, aiming to improve the quality of students' English vocabulary learning by using modern information technology such as 5G and cloud computing through empirical methods.

2. Related Work

With the rapid development of deep learning, semantic parsing, information extraction, and spatial vector modeling methods based on deep learning have become the mainstream methods for building knowledge graph question and answer systems. The main concept of this semantic parsing method is to elaborate the natural language with formalized logic and expressions, and to analyze the lowest part of the logic and expressions step by step to get the corresponding logical expressions, and then use lambda-like expressions to query statements and finally match them in the correct answer can be found by matching in the knowledge base. Reference [16] proposed a technique for developing a grammar parser for large databases based on standard supervised training algorithms, pattern matching, and pattern learning. Using these aspects, they developed a semantic parser for Freebase that improves 0.42% over purely supervised learning algorithms. Reference [17] proposed a new knowledge-base-based framework for semantic analysis of questions and answers. And a query graph similar to a knowledge base subgraph is defined that can be directly mapped to a logical form.

With the continuous advancement and rapid development of technology modernization and deep learning machine intelligence learning, the recognition technique is almost completely unnecessary as the previous traditional approach requires feature information engineering and other domain-specific knowledge [18]. Reference [19] combined bidirectional LSTM, CNN, and CRF and introduced a neural network structure to optimize the output sequence labeling, which substantially improved the accuracy of lexical annotation. Du et al. [14] proposed an LM-LSTM-CRF basic model and combined a character task-aware neural network-based language basic model with a multitask-based language framework to facilitate the representation of a new character by extracting it with multilevel wizards and quantified symbols.

This enables the use of graph structures so that local information can be clustered and summed, and global nodes can be added to achieve global information incorporation. Thus, the models of RNNs are vulnerable to word sense ambiguity. Ali et al. [15] proposed WC-LSTM, which adopts a words encoding strategy to carry out fixed encoding representation of lexical information ending with characters and then can effectively achieve batch simultaneous rowing. Reference [16] proposed a method to simply utilize lexicon at the embedding layer, which avoids designing complex sequence modeling architectures and introduces lexical information for any neural network model by simply fine-tuning the character representation layer. Reference [17] proposed that the position vector is introduced using the transformer to maintain the position information. The introduction of lexical information into the NER system has been of great interest as the main technical research area focuses on NER in these years.

3. This Article 5G Architecture Solutions

Based on the 5G technology capability, we have clarified the application scenarios of 5G technology for major types of educational institutions after research and sorting (see Table 1).

From education informatization (teaching, research, and education management), the general view of 5G education informatization is explored and proposed (see Figure 1).

4. System Introduction

The system consists of two main parts, named entity identification and attribute mapping. The first part of named entity recognition focuses on finding the entity appellation of the given topic; the second part, the attribute mapping step, focuses on finding the associated attributes of the entities of the given topic. In this paper, the model of the named entity identification step is described in detail.

4.1. Named Entity Identification

4.1. Named Entity Identification. The entity identification step focuses on finding the entity appellation for the given topic. The general framework system of this content is shown in Figure 2. The lattice structure of the character language vocabulary is first constructed by combining the entities in the knowledge graph, and then, the lattice is transformed into a flat structure.

4.2. Lattice Conversion to Flat Structure. After obtaining a lattice from a character using a dictionary as shown in Table 2, there is a simple algorithm to recover the original structure of the flat lattice. We can construct the sequence of characters by first taking the symbols with the same head and tail. Then, we use other tokens with head and tail (single words) to construct the skip path.

Table 1: Classification of demand scenarios for educational institutions.

Educational services	Enhanced mobile broadband	Massive IOT	High reliability and low delay connection
Primary and secondary school training institutions	AI evaluation of distance interactive teaching process	AI evaluation of the teaching process	Remote interactive teaching and remote listening and evaluation
Vocational colleges and military colleges	AI evaluation of the teaching process	Smart campus management	VR/AR teaching
Colleges and universities	AI evaluation of the teaching process	AI evaluation of teaching process of smart campus management	—

4.3. Relative Position Coding of Spans. Four relative distances can be used to represent the relationship between Y_a and Y_b. They can be calculated as

$$\begin{aligned} l_{ab}^{(hh)} &= h[a] - h[b], \\ l_{ab}^{(ht)} &= h[a] - t[b], \\ l_{ab}^{(ch)} &= t[a] - h[b], \\ l_{ab}^{(tt)} &= t[a] - t[b], \end{aligned} \tag{1}$$

where h $[a]$ and t $[a]$ denote the head and tail information of span Y_a, denote the distance between $l_{ab}^{(hh)}$ of Ya and tail of Y_b, and the rest $l_{ab}^{(ht)}$, $l_{ab}^{(ch)}$, and $l_{ab}^{(tt)}$. The final relative position encoding of the span is a simple nonlinear transformation of the four distances.

$$M_{ab} = \mathrm{Re}LU\left(W_m\left(P_{l_{ab}^{(hh)}} \oplus P_{l_{ab}^{(ht)}} \oplus P_{l_{ab}^{(th)}} \oplus P_{l_{ab}^{(tt)}}\right)\right). \tag{2}$$

$$\begin{aligned} P_d^{(2k)} &= \sin\left(\frac{d}{10000}^{2k/d_{\text{model}}}\right), \\ P_d^{(2k+1)} &= \cos\left(\frac{d}{10000}^{2k/\text{model}}\right), \end{aligned} \tag{3}$$

where d is $l_{ab}^{(hh)}$, $l_{ab}^{(ht)}$, $l_{ab}^{(ch)}$, and $l_{ab}^{(tt)}$, and k denotes the dimensional index of the location code.

We then use a variant of self-attentiveness [20] to exploit the relative span position encoding as follows:

$$\begin{aligned} A_{a,b}^{*} = {} & W_q^{\top} E_{Y_a}^{\top} E_{Y_b} W_{k,E} + W_q^{\top} E_{Y_a}^{\top} M_{ab} W_{k,M} \\ & + u^{\top} E_{Y_b} W_{k,E} + v^{\top} M_{ab} W_{k,M}. \end{aligned} \tag{4}$$

It consists of self-attentive and feedforward network (FFN) layers. Each sublayer is followed by residual connections and layer normalization. FFN is a location multilayer perceptron with nonlinear transformations. The transformer performs self-attention on the sequence by each of the H attention heads and then connects the results of the H attention heads. The result of each person is calculated as

$$\begin{aligned} Att(A, V) &= \operatorname{softmax}(A), \\ VA_{ab} &= \left(\frac{Q_i K_j^{\top}}{\sqrt{d_{\text{head}}}}\right), \\ [Q, K, V] &= E_x\left[W_q, W_k, W_v\right], \end{aligned} \tag{5}$$

where E is the output of the token embedding lookup table or the last transformer layer. $W_q, W_{k,M}, W_{k,E} \in R^{l_{\text{model}} \times l_{\text{head}}}$ is the learnable parameter and after FLAT.

5. Research Subjects

The subjects of the study were 110 senior students of class 2021 in our university. Students who had smartphones were enrolled in the experimental group and those who did not were enrolled in the control group on a voluntary basis, resulting in 50 students in the experimental group and 60 students in the control group. Although there was a huge difference in the number of students, the pretest of their vocabulary ability showed that there was no significant difference in the English vocabulary level between the two groups by independent sample t-test.

5.1. Test Content. Vocabulary ability test paper: the former test paper is selected from the "College English Comprehensive Course Vocabulary Intensive Lecture and Training 2" D test preparation; the latter test paper is prepared according to the teaching content and syllabus, and the type of questions include listening questions, word recognition linkage questions, spelling questions, single-choice questions, word formation questions, and word choice and fill in the blanks questions.

5.2. Modern Information Technology. "With the advent of the 5G era and the popular use of smart mobile devices, combined with the "cloud computing" technology that is emerging from the Internet, mobile learning will be truly realized anywhere, anytime, and in any way. Therefore, we envisage that, based on 5G and cloud computing technology, we can build an independent learning platform for English vocabulary, so that learners can use smart mobile devices to learn vocabulary and use vocabulary in real natural contexts anytime, anywhere, and everywhere.

5.3. Course Implementation. Research Process. This study began at the beginning of the second semester of 2021-2022 and lasted for 16 weeks and was conducted in the following five phases:

Week 1: English vocabulary proficiency tests were administered to the experimental and control groups before the experiment and the scores were recorded

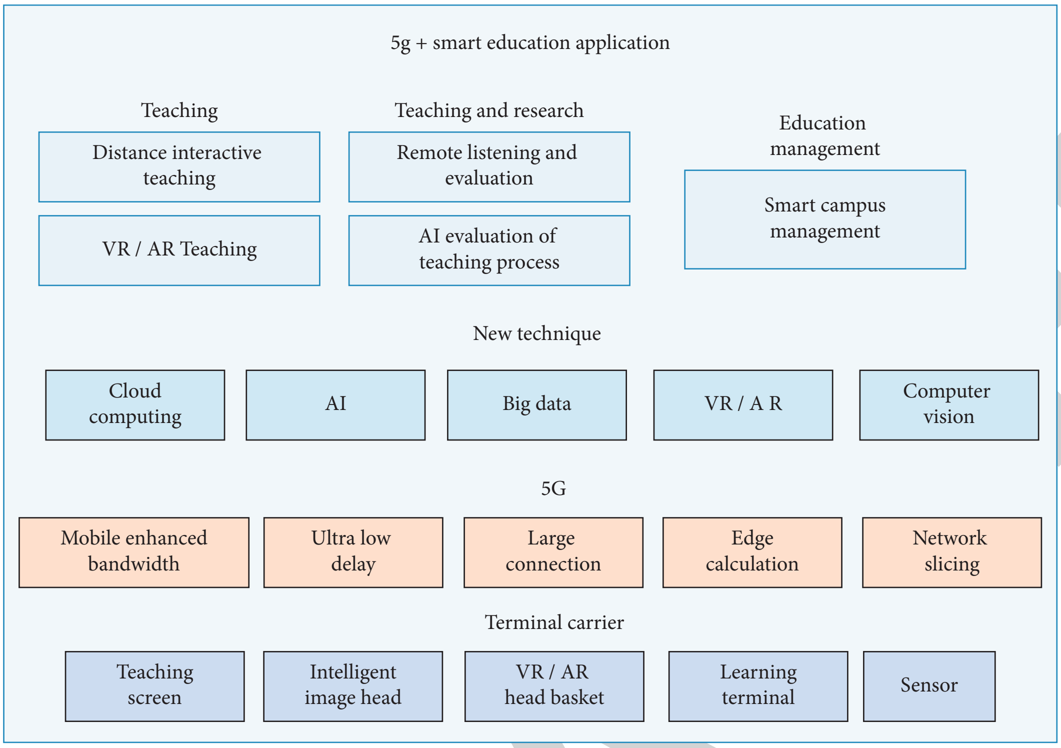

Figure 1: General view.

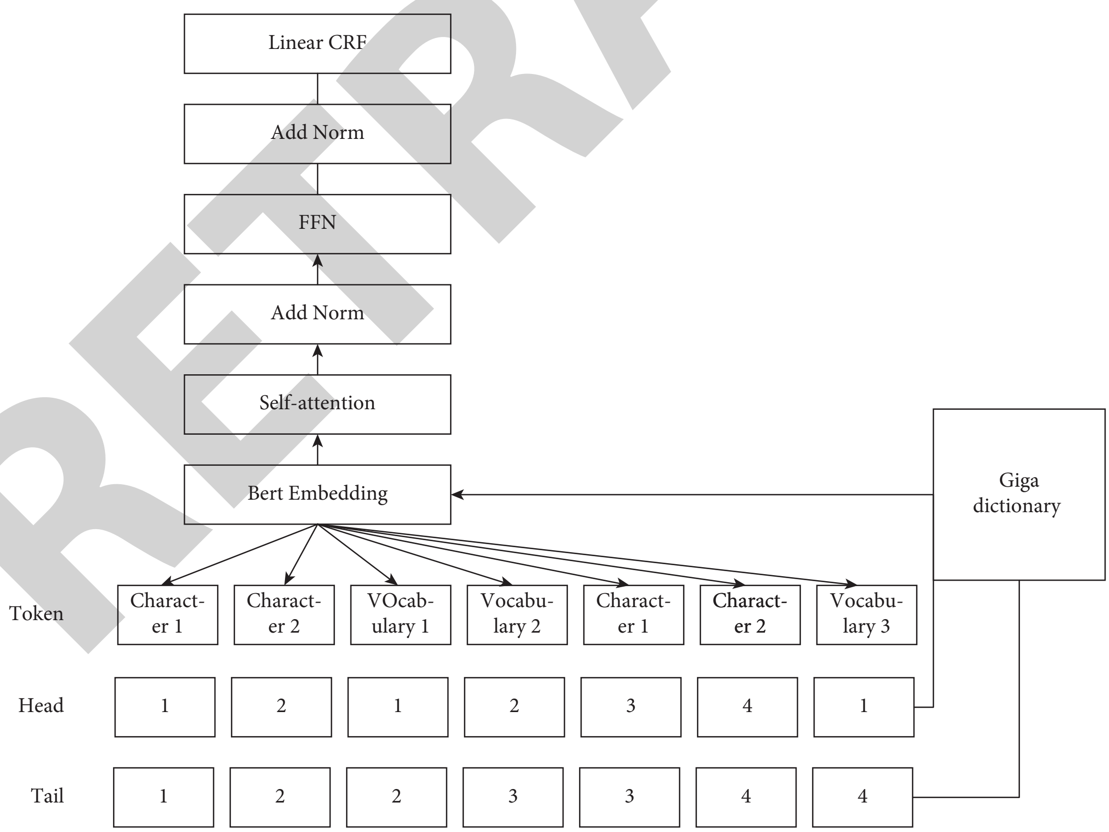

Figure 2: Intelligent question and answer entity recognition module based on vocabulary enhancement.

Week 2 to week 4: students in the experimental group will be trained to learn vocabulary independently in 5G and cloud computing environment

Week 5 to week 14: students in the experimental group were instructed and supervised to use smart mobile devices for independent vocabulary learning

Table 2: Knowledge map content.

Entity	Attribute	Attribute value/entity
Zhejiang village	Alias	Zhejiang village
Zhejiang village	Chinese name	Zhejiang village
Zhejiang village	Main composition	Wenzhou people
Zhejiang village	Position	Dahongmen and Muxiyuan areas, Fengtai district, Beijing
Zhejiang village	Radiation range	5 km around
Zhejiang village	Core	Muxiyuan bridge roundabout

Week 15: posttesting of English vocabulary skills and recording of scores for the experimental and control groups

Week 16: students in the experimental group were interviewed with two main questions: (1) How do you feel about using smart mobile devices for independent vocabulary learning? (2) What do you think about using smart mobile devices for independent vocabulary learning?

6. Test Results and Analysis of Vocabulary Ability

As can be seen from Table 3, before the experiment, the mean score of the vocabulary ability test group was 68.91 and that of the control group was 67.12, with little difference between the mean scores of the two groups; the *t*-test results showed that the difference between the mean scores of the experimental group and the control group did not reach a statistically significant level, indicating that the vocabulary ability of the students in the two groups was comparable.

As can be seen from Table 4, after the experiment, the overall score of the vocabulary proficiency test of the experimental group was 78.91, with a sig value of 0.04, which was less than 0.05, reaching a statistically significant level of difference. This indicates that independent learning based on smart mobile devices in 5G and cloud computing environments has a significant positive effect on improving students' vocabulary acquisition. The listening and sound discrimination questions, connection questions, and word spelling questions in the vocabulary ability posttest paper are mainly used to investigate students' cognition of vocabulary, that is, to test the size of students' vocabulary.

It can be seen from the statistical data in Table 5 that the average score of the vocabulary of students in the experimental group is 38.91 and that of the control group is 34.12. The average test score of the experimental group is higher than that of the control group. The results of the *t*-test show that the score difference in vocabulary between the experimental group and the control group is statistically significant, and there is an obvious positive correlation between students' vocabulary and learning style, indicating that autonomous learning based on intelligent mobile devices in 5g and cloud computing environment has more advantages in improving students' vocabulary. The single-choice questions, word formation questions, and word selection and blank filling questions in the posttest paper on vocabulary ability are used to investigate students' vocabulary application ability, that is, to test students' mastery of vocabulary quality.

It can be seen from Table 6 that the average score of vocabulary quality in the experimental group is 48.91 and that in the control class is 44.12. The average test score of the experimental group is higher than that of the control group. The sig value of the *t*-test is 0.05, reaching a statistically significant difference level. There is a significant correlation between students' scores of vocabulary quality and learning methods, indicating that autonomous learning based on intelligent mobile devices in 5g and cloud computing environments is still significant in improving students' vocabulary quality.

Table 7 shows the specific scores of each question type in the experimental group and the control group after the experiment. It is not difficult to see that the difference in test items is mainly reflected in listening and sound discrimination questions, word meaning discrimination connection questions, and spelling questions. The difference between the scores of listening and sound discrimination questions is the largest, which shows that autonomous learning based on intelligent mobile devices has a significant effect on the improvement of students' vocabulary listening ability. There is also a large difference in the scores of word connection questions between the two groups, which shows that based on intelligent mobile devices, the meaning, fixed collocation, and related example sentences of words can be effectively presented in multimodal ways such as audio-visual and oral, which has a good effect on students' understanding and memory of words. However, in terms of word spelling, the test scores of students in the experimental group are low, indicating that autonomous learning based on intelligent mobile devices needs to be strengthened to improve the accuracy of students' word spelling.

7. Discussion

In response to the first question "how do you feel when using smart mobile devices for vocabulary autonomous learning", the interviewed students generally feel very curious and excited: "they can independently choose the way, time, and place of vocabulary learning according to their English foundation and learning characteristics and can flexibly control the progress of vocabulary learning. Therefore, they will learn with special ease, happiness, confidence, and investment" [20–23]; "when you encounter difficulties in vocabulary learning, you will not lose face because you do not understand it through virtual communication with teachers and their peers through Feixin. Especially, when

Table 3: Pretest score of vocabulary ability and pretest results of vocabulary ability of experimental group and control group.

Research object	Number of people	Average score	Standard deviation	*T* value	Sig. (2-tailed)	Inspection results
Experience group	50	68.91	5.41	0.14	0.91	The difference is not significant
Control group	60	67.12	5.47			

Table 4: Overall scores of vocabulary ability posttest of experimental group and control group.

Research object	Number of people	Average score	Standard deviation	*T* value	Sig. (2-tailed)	Inspection results
Experience group	50	78.91	6.41	0.32	0.04	The difference is extremely significant
Control group	60	77.12	6.47			

Table 5: Posttest results of vocabulary in the experimental group and the control group.

Research object	Number of people	Average score	Standard deviation	*T* value	Sig. (2-tailed)	Inspection results
Experience group	50	38.91	5.41	0.19	0.08	The difference is extremely significant
Control group	60	34.12	5.47			

Table 6: Posttest results of vocabulary quality in the experimental group and the control group.

Research object	Number of people	Average score	Standard deviation	*T* value	Sig. (2-tailed)	Inspection results
Experience group	50	48.91	5.341	0.09	0.05	The difference is not significant
Control group	60	44.12	5.37			

Table 7: Comparative analysis of the scores of each question type between the experimental group and the control group.

Research object	Listening and sound discrimination questions (20 points)	Connecting questions (20 points)	Word spelling (10 points)	Multiple choice questions (20 points)	Word formation questions (10 points)	Choose words and fill in the blanks (20 points)	Average score
Experience group	15.21	17.84	5.41	17.45	8.52	17.45	82.21
Control group	11.54	15.47	7.32	16.21	7.65	15.47	74.52

your participation solves the students' vocabulary learning problems, you will have a strong sense of achievement."

When asked "what do you think of autonomous vocabulary learning using smart mobile devices", 80% of the students agreed that because smart mobile devices are portable and powerful, be able to learn English words in all directions anytime and anywhere: "after knowing how to use intelligent mobile devices for English learning, I can remember words in supermarkets, subway stations, bus stops, cinemas, canteens, and other places by using the waiting time"; "I do not worry about not understanding the original English movies and novels anymore, because I can use my mobile phone to check the English words I do not understand at any time"; "by accessing the Internet or consulting the mobile dictionary, it is easy to obtain the sound, shape, and meaning information of words, as well as a large number of example sentences and interesting etymological explanations." In this way, the meaning of words is deeply understood and easy to remember, and there are few mistakes in English expression [24–26]. There are two main factors that affect students' autonomous vocabulary learning: one is the lack of information technology and the second is the impact on vocabulary learning.

8. Conclusions

This study uses a combination of vocabulary tests and interviews to examine the effect of autonomous learning of English vocabulary in 5G and cloud computing environments. With the help of modern information technology and smart mobile devices, students can carry out personalized and diversified vocabulary learning anytime and anywhere and communicate with teachers and classmates in real time about vocabulary problems encountered in learning, which is conducive to a friendly, equal, and collaborative atmosphere. Vocabulary learning is improved. The results show that in the 5G and cloud computing environment, autonomous learning based on smart mobile devices has a good effect on English vocabulary acquisition and has a significant effect on improving students' vocabulary and vocabulary use ability.

Data Availability

The dataset used in this paper is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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