Interactive tool improves Chinese vocabulary in linguistic education via Computer Assisted Language Learning

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ABSTRACT: Computer-assisted language learning (CALL) tools are increasingly crucial, leveraging modern technology to address educational challenges, particularly in current circumstances. This study evaluates an interactive vocabulary tool on chinesetest.cn, aiding students preparing for Chinese language proficiency exams. Participants were divided into three groups based on their Chinese language proficiency (pre-HSK 1, HSK 3, and HSK 5) to utilize the tool. Findings reveal that lower proficiency students showed greater inclination towards and progress with the tool compared to higher proficiency counterparts. The study suggests tailoring CALL tools to learners' proficiency levels for optimal effectiveness. Understanding user satisfaction and progress can inform the selection and integration of CALL tools, whether in classrooms or for developing enhanced interactive vocabulary resources.
Keywords: interactive vocabulary, vocabulary skills, Chinese language, translation, language proficiency

Herramienta interactiva mejora vocabulario chino en educación lingüística mediante el Aprendizaje de Idiomas Asistido por Computadora

RESUMEN: Las herramientas de aprendizaje de idiomas asistido por computadora (CALL) son cada vez más cruciales, aprovechando la tecnología moderna para abordar desafíos educativos, especialmente en las circunstancias actuales. Este estudio evalúa una herramienta interactiva de vocabulario en chinesetest.cn, que ayuda a los estudiantes a prepararse para los exámenes de competencia en el idioma chino. Los participantes se dividieron en tres grupos según su dominio del idioma chino (pre-HSK 1, HSK 3 y HSK 5) para utilizar la herramienta. Los hallazgos revelan que los estudiantes con menor dominio mostraron una mayor inclinación hacia y progreso con la herramienta en comparación con sus contrapartes con mayor dominio. El estudio sugiere adaptar las herramientas CALL a los niveles de dominio de los estudiantes para una efectividad óptima. Comprender la satisfacción del usuario y el progreso puede informar la selección e integración de herramientas CALL, ya sea en el aula o para desarrollar recursos de vocabulario interactivos mejorados.
Palabras clave: vocabulario interactivo, habilidades de vocabulario, idioma chino, traducción, competencia lingüística.

1. Introduction

In the daily life of a contemporary individual, there are little to no activities that have not yet been integrated with or improved by modern technology. Within the last decades, progress in science and technology has been reaching peaks with new developments that aim to make contemporary life more convenient or more efficient. This statement is equally true when applied to the sphere of education, where a lot of processes have been automated or modernized and continue to be so. The response of the educational field to the emergence of new technologies is swift and frequently timely, while the many challenges that both teachers and students might encounter become less disturbing as more and more sophisticated developments come in handy when resolving them. Linguistic education is no exception, even more so, studying foreign languages receives a considerable space for growth in terms of both demand and supply. On one hand, the rapid globalization pace calls for more professionals masterful at proper cross-cultural communication, including translators, press workers, and so on. At the same time, the IT market is ready to offer a wide range of decisions for specific software, web-based programs, and applications efficient for improving language proficiency.

The term computer-assisted language learning (CALL) was coined at the end of the 20th century and applies to all learning models or strategies that involve computing algorithms applied to assist in language learning. The attention towards this phenomenon has only grown stronger since it was first introduced; the rapid increase in the presence of technology in everyday lives, as well as the challenges of modern education speed up the process of creating new CALL models or improving those that already exist. However, even as the presence and availability of CALL are wide, the question is about their quality and efficiency. While individual learners can have their perspective on which technologies suit them better, teachers and educational institutions must be very attentive and thorough when choosing the most proper tools for their students.

The evaluation of proper CALL technologies even though could be described as ‘useful’ or ‘useless’, is too complex to be observed in one dimension between these two extremes. In this research, we focus specifically on acquiring new vocabulary, memorizing words, understanding their meaning, and comprehending their context, with the use of an interactive vocabulary tool designed for the learners of the Chinese language. In the end, after conducting our study and analyzing its results, we will be able to determine if the interactive vocabulary tool is, in fact, an efficient CALL model and, if so, which features developed in it are the most useful for students in their linguistic education.

1.1. Literature review

The emergence of computers offered a wide range of opportunities to improve linguistic education, which was noticed and implemented in the early years of computer development. For example, as early as the end of the 10th century, Levy (1997) had already outlined some important statements for computer-assisted language learning, observed it in the context, and provided a complex analysis in favor of the idea of applying technology in educational process. The progress of CALL is mostly determined by the technological changes in the computers and other instruments, including the increase in operation capacity

and the growth of the feature variety, as noted by Tafazoli et al. (2019). Another important aspect influencing the presence of CALL within educational processes is the improvement of educational strategies or approaches; for example, Dooly and Sandler (2020) observe the application of online learning tools in the context of a flipped classroom approach, as well as the benefits of combining the two.

The academic studies on CALL in linguistic education present a variety of perspectives and ideas, creating a complex foundation with almost all the possible aspects covered. Zhang and Liu (2023), for instance, note that less research was dedicated to informal language learning with the use of technology, even though this activity, alongside a learner's background and classroom activities, is incredibly important. A similar statement is made by Godwin-Jones (2019), who highlights the importance of independent, non-informal, and self-directed language learning through technology. In many studies focusing on CALL in individual linguistic learning, a huge role is outlined for self-directed learning, especially when combined with formal, classroom education. For example, Lai et al. (2022) observe the usage of mobile technology in self-directed language learning in students, who also perform some in-class activities. At the same time, Chamani et al. (2023) focus on the impact of motivation in self-directed language learning, as well as the change in emotional state throughout the process. The application of CALL by teachers in classrooms is also a case that has received the researchers' attention. Chang et al. (2024) present the results of observing a smart classroom, with attention to the technological components of learning, to prove the positive impact of computer-based instruments when applied to learning in a general context. Su and Zou (2022), in turn, approach language learning in classrooms with the use of modern technology as collaborative learning; they analyze multiple research pieces to fully comprehend this phenomenon and prove its impact on language learning.

Various technologies have caught academic attention for their efficiency within the language learning process. For example, Tsai (2022) chooses Google Translate as a CALL tool for Chinese students learning English. Almusharraf and Alotaibi (2023), in turn, reference Grammarly and other automatic text spelling checkers and their usage in the education environment. In another article of theirs, Godwin-Jones (2023) focuses on digital communication tools, such as chatbots, and their application in the process of learning a foreign language. In the context of chatbots, Baskara (2023) presents the results of observing the OpenAI ChatGPT tool in the students' language learning process, while some other authors, such as Adeshola and Adepoju (2023) highlight the fact that, even though the perception of GhatGPT may be positive, in the academic environment it requires more limitations and regulations. Aloraini and Cardoso (2022), in turn, also support the idea of digital communication as an instrument of language learning, but their perspective has shifted from artificial intelligence to the online interactions of real people via social media. Some considerable attention has also been paid to mobile-based instruments, such as applications. For example, Loewen et al. (2019) composed a case study based on Duolingo, a popular language learning app, and its efficiency. In another study, Kessler et al. (2023) compare Duolingo to Babbel, another well-known language-learning application. Alongside the mobile-based language learning apps, gamification-based instruments appear in academic studies, as well, and are presented as an assistance technology (Ishaq et al., 2021; Spaska et al., 2021). Finally, a technology widely recognized by the research authors as a tool of language learning is an intelligent

assistant. This idea is present in the publication of Yang et al. (2024), who observe the impact of Google Assistant on adult language learners.

Overall, the topic of CALL in linguistic education is well-researched in modern academia. The results and discussion sections of the mentioned articles cover the overall idea that there are numerous ways for CALL tools to be applied; the abundance of methods and frameworks, mentioned above, provide a wide range of ideas for educators to apply in their environment. In this context, even though the idea of applying CALL in vocabulary learning is not impressively popular or widely accepted, it gives enough ground for academics to look into this line of research; relying on this aspect of the theoretical field and the environment that the prior research sets up, the current study finds a niche both fresh and relevant and, thus, responds to a lacuna in the modern linguistic academia.

As the present academic research shows, CALL can be applied to each sphere of the language learning process. Lin (2015) provides a complex analysis of computer-mediated communication as a tool to improve oral proficiency. Rahimi and Fathi (2024) found yet another instrument – e-tandem – for assisting with the improvement of speaking skills. Overall, as previously enhancing speaking in a foreign language could be limited under the circumstances of native speakers' absence, now, there already are some reliable computer technologies to overcome those limitations. Shin et al. (2021), instead, discovers digital systems to assist language learners with enhancing their writing proficiency. Reiber-Kuijpers et al. (2021) focus on digital reading in a foreign language, which has become more accessible with the development of technology, and its efficiency in supporting the learners' reading proficiency. Finally, listening skills can also be improved with the use of CALL, as Boubou et al. (2019) demonstrate in their quasi-experimental study. While those four dimensions of language proficiency are present in the CALL-related academic research, learning vocabulary, as a separate activity, has also received attention. For example, Chen et al. (2018) argue in favor of the gamification model for vocabulary learning; Ramezanali and Faez (2019) rely on social media as an instrument to enrich and enhance foreign language vocabulary naturally.

However, even though there are lots of articles on a wide range of technologies, instruments, and tools, the area itself is far from being covered completely. There are still models, software samples, interactive panels, websites, and applications, the impact of which has not been researched. Besides, the lack of a widely accepted common understanding of what components should be present in a vocabulary tool requires some additional research. In other words, even as the theme of CALL is relevant and frequently approached, there is space for more observations and more discoveries.

1.2. Problem statement

Computer-based tools for language learning are presented widely on the market; each student can look for them and choose one or more based on their preferences or needs. Thus, amid such a rich supply of linguistic technology, an evaluation of efficiency must be made to identify the strongest features and, at the same time, note the weaknesses. Therefore, in this research, we focus on the CALL tools to assess their usefulness in the educational context. This, on the one hand, will help the students to understand which instruments out of all the market offers they want to accept. On the other hand, the teachers will have an

opportunity to view the impact of technology on the student's language proficiency. Finally, the developers will have an experimental study outlining the advantages and disadvantages of computer-based linguistic tools to take into consideration during their future projects.

The purpose of this study is to observe the efficiency of computer-assisted language learning in linguistic education through the interactive vocabulary panel. Therefore, to provide more reliable and more specific results, we have decided to focus on only one aspect of language proficiency, which, however, is essential for Chinese language learners, which is lexicology or vocabulary.

To reach this purpose our study follows some specific objectives: to combine three groups of Chinese language learners with different language proficiency levels, asses and record their current vocabulary level; provide them with a computer-based learning tool, the interactive vocabulary panel in particular, to rely on in their vocabulary studies for a limited amount of time; evaluate their vocabulary level after working with the interactive vocabulary panel, compare to previous results, and draw conclusions.

2. Methods and materials

This article presents the results of an experimental study conducted among three control groups which consist of the international students receiving university education in PRC universities. The students come from different countries, but all have a proper command of English; the participation in the study was not limited by age or gender. All students are attending university-based language courses, necessary for international degree seekers before they join their degree course in China. The deciding factor is the level of Chinese language proficiency. Thus, group (1) consists of ten international students, 6 women and 4 men, ages 19 to 26, who had no prior experience in learning Chinese and only started doing so in China. None of them has an HSK certificate yet. Group (2) consists of ten international students, 5 women and 5 men, ages 19 to 24, who have recently passed HSK level 3 and obtain Chinese language skills sufficient enough for everyday use and mundane routine. Finally, group (3) consists of ten international students, 8 women and two men, ages 23 to 27, who have already passed HSK level 5 certificate and are currently preparing for HSK 6. The information of the native languages of all participants were recorded, though not presented in the study because the connection between the native language and the Chinese language proficiency were neither addressed nor mentioned and the expected variable change related to the specifics of the native language is small; besides, all students have confirmed that during their time in China, their use either English or Chinese for communication, both academic and mundane; as a result, no info on the native language of the participants were presented in the methodology.

All students were offered an interactive vocabulary learning panel on the official website dedicated to Chinese language proficiency tests chinesetest.cn. Most of the students have already encountered this website and have a profile there because this platform is used for registering for HSK, booking a test, and so on. Before being given the website, the students answered a questionnaire with basic information about computer-learning models in the process of their study. Besides, they received a test sheet evaluating their vocabulary skills, including the following types of exercise: (1) choosing a proper English translation of a word;

(2) listening to a word pronounced aloud and choosing a proper Chinese word written in a list; (3) choosing a Chinese word to fill a gap in a sentence; (4) writing a proper sentence with a given Chinese word. Each exercise includes 10 sentences or questions. The tests were developed manually, according to the linguistic and academic needs of every student group. The exact content of each test, however, was shaped randomly with the use of the randomizer tool. In other words, the tests were prepared in advanced but the choice of the questions and the words featured in the test itself were picked right before the test took place; this practice is widely used, especially in the language proficiency evaluation sphere, and was chosen as a way to make the tests more objective and efficient.

Afterwards, the students received full access to the website, focusing on the vocabulary section. Each group received their section, respectively; group (1) worked with vocabulary from HSK 1 (150 Chinese words), group (2) worked with the vocabulary of HSK 4 (1200 Chinese words), and group (3) worked with the vocabulary needed for HSK 6 (5000 Chinese words). All students were given a week to use this interactive vocabulary panel in their learning activities, the time a day dedicated to this technology was not limited and could be decided by each student on their own. Finally, after seven days, the students of each group filled out another questionnaire summing up their experience with the tool and another vocabulary test with 4 types of exercises and 40 sentences in total; this vocabulary test was different from the one given before, as it contained different words chosen randomly from the HSK vocabulary list. Between the tests being carried out, apart from self-disciplined and self-planned sessions with the chosen CALL tool, the students have attended the respective Chinese language classes, corresponding to their level. The academic content and number of class hours is logically corelating with the proficiency level difficulty (e.g. the students of the higher level have more classes and the content intensity is higher, as well as the number of words in their vocabulary).

The results of the study are limited in terms of the study groups' language proficiency levels and the interactive vocabulary tool. Firstly, only students aspiring to obtain HSK 1, 4, and 6 were studied. Even though these groups were chosen to provide a cross-section of studying patterns on different levels, studying the learners of HSK 2,3,5 and 7-9 might provide support for the claims made in this article. Besides, the interactive vocabulary model on the chinesetest.cn website was chosen as a tool for this experimental study among other available instruments and, if compared with other instruments, it can present more insight on how the most efficient vocabulary learning program is built. Additionally, the students were given the freedom to determine the duration of their vocabulary learning. Finally, the study covers vocabulary learning for an HSK exam, however, this is not the only linguistic aspect students should master and HSK is not the only language proficiency test available. Nevertheless, these limitations are not expected to distort the results and conclusions of this study but rather narrow down the objective and, thus, make the research more integral, detailed, and reliable.

3. RESULTS

The first stage of the experimental study after combining the control groups included a preliminary questionnaire to understand the previous experiences of respondents, their views on computer-assisted learning in general and interactive vocabulary panels in particular.

Table 1. *The answers to the preliminary questionnaire on the interactive vocabulary tool*

	GROUP (1) HSK 1	GROUP (2) HSK 4	GROUP (3) HSK 6
Have you ever used computer assisted learning models?	Yes – 2 (20%) No – 4 (40%) Not sure - 4 (40%)	Yes – 6 (60%) No – 2 (20%) Not sure – 2 (20%)	Yes – 8 (80%) No - 0 Not sure – 2 (20%)
Have you ever used computer assisted learning tools for vocabulary learning?	Yes – 2 (20%) No – 6 (60%) Not sure - 2 (20%)	Yes – 5 (50%) No – 2 (20%) Not sure - 3 (30%)	Yes – 6 (60%) No – 1 (10%) Not sure - 3 (30%)
Do you think an audio of the word in an interactive vocabulary panel is important?	Yes – 8 (80%) No – 0 Not sure – 2 (20%)	Yes – 5 (50%) No – 0 Not sure – 5 (50%)	Yes – 3 (30%) No – 1 (10%) Not sure – 6 (60%)
Do you think sample sentence with a word in an interactive vocabulary panel is important?	Yes – 6 (60%) No – 4 (40%) Not sure - 0	Yes – 8 (80%) No – 1 (10%) Not sure – 1 (10%)	Yes – 8 (80%) No – 2 (20%) Not sure – 0
Do you think a Chinese definition of a word in an interactive vocabulary panel is important?	Yes – 2 (20%) No – 5 (50%) Not sure – 3 (30%)	Yes – 5 (50%) No – 3 (30%) Not sure – 2 (20%)	Yes – 8 (80%) No – 0 Not sure – 2 (20%)
Do you think an English translation of a word in an interactive vocabulary panel is important?	Yes – 10 (100%) No – 0 Not sure – 0	Yes – 9 (90%) No – 0 Not sure – 1 (10%)	Yes – 4 (40%) No – 5 (50%) Not sure – 1 (10%)

As can be seen from Table 1, more than half of all students have experience with computer-based linguistic tools (53,3%) and little less than half of students have used interactive vocabulary, in particular (43,3%). Groups with better language proficiency demonstrate more awareness of computer-based tools and interactive vocabulary tools, which can be explained by their experience in language learning, in general. Most students of the group (3), who have mastered the Chinese language the most among other control groups, admit that the presence of a word in context (a sample sentence) and a definition of Chinese are important. Group (1), which consists of people who have just started learning Chinese, in turn, demonstrates the opposite; they agree on the importance of English translation and the word audio, the characteristics, which received less than half of the votes from group (3). In this context, group (2) demonstrates attention towards all proposed characteristics of an interactive vocabulary, noting that all of the offered features will be of help while learning new words.

In a random order, some students from all three groups were asked to provide arguments to support their responses. For example, one student from group (1) shared that the Chinese definition of a word in an interactive vocabulary is not useful for them because their overall proficiency does not allow them to use that definition for good. At the same

time, English translation is sometimes the only way, to understand that word and learn it. A representative of the group (3), in turn, revealed that sometimes English translation of certain words is not correct and distorts the understanding of that word, providing false learning materials. Therefore, students of HSK level 3 and above would recommend relying on the Chinese definition of a word rather than learning it by its English translation. As a result, it appears that their experience with the Chinese language, prior studies, and overall language proficiency were the deciding factors in filling in this questionnaire.

The interactive vocabulary on chinesetest.cn includes most of the features from the questionnaire above. The list of words itself is convenient to use, the words are presented in alphabetical order (by pinyin), and it can also be viewed as sorted by letters or simply by pages. There is a search field, where either an English or a Chinese word can be typed in (but not pinyin). Besides, each word has an audio of it being pronounced. The overall view of a wordlist in the interactive vocabulary tool is shown in Figure 1.

Figure 1. *Word list in the interactive vocabulary on chinesetest.cn*
Note: chinesetest.cn

It is possible to view each word in detail as every entry has an additional page with more information, as shown in Figure 2. Here, a Chinese word, its pronunciation written in pinyin, its audio, it English translation, and a sample sentence are present. Additionally, each character of a chosen word is analyzed, too, with a hyperlink to the character itself.

Figure 2. *Extended word page, available after clicking on a word in the wordlist*
Note: chinesetest.cn

As a result, all the characteristics of a proper vocabulary are present except for one: neither English nor Chinese definition is present in this interactive vocabulary. Considering the preliminary questionnaire, it might create some complications for the students of the group (3), who are almost unanimous in their support of this feature.

The final questionnaire was aimed to understand the overall perception of the chosen interactive vocabulary tool and evaluate the efficiency of its features; the responses are presented in Table 2.

Table 2. *Final questionnaire on interactive vocabulary tool chinesetest.cn*

	GROUP (1) HSK 1	GROUP (2) HSK 4	GROUP (3) HSK 6
Did you find chinesetest.cn a useful vocabulary tool for your learning?	Yes – 6 (60%) No – 1 (10%) Not sure - 3 (30%)	Yes – 5 (50%) No – 1 (10%) Not sure – 4 (40%)	Yes – 3 (30%) No – 5 (50%) Not sure – 2 (20%)
Was chinesetest.cn vocabulary tool convenient to use?	Yes – 8 (80%) No – 1 (10%) Not sure - 1 (10%)	Yes – 6 (60%) No – 2 (20%) Not sure - 2 (20%)	Yes – 5 (50%) No – 3 (30%) Not sure - 2 (20%)
Did you use the audio feature?	Yes – 10 (100%) No – 0 Not sure – 0	Yes – 9 (90%) No – 1 (10%) Not sure – 0	Yes – 4 (40%) No – 6 (60%) Not sure – 0
Did you use the sample sentences?	Yes – 5 (50%) No – 2 (20%) Not sure – 3 (30%)	Yes – 9 (90%) No – 1 (10%) Not sure – 0	Yes – 6 (60%) No – 3 (30%) Not sure – 1 (10%)
Did you use the character analysis?	Yes – 7 (70%) No – 2 (20%) Not sure – 1 (10%)	Yes – 5 (50%) No – 4 (40%) Not sure – 1 (10%)	Yes – 0 No – 8 (80%) Not sure – 2 (20%)
Will you use chinesetest.cn vocabulary tool in the future?	Yes – 8 (80%) No – 2 (20%) Not sure – 0	Yes – 5 (50%) No – 3 (30%) Not sure – 2 (20%)	Yes – 0 No – 4 (40%) Not sure – 6 (60%)

As can be seen from the table, the pattern of complete polarity between groups (1) and (3) is strongly present. While group (1) shows interest in this interactive vocabulary tool and expresses their plan to use it further, the students of group (3) are less inclined to rely on it in their learning. No students of the group (3) were ready to acknowledge that they would return to the chinesetest.cn vocabulary tool in the future. A randomly picked student from the group (3) shared an idea that the vocabulary panel on this website has many advantages, such as its structure; it is easy to go through the vocabulary list sorted by HSK level or search through it. However, the lack of Chinese definition, fewer sample sentences, and a limited number of English translations for words which can have more than one equivalent make this tool-less attractive to those who are preparing for HSK 6. For learners of group (1), it seems the vocabulary is in chinesetest. cn was the most useful as almost all the features were evaluated highly by the students and many representatives expressed their willingness to come back to this tool in their future studies.

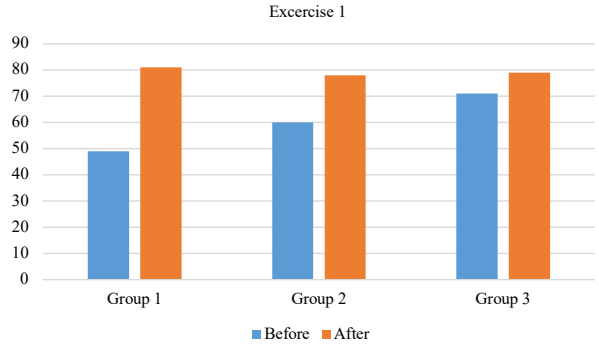

Figure 3. *The performance of three study groups in completing exercise 1 before and after working with the interactive vocabulary tool*

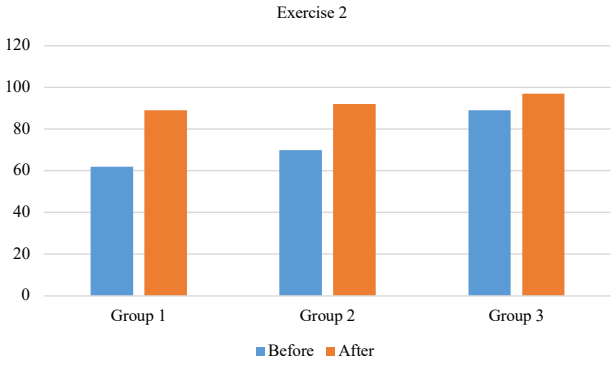

Figure 4. *The performance of three study groups in completing exercise 2 before and after working with the interactive vocabulary tool*

Exercise 1, which contained ten Chinese words from the respective HSK vocabulary lists was offered to the students with options of English translation for each; the number of correctly performed tasks is demonstrated and compared in Figure 3. The students had to choose the most proper translation for each word. The exercise was repeated after the week of studying with chinesetest. cn was completed. What can be observed from the comparison of those results is that the gap between the preliminary test and the final test is the biggest in the group (1). As students of group (1) have the least knowledge of Chinese, they rely on the translation of new words into the language they know, and the presence of such translation in the vocabulary tool of chinesetest. cn made it easier for them to memorize the word and perform better when they took the test for the second time. As for group (3), while their learning patterns do not include memorizing the English translation but rather comprehending its definition or context, both results are quite high. The gap is observed, even though not radical. The lack of definitions in the chosen interactive vocabulary tool is probably the reason the change in results was not dramatic. When observing the overall dynamics, it is important to point out that all three groups demonstrated progress and growth.

The second exercise which included choosing the correct Chinese word when hearing its pronunciation was used to evaluate the efficiency of the audio used in the interactive vocabulary tool. The difference between examples can be seen in Figure 4.

As can be seen from Figure 4, the results of both groups were quite high from the beginning, which can associate with the learning background of learning circumstances. All international students, even though having a different level of language proficiency, are currently studying in China, which means that their listening and speaking comprehension are developing in multiple scenarios actively. The introduction of the interactive vocabulary panel made a difference and the results of all groups were increased. As seen in the previous exercise, group (1) demonstrates the biggest growth. It is also logical in the context of the previous questionnaire, which proved that the students of groups (1) and (2) are mostly likely to use the audio feature from the interactive vocabulary tool.

The results are expected to be different, however, if the task structure is changed. If the answer options included the translation of the pronounced word, for example, the respondents would have demonstrated a smaller number of correct responses.

Exercise 3 included 10 sentences with gaps, where a word from 4 offered options should have been inserted. The logic of this exercise is tied to the context feature of the interactive vocabulary tool. Even if the students do not understand the entire sentence or some words from it, they are expected to guess the correct word based on the context, its place in the sentence, or the conjugations. The results of exercise 3 can be seen in Figure 5.

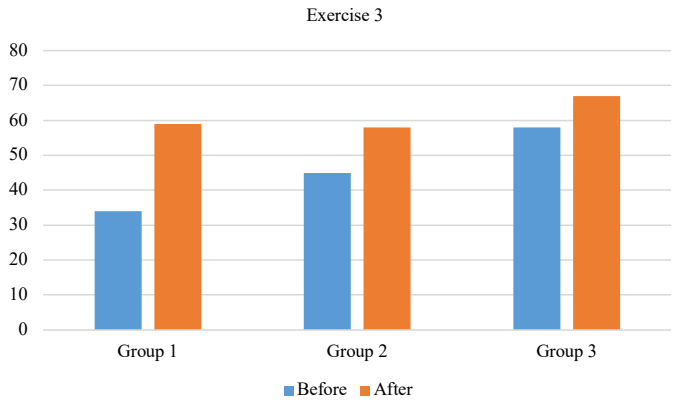

Figure 5. *The performance of three study groups in completing exercise 3 before and after working with the interactive vocabulary tool*

Exercise number 3, so far, demonstrated the most difficult circumstances for the students of all three groups; the results are shown and compared in Figure 5. While group (1) could be taken aback by the complicated conditions, groups (2) and (3) could have encountered issues because their vocabulary lists are longer and include more words, as well as more sample sentences. This pattern can be associated with their questionnaire responses, in which they identified the English translation of each word and audio as the most significant features, while the context learning in the interactive vocabulary tool could be overlooked by them.

Therefore, it is expected that in the long run, the presence of context will play a significant role for the students of groups (2) and (3), whose vocabulary lists were considerably longer. At the same time, the unwillingness of the students of the group (1) to pay enough attention to the sample sentences in the interactive vocabulary can be explained by the lack of motivation because they encountered more unknown words they could process. Therefore, if applied in proper conditions, the context learning with the sample sentences from the vocabulary will prove even more useful to them.

Finally, the last exercise contained 4 Chinese words from the respective vocabulary lists, the students were asked to write sentences with those words. This exercise in its logic was not tied to any vocabulary feature overall but rather targeted the assessment of their overall understanding and the ability to use the acquired knowledge in practice. The correct responses to exercise 4 are presented in Figure 6.

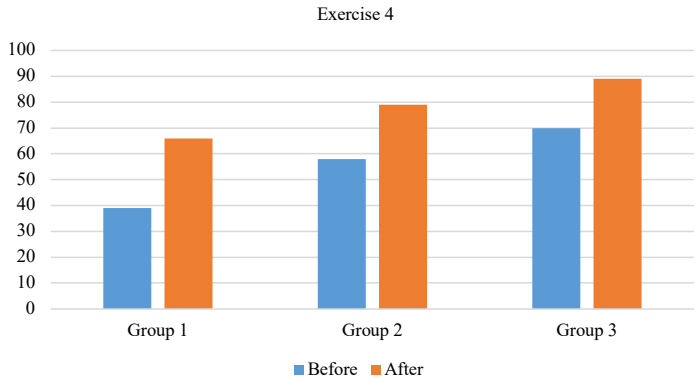

Figure 6. *The performance of three study groups in completing exercise 4 before and after working with the interactive vocabulary tool*

There were no limitations as to how long or complicated the sentences should be; the only condition was to use the word from the exercise correctly. Therefore, for all groups, this exercise was expected to be familiar and acceptable in terms of difficulty. The trend in this exercise is similar to the trend in exercise 1, with a big gap for group (1) and a lesser gap but considerably high results for group (3). It is also important to mention that the sentences of groups (1) and (2) became considerably more eloquent. Besides, in some cases, more than one word from the vocabulary list was used.

This exercise demonstrates that the new words acquired with the use of an interactive language panel are not just memorized, but they enter active vocabulary and can be applied in practice. This exercise also demonstrates, that knowing the meaning of a certain new word and being familiar with its usage in a sample sentence can be useful for future operations with this particular word.

The effectiveness of each tool and function was reflected on the difference of the language proficiency progress demonstrated via each exercise in each group respectively. The dynamics are shown comprehensively in Figure 7.

It is seen properly that the biggest development was demonstrated by group 1. However, the most progress was shown in Exercise 1, which requires choosing a proper translation of the word into English. This dynamic pattern corelates with the overall interest of the students of Group 1 in this function of the chosen CALL tool. According to the answers of the participants, demonstrated in Table 1, as the learners with little background knowledge of Chinese, they rely hugely on the English translation. As a result, it is the exercise tapping into this function allowed the students of Group 1 to demonstrate the most progress. Likewise, the students of Group 3 have shown more progress in improving the results of exercise 4, which addressed the contextuality and provides with enough knowledge and practice to not just complete an incomplete sentence (exercise 3), but also recreate a new sentence from scratch. The results demonstrated by Group 2 are rather median as they neither surpass nor lack amid the rest of the participants; this corelates logically with their feedback regarding the CALL tool, in which they demonstrate little to no preferences to one function over the other; as a result, their response in the evaluation was also lacking some well-defined predilections.

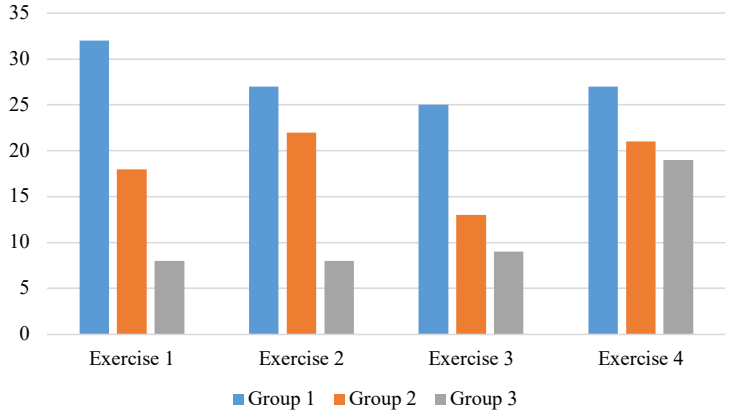

Figure 7. *The dynamics of improvement by each group in each exercise*

Overall, the results of the conducted study demonstrate that an interactive vocabulary panel chinesetest.cn, among all three study groups, was the most useful to students of the group (1), which can be explained by the fact that all their requirements, as expressed in the preliminary questionnaire, were met, and the comparably short nature of their vocabulary list. As for group (2), their progress was notable, even though not as dynamic; the students of this group showed stable development in all sections and exercises, as well as a favorable attitude towards an interactive vocabulary tool. The students of the group (3), who have the most experience in Chinese and the most words to learn from a new vocabulary, even though were reluctant about the efficiency of this interactive vocabulary tool, still demonstrated progress. Therefore, it is possible to state that an interactive vocabulary tool chinesetest.cn is useful, but the degree of its efficiency varies depending on the level of language proficiency.

4. Discussion

The importance of vocabulary learning for achieving language proficiency is hard to overestimate, as a good command of a foreign language's vocabulary is the basis for mastering that language and increasing the speed of improving language proficiency (Qian and Lin, 2019). In this study, we could prove that statement experimentally one more time. On one hand, the students who had the most experience in Chinese and, thus, had a better vocabulary at their disposal (group (3) after passing HSK is believed to have an active vocabulary of 2500 words, compared to less than 150 words for the group (1) and 600 words for the group (2)) demonstrated the best results in all exercises, even though their tasks were much more difficult and complex compared to other groups. At the same time, groups with lower initial language proficiency were able to demonstrate great development, even in a task not limited to vocabulary operation, only. In exercise 4, the dynamics show that the improvement of vocabulary helps to build better and more eloquent sentences.

Overall, mastering Chinese vocabulary through computer-based instruments has been covered in academia before. However, most studies focus on the gamification of vocabulary learning (Li, 2021), video or films (Go et al., 2023), or virtual reality (Xie et al., 2019). As most attention has been paid to such innovative and even entertaining tools, little research was made on an interactive vocabulary structure as in chinesetest.cn. Therefore, the conducted study that this article presents can contribute to understanding such instruments, which require less technical capacity for execution and less technical skills for self-directed implementation. Therefore, as the number of similar interactive vocabularies, both web-based and application-based, is big, this study can be used to analyze their efficiency in a certain learning environment or for certain groups of learners.

One of the most noticeable findings of this study is related to the contextual learning of vocabulary entries. In our research, we have approached this aspect directly, by both asking students about their usage of sample sentences for context and recommending an exercise that reveals a contextual comprehension of a word. This aspect of vocabulary learning has been revealed and confirmed in other linguistic studies, such as Zhang et al. (2019); however, little attention has been paid to it in the context of CALL. This study focuses specifically on the importance of sample sentences in interactive vocabularies.

Another vocabulary learning aspect that has appeared within our study but was not its focal point is the role of morphemes in Chinese vocabulary learning. The character-level learning was covered in Ke and Koda (2019) and Xu and Zhang (2022). However, the recommendations were presented in a wider context, mentioning vocabulary learning in general rather than computer-mediated learning. The tested interactive vocabulary panel chinesetest.cn included a character-by-character analysis of each new word and, according to the questionnaire, this feature was useful for the learners of the group (1), who have the least character awareness. An idea that the students of the group (3) repeatedly highlighted was related to the usage of word definitions in vocabulary learning. This idea appears in some linguistic studies, but mostly in the context of younger learners (Allen, 2023; McKeown, 2019). As for interactive vocabulary technologies for foreign language learners, especially the learners of the Chinese language, the active usage of word definitions to enhance comprehension, was not covered. As our study shows, it is an important aspect that is yet to be researched in greater detail.

5. Conclusion

Overall, the conducted study has reached its goal of evaluating the CALL instrument, an interactive web-based vocabulary tool, as an instrument for learning Chinese. Within the conducted study, the instrument has proven useful, however, for some groups the progress was more immediate and vivid, while for others more time is required. For example, the learners with lower level of Chinese demonstrated more dynamic improvement, while the group with better language proficiency showed smaller progress. Each group of learners appeared to have different preferences and efficient strategies, providing insight into how such interactive vocabulary panels can be used or developed further.

The results of the conducted study will be relevant for three potential groups of interest. Firstly, Chinese language learners can use the results of this study to choose a proper tool for vocabulary enhancement, especially in the context of preparing for their HSK exams. Secondly, Chinese language teachers can incorporate interactive vocabulary models in their classrooms according to the needs of their students. Finally, the developers of CALL tools can take the patterns observed in this research into consideration to create a complex instrument of language learning with maximum efficiency.

Besides, this study can be continued, improved and extended. Firstly, this research is complex as it focuses on three groups of students with different degrees of language proficiency to contrast and compare the implementation of an interactive vocabulary into their learning. However, focusing on each group in particular, extending the questionnaire and providing more different exercises in the evaluation of acquired vocabulary can give even more insight into the preferences of each group. The conclusions of each consequent study are expended to provide even more understanding of the interactive vocabulary tools and their application in Chinese language learning, but those results are not expected to contradict the findings of this particular research.

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