English Teaching Model Based on Mind Map and Cultivation of Innovative Thinking in the Age of Internet of Things

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Abstract: The current era is a multimedia network era. Under the current situation of the big data era, the use of the Internet of Things (IoT) in life is countless. Due to the existence of the IoT, the English Teaching Model is being updated more and more quickly. A series of teaching reforms have made the quality of English teaching more and more high. The purpose of English teaching is to cultivate students with comprehensive language application ability. The traditional English Teaching Model cannot adapt to the rapid development of the IoT era. The application of mind map can well eliminate the drawbacks of the traditional English Teaching Model, and provide students with an open and free imagination space. Based on the influence of English Teaching Model in the IoT era, the introduction of mind map teaching can improve students' logical thinking ability, and inspire imagination and innovative thinking. This paper studied the English Teaching Model based on mind mapping and the cultivation of innovative thinking in the IoT era, and explored the relationship between mind mapping input and academic performance. The experiment proved that the application of mind mapping in English Teaching Model would bring more efficient classroom for teachers and students. In view of the use of mind mapping technology, a questionnaire survey was conducted on 52 students. The survey results showed that 43 students believed that the introduction of mind mapping had a significant role in promoting their academic performance. At the same time, in order to cultivate students' innovative thinking in English, this paper set up a feasible plan to use mind mapping to promote innovative thinking.

1. Introduction

The times are changing constantly. The IoT would endow connected things with new capabilities. As a part of the future Internet, its field involves all aspects, effectively promoting intelligent development. It is obvious that the arrival of the IoT era has given a new revolution to information technology, and the IoT also has a progressive role in promoting English Teaching Models. However, the current English Teaching Model is facing the challenges of massive, diverse and hidden data resources. Integrating modern information technology into English Teaching Model

makes the IoT more realistic. The progress of IoT technology has made mind mapping more and more popular. Due to the slow development of the existing English Teaching Model and students' creative thinking ability, in order to cultivate students' innovative spirit and thinking ability, this paper proposes an English Teaching Model based on mind mapping and innovative thinking cultivation in the IoT era, conducts relevant comparative experiments and questionnaires, and provides a mind mapping scheme for cultivating innovative thinking. This paper also hopes that the use of mind mapping can provide inspiration for English Teaching Model and innovative thinking cultivation, so as to improve the adaptation to English Teaching Model and promote the cultivation of English innovative thinking.

In the teaching application of the IoT era, mind mapping is widely used in teaching applications, and its English Teaching Model and innovative thinking training has been attracting the attention of many scholars. Kumar S believed that the Internet of Things is a new paradigm, which has changed the traditional way of life [1]. Zein M S discussed the current practice of basic English education in relevant fields, paying special attention to the class size and teaching duration, the role and status of teachers, as well as the concerns in teaching, and analyzed the development prospects of education in the foreseeable future [2]. Abd Karim R has proved through research that the use of mind maps significantly stimulates students' creativity and critical thinking [3]. Winarso W believed that the 21st century education era needs a learning model that can improve critical thinking, collaboration ability, communication ability and creative thinking [4]. Therefore, the rapid development of the IoT has put forward a deeper requirement for English Teaching Model.

As the existing English Teaching Model is solidified, it can not fully meet the needs of the classroom. Mind mapping can promote the English classroom. Therefore, the influence of mind mapping on English Teaching Model and the cultivation of innovative thinking have also been studied by many scholars. Songbatumis A M. discussed the challenges faced by English teachers in English teaching [5]. Rahmavanto R.'s experiment proved that the use of mind mapping technology can improve students' academic performance [6]. It can be seen that with the continuous development of the IoT, mind mapping would gradually be introduced into English Teaching Model.

In order to reflect that the construction of mind maps has a positive effect on promoting the development of English Teaching Model and cultivating students' innovative thinking, this paper studies the advantages of the construction of mind maps. By using a controlled experiment, the average scores of students in an experimental class of a school are compared before and after using the mind maps four times. The results show that the introduction of mind mapping has a significant role in promoting the English Teaching Model, and has a significant help to students' thinking innovation ability.

2. English Teaching Model and Innovative Thinking in the Internet of Things Era

2.1 Internet of Things Technology

The IoT is the "Internet of everything." The mind map of the IoT is shown in Figure 1.

It can be seen from Figure 1 that the core technologies of the IoT include four aspects, namely, radio frequency identification technology, wireless communication, sensors and cloud computing. Among them, cloud computing inherits the advantages of traditional computer and combines the advantages of new network technology. It can be said to take the advantages of both. As one of the IoT technologies, cloud computing has the most prominent security features. Cloud computing can well achieve privacy and data protection, which also brings convenience to English Teaching Model.
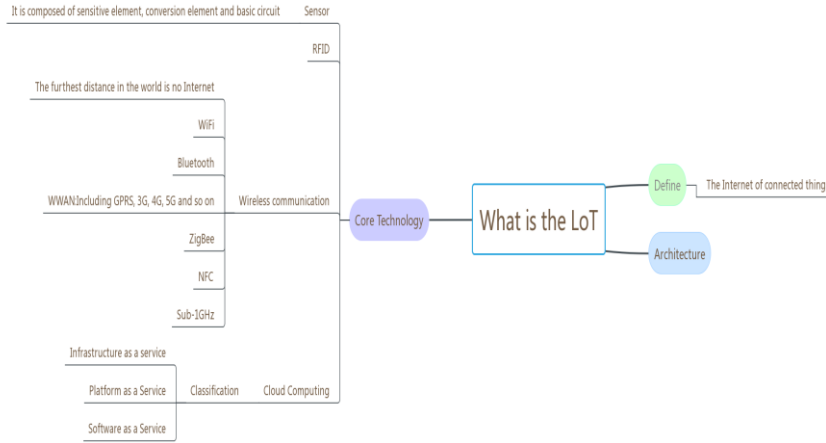
Figure 1: Internet of Things mind map

2.2 Cloud Computing Encryption Technology

In the application scenario of cloud computing Encryption Technology Solution (ETS), users are both data encryptors and data retrievers. Since all keys are saved by users, a general specific algorithm model is usually required to ensure that the interface of the algorithm is consistent.

A general encryption scheme model is a set of five polynomial time algorithms Generator (Gen), EncString (Enc), Token, Search, and Decreasing function (Dec). S is the query history, and n is the number of queries. Then, Formula (1) is obtained:

$$S_n = \frac{n(n+1)}{2}$$

(1)

$k \in X$ is a safety parameter and θ is a negligible small quantity. When the limiting condition ETS (S_0)=ETS (S_n) is met, for any polynomial time adversary Xa=(X_1, X_2), the probability Formula (2) based on the probability function generator is met:

$$P\left[EST_{Gen,Xa}(k) = 1\right] \leq \frac{1}{2} + \theta$$

(2)

For any polynomial time adversary Xb=(X_3, X_4), the probability Formula (3) based on the probability function EncString is satisfied:

$$P\left[EST_{Enc,Xb}(k) = 1\right] \leq \frac{1}{2} + \theta$$

(3)

For any polynomial time adversary Xc=(X_5, X_6), the probability Formula (4) based on the probability function Token is satisfied:

$$P\left[EST_{Token,Xc}(k) = 1\right] \leq \frac{1}{2} + \theta$$

(4)

For any polynomial time adversary Xd=(X_7, X_8), the probability Formula (5) based on the probability function Search is satisfied:

$$P\left[EST_{\mathrm{Search},Xd}(k)=1\right]\leq\frac{1}{2}+\theta$$

(5)

For any polynomial time adversary Xe=(X9, X0), the probability Formula (6) based on the probability function Decreasing function is satisfied:

$$P\left[EST_{\mathrm{Dec},Xe}(k)=1\right]\leq\frac{1}{2}+\theta$$

(6)

The Internet of Everything era has arrived. New technologies and new models keep emerging. IoT cloud computing encryption technology has become a well-known technology. With the in-depth promotion of cross-border integration and application of the IoT, the IoT would become an important carrier to support intelligence and a new infrastructure to support economic and social development.

This paper combines the meaning of the Internet of Things with the existing literature to obtain the definition of the Internet of Things [7]. The IoT represents the future technological revolution of computing and communications. It is not a simple extension of the Internet or telecommunications network. The IoT not only has the characteristics of the Internet and telecommunications network, but also has its own characteristics. Although the Internet of Things is still looking for its own form, it has made incredible progress as a universal solution media for the Internet scene [8].
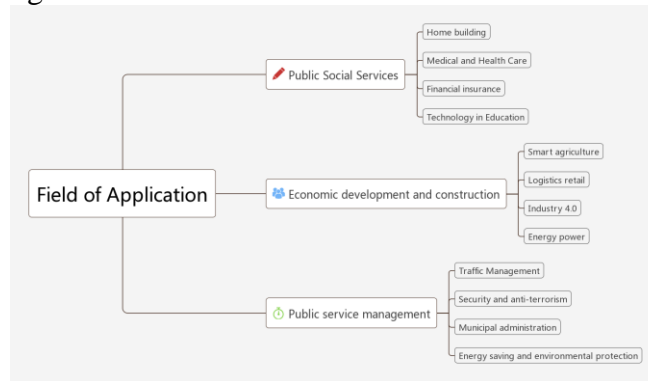

Figure 2: Internet of Things application field

The IoT is developing in full swing, and it is reasonable that its application is widespread in the neighborhood. The mind map of the IoT application field is shown in Figure 2. As an important work of human beings, the use of IoT technology in teaching research is of great significance. The IoT technology has a profound impact on English Teaching Model.

2.3 English Teaching Model

Generally speaking, the Teaching Model can be defined as a more stable framework of teaching activities, and an activity plan created under the guidance of certain concepts or theories. The Teaching Model usually includes five factors, which are regularly related to each other. That is to say, the structure of the Teaching Model is respectively the theoretical basis, teaching objectives, operating procedures, realization conditions and teaching evaluation. Classroom time of English course is used for content design, while that of computer course is used for multimedia design of digital stories generated by learners [9]. The allocation of classroom time in different disciplines is not the same, which is due to the different Teaching Models among different disciplines. As English teaching pays more and more attention to enhancing students' learning initiative and the teaching concept of "student-centered", language teachers and researchers are determined to explore

effective and appropriate Teaching Models in theory and practice. The types of English Teaching Models can be roughly divided into five categories:

2.3.1 Task Based Teaching Method

Task based teaching method refers to that in organizing educational and teaching activities, teachers design operable tasks with specific projects and communication language, and their abilities of participation, experience, learning, interaction, communication, cooperation and students' cognition are fully utilized and played. The goal is to explain problems through expression, action, communication or different forms of language activities. It is an activity form to perform tasks for learning and mastering languages.

Advantages of task-based teaching method:

(1) It can cultivate students' comprehensive language ability;

(2) It can better face all students;

(3) Through activities, people can learn knowledge, cultivate their ability to think and respond, and exercise their interpersonal skills;

(4) Every student can participate in thinking.

Task based learning as the core of English teaching can cultivate English writing ability and language creative thinking, which is a very effective English Teaching Model [10].

2.3.2 Situational Teaching Method

According to words and pictures, the teacher creates a vivid projection picture film. It is a kind of teaching activity that reappears the scene of the article with the appeal of literature, art and music.

Advantages of situational teaching method:

(1) Situational teaching focuses on students' psychological characteristics and cultivates students' emotions;

(2) It can promote the active participation of students;

(3) It is helpful to broaden students' knowledge and develop their intelligence.

2.3.3 Demonstration Method

Demonstrative method is a teaching method. Teachers show objects or object models for students to observe. Through demonstration experiments, students can obtain the latest knowledge through modern teaching methods. This is an auxiliary teaching method, which is usually combined with teaching, dialogue, discussion and other methods.

Advantages of demonstration method:

(1) It can improve students' observation ability;

(2) It is helpful to cultivate the ability of abstract thinking;

(3) It is easy to keep learning enthusiasm, reduce difficulties in learning, and develop good learning habits.

2.3.4 Three Dimensional Reproduction Teaching Method

The Ebbinghaus forgetting curve shows the law of forgetting. The three-dimensional reappearance teaching method aims at the "law of forgetting", and repeats important knowledge points in time, so that students can remember knowledge points to the maximum extent. Ebbinghaus forgetting curve is shown in Figure 3.

Advantages of three-dimensional reappearance teaching method:

(1) It is conducive to giving play to the students' subjective role;

(2) The content of knowledge covers a wide range and has a large amount of information;

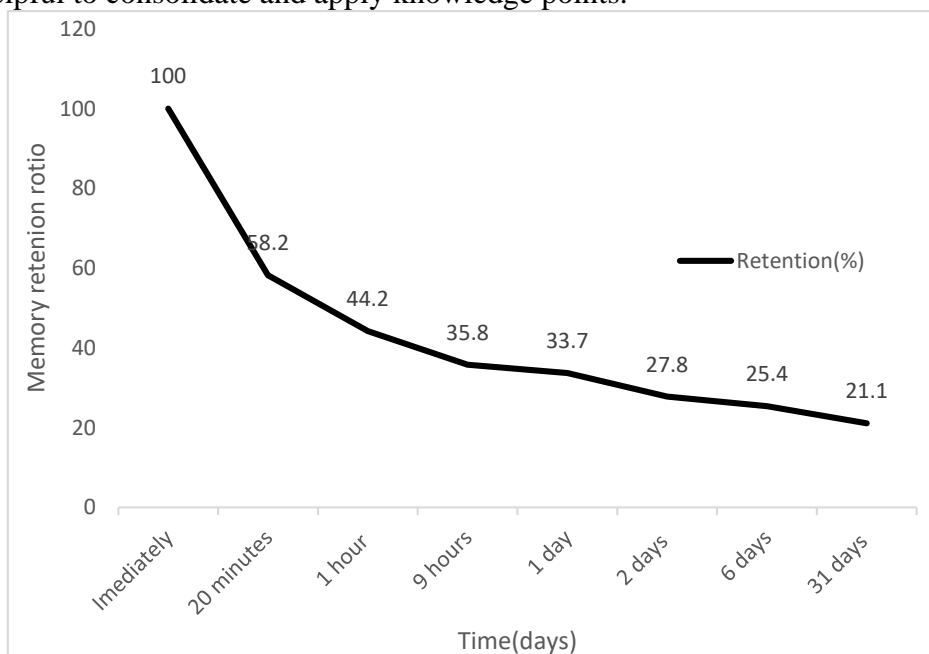(3) It is helpful to consolidate and apply knowledge points.

Figure 3: Ebbinghaus forgetting curve

2.3.5 Communicative Approach

Communicative approach is an educational system that develops the communicative ability to use language in a specific social environment.

Advantages of communicative approach:

(1) Learning from others' strong points and obtaining nourishment from existing language research achievements have an impact on language theory;

(2) Communication should comprehensively mobilize all kinds of language skills, which is helpful to cultivate students' ability to use language;

In general, the existing English Teaching Models can be summarized into five categories: task-based teaching method, situational teaching method, demonstration method, three-dimensional reproduction teaching method and communicative method. However, these five types of Teaching Models all have functional items. English teaching requires students to comprehensively use language knowledge and skills. These five types of Teaching Models cannot fully integrate listening, speaking, reading and writing. They are only good at listening and speaking, but not good at reading and writing. Obviously, it is not feasible. Training reading and writing alone would affect the training of listening and speaking ability. The so-called "fish and bear's paw" cannot have both, and students cannot accept the overly complex integration teaching method. In practice, the application of mind mapping has a long history. Using mind mapping can improve students' writing ability [11]. It also has a great impact on reading comprehension. Using mind maps to help students learn English more effectively is a new means of modern English Teaching Model [12].

2.4 Overview of Mind Mapping

Mind mapping is a visual way of thinking. This is the representative of radioactive thinking. It uses the method of attaching equal importance to pictures and images, uses the hierarchical graph of

mutual subordination and correlation to express the relationship between subjects at all levels, and establishes the memory connection between the theme keywords, images, colors, etc. It can be considered as a guide to understand and master how the brain works, helping people change their thinking and improve their learning efficiency.

The production method of mind map usually consists of manual drawing and software drawing. This article details manual drawing.

2.4.1 Manual Mind Mapping

Preparations are white paper, color pen, brain, and Lenovo.

Drawing steps:

(1) According to the central idea of the problem, the theme words or images are selected, which can be words or phrases, such as mice, cattle, tigers, rabbits, people, cars, etc. The central idea is written in the center of the white paper, drawn from the center of the white paper, and spread from the inside to the outside. A branch line is drawn;

(2) Each diffusion line is marked with things and phenomena related to the central idea. These things and phenomena constitute the node words marked in our mind map. The node words must be words or words, not sentences, but also graphic marks;

(3) The color of the trunk line is set at will, and the thickness of the line is determined by itself;

(4) The operation is repeated, and several branch trunks are radiated on each node word;

(5) The mind map is reviewed and modified accordingly.

2.4.2 Advantages of Mind Mapping

(1) It has the advantages of stimulating thinking, improving thinking, diverging thinking and concentrating thinking;

(2) It can effectively improve people's memory;

(3) Mind mapping can help people to expand the breadth of horizontal thinking and extend the depth of vertical thinking;

(4) Mind mapping can help people think and remember clearly;

(5) Mind mapping is helpful to jump out of fixed thinking.

Mind mapping is actually a form of divergent thinking. Divergent thinking can be summarized as a kind of innovative thinking, so mind mapping and innovative thinking have certain similarities in characteristics. Innovative thinking requires thinking from multiple perspectives and aspects, and solving problems with multiple ideas and methods. As a visual tool, mind mapping places the content and theme of thinking at the center of the radioactive structure, with keywords, symbols, signs, colors, images, etc. spreading around, forming an infinite radiating tree or network structure, and presenting the innovative thinking process in the form of images.

2.5 Connotation of Innovative Thinking

Creative thinking is an innovative way to break superstition, overcome outdated prejudices, and adapt to the times. People break through existing experience limitations, break through routines, and find ways to go beyond thinking activities. The complexity of the Internet of Things is the complexity of an increasingly interconnected environment, and the growing demand to develop partnerships to create innovative solutions [13]. Innovation requires "thinking outside the box". The sentence "thinking outside the box" can think more broadly and irregularly about how to use diversified, skilled and dedicated labor, but it also provides another opportunity for "thinking outside the box" [14].

The information network covered by multimedia has laid a solid foundation for the Internet of

Things. Multimedia has had a positive impact on students' English reading comprehension and creative thinking ability [15]. Innovative thinking ability is a comprehensive ability to innovate, summarize and break through on the basis of the original theoretical knowledge. Cultivating students' innovative thinking ability is conducive to their all-round development and improving their comprehensive quality. The information age emphasizes openness, equality, cooperation and sharing. Therefore, in order to make students better adapt to the increasingly competitive social environment, it is particularly important to actively introduce innovative thinking and promote English teaching reform.

3. Evaluation on English Teaching Model and Cultivation of Innovative Thinking

3.1 Role of Mind Mapping in English Teaching

In order to reflect the effect of mind mapping on English teaching in English Teaching Model, this paper selects experimental students from a school for a comparative experiment. This experiment is divided into two cycles, with four tests in each cycle. When using the traditional English Teaching Model, the average score of English is tested four times. One month after using the mind map based Teaching Model, the average score of English is tested four times, and the average scores of the two times are compared. The results are shown in Figure 4 and Figure 5.
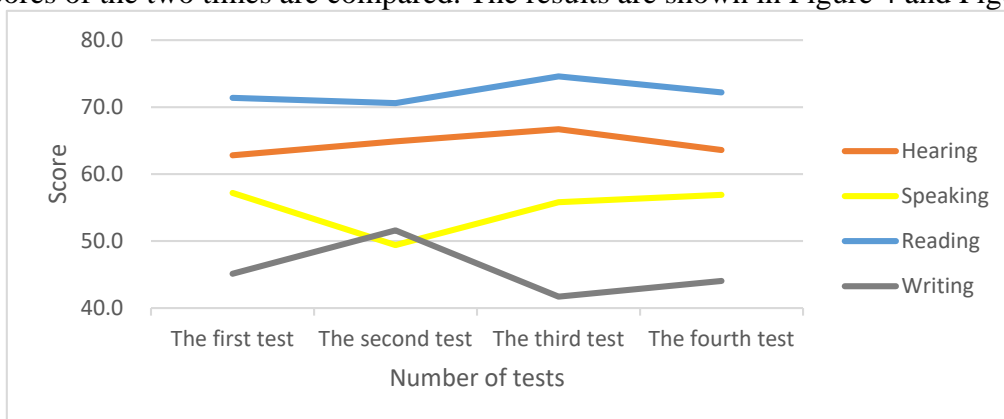

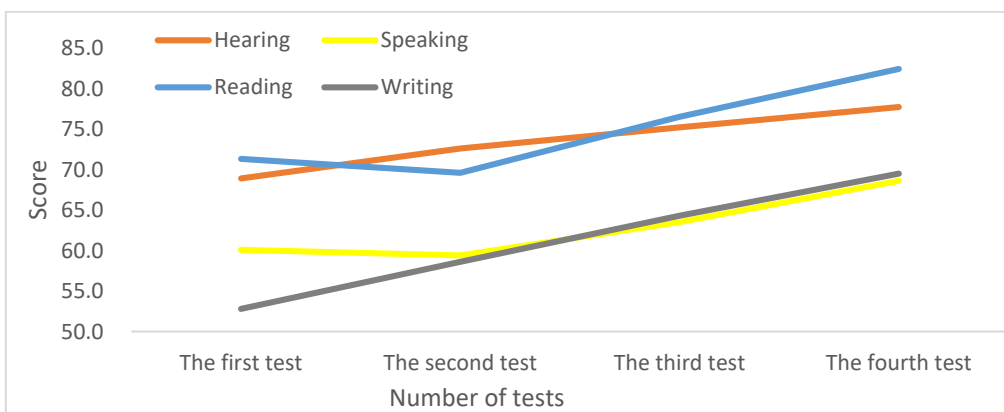Figure 4: Average score of English test in traditional English Teaching Model

Figure 5: Average score of English test in English Teaching Model based on mind mapping

From the experimental data, it can be seen that in the traditional English Teaching Model, the students' four English skills scores were at the middle level. Relatively speaking, the average reading score was high; the writing ability needs to be strengthened; the four test results were

relatively stable. After the mind map was introduced into English teaching courses, it is obvious that the scores of the four English tests were showing a relatively gentle upward trend, especially the reading and writing ability. This is because the use of mind map can strengthen students' memory. It can be seen that the use of mind mapping in English learning can improve students' learning effect.

In order to make the survey results more accurate and referential, and fully demonstrate the importance of mind mapping, it is refined on the basis of controlled experiments, and the impact of mind mapping on students' writing ability is studied separately. This study proposes a scenario game method based on mind map. Students are exposed to real English learning and practice situations to promote their writing performance. This study employs a quasi experimental method to recruit students from two English interest classes in a school. One class was arranged to use the suggested method of learning, that is, the experimental group, and the other class was arranged to use the traditional situation game method of learning, that is, the control group. This paper measures students' writing performance and learning perception, and reflects the influence of mind mapping on students' writing ability. Figure 6 shows the comparison of students' scores in the two classes.
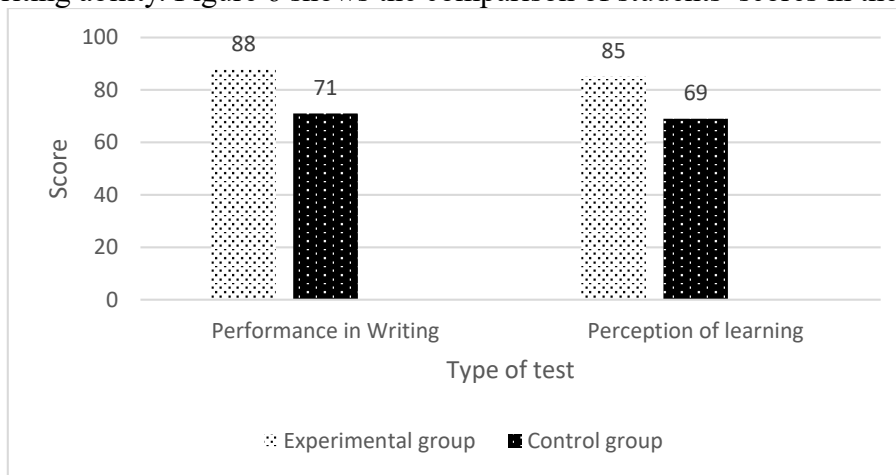
Figure 6: Comparison of writing ability scores

It can be seen from the data that compared with the control group students, the experimental group students who used mind mapping method to learn had better writing performance in fluency and refinement (reflected by writing scores). In addition, the study found that most students think games are beneficial and interesting, and they support mind mapping strategies.

3.2 Cultivation of English Creative Thinking by Mind Mapping

In order to study the English Teaching Model based on mind map and the cultivation of innovative thinking, a questionnaire (multiple choices) is designed as shown in Figure 7.

This questionnaire survey was carried out after the students in the experimental class spent a month on mind mapping. In this experiment, a total of 52 students participated in the questionnaire survey. Although cultivating innovative thinking is a long-term process, 43 students in the experimental class said that they could really experience the help of the Teaching Model based on mind mapping to their self innovative thinking ability during the one month study. In addition, another 5 students put forward different views on mind mapping. They thought that mind mapping is easier to help them generate positive thoughts and feelings, generate diversified ideas, and express actions or intentions.

From the questionnaire data, it can be seen that the students in the experimental class highly approve of this Teaching Model and also like to think with mind maps in English learning.
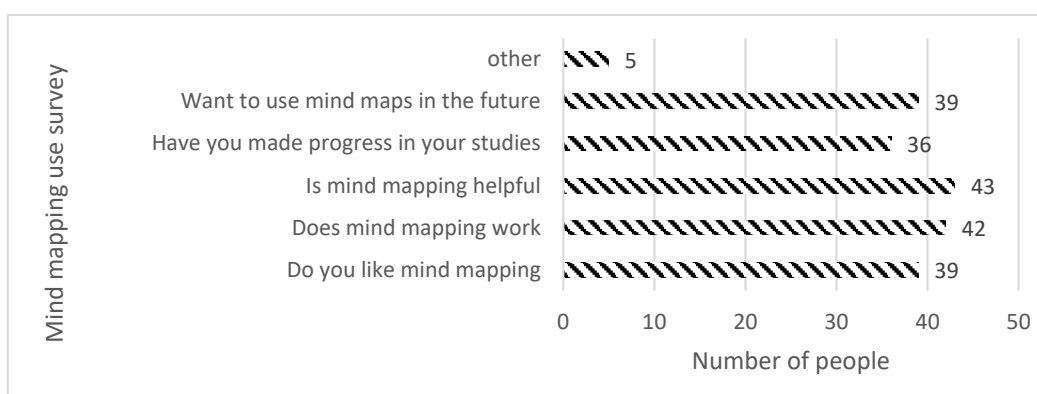
Figure 7: The experimental class uses mind mapping questionnaires

3.3 Innovative Thinking Training Scheme of English Teaching Model Based on Mind Map

This paper designs an innovative thinking training program of English Teaching Model based on mind map. From the perspective of word memory, this paper uses mind maps to make innovative memory of English words, so that word memory is no longer boring.

3.3.1 Similar Structure Mind Mapping Memory Method

Figure 8: Similar structure mind mapping mnemonics

This paper uses words with similar spelling structure to remember words with the same prefix and suffix. As shown in Figure 8, the word port can be associated with words such as "porter, import, report, portable, and export," and multiple layers of memory do more with less.

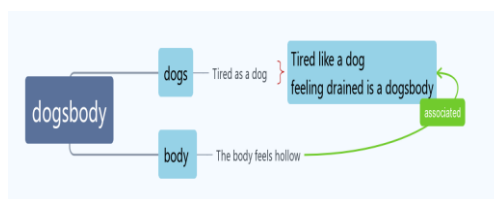### 3.3.2 Free Association Mind Mapping Memory Method

Figure 9: Free association mind map mnemonic method

Free association diagram is a method to connect words and phrases through phrases, sentences, allegorical sayings and other ways. In the process, it allows us to think creatively about a topic and give play to our imagination. As shown in Figure 9, the word dog means "dog", and the word body means "body", so the tired people are like dogs. Those who feel their bodies are hollowed out are migrant workers, namely, dogs body, a worker who works hard.

4. Conclusions

The English Teaching Model based on mind map and the cultivation of innovative thinking are

of great significance in the IoT era. From the experimental data, people can see that the form of mind map introduced into English Teaching Model is also an inevitable trend. Mind mapping can strongly increase students' logical thinking ability. The application of mind mapping can effectively help to develop the potential of the brain, get rid of the shackles of thinking stereotypes, and stimulate students' imagination and creativity in English thinking. However, language learning is a process of creative construction. Lagging reactions and errors would occur during tolerance. Due to time constraints, this experiment only selected the verification results of individual schools, and the reliability of the experimental data is not high. In addition, when innovative thinking has become the main theme of economic development, many colleges and universities still fail to change their educational ideas and methods in time. The differences in views lead to many challenges in English classes. The sources of challenges include both students and teachers. Students are not focused, and lack discipline and enthusiasm. The teachers have limited mastery of methods and insufficient allocation of resources and facilities. Education and teaching research is a subject that human beings have been constantly researching and developing. The transformation of English Teaching Model is also gradually followed up. Whether mind mapping would be widely used in English Teaching Model in the future depends on the development trend of the IoT era. In order to further analyze the advantages of mind mapping to English Teaching Model and the role of mind mapping in promoting innovative thinking, the analysis results would be further improved in the follow-up research.

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