

# Construction Method of English Grammatical Knowledge Map Tree Based on Association Rules

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## Abstract

A solid grammar is a necessary and sufficient condition for the advancement of English proficiency. The grammatical foundation plays an important role in the improvement of English proficiency. A good grammatical foundation can improve the ability of reading and writing, so it is extremely important for the study of English grammar knowledge. However, at this stage, the emphasis on English grammar has not been fully infiltrated, and no one has specifically explored the learning skills of English grammar. The goal of this paper is to explore the related items of English grammar and to study English grammar learning methods by constructing knowledge maps. Aiming at the problem that the grammar is difficult to grasp in the current English learning process, this paper proposes an English grammar knowledge learning algorithm based on association rules. By searching the frequent item sets of learning English grammar big data, a strong association rule is generated. According to the relevance, determine the set of auxiliary items for learning English grammar and construct a suitable knowledge map. The knowledge map provides method support for the association of knowledge learning. When learning English grammar, the knowledge map construction method is used to improve students' learning efficiency and learning effect.

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## 1. INTRODUCTION

Although the development of information technology provides a possible and effective way for lifelong learning, it also brings two major dilemmas to everyone who is determined to learn for life: language dilemma and choice dilemma. How to learn non-native language knowledge in an international environment? How to choose the information you need from the massive information? The introduction of artificial intelligence technology for lifelong learning information screening may be a good solution.

The knowledge map reveals the dynamic development of the knowledge field by combining numerous knowledge with graphics and information

collation techniques. With the continuous research on knowledge mapping technology, this technology has been gradually applied to various disciplines such as architecture, education, physical education, and environmental science. In 2017, in order to solve the rapid problem of ocean economic growth, Zhang Fujun, Ye Quanhui, Yu Luyun and others used knowledge mapping technology, using confession analysis method and predicate analysis method to compare papers and patents to obtain marine economy. Growth possibilities and ocean sciences explore technological opportunities <sup>[1]</sup>. In 2017, Shi Yan and Zhou Hao analyzed the relationship between sports and personality research in the future. The 610 articles on sports and personality topics in the database were analyzed, and the results were

summarized and summarized. Psychological resilience is directly proportional to the pressure of athletes, and personality has a great impact on physical exercise [2]. In 2017, Wu Anqi, Ouyang Xiaofang, Chen Fusheng and others conducted a biological study on the money tree, using knowledge maps to predict the resource excavation and cultivation techniques of honey pine and plant control problems, and concluded that the biological value of honey pine is limited. The protection of resources should be enhanced [3]. In 2018, Li Xiuling, Zhang Shusheng, Huang Rui, etc., in order to integrate process knowledge with model structural modeling, use knowledge map as a bridge for data exchange, solve the problem of reuse and sharing of heterogeneous CAM models, and the result is uniformity of process knowledge map expression. And accuracy [4]. In 2008, Li Yiping, Cha Zhengzao, Zhang Huijian, etc., in order to study the contents of biosynthesis, rubber and microbial degradation and the production of rubber products, use knowledge maps to combine the research of natural rubber in different periods to draw people's use of natural rubber and related production are fully processed and utilized, and the focus on natural rubber continues to rise [5].

With the deepening of research, the association rule technology has made great research progress. In 2017, in order to solve the problem of corporate financial risk prevention, Lin Yinghua and Chen Changfeng used association rules to study the threshold of mining financial risk model. By adjusting the minimum support and confidence threshold, the law between financial indicators was obtained [6]. In 2017, Xie Xiujuan, Mo Lingfei, Zhu Lin et al. used algorithm to improve the algorithm of intrusion detection system in order to solve the problem of system security and intrusion prevention. By extracting frequent sets and detecting network data packets, the detection rate of intrusion detection system was greatly improved. [7]. In 2017, Song Qian, Liu Jian, Qi Ling et al. used statistical rules to analyze the immune inflammation and oxidative index data of patients in order to solve the effects of gouty arthritis treatment indicators, and collected and sorted out the

electronic data of patients with gouty arthritis in hospitals. The data, obtained to improve some of the important extraction values will enhance the patient's immune index complement [8]. In 2018, Li Linfeng and Wang Jianping explored the efficiency of hydropower stations and used correlation rules to calculate the value of water level and the value of hydropower station power generation from historical data such as target water level and water quantity correlation. The relationship between the minimum water level, the amount of water in storage, and the amount of water in a specific power target [9]. In 2018, Chen Shuying, Xu Jianying, Liu Yuwei and others will solve the library service of university libraries in the future, and use the association rules to explore the borrowing data of the student groups, and analyze the analogy of the grades and borrowing books to obtain a targeted Recommend lending services to student groups [10].

This paper focuses on the problems existing in the current association rule technology for English grammar learning, and conducts a comprehensive and in-depth grammar analysis from the related learning of words and the regularity analysis of morphological forms and the normative research of phrases; Map, explore the management of fragmentation knowledge, analyze the two foundations of the construction of English grammar map, and study the map of English grammar learning.

## 2. PARSING BASED ON ASSOCIATION RULES

Grammatical analysis based on association rules is based on the knowledge of linguistic rules, the process of transforming language into ordered words. Our English grammar analysis uses the relevance of words, the regularity of morphology, and the normative nature of phrases to analyze the association rules of grammar.

The basic concept of association rules is as follows: Set the collection of items. Let  $I = \{i_1, i_2, \dots, i_m\}$  the task-related data D be a collection of database transactions T, where each transaction T is a collection of items, and  $T \subseteq I$ . There is a unique

identifier for each transaction, which is recorded as TID. Let  $A$  be an item set and transaction  $T$  contain  $A$  if and only if  $A \subseteq T$ . The association rule is an implication of the following form  $A \Rightarrow B$ : where  $A$  and  $B$  are two sets of items,  $A \subseteq I$ ,  $B \subseteq I$  and  $A \cap B = \emptyset$ . A collection of items is called an item set. A set of items containing  $k$  items is called a  $k$ -item set. The frequency of occurrence of an item set is the number of transactions that contain the item set, referred to as the frequency of the item set, the support count, or the count. If the item set satisfies the minimum support, it is called a frequent item set. Frequent  $k$ -item sets are usually recorded as  $f_k$ .

## 2.1 Relevance learning of words

From Figure 1, it can be seen visually that the number of people learning English has increased significantly. Then in the grammar learning process of English, if the grammar knowledge is told separately in the traditional model, the learning process is boring. In order to make English more

interesting, it is crucial to use the relevance of words to learn. For example, the word APPLE, if you simply remember the Chinese meaning of Apple, it is just a rigid back-to-back learning. However, if you use relevance, combine the pronunciation of the sound with the sound of the pistol, and use the combination of learning and gestures to add a lot of fun. In addition, the grammar knowledge and the content of the text are related and combined, the grammar is brought into the reading sentence, and the word meaning is summarized and applied according to the whole sentence. In the process of reading English articles, students can independently grammatically split and conduct self-thinking problems. In this process, students can deepen their understanding of the grammatical phenomenon and avoid the traditional rigid learning grammar. In the teaching process, teachers can also make practical connections, close to life examples, combine abstract English grammar with life practice, and increase the interest and integration of learning.

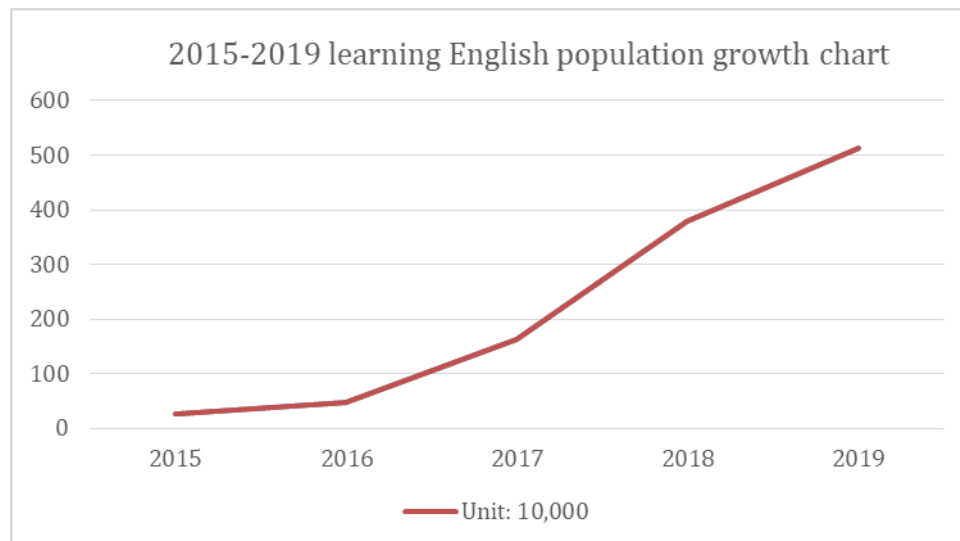


Figure 1 Growth in the number of students learning English in 2015-2019

## 2.2 Regularity analysis of morphology

Morphological analysis is to restore each of the imported English sentences with morphological changes to their basic form, and extract the morphological information to the analysis of the syntactic level. The morphological changes of English words are divided into two forms: rules and

irregularities. The irregular form of the word set is a finite closed set, so it can be included in the dictionary; while the regular form of the word set is an infinite open set, and cannot It is also not necessary to include it in the dictionary. The morphological changes of English words only change their morphological forms according to the

voice, without changing the nature of the words and semantics of the words themselves. Therefore, for a word that needs to be morphologically restored, it is only necessary to read all the features of the source word in the dictionary and then change the morphological feature. To quickly retrieve the corresponding rules, we index the rule base according to the length and alphabetical order of Morph-tail. For morphological analysis, do the following for each word in the input sentence:

- 1) Check the comprehensive dictionary. If the dictionary has been included, the information about the word is read from the dictionary. Turn 4).
- 2) Check the word list. If the dictionary has been included, the relevant information of the source word is read from the dictionary, and the part of speech and the translation are marked. Turn 4).
- 3) Apply each form rule to the word for morphological restoration.
  - a) . determine whether the word suffix matches the Morph-tail of the rule, if not, go to g);
  - b) . to suffix Morph-tail, supplement the suffix Original-tail, get its source words;
  - c) . Determine whether the source word is included in the comprehensive

dictionary, if it has been included, go to e);

- d) . determine whether the source word is included in the derivative vocabulary, if not included, go to g);
- e) . Determine whether the part of speech of the source word matches the Category, if not, go to g);
- f) . reading the relevant information of the source word from the dictionary, identifying the morphological feature Morph, and turning 4);
- g) . If the current rule is the last form rule, mark the word as unreceived words, go to 4);
- h) . Try the next form rule and turn to a).
- 4) If the current word is the last word, the algorithm ends.
- 5) 5) Process the next word and turn 1).

According to the above steps, the morphological analysis of each sentence of English grammar, analysis of its fundamental meaning and its grammatical collocation, fixed structure. If there are abbreviations or consecutive writings of special symbol words in the sentence, the form and processing techniques should be done before the morphological analysis. The existence of special symbols, etc., is a finite set, so we can include it in the dictionary.

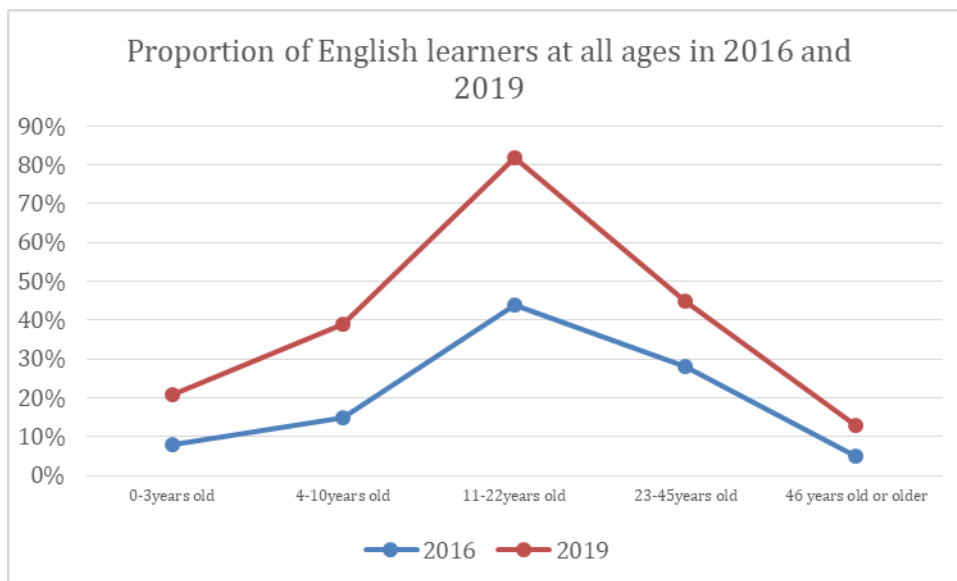


Figure 2 Proportion of English learners at all ages in 2016 and 2019

### 2.3 Normative study of phrases

Phrase analysis is the process of ordering words in an orderly combination. Phrase analysis includes phrase and idiom recognition based on dictionary information, and phrase recognition based on group word rules. Phrase analysis is an important part of the lexical analyzer. It maximizes the lexical-level word combination from the semantic perspective to reduce the burden of syntactic analysis and improve the accuracy and efficiency of language analysis.

Phrases and idioms are individual linguistic knowledge stored in a comprehensive dictionary that are attached to their central word entry. A phrase is more like a word, with features such as part of speech, form, and semantics. Sometimes it has a certain relationship with context words. Phrases can be divided into four types, namely, independent main type, fixed match type, mandatory type and pluggable type. Phrase recognition is based on the central word to skip forward and backward to move the variable components, searching for words that need to match. The idiom relative phrase is simpler, it can form a sentence or a sentence component independently, and is fixed. Idiom recognition also searches for words that need to match forward and backward based on the central word. After the phrase and idiom match successfully, these words need to be combined to

identify various features and attributes according to the dictionary information.

Another task of phrase analysis is to perform phrase recognition based on group word rules. When the phrase is recognized, the following work is done for each word and each group rule in the input sentence:

- 1) Match <word sequence>. Match each word in the word sequence with a sequence of words beginning with the current word. Matching means that the two word prototypes, word classes, morphological features, semantic features, sub-word classes, and numerical ranges are exactly the same. If it does not match, go to 4).
- 2) Combined word sequence. According to <phrase part of speech>, the part of speech, morphological characteristics and other attributes are identified, and the default features and attributes are the same as those identified by <word serial number>.
- 3) Generate a translation of the phrase based on <phrase translation>. The <word number> is replaced by the translation of the word identified by the <word number>. Turn 6).
- 4) If the current rule is the last group rule, go to 6).



- 5) Try the next group rule and turn to 1).
- 6) If the current word is the last word, the algorithm ends.
- 7) Process the next word and turn 1).

### **3. ENGLISH GRAMMAR KNOWLEDGE MAP CONSTRUCTION**

#### **3.1 Knowledge map management of fragmentation knowledge**

- (1) Acquiring knowledge based on the knowledge map, providing the learner with the function of viewing the total knowledge map, and classifying and viewing the knowledge in the form of map to the relevance of each knowledge point. In this form, when performing only the search, it is only necessary to perform the search according to the corresponding map points, thereby reducing the scope of the search and enhancing the high efficiency of the search. Providing the learner with the technology to view the details of the knowledge points, the learner can view the more detailed knowledge of the knowledge point by clicking on the node, which makes the viewing more concise and accurate. At the same time, it is also possible to re-learn and reflect on the existing resources, which helps the learners to learn new things and to enrich the knowledge system in the mind.
- (2) Based on the knowledge map to achieve knowledge preservation. In order to discover the deeper knowledge of learners, it provides the learner with the ability to save useful resources in the fragmented learning to the personal resource library. The saved data includes: title, link, label, notes, and learning time of the learning resource. The classification storage of learning resources is realized by adding tags to the learning resources, and the learning resources are matched to the personal knowledge map nodes.
- (3) Integrate knowledge based on knowledge maps. Provides the learner with the option to tag the learning resource classification. Reading the tag corresponding to the learning resource saved by the learner, determining whether two knowledge points exist in each relationship in the knowledge relationship list through the tag matching node technology and reading the knowledge point relationship list, and if present, displaying between the nodes Connect to achieve automatic construction of your personal knowledge map. At the same time, the scattered learning resources are matched to the corresponding knowledge map nodes through the label, and the scattered resources existing by the learners are organized in an orderly manner to make them systematic, realize the integration of the fragmented knowledge, and facilitate the later search and use.
- (4) Realizing knowledge exchange based on knowledge map. Learners can also compare the total knowledge maps, learn about other relevant knowledge points, and think about what needs to be learned. Therefore, the fragmented learning resources corresponding to other knowledge points are acquired, learned and preserved, and the personal knowledge structure system is continuously improved. In addition, learners can also search the map nodes in the user communication module to view related questions and answers, or comment or post their own questions about this topic waiting for other users to answer.
- (5) Learning resource sharing based on knowledge map. When the learners click the "Share" button to share their resources to the total repository, the knowledge management application uploads the data share to the total repository by reading the tag, title, and link data of the resource, and through the tag. To match the learning resources to the

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graph TD
    Structured[Structured data] --> DI[Data Integration]
    Semi[Semistructured data] --> KE[Knowledge extraction]
    Unstructured[Unstructured data] --> KE
    subgraph KE [Knowledge extraction]
        EE[Entity extraction]
        RE[Relationship extraction]
        AE[Attribute extraction]
    end
    KE --> SA[Solid alignment]
    TPDB[Third party database] --> DI
    DI --> SA
    KR[Knowledge reasoning] --> SA
    SA --> BS[Body structure]
    BS --> QA[Quality assessment]
    KU[Knowledge update] --> QA
    QA --> KM((Knowledge map))
    KM --> KR2[Knowledge retrieval]
  
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Figure3 Knowledge map construction method

There are two main reasons for the construction of English grammar maps. First, according to the construction of subject knowledge system, according to students' learning needs and interesting exploration of English grammar, we have identified the two major demand areas of students' teaching content and learning methods. Combine development learning methods with the quality of learning. Second, the current research on the core literacy of the discipline is on the rise. Therefore, according to the combination of the core literacy of English subjects (language ability, learning ability, thinking quality, cultural character) and learning methods, we find that traditional learning English only focuses on language knowledge. The output is overemphasizing the student's academic performance and ignoring the student's interest in learning. The core literacy of English subjects also requires teachers to change their teaching methods and behaviors, and improve the learning innovation and reform of students' learning

According to the construction of knowledge map, the construction of knowledge map involves two purposes: from the perspective of students, using knowledge map to study English grammar learning methods, adapt to students' interest needs and ability development requirements. According to the quality of subject quality and method teaching, the emphasis is on the student foundation for the construction of knowledge maps, providing students with a variety of method content choices, optimizing students' learning styles, and thus cultivating the core literacy of the subjects. The ultimate goal is to promote the growth and development of students. From the perspective of

teachers, using knowledge maps to learn English grammatical construction support and stimulating atmosphere, the teacher's teaching skills are greatly improved, which is helpful to teachers' professional growth and development, and contributes to teachers' professional status and professional independent research. Increased consciousness. On the basis of promoting the growth of students and the development of teachers' professional development, the overall English level has been strengthened. Therefore, in the process of constructing the knowledge map, according to the discipline quality and learning and training objectives, the English learning method can be adjusted and reorganized in a

certain order. The teacher has the autonomy of teaching content selection, which can be analyzed according to the actual teaching needs and the academic situation. Content and order are adjusted; content optimization, teachers can optimize the content according to specific academic conditions and teaching objectives, the selection of teaching content can include addition, subtraction, deletion, replacement, etc., and strive to meet the needs of students' growth and development. According to the requirements of knowledge map construction, teachers should explore English learning from many aspects and aspects, and adopt a classified teaching method for the nature of students.

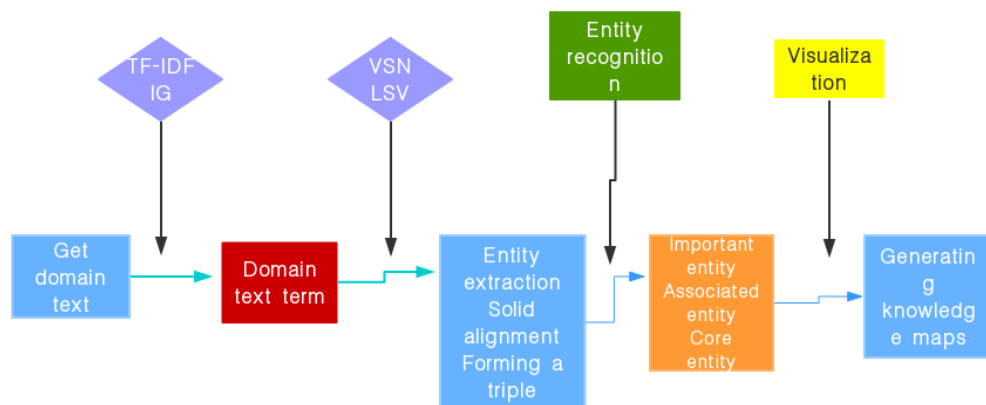


Figure 4 Knowledge map construction technology flow chart

## 4. EXPERIMENT

### 4.1 Experimental data

The knowledge map, that is, the scientific knowledge map, mainly comes from two major fields, one is the data analysis and learning method research in the English field; the other is the research on the knowledge domain visualization in the library and information industry. At present, the research of the two is integrated with other disciplines such as mathematics and graphics. Because the knowledge map does not appear for a long time, its related research is insufficient, and most of them are treated as tools or methods. In addition, the knowledge map itself is a kind of relational network based on graph

structure, which is used to analyze people's learning. Research on the effectiveness of methods and hobbies. It displays complex knowledge fields through data mining, information processing, knowledge measurement and graphic drawing, reveals the dynamic development law of knowledge field, and provides practical and valuable reference for subject research. For example, a school uses knowledge maps to analyze the learning efficiencies that most students use when learning professional courses, and analyzes the most efficient learning methods to improve overall student learning efficiency.



The data source of the knowledge map mainly comes from two channels: one is the data of the business itself, this part of the data is usually stored in the database table in the company and stored in a structured way; the other is the mass data from the network, these Data is usually in the form of web pages so it is unstructured data. Here we use English-themed data crawled from HowNet and Baidu

Academic Website, including about 23,800 documents, more than 5 million words, including 16 related keywords related to English and 5 related to English. Sexually small language keywords and 3 small scientific research keywords related to English.

Table 1: Number of articles in each topic

order number	keywords	Number of articles	order number	keywords	Number of articles
1	English	1000	13	English learning personalization	1200
2	Teaching English	1000	14	English experimental teaching	800
3	learning English	1000	15	English learning concept	1000
4	English major	1500	16	language translation	1000
5	Oral English method	500	17	Language learning	1000
6	English listening exercise	1000	18	language skill	1000
7	English reading ability	1000	19	Develop language autonomy	1200
8	English writing method	500	20	Language teaching	1200
9	English Vocabulary	1300	21	Foreign language education research	1400
10	English grammar research	800	22	Legal science research	1200
11	English course arrangement	1000	23	Small language research	1200

The corpus preprocessing process is done using the open source toolkit Ansj, including the process of word segmentation and named entity recognition. The word vector training is implemented by Google's open source toolkit word2vec. The window size is set

to 5 and the vector dimension is 200 dimensions. The knowledge map used in this paper is used for data analysis. The dataset covers both Chinese and English academic papers, with English learning as the main body of the search, supplemented by language and

scientific research papers for error rate verification. In order to make the research results objective, we screen the selected samples, and the final sample number distribution is shown in Figure 5.



Figure 5 Proportion of articles in each topic

## 5. ANALYSIS AND DISCUSSION

The experimental results show that the academic literature data from the Internet and Baidu academic websites with English as the theme is used to construct the corresponding ontology database for the data sources in different fields, and the association rules test is applied. The experimental results show that the keywords are being used. When searching for tasks, not only can the effective academic literature in the question bank be obtained through the association rules, but also the recommendation of the relevant keywords in the search results can be obtained. The average accuracy rate reaches 92.58%, which verifies the effectiveness of the method.

This paper first analyzes the problems in English grammar learning and the solutions to the problems, and analyzes the effectiveness of using related technologies for English grammar learning, and then puts forward the research background and significance of the new resource organization model

learning in the learning era, and then elaborates The research background and research significance of the automatic construction technology of knowledge map based on English grammar, the fusion analysis of learning English grammar theory and knowledge map, and the necessity and applicability of the research on automatic construction of knowledge map.

The research in this paper is based on the learning English grammar method, applying the knowledge map to it, and exploring the importance of the tuberculosis of the map from the integration of fragmented knowledge. At the same time, from the perspective of teachers and students on English grammar learning, using knowledge map to analyze the method of student learning, solving many problems in traditional teaching, there is great theoretical and practical significance. Secondly, this paper combs the knowledge map technology, investigates the knowledge map automatic construction platform, designs the knowledge map

technology framework based on learning English grammar, and then designs the required entity extraction, relationship extraction, entity recognition, etc. Compilation and implementation, and finally complete the automatic construction system of knowledge map in the field of English grammar learning, which has great significance for the extraction of knowledge entities. Then, the visualization of the knowledge map is analyzed. Finally, the visualization interface is used to complete the visualization of the knowledge map, which has a great impetus to the application and implementation of the knowledge map. Finally, the knowledge map construction results are applied to the study of English grammar, providing a method for learning English grammar, which accelerates the students' fun of English grammar learning.

## 6. CONCLUSION

With the inter-state blending, language learning is more important. With the development of friendship between China and other countries, the mastery of English is more important, and the importance of learning English grammar is generated and developed in this context, and has gradually Become a popular language learning category for most people. At this stage, English has developed into a second mother tongue learning from early childhood, and the mastery of English has laid a solid foundation for English learning. In order to facilitate a better understanding of the research situation in the field of English language learning, this paper uses the relevance of the English grammar learning method to explore, using knowledge map technology to visualize the whole picture of the field, aiming to show the grammar the change of learning has certain guiding significance for the research work.

This paper is based on the association rules for the study of English grammar learning. From the analysis, it is known that the use of relevance in learning English grammar, from the fixed collocation of phrases, the conversion of grammatical forms, etc., to make the search for the dictionary more convenient. At the same time, the association rules

combine learning with life, which further enhances the fun of learning, which makes the learning efficiency of students greatly improved, and the teaching skills of teachers are also strengthened accordingly. For the construction of grammatical maps, the use of graphical forms makes the learning process more concise and convenient. The construction of the map enhances the versatility of grammatical knowledge, making the teaching method more qualitative.

The main innovation of this paper lies in the use of association rules for knowledge graph search, because the clustering effect of association rules improves the accuracy of knowledge search.

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