

Implementation of visual mind mapping strategy to improve students' language competence

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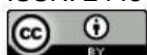
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Abstract

The opportunities of the educational process can be expanded through the use of innovative mechanisms. The aim of the work is to determine the effectiveness of teaching as a result of implementing the Visual Mind Mapping strategy to improve students' foreign language competence. The general theoretical method of comparison, calculation of the concordance coefficient, the efficiency coefficient, and the Whitney-Wilk test enabled us to achieve the aim. We ensured learning through educational mechanisms, which included visualizing information and developing intellectual activity. We also provided the study of new words, the use of digital technologies (Writer, Rosetta Stone, Busuu), the development of communication skills, and the enhancement of professional skills. It was found among students that using Visual Mind Mapping contributes to obtaining a high level of knowledge in a shorter time. Focusing on the Kirkpatrick model made it possible to establish that most students acquired a high level of foreign language competence after testing their knowledge. The students have a positive attitude to learning using Visual Mind Mapping. The practical significance of the article is the possibility of involving innovative technologies for learning a foreign language. The prospects of further research are to compare learning effectiveness using Visual Mind Mapping for junior and senior year students.

Keywords

information visualisation; mind map; digital technologies; Kirkpatrick model; self-learning.



Implementação da estratégia de mapeamento mental visual para melhorar a competência linguística dos alunos

Resumo

As oportunidades do processo educativo podem ser ampliadas através da utilização de mecanismos inovadores. O objetivo do trabalho é determinar a eficácia do ensino como resultado da implementação da estratégia Visual Mind Mapping para melhorar a competência dos alunos em línguas estrangeiras. O método teórico geral de comparação, cálculo do coeficiente de concordância, do coeficiente de eficiência e do teste de Whitney-Wilk permitiram atingir o objetivo. Garantimos a aprendizagem através de mecanismos educativos, que incluíram a visualização de informações e o desenvolvimento da atividade intelectual. Proporcionamos também o estudo de novas palavras, o uso de tecnologias digitais (Writer, Rosetta Stone, Busuu), o desenvolvimento de habilidades de comunicação e o aprimoramento de competências profissionais. Foi constatado entre os alunos que a utilização do Visual Mind Mapping contribui para a obtenção de um alto nível de conhecimento em menor tempo. A aposta no modelo Kirkpatrick permitiu constatar que a maioria dos alunos adquiriu um elevado nível de competência em línguas estrangeiras após testar os seus conhecimentos. Os alunos têm uma atitude positiva em relação à aprendizagem usando o Visual Mind Mapping. O significado prático do artigo é a possibilidade de envolver tecnologias inovadoras para a aprendizagem de uma língua estrangeira. As perspectivas de futuras pesquisas são comparar a eficácia da aprendizagem usando o Visual Mind Mapping para alunos do primeiro e último ano.

Palavras-chave

visualização de informações; mapa mental; tecnologias digitais; modelo Kirkpatrick; autoaprendizagem.

Implementación de una estrategia de mapeo mental visual para mejorar la competencia lingüística de los estudiantes

Resumen

Las oportunidades del proceso educativo se pueden ampliar mediante el uso de mecanismos innovadores. El objetivo del trabajo es determinar la efectividad de la enseñanza como resultado de la implementación de la estrategia Visual Mind Mapping para mejorar la competencia en lenguas extranjeras de los estudiantes. El método teórico general de comparación, el cálculo del coeficiente de concordancia, el coeficiente de eficiencia y la prueba de Whitney-Wilk nos permitieron alcanzar el objetivo. Aseguramos el aprendizaje a través de mecanismos educativos, que incluían la visualización de información y el desarrollo de la actividad intelectual. También brindamos el estudio de nuevas palabras, el uso de tecnologías digitales (Writer, Rosetta Stone, Busuu), el desarrollo de habilidades comunicativas y la mejora de habilidades profesionales. Se encontró entre los estudiantes que el uso de Visual Mind Mapping contribuye a obtener un alto nivel de conocimiento en un menor tiempo. Centrarse en el modelo de Kirkpatrick permitió establecer que la mayoría de los estudiantes adquirieron un alto nivel de competencia en lenguas extranjeras después de evaluar sus conocimientos. Los estudiantes tienen una actitud positiva hacia el aprendizaje utilizando mapas mentales visuales. La importancia práctica del artículo es la posibilidad de utilizar tecnologías innovadoras para el aprendizaje de una lengua

extranjera. Las perspectivas de futuras investigaciones son comparar la efectividad del aprendizaje utilizando mapas mentales visuales para estudiantes de tercer y cuarto año.

Palabras clave

visualización de información; mapa mental; tecnologías digitales; modelo Kirkpatrick; autoaprendizaje.

1 Introduction

Transformational changes in the development of society, technology, and science also contributed to changes in the educational system. Learning becomes more mobile, promoting deep thinking approaches, the development of independence, and digital technologies. However, the transformation of education also has negative consequences, manifested in the lack of perception of the information volume, its understanding, and further use in practice (Godiš, 2022). Identified problems can be solved using the potential of Visual Mind Mapping, which establishes the relevance of the issue under research.

Visual Mind Mapping is a method of presenting information through a diagram using structuring and visualisation techniques. Visual Mind Mapping helps to provide a combination of methodological techniques, and a continuous process of information visualisation for the development of cognitive thinking (Park; Son, 2022; Chaves-Yuste; De-La Peña, 2023). Visual Mind Mapping, which is used to improve the learning process, enables the perception of large information volumes, which various schemes, models, and reference notes present. The creation of intellectual maps in education contributes to memorising basic terms and concepts, which can be reflected in improving students' foreign language competence (Bowen; Thomas, 2022). Learning another language requires memorising a large amount of information, which, with the help of mind maps, will contribute to the effectiveness of the learning process. Mind maps enable focusing only on the necessary information, which contributes to developing critical thinking (Tolomei, 2022). This approach aims to ensure the understanding and generalisation of information, promoting its complete perception. The students' foreign language competence improves due to the active participation of thinking processes in learning. This enables perceiving graphic images as arrows that connect and improve the understanding of the displayed information. Auxiliary

elements in the form of pictures contribute to the perception of information in a convenient form.

Learning a foreign language with the help of Visual Mind Mapping makes it possible to provide a schematic perception of information, contributing to its memorisation (Schnoor; Usanova, 2023). This affects the improvement of visual literacy and cognitive activity. Focusing on Visual Mind Mapping while learning a foreign language contributes to developing communicative, linguistic and cognitive skills. They are related to the issue under study, ensuring emotionality and accuracy of rendering intonation during communication (Jaskot; Wojakowska; Sosnowski, 2022). Competence is a synthesis of knowledge and skills to develop professional skills formed during the learning period. Visual Mind Mapping contributes to the study of lexical units, learning grammatical rules, and shaping linguistic behaviour (Váchová *et al.*, 2021). During training, this approach will allow for logical expression of thoughts when answering questions or in the course of communication. It is also important to ensure an accurate perception of information to ensure its understanding and evaluation. Fluency in foreign language vocabulary (general or specialised) contributes to the achievement of a professional level.

The study of general theoretical information established that the main directions of research are related to the improvement of the learning process through the visual perception of information. But, approaches to improving foreign language learning are studied superficially. The aim of the article is to study the specifics of the implementation of the Visual Mind Mapping strategy to improve students' foreign language competence.

Research objectives are related to:

- Elaboration of learning mechanisms aimed at developing students' foreign language competence using Visual Mind Mapping;
- Determining the students' preference of different approaches to learning, taking into account the calculations of the concordance coefficient;
- Determining the effectiveness of using Visual Mind Mapping for learning a foreign language using Kirkpatrick model.

2 Literature review

Mind maps contribute to the conscious perception of educational information. Visual maps for learning that promote creativity and logic can be created using GitMind, Miro, MindMeister, and MindMup. The transfer of information using infographics enables identifying strengths in the study of the topic and affects the students' interested perception. This approach facilitates familiarisation with the new educational environment. Mind maps contribute to the development of analytical abilities, creativity, and digital literacy. Visualisation promotes a simplified perception of information (Araújo; Hannachi, 2021). The use of mind maps during education is connected with quantitative evaluation analysis and mechanisms for comparing educational information. It was found that visual elements can be ignored when including smart maps in learning. The use of symbolic elements for information perception should be ensured to avoid such an approach (Jirásek *et al.*, 2016). The possibility of visual perception of information should be provided when learning a foreign language. Communication between students and the study of theoretical materials should be ensured in the course of learning. Visualisation of information contributes to the identification of important criteria during the study of a separate topic, which entails the fulfilment of the determined objectives (Thomas *et al.*, 2021).

The development of intercultural communicative competence of students should be ensured during the study of a foreign language. Intercultural learning can be implemented as a result of the integration of various educational materials. The materials can be presented in the form of drawings, mind maps, specialised videos. Students' critical thinking develops during the discussion of linguistic and cultural elements of a particular country and specialised texts (Permatasari; Andriyanti, 2021). When learning English, one of the problems is the lack of the necessary practice. The use of artificial intelligence systems enables the development of practical skills with the help of chatbots that can be used in class and extracurricular activities. This contributes to the development of foreign language competence and increases the effectiveness of learning (Lin; Mubarak, 2021).

The mind mapping promotes a better understanding of the material read and the development of reading skills. Visualisation of information helps to increase the

frequency of fixations on a separate text and enables focusing on the study of particular words and key sentences. It also affects the speed of information transfer and ensures accuracy in the perception of information, thereby improving reading skills (Liu; Yuizono, 2020). The process of understanding the English language requires the study of phrasal verbs, taking into account their multi-meaning nature. Creating mind maps helps to memorise new words. The analytical procedure contributes to the cognitive understanding of phrasal verbs, which ensures the interaction between the verb and the particle. It also provides the possibility of building foreign language competence in the process of professional training (Al-Otaibi, 2019). Learning foreign languages should be related to the study of the relationship between phraseology and grammatical construction. The use of the Legallois mind map ensures the study of a foreign language between fixed constructions in a certain context. A mind map helps to organise the study of the material and learn grammatical constructions (González-Rey, 2016). Building foreign language professional competence requires writing various student essays, which contributes to the development of writing skills. Writing an essay develops analytical skills as a result of the analysis of a separate text, which helps to study a certain issue in detail. The use of mind maps enables breaking down the topic into separate fragments, thereby improving creative abilities. The use of brainstorming strategies improves writing skills (Vijayavalsalan, 2016).

The analysis of academic articles revealed that the advantages of using mind maps when learning a foreign language are studied the most often. Gaps in research are related to the lack of specific approaches to learning using Visual Mind Mapping.

3 Methods

3.1 Research design

The first level of research was provided for the development of learning mechanisms that provided for the use of Visual Mind Mapping. The development of learning mechanisms was aimed at building students' foreign language competence. When choosing learning mechanisms, the authors of the article focused on existing methods and also studied the specifics of Visual Mind Mapping. The search for

approaches was provided for the possibility of the visualisation of materials and the development of students' independence. The possibility of developing creative thinking, which is connected with the performance of complicated assignments related to building foreign language competence, was also taken into account during training. Modern technologies were also used in the developed learning mechanisms to meet the criteria of Visual Mind Mapping. The students studied a foreign language in the period from October 2022 to December 2022.

The second level of research was to examine the learning approach preferred by students. For this purpose, a comparison was made with the traditional approach, which was used to teach students before the start of the research. The mechanisms that included Visual Mind Mapping developed by the authors were also taken into account, which were used for teaching students during the research. The traditional approach to learning provided for learning a foreign language by studying theoretical information. Mechanical memorisation of words, tenses, construction of sentences, listening and reading were taken into account. The developed mechanisms for learning a foreign language consisted in the development of visual maps, which provided for the active participation of students in studying the topic. The developed educational mechanisms consisted in the possibility of using digital technologies, which ensured a more detailed study of the material. The comparison of students' preference for the corresponding learning approach was limited to a study period of 3 months. Students had to take into account all the positive and negative aspects of learning, the quality of teaching and learning the material. The amount of information that could be learned in 3 months of training according to different approaches was also taken into account.

The third level of research involved determining the effectiveness in the development of students' foreign language competence as a result of using Visual Mind Mapping. In the third stage of the research, the Kirkpatrick model was used to determine students' reaction to the arrangement of the learning process. The level of knowledge, the quality of education and the achievement of the results were also determined. The Kirkpatrick model is used to evaluate the effectiveness of the chosen approach to learning not only based on the obtained results, but also on the students' views.

3.2 Sampling

The study involved a172 students from Alfred Nobel University, National University of Water and Environmental Engineering, South Ukrainian National Pedagogical University named after K.D. Ushynsky. The students studied in the 2nd year, which made it possible to assess the level of their foreign language competence during the study. Focus on 2nd-year students was made in order to ensure equal learning conditions. It also enabled obtaining relevant data as a result of the development of learning mechanisms using Visual Mind Mapping. Before starting the research, the authors planned to involve the 2nd and 3rd year students. However, we concluded that the effectiveness of Visual Mind Mapping in improving foreign language competence as a result of using a single training programme should be verified.

3.3 Methods

The developed learning mechanisms consisted of the use of the general theoretical method of comparison. The authors first compared the existing methods of learning a foreign language, which later enabled identifying the correct ones for building a foreign language competence. The possibility of using Visual Mind Mapping while learning a foreign language was also a mandatory condition. The authors compared the theoretical aspects of existing training programmes and the possibility of using modern digital technologies. The obtained results gave grounds to develop a general mind map for learning, which was later adapted to the study a particular topic.

The concordance coefficient was calculated to determine the learning approaches preferred by the students, as well as to ensure a short learning period (Chaves-Yuste; De-La Peña, 2023). The calculation was carried out on the basis of the Thurstone Scale.

$$W = \frac{12 \times S}{m^2(n^3 - n)}, \quad (1)$$

m – an indicator of points assigned by students, which reflects a certain level of acquired knowledge in accordance with the analysed learning approach within 3 months;

S – the sum of the squared deviations of the studied indicators (depends on the conditional marked points);

n – the number of parameters that affected the calculations.

The effectiveness of teaching to improve the foreign language competence of students was determined for each indicator of the Kirkpatrick model. Indicators related to students' attitude to learning were presented as a percentage. The level of knowledge acquired by students was achieved as a result of calculations of the efficiency coefficient:

$$r = \frac{\sum b_{theor} + \sum b_{prac}}{\sum b_{ef}} \times i, \quad (2)$$

$\sum b_{theor}$ – evaluation for theoretical knowledge;

$\sum b_{prac}$ – assessment for practical skills;

$\sum b_{ef}$ – acceptable learning effectiveness;

i – the level of ease of completing situational assignments.

The indicator ranging within 9.0 - 10.0 shows a high level of knowledge; 7.0 - 8.9 — medium level; less than 6.9 — a low level.

3.4 Data analysis

Statistical calculations of the Whitney-Wilk test were carried out in the work to determine the reliability of the obtained data (Al-Otaibi, 2019). Statistical calculations were used to compare the results to identify the most effective learning process in 3 months. At the same time, statistical calculations were taken into account to determine the high, medium, and low preference for learning in the selected period. The calculation of the Whitney-Wilk test was also used to confirm the obtained efficiency results according to the Kirkpatrick model. The Whitney-Wilk test determined the ratio of parameters that are selected for calculations.

$$U = n_1 \times n_2 + \frac{n_x \times (n_x + 1)}{2} - T_x, \quad (3)$$

n_1 and n_2 – critical values of calculated indicators;

n_x – number of parameters for calculation;

T_x – data reliability, table value.

If the calculated indicators are lower than the values in the table, they are characterised by the established relationship between them. But it should also be taken

into account that the smaller the calculated value of the criterion, the higher the probability that the calculated indicators do not correlate with each other.

3.5 Data collection

The data from students were obtained using the Thurstone Scale. The Thurstone Scale was used to collect data to identify the most qualitative learning approach and evaluate learning mechanisms according to the Kirkpatrick model. The Thurstone Scale provided for evaluating each indicator, taking into account the value of the most pronounced indicator and assigning it a score of 1. Information from students was obtained within 7 hours using the Viber messenger. The Thurstone Scale in this work enables revealing the largest value of a separate indicator according to the students.

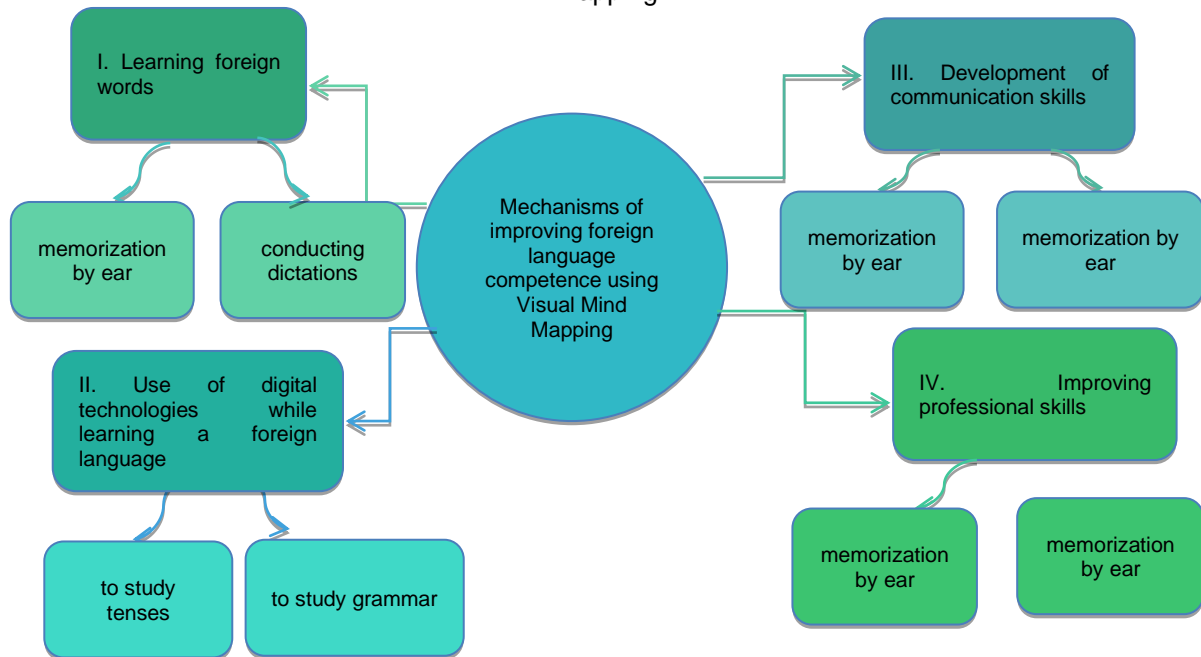
3.6 Ethical criteria

During the research, the authors followed the ethical norms of Cope (2021), which contributed to the reflection of the ideas in accordance with the established requirements. The use of plagiarism was excluded during the study, which could affect the violation of the principles of tolerance. The principle of objectivity regarding the presented results was observed in the work, which emphasised the relevance of this research.

4 Results

Students' foreign language competence can be improved as a result of the introduction of the Visual Mind Mapping strategy into the learning process. Learning mechanisms focused on the capabilities of Visual Mind Mapping were developed during the study, taking into account the advantages and disadvantages of various teaching methods (Figure 1).

Figure 1 – The mechanisms of improving students' foreign language competence using Visual Mind Mapping



Source: Authors (2023).

I. The developed learning mechanisms, which are based on the use of Visual Mind Mapping, primarily provided for the study of foreign words. The new words were perceived by the ear, which excluded the initial visual perception. The perception and repetition of words by ear are connected with the principle of ensuring the study of words in the native language. This approach promotes the activation of brain activity as a result of repeating the heard word. Learning the word by ear and drawing associations was followed by studying the writing of the word. At the same time, students should visually represent the word with the help of drawings, diagrams or graphic symbols.

According to the first learning mechanism, dictations were used to memorise words better. The texts which evoked associations with learned words and their repetition were used for dictation. Short dictations were selected according to the students' level of knowledge. During dictation, a student from the subgroup should have memorised a part of the text and passed it on to other students. This approach contributes to the development of memory and the activation of thinking processes for memorising information.

II. The use of digital technologies while learning a foreign language contributes to the visual perception of educational information, which relates to the process of Visual Mind Mapping. Digital technologies contribute to the development of professional knowledge and develop speaking and writing skills in accordance with the level of previously acquired knowledge. First of all, the study of time forms as a result of completing practical assignments was provided. The Writer application was used to train writing skills, which allows adding phrases, correcting sentences, selecting synonyms, etc. A digital programme helps to ensure the accuracy of completed assignments and selection of tenses.

The Rosetta Stone application was used to learn grammar, which helps to rethink words, helps to remember them and use them in practice. This approach is also aimed at ensuring the possibility of variation with different words. It was also planned at this stage to ensure the understanding of information as a result of the visualisation of completed assignments by selecting words and phrases.

III. The development of communication skills contributes to the improvement of the students' professional competence, which enables avoiding barriers during communication on professional topics. Building professional skills is possible as a result of a full understanding of words during dialogue, the ability to transfer non-standard constructions in communication, and the use of creativity. Live communication in a group and virtual communication (discussion of a given topic using digital technologies) were ensured in the learning process. Communication in a group was realised through the discussion of the working topic, its visualisation. Students were asked to make a diagram according to Visual Mind Mapping, which facilitates easier perception of the asked question. This contributes to the development of creative thinking, resulting in a more fluent command of a foreign language.

Discussing a given topic with the help of digital technologies expands communication skills, which can be associated with an extended study of the presented topic. Using the Busuu digital application enables communicating not only with students of the same group but also with native speakers. The mechanism contributes to the conscious study of the topic memorisation of different words, including professional vocabulary.

IV. The complication of students' professional skills is connected with preparation for achieving a high level of professional qualification. This contributes to the automation of the process of perception and display of foreign words and their combination with each other. It is also related to the accuracy of expressing thoughts, both in writing and orally.

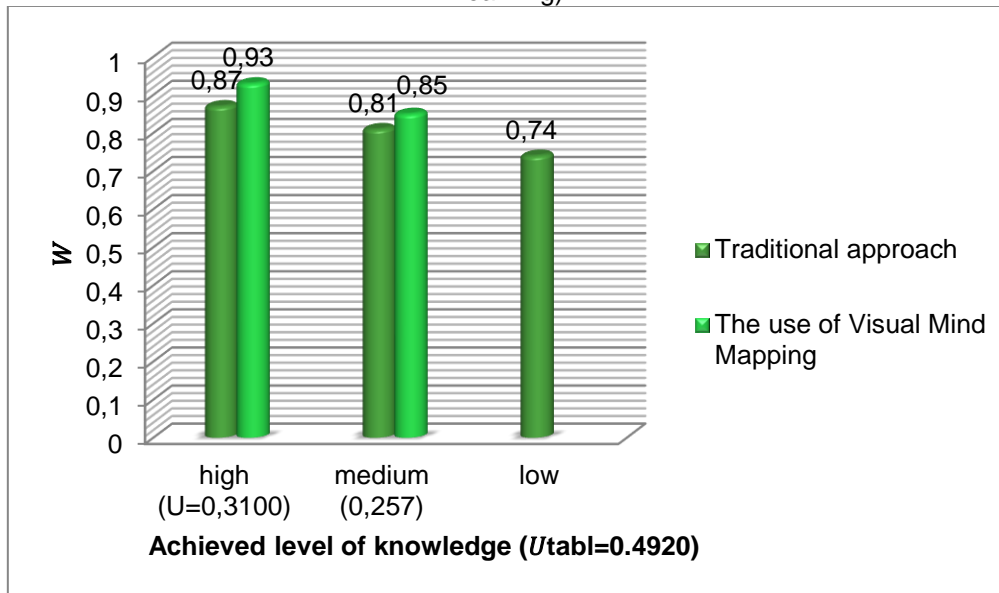
The method of activating the student's capabilities is connected with acting out professional situations, where each person is assigned separate roles. This contributes not only to the in-depth study of the topic but also to the use of new words and the development of creative thinking to resolve a particular situation. The approach also affects the development of students' independence, which contributes to the improvement of perception within the framework of Visual Mind Mapping.

The development of emotionality during communication is also a separate element of learning, as it promotes purposeful interaction between students. Reflecting emotionality in communication enables the achievement of a higher level of competence and accurate rendering of information, which is reflected in the development of thinking.

The learning process provided that a similar Visual Mind Mapping scheme was created for each topic in accordance with Figure 1. At the same time, the name of the topic, separated words to remember, and the number of exercises (and their complexity) to be performed were indicated. Topics and approaches to group discussion and the use of digital technologies are also indicated. Situational tasks were developed, and phrases were indicated, which contributed to the transfer of the necessary emotionality during the study of the topic.

After the training, the students determined an approach to learning, which contributed to building professional competence during the study of a foreign language. A period of 3 months was taken into account during the study. For this purpose, a comparison was made between the previously used training system and training with the use of Visual Mind Mapping. The results were obtained by calculating the concordance coefficient (Figure 2).

Figure 2 – Determining the importance of a certain approach to learning for students (after 3 months of learning)



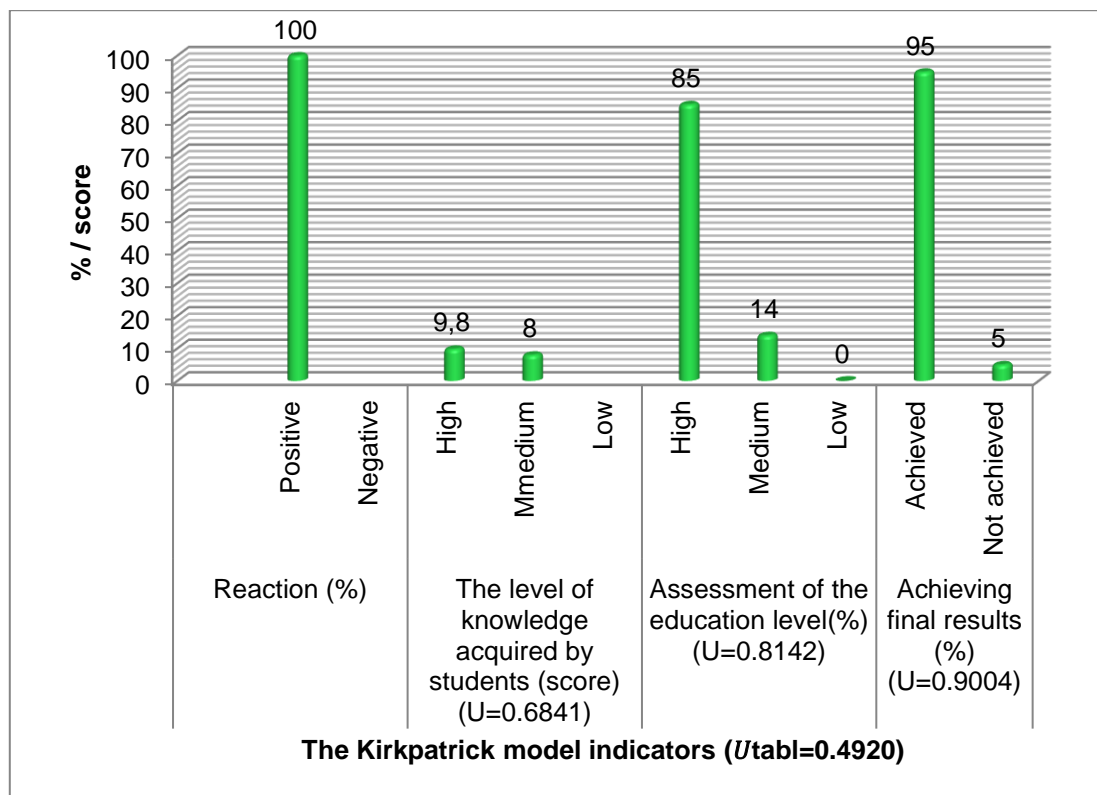
Source: Authors (2023).

It was established that the majority of students (88%) believe that the use of Visual Mind Mapping enables obtaining a higher level of knowledge. The results were determined through ensuring the study of a foreign language for 3 months. The results are related to the possibility of providing visualisation of educational information and its active use, which results in memorisation in shorter terms. Focusing on Visual Mind Mapping provides a detailed approach to the study of a separate topic and develops students' independence. This is related to the use of various innovative approaches to learning information. A small part of students (12%) believes that the use of Visual Mind Mapping during the study of a foreign language ensures a medium level of knowledge because the learning process is characterised by complexity and requires independent study of individual aspects of the learning process.

Students believe that the traditional approach to learning, which was used before the study, enables obtaining a medium level of knowledge within 3 months of studies (57%). The results are manifested in the system before learning, lack of motivation, and lack of specialised approaches to the assimilation of information, which results in poor memorisation of words. These indicators affect the absence of high results during 3 months of studies. It was established that only 29% of students believe that it is possible to achieve high results within 3 months of study. This is explained by the possibility of using verified information that contributes to learning a foreign language.

The third stage of the study provided for determining the effectiveness of the implementation of Visual Mind Mapping for learning a foreign language. The data were obtained using the Kirkpatrick model. The Kirkpatrick model enables determining the effectiveness of learning using Visual Mind Mapping (Figure 3).

Figure 3 – Determining the effectiveness of learning using the Kirkpatrick model



Source: Authors (2023).

The research established that the majority of students believe that the implementation of Visual Mind Mapping for building foreign language competence is a positive approach. Learning mechanisms are designed in such a way that they contribute to the improvement of knowledge of a foreign language, which further affects the formation of foreign language competence. They also contribute to the development of professional knowledge during the study of foreign languages.

Checking the level of acquired knowledge among students after training showed that the majority of students achieved a high level. The results were reflected in the expansion of professional competence knowledge of specialised terminology. This approach to learning also contributed to the development of written and oral skills, which was also reflected in emotionality during communication.

It was established that students believe that learning mechanisms are characterised by high quality, which is associated with the use of Visual Mind Mapping. The high quality of education is also related to the use of visualisation elements, regular discussion of the educational topic, and the development of independence.

The students established that the developed mechanisms for learning contributed to the achievement of the final results. Data is related not only to obtaining appropriate grades but also to the assimilation of knowledge. Visual perception of information made it possible to build professional competence during the study of a foreign language.

5 Discussion

When building foreign language competence, grammar can be studied using the development of intellectual maps, which contributes to a constructive approach to learning. Mind maps ensure the development of thinking as a result of orientation to cause-and-effect relationships. It also helps ensure the transfer of pragmatic statements that contribute to the formation of schemas for learning information (González-Rey, 2020). The use of synonyms expands foreign language competence, as it contributes to rendering specific features of words and contributes to a more accurate rendering of thoughts. The correctness of the formation of individual word combinations can be achieved as a result of the use of mind maps that contribute to the development of thinking. This is a result of discussions and comparisons of different approaches to interpretation. It was established that building foreign language competence of future researchers should be connected with the use of the most appropriate words. Novice researchers shouldn't use synonyms when writing research papers, as it can negatively affect the selection of exact combinations. The relationship between the etymology of the word and its semantics should be ensured (Al-Otaibi, 2022). The use of mobile technologies and mind maps in the learning process enhances students' motivation, develops self-awareness, promotes cognitive development, and increases academic performance. The use of mobile technologies during the study of a foreign language provides an understanding of the reading material and the possibility of variation with foreign words. This approach contributes to a deeper understanding and perception of information (Wang *et al.*, 2023). The aspects of learning were connected in this work with the combination of the features of Visual Mind Mapping and the use of

modern technologies. Writer, Rosetta Stone, and Busuu applications were used as digital technologies during training.

During the study of a foreign language, mind maps contribute to the development of students' thinking, building arguments, and the accuracy of rendering information. Learning a foreign language should be based on the development of cultural interest, which affects the development of creative thinking. Working in a group using the basics of virtual reality makes it possible to provide appropriate arguments, thereby developing creative thinking (Mubarok; Lin; Hwang, 2023). Learning a foreign language should be related to the understanding of cultural aspects that contribute to the reflection of the specifics of a foreign language. The approach contributes to the formation of a correct understanding of the language and the study of various elements. The perception of information can be improved through the use of mind maps (Rohmani; Andriyanti, 2022). In this work, the effectiveness of the use of Visual Mind Mapping was established on the basis of the mechanisms developed by the authors. The effectiveness of learning was checked as a result of determining the reaction of students to the educational process and evaluating the quality of education. The level of knowledge acquired by students and the possibility of achieving final results were also determined.

The students' foreign language competence should be developed in the course of the improved language learning process, which is connected with oral and written translation. The development of conversational skills can be related to the creation of podcasts and visual diagrams. This contributes to the recognition of the correct pronunciation of words and, subsequently — to participation in international conferences. Orientation to various topics should be ensured during training to enrich speech and the study of professional words (Ferreiro-Vázquez; Varajão Moutinho Pereira; Gonçalves Araújo, 2023).

The analysis of studies revealed that foreign language competence builds as a result of the development of writing skills or communication skills. The development of mind maps in the learning process allows for a meaningful study of the language, which contributes to the in-depth perception of information. In this study, specific learning mechanisms were developed using Visual Mind Mapping to improve students' foreign language competence. The effectiveness of the developed learning mechanisms using the Kirkpatrick model, which is related to the quantitative assessment of the obtained

results, was also determined. The model also takes into account students' views on the learning process.

6 Conclusions

It was established that the aim of this research was achieved, as the effectiveness of the introduction of Visual Mind Mapping to improve students' foreign language competence was measured. The development of learning mechanisms with the use of Visual Mind Mapping contributed to the achievement of the determined aim. A mind map was developed in the work to visualise the educational information and was aimed at the development of thinking. The study of foreign words was provided during the educational process through their perception by ear, taking dictations. Digital technologies were used during the study of a foreign language for a better visual perception of the educational material. The Writer application was used to learn tenses, and the Rosetta Stone application helped with grammar. Communication in a group and discussion of a separate topic with the help of digital technologies were provided for the development of communication skills. It was planned to provide a method of activating the student's capabilities to develop emotionality during communication to improve professional skills during studies.

The research established that the use of Visual Mind Mapping in education contributes to obtaining a high level of knowledge, according to 88% of students. On the other hand, the traditional approach to education provides a high level of education among 29% of students after 3 months of studies. The difference is explained by the fact that Visual Mind Mapping enables learning the educational material faster as a result of its visualisation, ensuring the independence of learning.

The Kirkpatrick model was used to establish that the students' reaction to the learning process was positive (100%), which is related to ensuring the independence of learning. This approach to learning also promotes in-depth study of information that develops students' foreign language competence. The results showed that most of the students acquired a high level of knowledge during their studies, which influenced their further professional activities. Using the Kirkpatrick model, it was established that 95% of students believe that the expected results were achieved.

The results of the research are useful for students and teachers who are engaged in the development of a foreign language competence as a result of using Visual Mind Mapping. The prospects of the research will be related to the comparison of the quality of learning different topics in a foreign language using Visual Mind Mapping.

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Responsible editor: Lia Machado Fiuza Fialho

Ad hoc experts: Helena Gama Dias and Paula Rivera Jurado

How to cite this article (ABNT):

DERBAK, Olha; PAK, Antonina; HOLUBIEVA, Iryna; CHERNIAVSKA, Svitlana; PYSARSKA, Nataliia. Implementation of visual mind mapping strategy to improve students’ language competence. *Educ. Form.*, Fortaleza, v. 8, e11234, 2023. Available at: <https://revistas.uece.br/index.php/redufor/article/view/e11234>



Received on June 7, 2023.

Accepted on October 21, 2023.

Published on December 11, 2023.