A Study on Knowledge Network Acceptability Facilitated by a Computer-Based Translation Learning Platform

Yuanyuan Mu[1], Lizhen Du[1(✉)], and Qianyu Li[2]

[1] Chaohu University, Hefei, China
3065180045@qq.com
[2] Hefei University of Technology, Hefei, China

Abstract. The research aims to prove knowledge network acceptability in/between Chinese and English translation learning by interviewing 82 junior EFL undergraduates who have used a computer-based platform for one semester. With the assistance of Likert Scale and statistical tools, it reveals that students can widely accept the concept, translation knowledge network, and this computer-based translation learning strategy, and they even consider this strategy more efficient than traditional offline teaching-learning activity. Based upon exploration of translation learning strategy on the platform, experiment design and analysis of experiment data, the study finds how the knowledge network acceptability can enrich students' translation learning strategies, learning resources management strategies.

Keywords: Knowledge network · Translation learning · Learning strategy

1 Introduction

With the boost of online learning and multi-language communication, advanced technologies are utilized in the language teaching-learning field. Language learners commonly adopt learning resource management strategy, including references and computers, in order to advance the efficiency in the novel learning activity [1]. As a language learning method, translation requires multifaceted activities from the perspectives of lexicon, syntax and text, in which professional knowledge is connected in a systematic network. Textwells, a computer-based translation learning platform, has been designed and developed by our research team, where knowledge nodes in/between Chinese and English translation are

Supported by Chaohu University.

C. S. González-González et al. (Eds.): ICWL 2022/SETE 2022, LNCS 13869, pp. 445–459, 2023.
https://doi.org/10.1007/978-3-031-33023-0_42

annotated based upon the knowledge network. An intelligent algorithm can automatically recommend related knowledge as learners click to learn, which helps learners form the translation knowledge network and learning strategy.

Interdisciplinary approaches support the research project, which are natural language processing, translation studies, bilingual corpora, EFL (English as a Foreign Language) education, information management, functional linguistics, computer science, etc. Textwells provides a revolutionary and efficient knowledge-network-based learning model for the bilingual learners in classroom or Internet-based courses to alleviate their resource management pressure.

2 Translation Knowledge Network

2.1 Knowledge Network

Some papers have reviewed the concept of knowledge network in a general manner. This paper aims to introduce the term, knowledge network, in a specific field, namely translation education field. In Web of Science database, the content in the topic was searched as (knowledge network AND (translation teaching OR translator education OR translator training OR translation pedagogy)), 186 pieces of records are retrieved. The term, knowledge network, was firstly used by Hamburg in translation field in 1983, while "knowledge" has many meanings. It is widely applied in different disciplines like computer science, education research, communication and engineering, whose records are representatively 118, 72, 52 and 37 in the whole database [2,3]. And some papers have applied the term into translation education field in recent years [4–6]. The publications has remarkably increased each year since 2010, reaching the peak in 2020. Accordingly, another database, CNKI (China National Knowledge Infrastructure) was also retrieved in order to gain more literature information, where several authors explore knowledge network in translation education field. The published papers, which both discuss knowledge network and translation education, usually lay emphasis on the macro framework in teaching-learning activity, namely how to construct corpus-based systems; however, there are not enough feasible and empirical studies about how knowledge network can influence translation learning activity and how to testify that [7,8]. In the research, a further exploration is made between knowledge network acceptability and learning strategy. The former term comes from one dimension of knowledge network, which means learners can accept the definition, knowledge correlation and understandability of knowledge network. These data and phenomena indicate knowledge network is a novel and meaningful concept in translation education field, where related researches are at its initial stage and further discussions will be beneficial.

2.2 Computer-Based Platform Design

The Textwells is mainly designed for translation educators and learners, who interact through annotated bilingual texts, online recorded translation courses and translation practice projects [9,10].

For the learner account, there are six options in the navigation bar area, namely translation learning, translation practice, course interaction, Q&A (Questions & Answers), user data and my favorites (Fig. 1). Translation learning, as the indispensable part, is comprehensively and precisely annotated by scholars in accordance with a systematic knowledge node classification, which is the base of knowledge network [11–13]. There are totally six categories, namely lexicon, syntax, text, information, rhetoric and intertextuality, and fifty-six knowledge nodes, such as semantic matching, sentence component addition and rhetorical device alteration. Scholars extracted adopted knowledge nodes from classic or representative texts as they have a good knowledge of text linguistics, stylistics, functional linguistics, and discourse studies. In the knowledge-network-based translation learning section, learners can click to study according to text themes (eight first-level themes: culture, finance, law, literature, public affair, technology, prose and media; thirty-one second-level themes, such as education, natural scenery and holidays) or genres (five first-level genres: expository, narrative, argumentative, descriptive and applied writings; fourteen second-level genres, such as academic writing, publicity writing and narration of events), where learners form their own knowledge network. In the user data section, the learner's data are automatically monitored by the platform, which helps learner adjust their learning strategy.

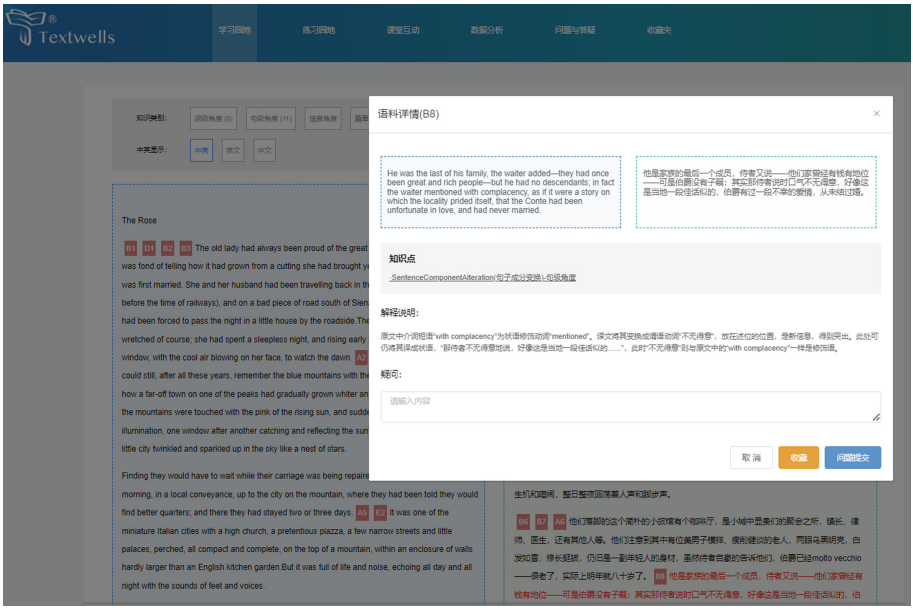

Fig. 1. Translation learning of the Textwells platform.

For the teacher account, the platform endeavors to provide a convenient teaching information management system, including teaching management, exer-

cise & homework management, and project management. Teacher can give feedbacks to their students as they study knowledge nodes to form knowledge network.

The innovations of this platform lie not only in its advanced algorithm but also in its scientific and theory-supported translation knowledge annotations. As a technology-driven system, this platform provides favorable interactive experience among students, teachers and these knowledge networks. The advanced algorithm endeavors to support students based-upon knowledge network monitoring. This platform, like a map, provides a translation knowledge learning channel, while the knowledge network forms the road for the learners on the platform.

3 Experiment Design

Facilitated by the computer-based translation learning platform, this research aims at proving that students can widely accept translation knowledge network, and computer-based translation learning strategy. Textwells, a knowledge-network-supported platform, helps the experiment testify that knowledge network is feasible to influence translation learning activities.

3.1 Participants

The experiment involved 82 junior undergraduates majoring in English-Chinese translation, one experienced English teacher, and two trained teachers to conduct the teaching experiment in Anhui Province, China. These students had studied translation between English and Chinese for three semesters in offline courses, which indicated they mastered basic translation knowledge, including translation methods, strategies and skills. Before they participated in this online experiment, they had attended computer operating courses and were familiar with information technology. Based on this, every student could well operate the platform, Textwells, as they were instructed.

3.2 Data Collection

Diagnostic and Formative Assessments/Tests. 82 students attended a diagnostic assessment at the initial stage in order to test their translation ability. In the diagnostic assessment, the source text is an English text about 220 words, whose theme is natural scenery (Fig. 2) [14]. During the teaching-learning activity, teacher instructed students to learn translation knowledge nodes, including 9 knowledge nodes which appear in the text of formative assessment. The 9 knowledge nodes are: (1) positive-negative alteration; (2) semantic matching; (3) rank alteration; (4) sequence alteration; (5) voice alteration; (6) perspective alteration; (7) sentence component alteration; (8) rhetorical device alteration; and (9) notional word omission, which belong to four categories, namely lexicon, syntax, text and rhetoric. In the knowledge nodes learning process, students accepted and formed knowledge network through inner correlation among nodes.

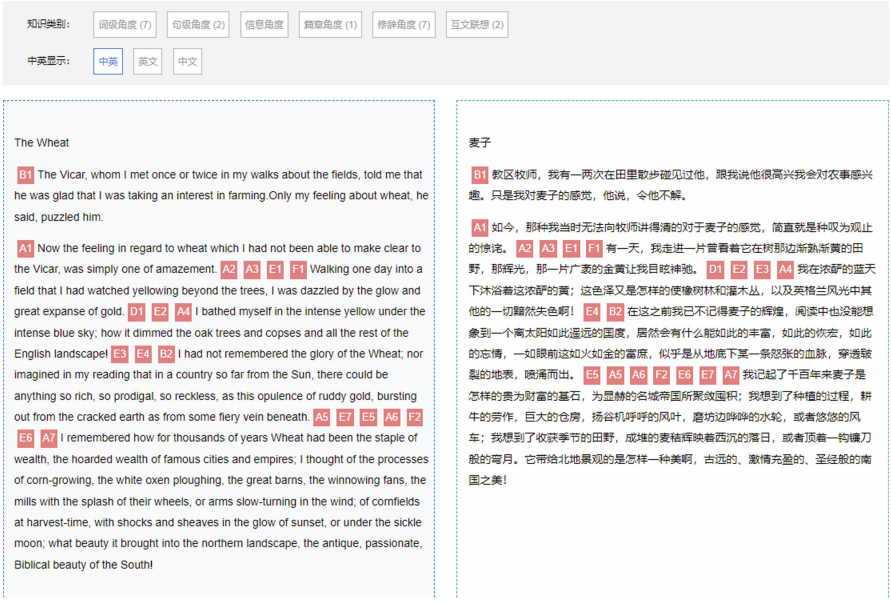

Fig. 2. Diagnostic assessment.

At the end of the semester, all students participated in a formative assessment to testify their knowledge network acceptability and its influence on translation learning. In the formative assessment, the source text is an English text about 210 words, whose theme is people and events. The source texts in diagnostic assessment and formative assessment both belong to literature, which are similar in language style.

In the whole experiment, teacher and students were allowed to use this platform and English-Chinese paper dictionaries instead of other electronic and paper resources. As they were informed to translate another text in the formative assessment, students could develop their independent learning strategy with this platform after knowledge nodes were explained by their teacher. To ensure the reliability and accuracy of test, students could not turn to other pages on the platform except the translated text page when the paper dictionaries were the available references.

The scores were recorded on the platform as two trained teachers mark scores and provide comments on all translation versions. They mark scores according to the translation scoring standards of TEM-8 (Test for English Majors, Band 8, which is used to test senior undergraduates). When the threshold between two scores was or less than 7 points towards the same translation version, the two scores were averaged as the final score of the tested students. Otherwise, the experienced English teacher scored for the third time and the three scores were averaged as the final score. With the help of SPSS 26.0, one statistical software,

the study analyzed these scores to form quantitative results and verify how to improve translation learning by knowledge network learning strategy.

Besides the diagnostic assessment and formative assessment, the research also collected useful data through Likert Scale questionnaire and one-one interview to explore students' acceptability towards translation knowledge network and this translation learning strategy based-on knowledge network in a comprehensive view. The following figure illustrates the methods to collect data in this experiment and detailed description (Fig. 3).

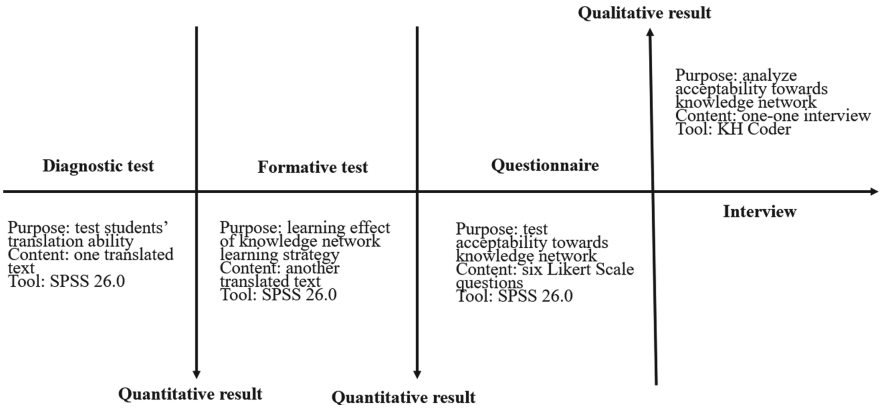

Fig. 3. Methods to collect data.

Questionnaire. The questionnaire consists of six questions, which were designed according to Likert Scale. In the Likert Scale, there are five answers in each question, where the numbers, 5, 4, 3, 2, and 1, respectively indicate strongly agree, agree, somewhat agree, disagree and strongly disagree [15]. The research verifies the reliability of the questionnaire structure and validity among questions for further factor analysis. The reliability is demonstrated by the value of cronbach's alpha as validity is proved by the value of KMO in the software SPSS 26.0. The details and data analysis will be introduced in the next section.

Interview. One-one in-depth interviews were conducted among 82 students. The interviewed question is: How do you evaluate the platform and knowledge network learning strategy and please give a specific evaluation description instead of giving a simple grade evaluation. Before they were interviewed, the above question was sent to the students several days in advance. Their answers were non-structured and non-standard, which cannot be analyzed by software directly. After the answer texts were processed into semi-structured form, the study selected the text processing software, KH Coder, to explore the deep opinion towards knowledge network and this learning strategy. Data analysis will be presented in the next section.

4 Analysis of Experiment Data

4.1 Score Data

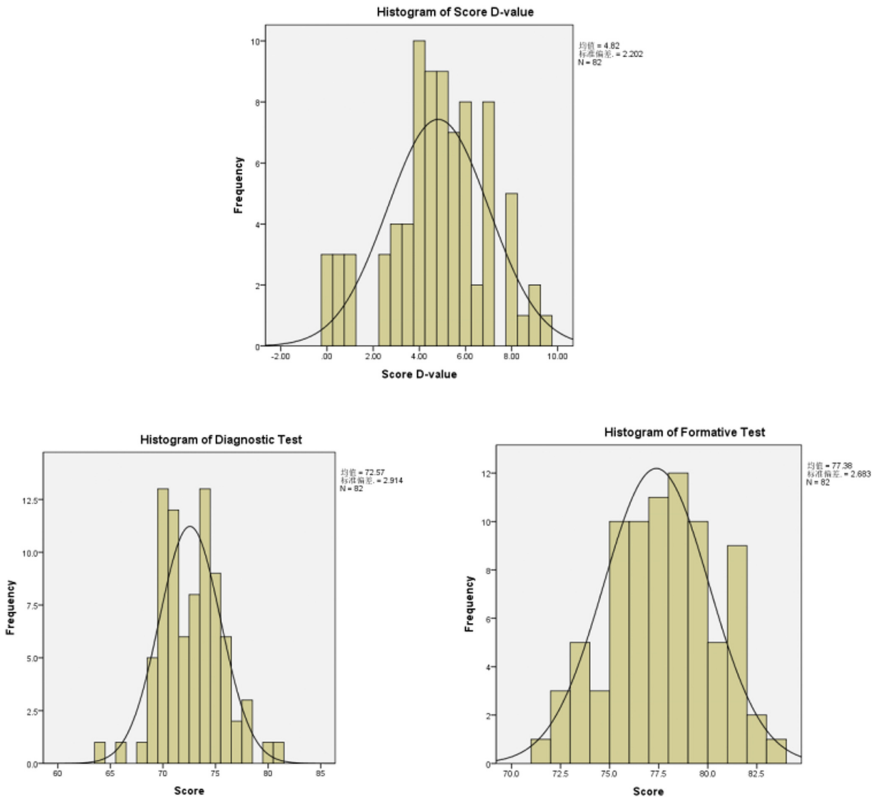

Fig. 4. Histograms of score D-value and scores in each group.

The research counted and calculated 164 records of scores of 82 students, which were made by three teachers and collected in the diagnostic assessment and formative assessment. The experiment aims to prove that translation knowledge network improves learners' translation learning by analyzing the two groups of scores and their difference. The relationship among scores was analyzed by paired sample t-test, where scores in each group and D-value (score of formative assessment subtracts one of diagnostic assessment) of two groups need to be in accordance with normal distribution.

At the initial stage to analyze, the scores in each group and score D-value of the same student in two groups are approved to be taken as normally distributed in SPSS 26.0, whose results are respectively illustrated in the following figures (Fig. 4). The histograms of diagnostic and formative assessments demonstrate

that the distribution of the scores and student number in each test is symmetrical, which is the typical feature of normal distribution. As observed in the same way, D-value and student number can also be regarded as normally distributed. According to the above analysis, it is feasible to apply the paired sample t-test.

The paired sample t-test is one type of hypothesis tests, where H_0 (invalid hypothesis) and H_1 (alternative hypothesis) indicate the difference between two groups and their statistical meaning. In the research, H_0 is that there are no changes between two groups of scores after they accepted the translation knowledge network learning strategy. In H_0 hypothesis, the mean of D-value is zero. H_1 is that there are changes and the mean of D-value is not zero. In paired sample t-test, three tables are essential in the following. In this condition, the standard α is set as 0.05 to decide to accept which hypothesis.

As can be seen from Table 1, the score in diagnostic assessment is 72.57 ± 2.91 while the score in formative assessment is 77.38 ± 2.68. The score mean (77.38) in formative assessment is higher than the one (72.57) in diagnostic assessment, which shows students' translation ability had been improved from a whole view. From the perspective of standard deviation, the scores in formative assessment are closer to the mean.

Table 1. Statistics of paired samples.

	Mean	N	Std. Deviation	Std. Error Mean
Diagnostic assessment	72.57	82	2.914	0.322
Formative assessment	77.38	82	2.683	0.296

The table describes the correlations of paired samples, the correlation value is 0.693, which presents that the data in two groups have a positive correlation (Table 2). The observed value of p, 0.000, means the correlation is obvious.

Table 2. Paired samples correlations.

	N	Correlation	Sig.
Pair 1 diagnostic and formative assessment	82	.693	.000

From the above table, the observed value of p, 0.000, is less than 0.01 (standard α is usually 0.05 or 0.01), indicating a convincing result to reject H_0 hypothesis and accept H_1 (Table 3). The p value supports the great changes between groups of data. As observed in the above table, mean and t values are negative, which illustrates the data in diagnostic assessment are less than ones in formative assessment in general. It can be known from these values that there are differences or changes between two groups, which are meaningful in statistics. Combined with H_1 hypothesis, the conclusions of t-test are: (1) There are

Table 3. Paired sample test.

	Paired differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Diagnostic-formative assessment	−4.817	2.202	.243	−5.301	−4.333	−19.809	81	.000

obvious changes between two groups of scores after they accepted the translation knowledge network learning strategy; (2) Students can accept knowledge network and this learning strategy to improve their translation ability.

4.2 Questionnaire Data

Table 4. Questionnaire and Likert Scale results.

English Question	Likert Scale				
	5	4	3	2	1
Q1. The linguistic knowledge involved in the definition of the tagged knowledge nodes is acceptable after explanation	32	47	3	0	0
Q2. There may be more than one knowledge node involved in the annotation of the example sentence. There will be other related knowledge nodes combined to explain the translation method. You think the combination of knowledge nodes is acceptable	42	38	2	0	0
Q3. The knowledge network learning method of combining the knowledge nodes mentioned in question 2 is helpful for translation learning	40	39	3	0	0
Q4. Through this platform learning, you agree to conduct translation learning with knowledge nodes and their combination of knowledge network learning	40	38	4	0	0
Q5. As shown in the platform, the translation learning of the knowledge network is more accurate in positioning and more effective in learning and mastering than the explanation of the translation method in the traditional classroom. You agree with this above-mentioned statement	31	42	7	1	1
Q6. In the future study, you are willing to consciously cultivate yourself a translation learning mode that starts from knowledge nodes and forms a knowledge network	38	39	4	1	0

82 students finished the online Likert Scale questionnaire after they had attended the formative assessment. In the Likert Scale questionnaire, there are five answers in each question, where the numbers, 5, 4, 3, 2, and 1, respectively indicate strongly agree, agree, somewhat agree, disagree and strongly disagree, which is clearly showed in the following table. These five questions are designed to explore students' acceptability towards knowledge-network-based platform. Knowledge network acceptability is classified into definition acceptability, knowledge correlation acceptability and understandability acceptability towards knowledge network. The definition acceptability towards knowledge network is studied in the first question while understandability acceptability is evaluated in the fifth and sixth questions. Other questions are about knowledge correlation acceptability. According to the collected data, only two students disagree the opinion in the fifth question and one student is against for the sixth question. The student strongly disagreed with the fifth opinion, which indicates this knowledge network learning strategy cannot absolutely replace the traditional classroom learning. Without further analysis, it can be simply concluded that students can accept the translation knowledge network from its above aspects and the knowledge-network-based learning strategy. More evidences are in the following tables and explanation (Table 4).

The scale data are statistically analyzed with the help of these values, mean, standard deviation, Kurtosis and Skewness. As can be observed in the table, the means of six questions are all over 4 points, suggesting a strongly positive attitude toward knowledge network acceptability (Table 5). The listed values of standard deviation are smaller than 1 point, indicating a rather low discrete distribution of students' scale option, which means the scale numbers are very close to the means in each question. In addition, the value of Kurtosis is over 0 point, showing a wide distribution of scale option in each question, while that for negative value vice versa.

Table 5. Statistical results of questionnaire.

English question	Mean	Std. Deviation	Kurtosis	Skewness
Q1	4.35	0.553	−0.779	−0.066
Q2	4.49	0.55	−0.955	−0.408
Q3	4.45	0.57	−0.776	−0.42
Q4	4.44	0.59	−0.643	−0.497
Q5	4.23	0.758	3.35	−1.288
Q6	4.39	0.643	1.06	−0.861

Considering the above analysis, the questionnaire proves that students have a strongly positive knowledge network acceptability of this translation learning strategy, while it is noted that this knowledge-network-based learning strategy cannot absolutely replace the traditional classroom learning.

To ensure the rationality and validity of data, it is indispensable to verify the reliability and validity of the questionnaire, which is proved by the values of cronbach's alpha and KMO. The following tables show the details.

Cronbach's alpha shows the internal consistency and relationship of a group of items or a set of scales, which is considered one of the most universally adopted measures of reliability in science research [16]. As cronbach's alpha is measured in a questionnaire, it measures the reliability or consistency of 6 interviewed items and five scales [17]. The following figure illustrates the cronbach's alpha of questionnaire discussed in the study, where the coefficient of reliability is configured as α. α ranges from 0 to 1 in the cronbach's alpha analysis, where high score means high internal consistency in the items. Based on this premise, cronbach's alpha is 0.974 in the result, which shows a very high reliability (Table 6). As a result, the questionnaire design is reliable and consistent in the study.

Table 6. Reliability statistics.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.974	0.977	6

In the following table, KMO value is 0.868, which is over 0.5 when compared with this fixed number (Table 7). It indicates there is a relatively ideal validity in the questionnaire, proving the correctness of collected data assisted with the questionnaire. Factor analysis is not the main topic in the study, thus there is no further exploration about that.

Table 7. KMO and Bartlett's test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.868
Bartlett Test of Sphericity	Approx, Chi-Square	873.129
	df	15
	Sig.	0

4.3 Interview Data

A further exploration about knowledge network is an interview, where the interviewed question is: How do you evaluate the platform and knowledge network learning strategy and please give a specific evaluation description instead of giving a simple grade evaluation. The study adopts KH Coder, one text mining software (developed by Koichi Higuchi), to analyze the inner connection in interviewed text (over 2000 English words), whose co-occurrence result is in the following figure [18].

In KH Coder, the figure is one form of co-occurrence network of interviewed text, suggesting words with similar appearance patterns and high degrees of

co-occurrence. Only the words connected with lines or edges have strong co-occurrence. The darker or thicker the line is, the stronger the co-occurrence is, which can be observed by coefficient. The word or node size vividly represents its frequency (larger nodes for higher frequency words), which can be seen by frequency value. The colors indicate how central each word plays the role in its network. Circles representing nodes are colored with colors through light yellow to dark blue, reflecting their ascending degree of centrality. As can be known in the figure, there are two most central and strongest co-occurrence networks except the non-complete meaning networks (Fig. 5). The first network includes nodes, namely "be", "very", "good", "think" and "platform". The second network includes nodes, namely "learn", "knowledge", "network", "improve" and "method". It can be well illustrated from the above networks that students think the platform is very good and knowledge network provides a novel learning method. More evidences can be found in the interview.

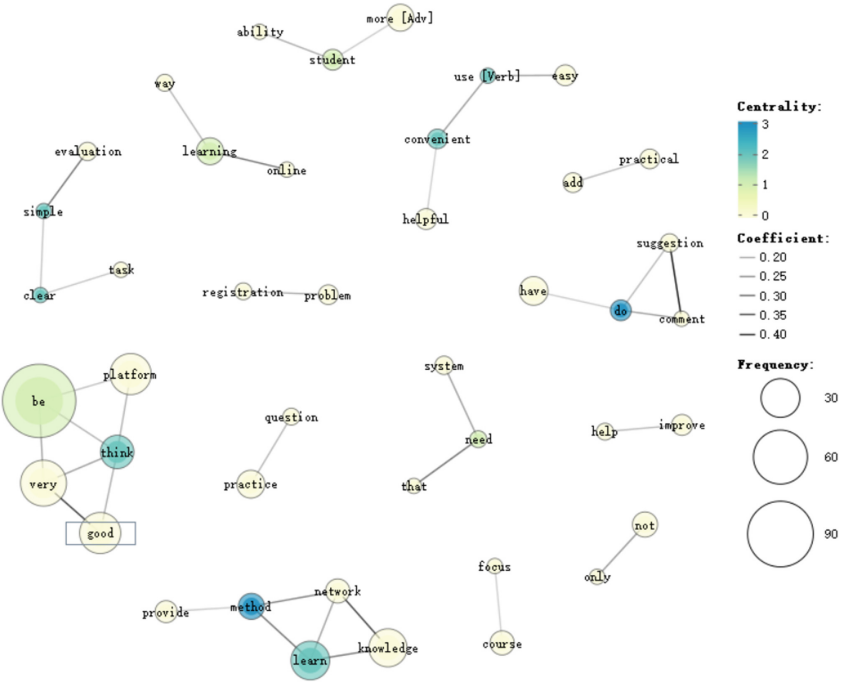

Fig. 5. Co-occurrence of interviewed text.

Students commented that "I think this way of learning is very good, and this kind of translation learning based on knowledge network is also more suitable for those who want to do translation. Knowledge nodes are more comprehensive and have wide coverage and strong operability.", indicating comprehensive knowledge nodes help students learn translation. Although some students described

this knowledge-network-based learning strategy from different dimensions, they positively supported this learning model and accepted knowledge network. They argued that this novel knowledge network model "provides different knowledge modules to facilitate learning and correction for different problems", "really provides me with a very maneuverable and self-learning translation learning method", "definitely help our translation study" and "make breakthrough for the traditional translation practice method".

It is worth noting that there is one negative scale towards the sixth question in the questionnaire. In the interview, one student argued that "I personally think that the method is a little difficult for basic translators. It would be better if some unfamiliar concepts were explained first.", indicating students' learning habits influence their willingness of forming a novel learning strategy. In general, students held positive attitudes towards translation knowledge-network-based learning strategy. Combined with the detailed interviewed content, it is believed that students give a much positive evaluation concerning the platform and knowledge network learning strategy.

5 Findings and Conclusion

The research has drawn on a series of methodologies, Likert Scale and statistical tools, to reveal knowledge network and this translation learning strategy. Based on the results of diagnostic and formative assessments, it can be seen that students can accept knowledge network. There are improvements in students' translation scores after they learn the knowledge nodes to form their knowledge networks. From the data analysis of questionnaire, the students widely accept knowledge network and this translation learning strategy. It is essential to conclude that this knowledge-network-based learning strategy cannot absolutely replace the traditional classroom learning; students' learning habits influence their willingness of forming a novel learning strategy. The interview supports the above findings with more detailed evidences. Students believed that "the platform is very good and knowledge network provides a novel learning method." These finding are found with the help of qualitative and quantitative methodologies. There is no argument about the results of qualitative methodologies, questionnaire and interview. However, disagreement may be found in the finding of scores, where knowledge network and this learning strategy cannot completely determine students' scores. As can be observed in the scores, there are significant improvements after students accept knowledge network. To some extent, it is undeniable that knowledge network has a positive influence on translation learning.

Finally, there are two main limitations in the research. Firstly, only 82 students of the same grade in a certain university attend the experiment, which limits the universality of findings. It is necessary to conduct further experiments in order to testify the validity of the universality. Secondly, because of the distinctive algorithm and platform layout, the knowledge network and this learning

strategy differ from traditional translation learning tools, suggesting this training mode may not apply to other teaching platforms. Therefore, the research team needs to explore further in terms of platform design and application.

Acknowledgements. The work was substantially supported by The National Social Science Fund of China (Project No. 19BYY125: A Data-Mining Driven Mode of Co-construction of Knowledge Network for Translation Learning and Its Application).

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