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A Study on Mobile Terminal-Based Deep Learning of English Vocabulary from a Multimodal Perspective

Ji Dang[1]*, Yan Zhang[2]

[1]Boda College of Jilin Normal University, Siping 136000, Jilin Province, China
[2]Jilin Engineering Normal University, Changchun 130000, Jilin Province, China

Corresponding author: Ji Dang, jeanie00757@163.com

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Abstract: Within the cognitive theory of multimedia learning framework, this study explores the practical path to realize the deep learning of mobile terminal-based English vocabulary. It also discusses how to stimulate learners' positive emotions to learn actively, construct a mental lexicon, and encourage learners to use high-order thinking to realize the transfer and innovation of knowledge.

Keywords: Multimodality; English vocabulary; Deep learning

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1. Introduction

The application of modern information technology to college English teaching has achieved modernization, diversification, and convenience in teaching methods. However, it has also undergone profound changes in teaching concepts, teaching content, and teaching methods [1]. Mobile terminal-based English vocabulary learning is a flexible learning model that not only adapts to the learning characteristics and methods of college students in the new era, but its rich mobile learning resources provide learners with a new learning experience and interactive model, highlighting the advantages of mobile learning such as autonomy, mobility, availability, and scalability. However, the English vocabulary learning platforms or software commonly used by learners have problems such as fragmented vocabulary knowledge, mechanized learning methods, and incompatible vocabulary acquisition rules.

2. Current status of mobile learning of English vocabulary

The original intention of applying mobile information technology to the field of foreign language learning, especially the field of vocabulary learning, is to help learners to establish systematic vocabulary knowledge through mobile vocabulary learning platforms or software, develop the habit of independent learning, and

the ability to practise flexibly in various forms and apply the knowledge they have learned to meet their daily learning, work, and practical communication needs. However, the current English vocabulary learning platforms or software commonly used by foreign language learners have problems such as mechanized learning methods and fragmented vocabulary knowledge. In quickly judging whether the correspondence is correct, learners memorize the correspondence between meanings, pictures, and words repeatedly and mechanically within a certain period through familiarity and error correction, stimulation, and reaction. Without deeper thinking and information processing, vocabulary learning often stays at the superficial level of knowledge such as spelling and pronunciation. It is difficult for learners to understand reading text, let alone effectively output in productive translation and writing tasks. If learners continue to maintain this fragmented, superficial way of learning, not only will it be challenging to represent vocabulary knowledge in their minds effectively, but their interest in learning English will gradually disappear. Therefore, reorganization of fragmented knowledge into a systematic and stably connected knowledge network to achieve deep learning of English vocabulary is still a problem that requires further exploration in mobile learning research.

3. Deep learning

Domestic scholars He and Li first defined deep learning as follows: Based on understanding, learners critically learn new ideas and knowledge, integrate them into the original cognitive structure, interconnect the ideas, and transfer existing knowledge to new situations to make decisions and solve the problem [2].

It is generally believed that shallow learning is more about learners' passive memory and simple reproduction of learning content. In contrast, deep learning aims to promote the development of learners' critical thinking and innovative spirit, emphasizing learners' positive and active learning state, critically and profoundly understanding the knowledge learned, and integrating the learned knowledge into the existing knowledge system. When facing real and complex problems in real-world environments, they can be smoothly extracted, flexibly migrated, and applied to problem-solving [3].

4. Research on multimodal theory and English vocabulary learning

Only when educational information technology is combined with relevant learning theories and teaching strategies can learners' learning effects be significantly improved. In social semiotics, modality refers to the way or medium of representing information, which can form a system to express meaning clearly. Therefore, using different modalities can convey different forms of meaning [4]. Relevant researches at home and abroad have found that multimodal vocabulary presentation is helpful for foreign language learning [5-8]. There are also some studies on the information processing model of English vocabulary acquisition from a multimodal perspective [9] and the application of multimodal theory to mobile learning of English professional vocabulary [10]. In addition, research by Zheng and Xu shows that multimodal vocabulary presentation methods are effective in alleviating the overall anxiety and communicative anxiety of non-English major graduate students in vocabulary learning [11].

The cognitive theory of multimedia learning includes the dual-channel assumption, the limited capacity assumption, and the active processing assumption [12], which further reveals the primary working mechanism of the human brain in multimodal information processing. The dual-channel assumption means that the information processing system of the human brain consists of two independent channels: auditory/verbal channel (encoding the presented sound information through the auditory modality) and visual/pictorial channel (encoding the presented text, dynamic image, or static picture information through the visual modality). Content encoded verbally and non-verbally will be more conducive to meaning construction than content encoded by

a single information channel [13]. However, the cognitive processing capacity of these two channels is limited, which means that the human brain's capacity to retain and process text or images in working memory at one time is limited [14]. Cognitive load will occur if too much information is presented in a single channel and redundancy occurs [15], which is the limited capacity assumption. The active processing assumption means that during the meaningful learning process of the human brain, both verbal and non-verbal channels will produce a large amount of cognitive processing, which includes proactively selecting and paying attention to the information presented, building new data into a coherent network of mental structures, and integrating it appropriately with existing knowledge in long-term memory. According to the perspective of cognitive theory of multimedia learning, instructional design should properly select multiple modalities to reasonably present the learned content, reduce redundant information and cognitive load, and promote positive and active knowledge processing.

5. Connotation of multimodal mobile terminal-based English vocabulary deep learning

Based on the cognitive theory of multimedia learning and combined with the characteristics of deep learning, multimodal mobile terminal-based English vocabulary deep learning refers to using mobile information technology to optimize vocabulary presentation in verbal and non-verbal channels, provide interactive situations, and create easy and flexible vocabulary learning and application scenarios for learners to proactively encode new vocabulary based on the original vocabulary system and use higher-order thinking skills including meta-cognition. Through experience and interaction, based on understanding and perception, the entries are integrated into a stable, multi-dimensional psychological vocabulary network.

In order to expand the breadth and depth of vocabulary knowledge, teachers should use mobile information technology to provide learners with multimodal and rich contextualized learning resources in order to support learners to flexibly and proactively construct complex mental vocabulary networks including form, pronunciation, meaning, collocation, syntactic features, register features, cultural connotation, and meta lexical knowledge through multiple channels. Based on understanding, relying on the physical environment and multi-modal situations integrating virtual and real situations, it provides technical support for communication and collaboration between teachers and students, and between students and students. It promotes the dynamic and progressive application and transfer of vocabulary knowledge. In the learning process, the information form in the learner's brain is like the information processing process of a computer, showing changes in "input-processing-encoding-storage-extraction" [3]. Multimodal mobile learning should continuously strengthen the "processing-encoding-storage-extraction" process of learners' mental lexicon to follow cognitive laws, thereby promoting the continuous development of higher-order thinking, such as language learning transfer and innovation among learners.

6. Implementation path

The following are the implementation path of mobile terminal-based deep learning of English vocabulary.

(1) Reasonably adopting multiple modalities to enrich vocabulary presentation methods and promote vocabulary construction

In foreign language teaching, in order to enable students to effectively master vocabulary knowledge, build learning confidence, and turn passive learning into active learning, teachers need to use multiple modalities in the classroom, mobilize multiple senses to present vocabulary knowledge, appropriately

allocate information processing channels, reduce cognitive load, and improve the initial processing efficiency of vocabulary knowledge. For example, the "pictures, animations, or images" presentation method significantly impacts the vocabulary memory and output [16]. In addition, the presentation method of "text + voice" or "text + voice + picture" can alleviate students' anxiety about learning words to a certain extent [11]. Commonly used visual and auditory sensory interaction is the primary mode of foreign language classroom teaching. It can realize multi-channel information interaction, strengthen the connection between new knowledge and existing nodes in the mental vocabulary network, and help to encode new vocabulary knowledge in the mental vocabulary library. Thus, a dynamic mental vocabulary network is established.

(2) Skillfully utilizing modalities to create vocabulary usage situations and enhance deep processing

Situated cognition theory believes that learners need to interact with the external environment during the learning process, and transfer and apply the knowledge they have learned to real-life environments to produce real and meaningful learning [3]. Application is the ultimate goal of vocabulary learning, and learners' actual use of target vocabulary is also conducive to achieving deep processing and promoting vocabulary memory [17]. Teachers should combine unit themes and teaching content in actual teaching to create specific, real, or virtual multimodal communication situations and use mobile information technology to build multiple senses for students without providing too much redundant information. A multimodal vocabulary application platform that engages multiple senses and flexibly uses learned vocabulary should be built to promote in-depth processing of contextualized vocabulary knowledge.

(3) Appropriately using multiple modalities to stimulate students' internal drive and encourage active learning

One of the main characteristics of deep learning is that learners learn proactively. In order to achieve deep learning of multimodal mobile terminal-based English vocabulary, teachers should design multiple modal output and practice tasks according to the unit theme to stimulate learners' interest and promote the generation of positive emotions and learning motivation. According to Ebbinghaus' regularity of forgetting, teachers can design output tasks involving multiple senses at different learning time points to promote learners' retrieval and recording of knowledge. Learners should plan their learning reasonably and use the after-class time to continuously, proactively, and efficiently carry out relevant exercises to achieve better memory and application effects. Mechanical autonomy, cooperation, and exploration to stimulate learners' intrinsic motivation is avoided and a good learning mood is maintained.

7. Conclusion

Vocabulary learning is the basis for mastering a language. The application of modern mobile information technology in foreign language learning attempts to change the time-consuming and inefficient phenomenon of English vocabulary learning. However, learning methods contrary to cognitive laws and requiring more systematicity are challenging to change the nature of fragmented and mechanized learning. The application of multimodal theory in mobile terminal-based English vocabulary learning can help learners to construct a dynamic mental vocabulary network. The methods to stimulate learners' positive emotions to learn in actual teaching and to encourage learners to use higher-order thinking to achieve knowledge transfer and innovation require further practical research in order to explore and improve its implementation path continuously.

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Disclosure statement

The authors declare no conflict of interest.

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