

Research on the Application of Mind Mapping in Promoting English Learning Efficiency of High School Art and Sports Specialty Students

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How to cite this paper: Ma, X. L., Jia, Y. J., Jiang, X., & Nie, Z. N. (2022). Research on the Application of Mind Mapping in Promoting English Learning Efficiency of High School Art and Sports Specialty Students. *Open Journal of Social Sciences*, 10, 335-358. <https://doi.org/10.4236/jss.2022.106025>

Received: May 24, 2022

Accepted: June 26, 2022

Published: June 29, 2022

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Abstract

Since the new curriculum reform, the requirements and difficulties of high school English learning have generally increased, which has brought severe challenges to teachers and students' teaching and learning, especially for high school art and sports students. This study mainly explores how to apply mind mapping to senior high school art and sports students' English learning, focusing on word learning, reading comprehension and writing. The purpose of this study is to study whether the English learning mode of senior high school art and sports students assisted by mind mapping tools can stimulate students' interest in learning English and improve students' learning ability, so as to explore a set of effective modes and methods. The research adopts the methods of literature research, questionnaire survey, classroom observation, interview and experimental research. Taking two classes of art and sports specialty students in grade one of School B in city a of Gansu Province as the research object, the experimental group and the control group are set up respectively to carry out a course for a semester. The results show that mind mapping has greatly improved the level of emotional attitudes and values such as interest and attitude in English learning of art and sports students in senior high school, promoted the English vocabulary learning and reading comprehension ability of art and sports students, and also played a very positive role in Teachers' professional growth and students' autonomous learning.

Keywords

Mind Mapping, High School English Learning, The Application of Mind Mapping in English Teaching, Art and Sports Specialty Students, English Learning Efficiency

1. Introduction

1.1. English Learning Difficulties Faced by High School Art-Sports Specialty Students

Art and sports specialty students, referred to as “art and sports students” for short, refer to students with special potential in the field of art and sports. After scientific training and targeted education, they can improve their quality and carry forward their personality and specialty. The school where this research is carried out is a provincial training base for art and sports specialty students. In order to attract a large number of junior middle school students with specialties to study their specialties, the enrollment scores of specialty students are lower than ordinary students under the same conditions. These art and sports students usually not only bear the pressure of high load professional training (especially sports students), but also take into account the study of cultural courses. They pay more and have greater pressure than other cultural students.

As a special kind of educated group, these special students need to spend a lot of time learning professional skills, so most choose liberal arts with less learning pressure. However, in the interview with them, it is found that they generally have big problems in mathematics and English learning. In the survey of the current English learning, nearly 80% of the students said that there are many contents need to be remembered in English, and the teachers’ class form is monotonous and lack of guidance and change, which makes them not interested in English learning, results in low efficiency.

1.2. Integration of Information Technology and English Teaching in High School

Facing the basic education environment of educational informatization and educational modernization, English teaching in senior high schools in China is quietly changing. The elements of information technology and curriculum integration are gradually infiltrating into it, which is adding new vitality to English teaching. The English curriculum standard of senior high school also clearly puts forward that teachers should make full use of modern educational technology, develop English teaching resources, broaden students’ learning channels, improve students’ learning methods and improve students’ learning efficiency; we should use computer and multimedia teaching software to explore new teaching modes and promote students’ personalized learning (Ministry of Education of the People’s Republic of China, 2003).

However, the new curriculum reform has greatly improved the learning requirements and difficulties of senior high school English subjects. The amount of vocabulary mastery is gradually increasing, the difficulty of vocabulary memory is large, the textual information is complex, the topics involved are rich, and the article structure is difficult to grasp. All these problems have brought many challenges to teachers’ classroom teaching and students’ learning. Front line teachers believe that the traditional model of English teaching and learning can no longer adapt to students’ diversified learning. They hope to use a good tool,

method and means to reduce students' cognitive difficulty in learning English and improve students' learning enthusiasm. Therefore, the idea of the integration of information technology and curriculum has gradually entered the front-line teaching. Teachers use information technology to display, develop and reorganize the teaching content, and actively explore new teaching and learning modes to adapt to the current efficient English class.

1.3. Practical Application of Mind Mapping in Senior High School English Teaching

Mind mapping is a graphic tool to open the potential of the brain. It is widely used in the fields of business, life, training and education. Mind mapping uses its rich colors, lines and structures to represent the thinking process and knowledge structure, which plays a very positive role in learners' logical thinking ability, image thinking ability and divergent thinking ability.

English is a linear and analytical language, and its language logic has the characteristics of decentralization. The curriculum design of English teaching also has the characteristics of framework and structure. Therefore, a lot of thinking organization and logical expression are needed in English teaching, and thinking map can just meet this characteristic (Han, Bao, Wu, & Shen, 2014). Moreover, efficient communication, cooperation and interaction are the key to learning and teaching for English teaching.

The process of making and using mind mapping is an interactive process of dialogue communication. Through the communication between teachers and students, students can give full play to their subjective initiative, help them deeply understand knowledge and deepen the connection between knowledge. This interactive and cooperative teaching mode can improve learners' English learning efficiency.

At present, a large number of empirical studies at home and abroad have shown that mind mapping plays a very important and positive role in improving the effect of English teaching and learning in senior high schools. It has made some achievements in promoting learners' vocabulary and grammar learning, reading comprehension, writing and after-school review. Of course, there are also some research deficiencies, the most important of which is found after a large number of literature surveys. First, most of the researches have a short research cycle, and have not effectively completed the deep integration of mind mapping and English teaching and learning, and have not developed a set of effective and operable English teaching models; second, there is a lack of more targeted research. Based on the situation of the school, this study selects art and sports students as the research object. Through the previous questionnaire survey and interview, it carries out the integrated teaching of mind mapping according to the current situation of learners, which makes the research more targeted and the research conclusion more meaningful.

1.4. Research Questions

The purpose of this study is to solve the following problems:

1) How to effectively integrate mind mapping into vocabulary learning, so as to improve the vocabulary memory level of high school art and sports students?

2) How to effectively explore the application mode of mind mapping in senior high school English reading comprehension, so as to promote the reading comprehension ability of senior high school art and sports students?

3) Does the use of mind mapping greatly improve the level of emotional attitudes and values such as interest, attitude and so on?

4) What is the effective model of senior high school English teaching design and classroom teaching based on mind mapping and what is the relationship between the mode of mind mapping and improvement of the English learning efficiency of high school art and sports students?

2. Literature Review

2.1. Overview of Mind Mapping

Mind mapping is a thinking tool invented in the 1960s by Tony Buzan, a famous British psychologist. He believes that mind mapping, as a new note taking tool, should have five characteristics: focus, trunk divergence, clear hierarchy, node connection, graphic color and other multi-point representations (Done & Gang, 2009).

Generally speaking, mind mapping is not only a visual tool for graphical representation, but also an expression of divergent thinking. Mind mapping, a radioactive thinking method, can further stimulate people's creativity, imagination and thinking, and accelerate the accumulation and understanding of information by the human brain. It can not only describe the complex hierarchical relationship between concepts, but also serve as a structural framework for presenting problem thinking. This visual framework can make the problem structure and the relationship between problems clearer, and the process of problem expansion smoother. Mind mapping can effectively promote learners' meaningful learning, cultivate and improve learners' comprehensive ability to use English. It is an effective thinking tool for teachers' teaching and students' learning.

2.2. Research of Mind Mapping in English Teaching

2.2.1. Research Status and Key Strategies

In China, the attempt of using mind mapping to promote English classroom teaching has only been active in recent ten years. Chen and others believe that in foreign language teaching, mind mapping can visually represent knowledge and thinking process. As an excellent scaffolding strategy, it can effectively promote "the knowledge learned into their own internal expression" (Chen, 2005). Based on this understanding, many authors have extended their research focus to the integration of mind mapping and English teaching and learning methods, and achieved a series of gratifying research results.

Mind mapping is widely used in English teaching. These studies mainly include comprehensive research, word research, grammar research, reading com-

prehension research, listening research, writing research and English learning strategies research. From the perspective of the research process, many authors prefer to use mind mapping as an assistant to strengthen vocabulary memory, which is widely used in primary and secondary school English classes. For example, Tan guides the students to carry out the pronunciation training of “seeing words, reading, listening and writing”, and uses the mind map to draw the meaning of words according to their own thinking logic, so as to promote the students to facilitate the associative memory of words and improve the efficiency of English learning (Tan, 2011). Zhuo and others elaborated the application strategy of mind mapping in the review stage of primary school English classroom teaching (Zhuo, 2011). Modern foreign language reading teaching strongly advocates helping students learn to read with the help of mind mapping, and promoting the possibility of students’ further learning through reading. Liu applied the teaching mode of “mind mapping” to the reading discourse teaching of junior middle school English, so that students can clarify the framework structure of different topic discourses and the author’s writing intention, and also make students easily and happily experience the fun of the practical application of “mind mapping” (Liu, 2011).

In terms of mind mapping to promote senior high school students’ English learning strategies, Miao believes that the combined training of metacognitive strategies and brain map has a positive effect on Chinese senior high school students’ word learning (Miao, 2007). Huang and Hu, on the other hand, put mind mapping into the cultivation of English learning strategies more specifically, and conducted the production training of mind mapping in the three English teaching links of task planning, vocabulary memory and discourse structure. Finally, they confirmed that students exercised memory thinking in the process of making, modifying and perfecting mind mapping, formed their own effective English learning strategies and developed students’ autonomous learning ability (Huang & Hu, 2009). It can be seen that mind mapping plays a positive role in promoting the choice of English learning strategies and the acquisition of autonomous learning ability of senior high school students, and provides a strong basis for subsequent application research.

2.2.2. Application of Mind Mapping in English Teaching

Vocabulary is the basis of English learning and the basic part of language communication. Wilkins, a famous linguist, once summed up the importance of word learning: “without grammar, people can express very few things; without vocabulary, people can’t express anything.” (Wilkins, 1978). The lack of vocabulary will inevitably lead to learners’ weak grammar and reading comprehension ability. In the research of mind mapping promoting students’ word learning efficiency, it is mainly to use mind mapping in senior high school vocabulary teaching, integrate, memorize, extract and store vocabulary from the perspective of near words, near words, near synonyms and lexical chunk chain, and mark the relationship between vocabulary by means of graphics and icons, which can great-

ly mobilize students' subjective initiative, arouse students' interest in learning and improve the efficiency of vocabulary teaching (Wang, 2015). Yang confirmed through the quasi experimental research method that the effect of word learning based on mind mapping is better than that without mind map. Mind mapping can exercise students' divergent thinking ability, enable students to master the method of systematically memorizing vocabulary and gradually improve the effect of single word learning (Yang & Fang, 2016).

English reading comprehension is an essential part of English learning. It is a clue that runs through the whole English teaching and can be integrated with all the knowledge points of English. Li believes that teachers can use mind mapping to divide the whole English article, so that students can clearly see the hierarchical structure and process in the article, and help improve students' English reading ability (Li, 2015). Ma and Chen believe that through mind mapping, learners can focus on key knowledge points to get rid of the trouble that they can't grasp the theme because the article is too long or too difficult. It can also stimulate learners' subjective initiative in learning and change passive learning into active learning (Ma & Chen, 2008).

High school English writing course is not only an important and difficult part of high school English learning, but also a part of expanding students' comprehensive ability to use English. The new curriculum standard also requires more attention to the cultivation of language ability and thinking ability. This poses a certain challenge to teachers and students in the actual teaching. The research of Shu and other scholars shows that: the teaching mode in class is old, that is, teachers' propositions, and students mostly draft them alone without any help. This mode ignores the experience basis of writing individuals and regards the writing teaching process as a mechanical process in which teachers give stimulation and students respond, so students can't have interest; teachers always focus on the final product, and lack reasonable monitoring of the process of text generation, resulting in rigid and inefficient writing teaching procedures (Shu, 2009). Yin and other front-line teachers found in the teaching practice of English writing in senior high school that the teaching mode with mind mapping as a tool can effectively stimulate students' writing thinking, expand students' writing vision, and promote the effective development of students' English writing ability and English language literacy (Yin, 2014). Using qualitative and quantitative research methods, Cui found that the teaching of English writing with the help of mind mapping not only stimulated students' interest and enthusiasm in English learning, improved students' English writing strategies, but also greatly deepened students' understanding of teaching materials and texts (Cui, 2012).

3. Research Design

3.1. Research Framework

3.1.1. Research Framework

This study focuses on English Teaching for art and sports students. The whole

study will follow the general paradigm of teaching research. The main research methods are quasi experimental method, questionnaire survey method, interview method and observation method, which are carried out from three levels: teachers, students and classroom teaching. The specific flow of the study is shown in **Figure 1**.

3.1.2. Method

1) Quasi experimental research method

This study mainly adopts the method of quasi experimental research, and selects two classes of art and sports specialty students in grade one of School B in city a of Gansu Province as the research object. Each class has about 52 people. There is basically no significant difference in the English admission level between the two classes. One class is used as the experimental class, and the teachers carry out classroom teaching and students' offline autonomous learning in combination with mind mapping; While the other class, as the control class, still uses the existing way of teaching. The two classes are taught by the same teacher. After one year of teaching and learning, the students in the two classes are finally evaluated in three aspects: test scores, English learning ability and interest and attitude in English learning, so as to evaluate the effect of mind mapping on students' English learning.

2) Questionnaire survey method

Before the beginning of this study, a pre-test was conducted on the two selected classes, which were investigated from three aspects: the overall situation of English learning (including English learning attitudes, habits and methods), the current situation of English vocabulary memory and reading comprehension ability and the current situation of English learning review strategies; after the experiment, the two classes were investigated by questionnaires, and the preliminary questionnaire was still used, but the topic order and options were disorganized. The similarities and differences between the experimental group and the control group were compared from the above three dimensions, and finally a conclusion was drawn.

3) Interview

The interview runs through the whole research process. In the research, through continuous interviews with students, the author timely obtains the feedback of the students in the experimental group, and adjusts and optimizes the teaching materials and teaching methods. After the experiment, continue to conduct targeted interviews with students to understand the situation from multiple perspectives from the perspective of learning methods, thinking habits, emotional attitudes and values; at the same time, teachers should also be interviewed.

3.1.3. Teaching Evaluation Tools

As a teaching research activity, the evaluation of teaching effect will be organized from two dimensions: the level of knowledge and skills and the development of students' comprehensive literacy.

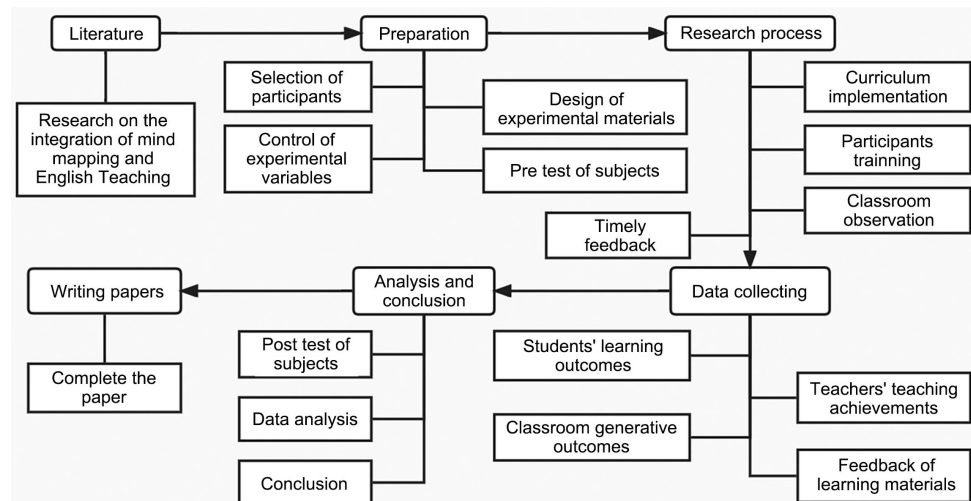


Figure 1. Flow chart of the study.

1) Knowledge and skill evaluation

The evaluation of students' knowledge and skills will mainly start from the dimensions of daily formative evaluation and final examination results, and analyze the students' knowledge and skill level with the help of the post-test data of the results of the experimental class and the control class.

2) Comprehensive literacy evaluation based on questionnaire data

The evaluation of art and sports students' comprehensive literacy is mainly realized through questionnaire survey. In order to achieve this evaluation, the author designed the questionnaire on English learning status and Strategies of art and sports students in school B. The questionnaire is mainly carried out from four dimensions: learning interest, vocabulary learning, reading comprehension and review strategies.

In order to ensure the scientificity and validity of the questionnaire, the author invited three front-line teachers and subject experts to iterate and review. At the same time, a small range of measurement data confirmed that the Cronbach coefficient of the questionnaire was 0.877, which had good validity.

3.2. Research Participants and Content

3.2.1. Participants

In this study, a provincial art and sports specialty school was selected as the experimental school. The school includes art students, physical education students, music students and media students. There are also some culture students, but the performance of culture is not ideal, and the students' interest in learning is generally low. Moreover, due to the weak learning foundation, most of them lack the mastery of English learning methods, especially for the learning of memory knowledge, then affect their English learning initiative and enthusiasm.

The class division of senior one in school B adopts the method of "sunshine class division" and uses the computer to divide the classes automatically. There is almost no difference in the average scores of various subjects between classes,

with about 52 people in each class. The author selected two classes of senior one as the research object, one class as the experimental class, using mind mapping in teaching, and the other class as the control class, still using the conventional way of teaching, and the teacher is the same teacher. The rigor and control of the teaching process are ensured from many dimensions.

3.2.2. Selection of Teaching Content

This study selected the compulsory one of the people's education edition of the experimental textbook English of senior high school curriculum standard as the experimental content. Each teaching unit has six sections: warming up, reading, learning about language, using language, summing up and learning tips. The author mainly uses mind mapping for integrated teaching in the warming up and reading links of the above six teaching and learning links.

4. Teaching Design and Implementation Based on Mind Mapping

The author's teaching of the experimental class is carried out by applying mind mapping to word learning, reading comprehension and review strategies, according to five steps: warming up activities, pre reading activities, reading comprehension activities, language learning (word learning) activities and after-school review.

4.1. Warming up Activity Design Based on Mind Mapping

“Warming up” is a preparatory module for students to learn new knowledge. An interesting and meaningful “warming up” is directly related to whether students can effectively perceive the fun and enthusiasm of learning, thus affecting the learning effect of the whole unit. Therefore, it poses a severe challenge to teachers' teaching. Teachers must make good use of this advance organizer strategy to fully mobilize students' learning enthusiasm and make students bring problems, situations and topics to conduct in-depth learning in the next link to promote meaningful learning (Gao, 2009).

As a graphical thinking tool, mind mapping can not only help learners carry out brainstorming and divergent thinking in the “warming up” link, but also help learners carry out a series of interesting inquiry activities, carry out structural thinking and individualized learning. At the same time, teachers can make full use of the mind map to guide and summarize, and encourage and affirm the thinking achievements formed by students. By analyzing the three most commonly used teaching forms in “warming up”, the author integrates the ideas and methods of mind mapping into it, and has achieved very ideal results. The following is the design of teaching activities based on mind mapping for the three links of vocabulary accumulation, brainstorming and problem thinking in “warming up”.

4.1.1. Activity Design 1: Vocabulary Accumulation

One of the important teaching tasks of warming up is the accumulation and re-

view of vocabulary. By guiding the review of vocabulary related to the topic of this unit and expanding vocabulary, teachers can establish a connection with students' existing knowledge, experience and foundation, which can effectively help students have a deeper understanding and understanding of new topics in subsequent reading activities.

Take the warm-up activity of Unit1 “friendship”, a compulsory part of senior high school English people’s Education Edition, as an example. The content of this unit mainly tests the students’ understanding of the theme of friendship. The teacher guides the students to think about the words related to “friends”, guides the students to use the mind mapping for divergent thinking, and draws the mind mapping. After drawing, each student is required to show their own thinking achievements and try to introduce their own map in oral English. The teacher can further supplement and expand it according to the actual situation; Of course, the teacher can also complete a mind mapping with the students, or ask some students to create a situation for each word and connect words into sentences, as shown in **Figure 2**.

4.1.2. Activity Design II: Brainstorming

Brainstorming is a kind of thinking method proposed by Aus in the United States to stimulate the generation of collective wisdom and put forward innovative ideas. It is usually that teachers put forward a central topic or task, then organize students to discuss, let students express their opinions freely in the discussion, put forward suggestions and ways to solve problems as much as possible, and then determine the best solution to the problem. This method can fully show students’ personality, broaden students’ imagination and thinking space, induce collective wisdom, and activate students’ creativity and inspiration (Yu, 2005).

Taking the warm-up activity of Nelson Mandela—a modern hero, a compulsory part of senior high school English people’s Education Edition, as an example, teachers can throw a topic to students to discuss and think: how to be a great man? And let students think freely. During the activity, students are required to think as divergently as possible, complete a complete mind map and communicate, as shown in **Figure 3**.

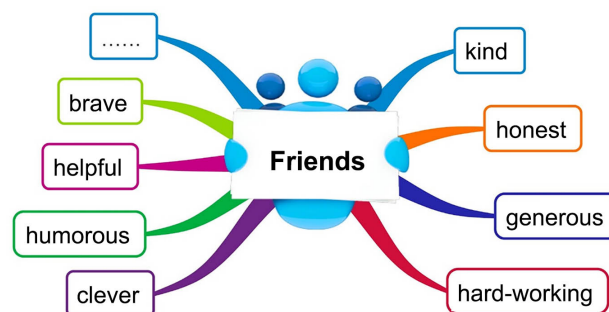


Figure 2. Warming up activity design of “Friendship”.



Figure 3. Warming up activity design of “Nelson Mandela—a modern hero”.

4.1.3. Activity Design III: Problems and Thoughts

As a language discipline, English can not only provide learners with a lot of information, rich knowledge and diverse cultures, but also broaden learners’ horizons and train learners’ thinking. English learning is conducive to promoting the development of students’ various thinking abilities, including observation, discovery, comparison, analysis, transformation, criticism and innovation (Zhang, 2016). Since the new curriculum reform, the shadow of “problem thinking” can be seen everywhere in the English discipline, which aims to cultivate learners’ logical thinking ability, critical thinking ability and English thinking ability, and “problem thinking” has also become the most commonly used customary method for teachers in warming up. Mind mapping can effectively help teachers and students analyze problems and organize the thinking process, and clearly present the thinking results. In the process of implementation, teachers can guide through a variety of thinking methods, such as analogical thinking, divergent thinking, reverse thinking, etc., so as to enable students to analyze problems from multiple different angles and deeply understand the contents similar to the topic of the unit.

Take the warm-up activity of Unit3 travel journal, a compulsory part of senior high school English people’s Education Edition, as an example. The warming up activity in this chapter is not to present new knowledge to students at the beginning, but to let students start with their familiar travel knowledge and guide students to think about the topic of travel. Exercise 1 of this part involves the selection of travel tools. The teacher guides the students to compare the advantages and disadvantages of each travel tool, and requires each group to select a vehicle and make a corresponding mind map. After making it, each group will send representatives to describe their mind map in English, which can be supplemented by other groups, **Figure 4** shows the selection of travel tools and the presentation of advantages and disadvantages by a group using mind mapping.

4.2. Warming up Activity Design Based on Mind Mapping

English reading class plays a very important role in cultivating students’ thinking quality, enhancing their learning efficiency and cultivating their English literacy (Yang, 2021). Students’ logical thinking ability, critical thinking ability, English

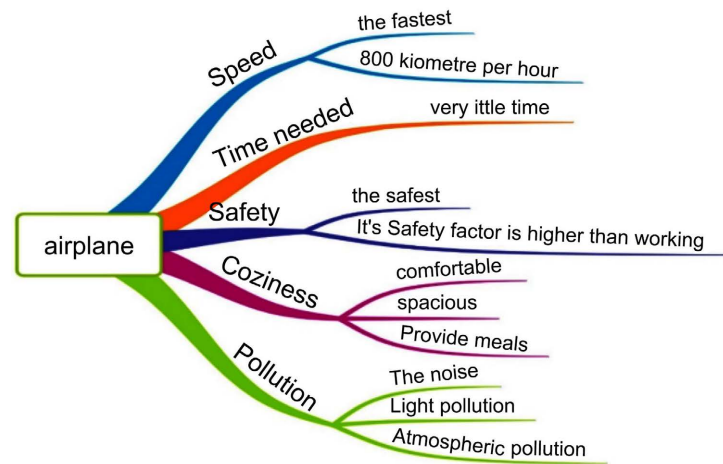


Figure 4. Warming up activity design of “Travel Journal”.

thinking ability and language and cultural identification ability need to be gradually cultivated with the help of fine reading. For the teaching of senior high school students, teachers should weaken the indoctrination and teaching of language knowledge, pay more attention to the cultivation and training of students' thinking ability, and pay more attention to the improvement and development of students' expression ability. Therefore, in the teaching process of the experimental class, according to the three links of pre reading activities, in reading activities and post reading activities, the author integrates the application of mind mapping, and tries to improve the original traditional reading teaching mode, which can help students carry out more relaxed and effective thinking.

4.2.1. Pre reading Activity

The purpose of pre reading activities is to make students familiar with the topic and understand the characteristics of the article genre, predict the content of the article through the title and pictures of the article, fully mobilize students' reading enthusiasm and make full preparations for formal reading.

1) Requirements

Choose the pre reading activity of Unit1 “friendship”, which is a compulsory part of senior high school English people's Education Edition. Teaching content: why do you need friends? Make a list of reasons why friends are important to you.

2) Case design

Teachers can guide students to list why friends are so important to mankind in the form of mind map, so that students can find answers from themselves and others. After drawing, students should explain their opinions in English. **Figure 5** presents an example of pre reading activities by using mind map

4.2.2. Reading and Comprehension

The activity in reading is the most important link in reading teaching. The purpose of the activity is to enable students to master the content of the article and cultivate students' reading skills and reading strategies. In this link, teachers

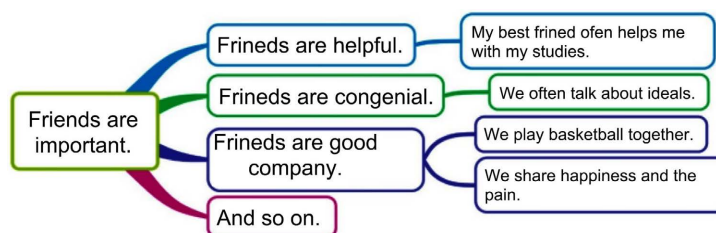


Figure 5. Design of pre reading activities of “Friendship”.

present or guide students to make a mind mapping of the text structure and hierarchical relationship of the text, and constantly optimize it to enable students to understand, appreciate and evaluate the content of the text. Finally, they deeply excavate and sort out the content of the article, lay a good foundation for the future expansion of writing.

1) Requirements

Choose the reading activity of “earth quarters” in Unit4, compulsory English for Senior High School of people’s Education Edition. Teaching content: a night the earth didn’t sleep.

2) Case design

Reading in this lesson presents a large amount of detailed information with a large vocabulary. Teachers need to explain unfamiliar words first, and then arrange learning tasks in the reading process (as shown in **Figure 6**), then communicate and discuss in pairs, and improve the mind map, so as to deepen the understanding of the reading content and master the overall context and important details of the article.

4.2.3. Post reading Activity—Learning about Language

The post reading activity mainly guides students to further process the content of the article, and deeply remember and understand the pattern vocabulary and grammar in the article. Finally, students can use the words in the mind map to make a “vivid description”, which can be described by a single word or multiple words in the form of a story for associative memory.

1) Requirements

Choose the reading activity of Unit4 earth quarters, a compulsory part of senior high school English published by people’s Education Edition. The teaching content is: a night the earth didn’t sleep

2) Case design

There are a lot of words about earthquake in this section. In the actual teaching process, teachers found that the words about earthquake still need to be expanded. Therefore, on the basis of combing the words in the text and within the scope required by the outline, according to the category of words, signs before the earthquake, people’s feelings, people’s behavior, damages caused by the earthquake and rescue after the earthquake are summarized and studied, and students are guided to practice “description” of each word. They can use one or more words for description training to strengthen students’ mastery of vocabulary. As shown in **Figure 7**:

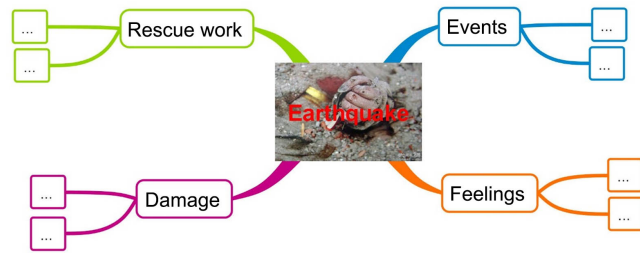


Figure 6. Design of reading activities of “Earthquake”.

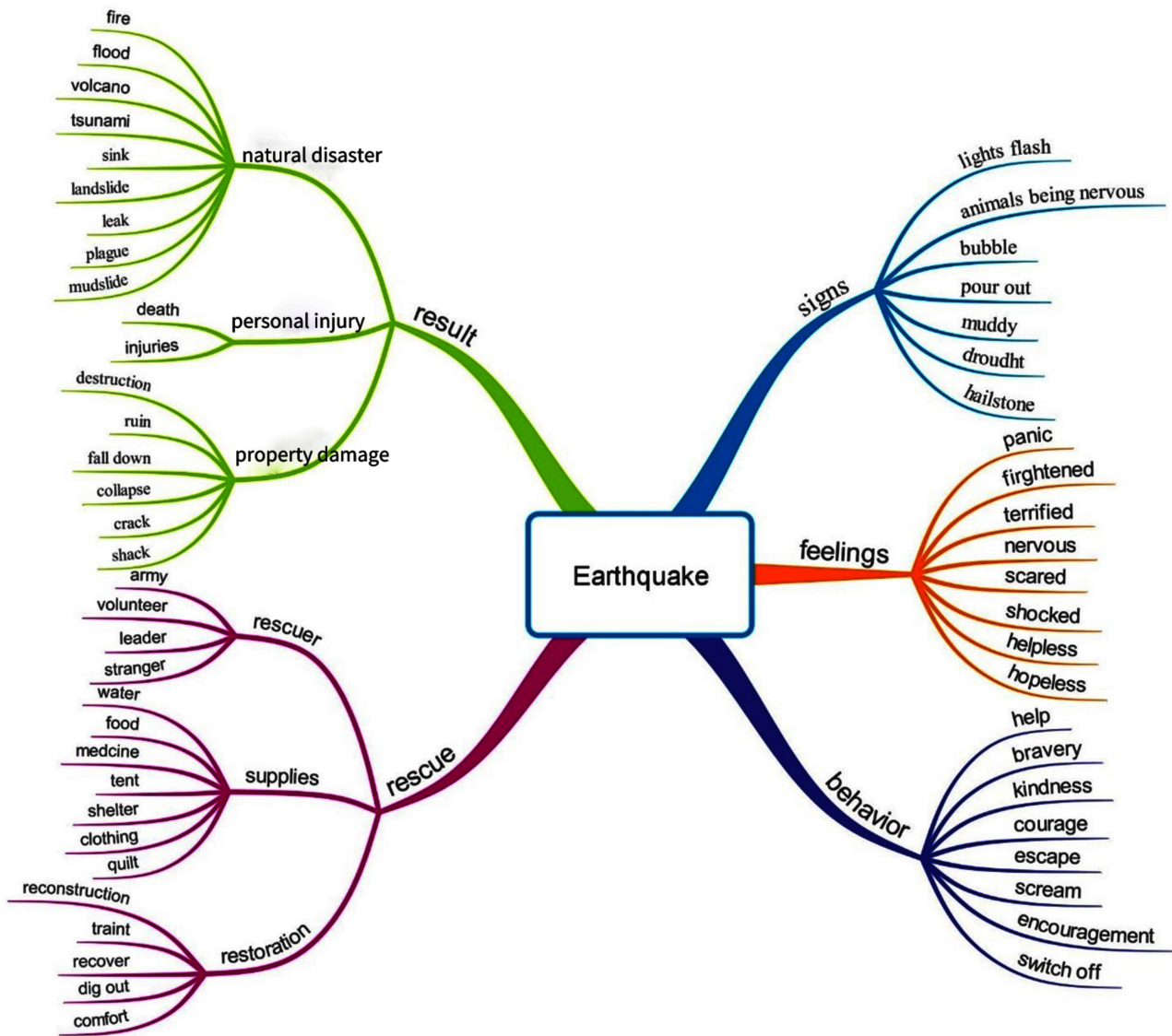


Figure 7. Design of post reading activities of “Earthquake”.

4) Review the strategy

Review class is mainly a comprehensive and systematic review of the learned knowledge in a specific period of time. The purpose is to strengthen memory and deepen understanding through review, and classify and sort out the learned knowledge through this intensive learning, so as to form a clear knowledge struc-

ture and make the learned knowledge organized and clear, so as to facilitate the extraction and application of knowledge. As a tool of thinking divergence and guidance, mind mapping enables students to better improve the efficiency of review by fully mobilizing students' senses and active learning. Therefore, teachers should skillfully use mind mapping to help students review in the selection of review strategies, and complete the following three requirements:

- 1) By starting with the familiar knowledge of students, teachers guide students to review the text and learn words with problems, and teachers lead students to draw a mind mapping together;
- 2) Show the mind mapping and ask the students to carry out activities such as speaking with pictures, adding sentences, impromptu composition, reading with questions, memory competition and so on, so as to strengthen the consolidation practice of existing knowledge;
- 3) Teachers should check the learning effect of students, review and feedback in time.

4.3. Organization and Implementation of Teaching Experiment

The teaching practice is mainly divided into the experimental preparation stage (two weeks before the beginning of school) and the experimental stage (weeks 3 - 18). In the experimental preparation stage, the author carried out the first round of questionnaire survey on the four classes of senior one. The questionnaire mainly includes students' interest in English learning, vocabulary learning, reading comprehension and review strategies, and trained teachers and students in the experimental class in mind mapping. In the experimental stage, mind teaching is carried out in the experimental class, and the control class is taught according to the conventional teaching mode. During the teaching process, interviews are used to collect the real feelings of teachers and students, and in-depth analysis is carried out. After the experiment, a questionnaire survey was conducted again in the experimental class. Similarly, a comparative survey was made on students' interest and attitude in English learning, vocabulary learning, reading comprehension and review strategies. The two rounds of surveys are carried out on the "questionnaire star" platform, and the data analysis function of the platform is used to analyze the data and draw a conclusion.

5. Data Analysis and Discussion

5.1. Analysis and Discussion Based on Achievements

The primary goal of teaching research is to promote students' learning and achieve better academic results. Therefore, the primary problem of teaching evaluation is to test and analyze the results of the students in the experimental class and explore whether the students in the experimental class have excellent performance.

On the premise that there is no significant difference between the pre-test scores of the experimental class and the control class, after a learning teaching ac-

tivity, the author found that the score distribution and independent sample t-test results of the experimental class and the control class are shown in **Table 1**.

The results of t-test based on independent samples are shown in **Table 1**. The results confirm that there is a significant difference between the post-test data of the experimental class and the control class under the standard of 99% confidence. This shows that the English Teaching of senior high school art and sports students based on mind mapping has achieved good results. From the perspective of knowledge training and skill development, the English teaching based on mind mapping is effective.

5.2. Analysis and Discussion Based on Questionnaire Data

In order to investigate the students' mastery of mind mapping, their attitude towards English learning, and their application in English word learning, reading comprehension and after-school review in the experimental class in the past semester, the author conducted a questionnaire survey on the experimental class to qualitatively evaluate the students' English learning effect based on mind mapping since this semester. The results show that compared with the pre-test data, mind mapping is effective in English learning satisfaction, improving word learning efficiency and reading comprehension based on mind mapping.

5.2.1. A Survey of English Learning Satisfaction in Experimental Class

The survey results of students' satisfaction with the overall effect of English learning in the experimental class are shown in **Table 2**.

It can be seen from the data in **Table 2** that more than half of the art and sports students are satisfied with their current English learning, which has improved compared with the initial test, and more than 70% of the students believe that the difficulty of English learning is decreasing; about 52% of the students like teachers' application of mind maps in English teaching, 55% of the students think that the use of mind maps has stimulated their interest in learning, and three quarters of the students can actively use mind maps to help themselves in their daily English learning.

The use of mind mapping can help students greatly improve their ability of memory, understanding and writing, and greatly improve the learning effect of English. With better learning effect, students will have greater interest in learning and form a virtuous circle (Shi, 2010). Moreover, the data reflect that the students' fear of difficulties is gradually decreasing and the achievement motivation of English learning is gradually increasing. It was also found in the interview with students, many students said: "In the past, when learning English, I knew how to recite words, grammar and texts. I felt very boring, and I always felt that I couldn't recite them alive and dead, but after mastering the methods, it wasn't very difficult. The teacher guided us to draw a mind map when speaking, and then took us to analyze the structure of the article, and then spoke vocabulary and grammar. I felt that I could memorize them a little after speaking. If I had to understand them first, it would be easier to remember them."

Table 1. Comparison between experimental class and control class.

Class	Mean	Standard deviation	SE (Standard error)	T	Sig
Experimental class	78.41	11.24	3.872	4.458	0.000**
Control class	61.23	18.91			

Table 2. A survey of English learning satisfaction of art and physical Students.

Title	Students' English learning satisfaction results Percentage of data				
1. How satisfied are you with your current English learning?	very dissatisfied 3.85%	dissatisfied 11.54%	general 30.77%	satisfied 42.31%	very satisfied 11.54%
2. Do you find it difficult to learn English?	very difficult and incomprehensible 3.85%	a little difficult, but it's better than it can be overcome before 23.08%	40.38%	it's easy as long as you master the method 32.69%	
8. Do you like the way teachers incorporate mind mapping into English teaching?	very dislike 5.77%	dislike 7.69%	general 34.62%	like 36.54%	very like 15.38%
9. Can the clever use of mind mapping in English stimulate your interest in learning?	can't 13.46%	general 30.77%		can 55.77%	
10. Do you take the initiative to use mind maps to help yourself in English learning?	don't 25.00%		do 75.00%		

5.2.2. Mastery and Application of Mind Mapping

The students' mastery and application of mind mapping are also briefly understood. The students' answers are shown in **Table 3**.

The data shows that about 60% of the students can master the drawing method of mind mapping more skillfully after the author has carried out five class hours of mind mapping training. More than 90% of the students think that mind mapping is not difficult, and can use mind mapping to take notes or sort out ideas, which will be widely used in future study and life.

5.2.3. Evaluation of Word Learning Effect Based on Mind Map

For the research on mind mapping promoting the word learning of art and sports students, the author designed five questions. The students' answers are shown in **Table 4**.

The data show that for most art and sports students, the new teaching method of mind mapping assisted word learning is accepted and affirmed. About 86% of art and sports students said that the effective use of mind mapping is helpful for them to memorize words, and has been greatly improved compared with the previous test data in word learning, 84% of the students can associate and memorize words according to the internal relationship of words, such as near words, synonyms, homonyms, etc.; Moreover, the time spent on English word learning has also been greatly shortened, 60% of students spend a lot less time on word learning, and nearly 60% of students say they can consciously use mind map to summarize and review words in their learning.

Table 3. A survey of English learning satisfaction of art and physical students.

Title	Student mind mapping application results				
	Percentage of data				
3. Can you master mind mapping through training and learning?	very unskilled 1.92%	unskilled 11.54%	general 28.85%	skilled 44.23%	very skilled 13.46%
4. Do you find mind mapping difficult to learn?	it's too hard to learn 5.77%	it's a little difficult, but it can be learned 28.85%		it's easy 65.38%	
5. Do you use mind maps to take notes (or organize your thoughts)?	never 1.92%	sometimes 34.62%		often 63.46%	
6. In your introduction to mind mapping, what do you think mind mapping can help you do?	it doesn't help. I barely use it 1.92%	think outside the box and generate more ideas 21.15%	to think deeply and establish the overall framework of knowledge 50.00%		summary and collation 26.92%
7. Will you use mind mapping to solve some problems in your future study and life?	won't 5.77%			will 94.23%	

Table 4. Mind mapping facilitates word learning investigation.

Title	Student mind map promotes word learning situation answer result				
	Percentage of data				
11. Do you like to use mind maps to learn and remember words?	dislike 7.69%	general 25.00%		like 67.31%	
12. Do you think it's better to remember words using mind maps?	not at all, same as before 13.46%	a little bit, I feel better than before 61.54%			it works really well 25.00%
13. When you memorize words, do you associate related words, such as close words, synonyms, homonyms, etc.?	never 3.85%	sometimes 11.54%	often 44.23%	always 40.38%	
14. In your English study, do you feel that the time you spend on memorizing words now accounts for about the total time of your English study?	1/5 28.85%	1/4 32.69%	1/3 15.38%	1/2 19.23%	1 3.85%
15. Can you consciously use mind maps to summarize the words you have learned?	never 5.77%	sometimes 34.62%		often 59.62%	

The author is gratified that for most of the students in the experimental class, they have fully accepted the changes brought by mind mapping to their English learning. In the actual classroom observation, the author found that at the beginning, when the teacher instructed the students to draw mind mapping in word learning, many students had some rejection. Later, at the insistence of the teacher, the students slowly accepted and recognized the mind mapping.

Mind mapping learning words can enhance the meaningful connection be-

tween words and reduce the number of working memory, which is conducive to cultivating learners' metacognitive ability, and it is easy to make the learning content enter learners' long-term memory, so as to achieve the effect of not easy to forget and easy to extract, so as to improve students' ability to remember words, reduce the forgetting rate of words, improve the ability to distinguish similar words, and improve students' ability and efficiency of memorizing words (Wei & Guo, 2007; He, 2013).

5.2.4. Evaluation of Reading Comprehension Effect Based on Mind Mapping

For the investigation of mind mapping promoting reading comprehension of art and sports students, the author designed 6 questions. The students' answers are shown in **Table 5**.

The data show that more than 80% of the students will use mind mapping to help them sort out the structure of the article, and focus more on the frame structure of the text, rather than the reading comprehension around unfamiliar vocabulary, grammar and syntax. With the unremitting efforts of teachers, many difficulties have been overcome. More than 90% of students can find keywords and key sentences from the article, draw the thinking map of the text independently, sort out the structure of the article and grasp the main idea of the article.

Therefore, in English reading, the effective use of mind mapping to analyze the text can make the difficult and complex content very clear and systematic, so it can help students understand the content more deeply, organize and remember the materials more easily, and promote students' in-depth processing of the reading content (Zhang, 2005). In the actual teaching process, the author found that compared with word learning, students prefer to use mind map in the process of reading comprehension. Teachers and students jointly extract the main contents and ideas of the article, draw the mind map, and write according to the mind map, which has achieved good learning results.

5.2.5. Effect Evaluation of after Class Review Based on Mind Mapping

The author evaluated the strategy and effect of after-school review of art and sports students using mind map, and designed three questions. The students' answers are shown in **Table 6**.

The results show that more than 90% of the students with special skills in art and sports can use mind mapping to help them review, 30% of the students can use the strategy of summarizing before review, 53% of the students can use various learning tools to help them review, and more than 50% of the students are satisfied with their review effect.

From the pre-test data, it can be seen that art and sports students do not pay attention to review in the process of English learning. Through the review class, teachers guide students to use mind map to summarize the learned words, grammar and syntax according to a certain logical structure, and intuitively show the words, grammar and reading with the help of mind map, which provides a good grasp for students' effective review.

Table 5. Mind mapping improves reading comprehension.

Title	Student mind mapping promotes reading comprehension				
	Percentage of data				
16. Do you use mind maps to help you organize your reading comprehension?	never 11.54%	sometimes 53.85%	often 34.62%		
17. Do you focus on the structure of the text as you read it?	never 3.85%	sometimes 11.54%	often 25.00%	always 59.62%	
18. Can you figure out the structure of the text as you read it?	very difficult 9.62%	difficult 13.46%	general 36.54%	easy 15.38%	very easy 25.00%
19. Can you quickly find the key words or key sentences in the passage?	it's too hard to find out 9.62%	it's a little hard to figure out 34.62%		it's easy to find 55.77%	
20. Can you map the reading passage independently?	can't 7.69%	some of the time 13.46%	most of the time 40.38%	can 38.46%	
21. Currently, which of the following do you think is the most important in reading comprehension?	find new words and grammar and note their meanings 23.08%	read and translate word for word 32.69%		find the key words quickly, comb the structure of the article, grasp the general idea of the article 44.23%	

Table 6. Mind mapping improves reading comprehension.

Title	Student mind map promotes review effect situation answer result				
	Percentage of data				
22. Do you use mind maps to help you review?	can't 9.62%	some of the time 26.92%	most of the time 36.54%	can 26.92%	
23. What strategies do you use in your review?	recite notes directly 13.46%	first sum up and then review 30.77%	use tools to help you remember 53.85%	never review 1.92%	
24. How do you feel about the effect of your review now, compared with the previous one?	very bad 5.77%	bad 9.62%	general 30.77%	good 42.31%	very good 11.54%

5.3. Conclusion

5.3.1. The Influence of Mind Mapping Tools on the Learning of Art and Sports Students

1) Mind mapping plays a significant role in promoting the English learning of art and sports students in our school

Based on the questionnaire data and interview results of the experimental class and the control class, it is found that high school English teaching based on mind mapping can greatly promote the English learning interest and learning attitude of high school art and sports students, and has a significant effect on their vocabulary recognition ability, reading thinking ability and reading and speaking abili-

ty. In addition, it also plays a very positive role in promoting teachers' efficient lesson preparation and enhancing students' learning autonomy.

2) Summary of design points when applying mind mapping to support English Teaching of art and sports students

In the design model of warming up based on mind mapping, through the design of vocabulary accumulation, brainstorming and problem thinking, teachers should start from students' existing knowledge and experience, understand students' recent development areas through questions and answers, tests and statements, and vigorously stimulate students' existing understanding of topics, which can help students better achieve the effect of internalizing new knowledge, promote students' meaningful learning.

In the reading activity design model based on mind map, teachers can give full play to the visual and structured characteristics of mind map through the hierarchical and structured design of pre reading, reading and post reading activities, make use of its rich colors and lines as much as possible to express students' divergent thinking and linear thinking in multiple dimensions, and focus on guiding students to refine key words and key sentences in reading articles, forming a complete mind map and then clarifying the structure of the article is very effective for students to deeply understand the article and expand their writing.

3) Mind mapping has distinct genre adaptability to English reading articles

For different genres such as expository, narrative, argumentative and drama, the way of integrating mind mapping into teaching and learning should be different. Especially in expository, the teaching effect of using mind mapping is relatively significant. At the beginning of teaching design, teachers should pay special attention to the in-depth analysis and excavation of reading genres, which can effectively help students make rational use of mind mapping and improve learning efficiency.

5.3.2. The Role of Mind Mapping Tools in English Teaching for Art and Sports Students

Combined with the data before and after the experiment and the interview data of teachers, this study makes a comprehensive understanding and analysis of the current situation of English learning of art and sports students and the overall effect of mind mapping integrated teaching.

1) Mind mapping is an effective tool to improve the efficiency of teachers' lesson preparation

Teachers use mind map to prepare lessons and classes, which is not only easy to remember, but also can help teachers grasp the teaching content as a whole, think more clearly, and be able to complete the lesson preparation task with ease, efficiency and high quality according to their own mind map.

The teaching plan of conventional lesson preparation cannot allow teachers to adjust the classroom teaching to the best state according to the local needs of students at that time. Using mind map to prepare lessons and attend classes can

solve this problem to a great extent. Teachers use mind maps to give the main structure of the content to be taught in advance. If there is a special need in the interaction between students, teachers can immediately connect these problems with the existing mind maps to explain them; If the class time is suddenly extended or shortened, the teaching content can be summarized and adjusted again; Moreover, teachers are constantly stimulated by mind mapping in this process, updating ideas from time to time, and generating more generative and valuable questions and contents.

2) Mind mapping is an effective tool to improve students' English learning efficiency

This study combines the cultivation of thinking ability with specific courses and classroom teaching, takes thinking tools as an effective method and way for learning subjects to master and self-construct knowledge, and fully stimulates students' interest in learning English by applying mind map to English teaching classroom, providing effective methods and guidance for students' word learning and reading comprehension, which are generally troublesome in English learning. It reduces students' fear of difficulties, cultivates students' divergent thinking, and finally promotes the improvement of English learning ability of special learners mainly high school art and sports students. Teacher A deeply felt the changes of students in his teaching. "They slowly began to be willing to learn English, especially some students with middle grades. They had the highest enthusiasm for mind mapping and the strongest interest in learning. The change was really great. They were gradually able to recite the full text by using the drawn mind mapping."

3) Mind mapping is an effective tool for teaching evaluation and reflection

By observing the process of students' designing and making mind map, teachers can accurately grasp the situation of students' mastery of knowledge and whether there are problems in the thinking process, so as to give diagnosis and feedback in time and promote students' deep thinking and knowledge processing. It is an effective tool for teaching evaluation and reflection. Teacher A said: "in the course of class, I usually ask them (students) to sort out the structure of the article or the words. According to the images they draw, I can clearly know where they still have problems and where they haven't mastered thoroughly, which can let me master the problems of each student and facilitate me to carry out personalized counseling."

6. Reflection

The period of this study is one semester. The research period is limited, and the students' ability to master mind mapping is limited, which makes some students unable to keep up with the rhythm of the teacher; there are also some limitations in terms of research conditions. In addition to the mind map displayed by teachers, students can only learn by hand drawing mind map. Compared with soft-

ware production, it takes more time and cannot use rich lines and colors. Moreover, students often need to transcribe the drawn mind map again, which greatly wastes students' time in class, so the mind map drawn in class is relatively rough.

High school art and sports students are a special group. When doing literature research, the author also found that the attention to this group is still not enough, and there are few teaching experiments about this group. In the limited research cycle, the author cannot carry out a large number of in-depth research, which only involves the use of words, reading comprehension and review strategies in English learning. Further in-depth research is needed on the use of mind mapping in writing, grammar and oral English, as well as the integration with other disciplines. The conclusion of this study needs to be continuously improved in the process of teaching practice in the future. I hope more authors can invest their energy in the research of improving the learning ability of high school art and sports students, so as to help them realize their ideals.

Acknowledgements

We are grateful to Beijing Normal University for embracing this research.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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