Enhancing foreign language learning with cloud-based mind mapping techniques

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Abstract

This paper explores the potential of using cloud-based mind maps as a tool for learning foreign languages. It is concluded that their use is suitable for both language classes and students' independent work. Criteria have been developed for evaluating cloud services in terms of their effectiveness in the educational process of creating mind maps. The paper characterises the conditions for accessing free versions of 16 cloud services for creating mind maps. Based on an experimental study, five cloud services are compared: Ayoa, Mindomo, Miro, Smartdraw, and Xmind. The paper demonstrates examples of using mind maps based on these cloud services' templates for various types of language learning activities, including studying grammar topics, learning or repeating vocabulary, and writing essays. The paper identifies several advantages of using mind maps, such as visualising lexical material, structuring terminology by sector, enabling control and self-control in checking listening and reading comprehension, and serving as support for writing essays and composing oral stories.

Keywords

foreign language learning, cloud-based mind maps, educational technology, language teaching, language learning activities, visual learning, learning styles, vocabulary learning, grammar learning, essay writing, oral storytelling, language assessment, Ayoa, Mindomo, Miro, Smartdraw, Xmind

1. Introduction

The relevance of proficiency in at least one foreign language has been growing steadily in recent years. The need for prospective specialists of various specialities to learn foreign languages in higher education institutions has long been undeniable [1]. Problematic issues are related to the search for effective ways to master lexical material, learn grammatical structures, and form

and develop foreign language communication skills. One of the ways to visualise and learn the lexical and grammatical structure of any foreign language, as well as visual support during speaking, is through mind maps.

Mind maps are generally considered to be useful in brainstorming sessions, which have been used in business for quite some time. Mind maps visualise the ideas expressed, illustrate their relationship with each other, and help to create a quick overview of the main concepts of the issue under discussion. At the same time, this understanding of mind maps narrows the range of their use, because it is often extrapolated from the business sphere to the educational sphere precisely as a way to capture the expression of different ideas by brainstorming participants. Undoubtedly, this variant of using mind maps in the educational process is quite appropriate and can be applied in the study of various courses. However, the value of mind maps for learning foreign languages is actually much higher than using them in this way. It is also important that they can be used not only in the process of learning new material, but also to deepen existing knowledge. In addition, the creation of mind maps helps to develop logical thinking through the awareness of the interrelationships of concepts, terms, and ideas that are captured in the mind map.

The *purpose* of the paper is to consider the possibilities and advantages of using mind maps in foreign language classes and during students' independent work.

2. Literature review

The issue of modernising foreign language learning methods has recently been linked to the use of various available services and programmes on the Internet [2, 3, 4]. In particular, Biebighäuser [5] emphasised the importance of using the potential of the Internet, which she interprets as the use of so-called "virtual worlds" to learn a foreign language and the culture of native speakers. Despite a number of advantages, this didactic and methodological approach is only becoming widespread. She proposes to rely more actively on digital media in learning a foreign language, which provide an opportunity to organise cooperation in a group of students. After conducting an experiment with dividing the group into tandems and tridems, the researcher concluded that communication in the virtual world works well, but for inexperienced users, too much attention is paid to technical aspects rather than content [5].

The concern of foreign language teachers who, on the one hand, want to use modern tools in their work of teaching a foreign language, and, on the other hand, face technical difficulties in this process, is quite understandable. Therefore, we believe it is advisable to consider the possibilities of those services and tools that are accessible and relatively easy for teachers and students to master, as they do not require special skills. In this context, we decided to consider the use of mind maps.

Buzan [6], who is considered the inventor of mind maps, stood for the idea that the human brain perceives information not linearly, not sequentially, but immediately and completely. According to Buzan, he suddenly realised that his head, like the collective "global brain", was blocked by a huge cork that could only be unlocked with the help of a completely new tool for recording and thinking [6, p. 11]. In search of a tool that would give us the freedom to think, and indeed the freedom to think in a way that corresponds to our natural way of thinking [6,

p. 12], he turned to Greek systems of thought, which could accurately reproduce hundreds and thousands of facts. The Greek systems of thought were based on imagination and associations, so Buzan concluded that there must be one central idea, which then branches out and is connected to others by a series of connections. Accordingly, he proposed mind maps that allow to present a holistic picture of ideas, concepts, phenomena, and objects.

According to Grossmann, "a mind map is a creative method of successfully collecting our scattered ideas and putting them on paper in an orderly manner" [7], but the author notes that mind maps can be successfully used in the learning process. Neumann has identified some positive effects of using mind maps during learning, namely: supporting memorisation, consolidating complex connections in memory, representing branched connections as a single whole, facilitating the repetition of the material studied, improving creativity by activating unused areas of the brain [8].

Jokisch [9] believes that learning is best done when the learning material is organised and structured, in particular, when the foreign language learner organizes and classifies words. Specifying the ways to learn new words, the researcher recommends making a kind of cluster based on brainstorming, then classifying the associations found in the cluster, and then visualising them with a mind map. For this purpose, it is advisable to divide the words into thematic fields [9].

The relevance of finding effective ways to learn foreign languages and, in particular, to acquire new vocabulary is emphasised by the fact that the Common European Framework of Reference for Languages clearly outlines the criteria for assessing progress in learning a foreign language and provides a list of language material that is required to achieve one of the six levels of foreign language proficiency [10, 11]. To help those seeking to obtain a certificate of proficiency in a foreign language, separate lists of words and phrases to be learnt are even created [12, 13]. Therefore, many scholars and practitioners have devoted their work to finding effective strategies, methods and techniques for learning them [14, 15, 16, 17, 18, 19]. Plikat [20] and Targonska [21] emphasised the difficulties in forming lexical competence due to difficulties or insufficient attention to learning new words. In her dissertation, Neveling [22], based on her practical experience, states that the greatest difficulties in learning words arise at the stage of their long-term storage in the mental lexicon. Therefore, she substantiates in detail that so-called word networks are an effective learning strategy with a high degree of learning new words [22]. In this aspect, interactive semantic networks deserve attention, as they allow constructing a hierarchical structure of a certain semantic field with different types of links between them [23].

3. Results and discussion

A mind map, also called a concept map, is a visualisation technique that displays a central idea or concept and all the concepts associated with it in a non-linear way, as well as the relationships between the concepts, thus structuring the information. Mind maps can be drawn in the traditional way on a sheet of paper or on a whiteboard in the classroom. However, a much more attractive option for both students and teachers is to create such maps using online tools. Currently, there are a large number of cloud services that can be used to create mind

maps, including those with free or partially free access.

3.1. Functionality of cloud services for creating mind maps

Having reviewed and analysed the functionality of a number of cloud services, we believe that the main characteristics that should be used to evaluate systems aimed at building mind maps include the following

- the cost of the licence,
- user-friendliness and clarity of the interface,
- the compatibility with Windows, Android, Linux, and iOS operating systems,
- the possibility of teamwork in real time,
- the number of participants in case of teamwork,
- the number of maps available for creation,
- the ability to create your own templates,
- the availability and number of built-in templates,
- the availability of built-in diagrams for analysis (time, organisational, matrix, cause and effect, Vienna, Ishikawa, etc.),
- the possibility to add files and images to the map structure,
- the possibility to restore previous versions of maps (view history),
- editing options (selection of fonts, styles, colour scheme, etc.),
- advanced image export options (no watermark, PNG, JPEG, SVG, PDF, OPML, Freemind (.mm), Markdown (.md) formats, etc.),
- the integration with common applications and file sharing services (MS PowerPoint, Google Drive, Dropbox, OneDrive, Google Workspace, Microsoft Teams, etc.),
- the amount of disk space to store the results,
- the availability of interactive training materials,
- the availability and efficiency of the support service.

However, if we talk about the criteria for selecting these cloud services for use in the educational process for learning foreign languages, we should first of all pay attention to the following

- the availability of a free version,
- the availability of an online version,
- special financial offers for students and teachers,
- the possibility of mastering the programme based on training videos,
- the type of restrictions on the use of the free version,
- the availability of templates in the software library suitable for the most efficient structuring and presentation of terminological data, depending on the purpose.

Given the importance of the availability of free online versions of cloud services and the type of restrictions they have, we summarise some characteristics in table 1.

Table 1

Characteristics of access to free versions of cloud services for creating mind maps.

Name of cloud service	Possibility to register via Google account	Time limitations, days	Limitation on the number of created maps, pcs.	Availability of online/ desktop versions	Possibility to export results
Ayoa	+	7	–	+/–	+
Bubbl	+	10	3	+/–	+
Coggle	+	–	3	+/–	+
Edraw	+	–	–	+/+	+
GroupMap	+	14	–	+/–	–
Mind–Map–online	–	–	–	+/–	+
MindGenius	–	15	–	+/+	–
MindManager	–	30	–	–/+	+
MindMeister	+	–	3	+/–	–
MindMup	–	180	–	+/–	–
Mindomo	+	–	–	+/+	–
Mind42	–	–	–	+/–	+
Miro	+	–	3	+/–	+
Smartdraw	+	7	–	+/–	–
WiseMapping	+	–	–	+/+	+
Xmind	–	–	–	+/+	+

Taking into account the criteria for selecting these services for use in the educational process in foreign language learning, we have chosen five of them for the pilot study, which, in our opinion, best meet the goal. The list of selected services includes the following: Ayoa, Mindomo, Miro, Smartdraw, Xmind. After introducing the students to the capabilities of these services, we focused on creating mind maps based on the use of templates available in their libraries.

3.2. Using mind maps when learning a foreign language

When learning a foreign language, mind maps have the advantage of representing knowledge in a structured and organised way. It is also worth considering that the creation of such a map means that its author builds on his or her previous knowledge, but often connects it with other connections, which helps to assimilate new knowledge. When suggesting the use of mind maps to students, we drew attention to some of the possibilities of their use, namely

- to present information on a specific topic or section;
- to visualise important concepts, revealing their connections with other concepts, including those subordinate to them;
- to systematise thoughts and ideas on a particular topic by visualising them with a map;
- to create a concentrated collection of the main ideas of the text;
- to develop presentations;
- to plan and prepare projects, including teamwork.

We also believe that it is important to structure the content of the course before the exam. With the help of mind maps, students can write down only really relevant information and thus save a lot of time when preparing for an exam or test, especially when it is carried out in an automated mode [24].

Grammar is essential for learning any foreign language. However, grammar is usually perceived as rather complicated, not very interesting, and grammatical rules are difficult to remember. At the same time, students mostly believe that these rules need to be learnt by heart, and this method of learning them often does not lead to the desired results. By using mind maps, it is possible to increase the effectiveness of learning grammatical material in a foreign language by using a fundamentally different approach to organising grammatical rules. Any grammatical issue (parts of speech, their declensions, sentence construction, etc.) can be structured, summarised and presented in the totality of its internal relations, and only then can it be studied in detail. In addition, the created mind map can be used in the future for repetition, in order to "refresh" one's knowledge. It is much easier and faster to do this with a map, because it is completely within sight, unlike a textbook that needs to be read and reviewed. A separate positive effect is that each student makes a mind map independently, for their own needs and in accordance with their own individual characteristics in terms of associations, perception, memorisation, etc. In this way, they structure their grammar knowledge independently, i.e. they actively work with it and, accordingly, their ability to achieve better results or achieve the desired results faster increases.

Figure 1 shows a representation of the German grammar topic "Word order in a simple sentence". The mind map with its representation was created using the Miro system. The order of words in a German sentence (simple, compound, compound-subordinate) is clearly regulated, which often creates difficulties for students and leads to mistakes, as they are used to a more free arrangement of words in a sentence in their native language. In order to learn one of the basic rules for building a simple sentence in German, which is that, regardless of the forward or reverse order of the words in the sentence, the verb – the predicate or part of it – always comes second. In this case, the first place is taken by another member of the sentence, which can be either a single word or a phrase. By building a mind map, the student will have a clear idea of the place of the verb in the German sentence. Of course, the example shown here is one student's idea, and other students have built their maps on this issue in different ways. We have used it for demonstration purposes to show that even very simple, basic mind maps structure a particular issue.

The bulk of mind maps in the educational process are usually used to learn and consolidate vocabulary. And this is no coincidence, as the creation of such maps allows using different ways of visualising vocabulary, taking into account the connections between the words that fill the map. In particular, it can be a reflection of a particular thematic group of vocabulary, semantic field or the main vocabulary of a particular text. This way, the vocabulary is organised within a logical context. From their experience, students reported that when it comes to learning unrelated words, it is difficult to remember them and it takes quite a long time. But the main thing is that the words learnt in this way are quickly forgotten.

It should not be forgotten that, as in the case of grammatical material and lexical items, the student works independently, compiling a kind of vocabulary. He creates it in a way that is convenient for him to use. So, using mind maps to learn vocabulary, one can individualise
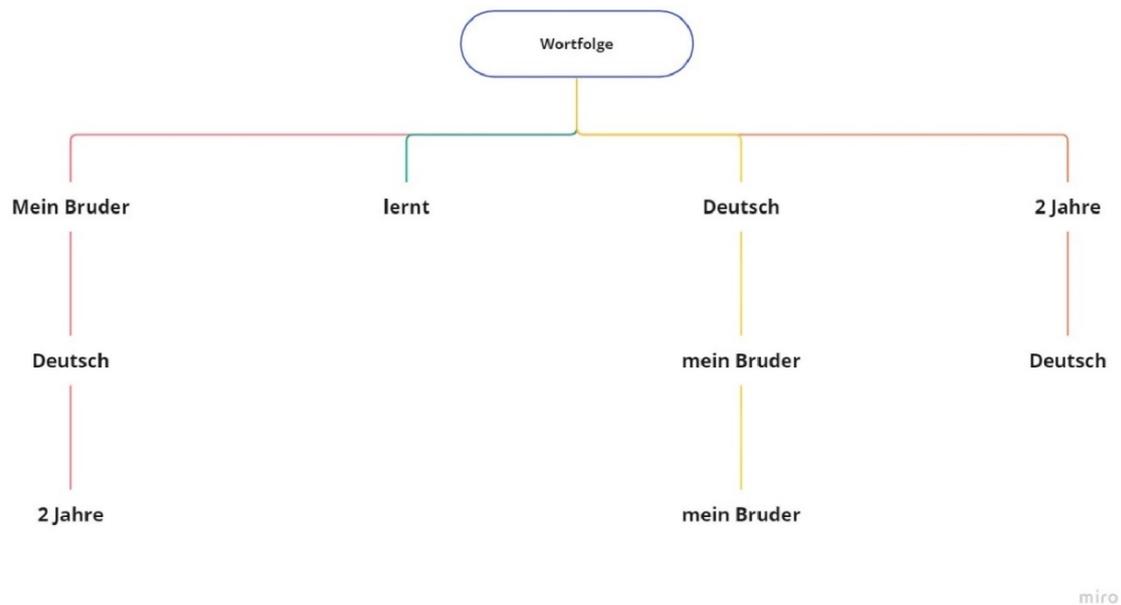
Figure 1: Representation of the grammatical issue "Word order in a simple sentence" (German) in the Miro mind map.

this process. Frequently using a personally created map as a reference for further tasks is an effective way to learn vocabulary, as it involves the practical use of one's own mini-vocabulary.

Another aspect of using mind maps in vocabulary work is the ability to independently identify and eliminate gaps in a student's knowledge of a particular issue. By depicting the central topic and then branching out, the student very quickly notices the lack of individual words on this topic. By filling in the gaps with words, he or she also learns the words faster. This method of structuring vocabulary can also be used by the teacher, for example, to quickly test students' vocabulary knowledge. It is also possible to use mind maps to control listening skills, although this requires more preparation time, as the teacher has to prepare a template for students to fill in. The positive effect of this form of ongoing control is that from the psychological point of view it is more comfortable for the student, and therefore he or she can concentrate on the task at hand more quickly and effectively. This, to some extent, contributes to the improvement of the results of their knowledge presentation.

An example of working with vocabulary for the topic "Naturschutz" ("Nature Protection") is the mind map shown in figure 2. It was created in the Xmind system. As we can see, the central theme is revealed through such key concepts as "Pollution" ("Verseuchung und Verschmutzung"), "Biodiversity" ("Vielfalt") and "Climate" ("Klima"). In turn, they are specified through other concepts directly related to them. In particular, pollution refers to air, water, soil, and household waste (waste distribution).

The presented mind map was used during the practical lesson as a visual aid for speaking. Based on this map, students created short stories outlining the main problems of nature conservation. By actually connecting the concepts presented on the mind map, they could focus on fairly general issues or develop their story in any of the directions that the mind map opens up.
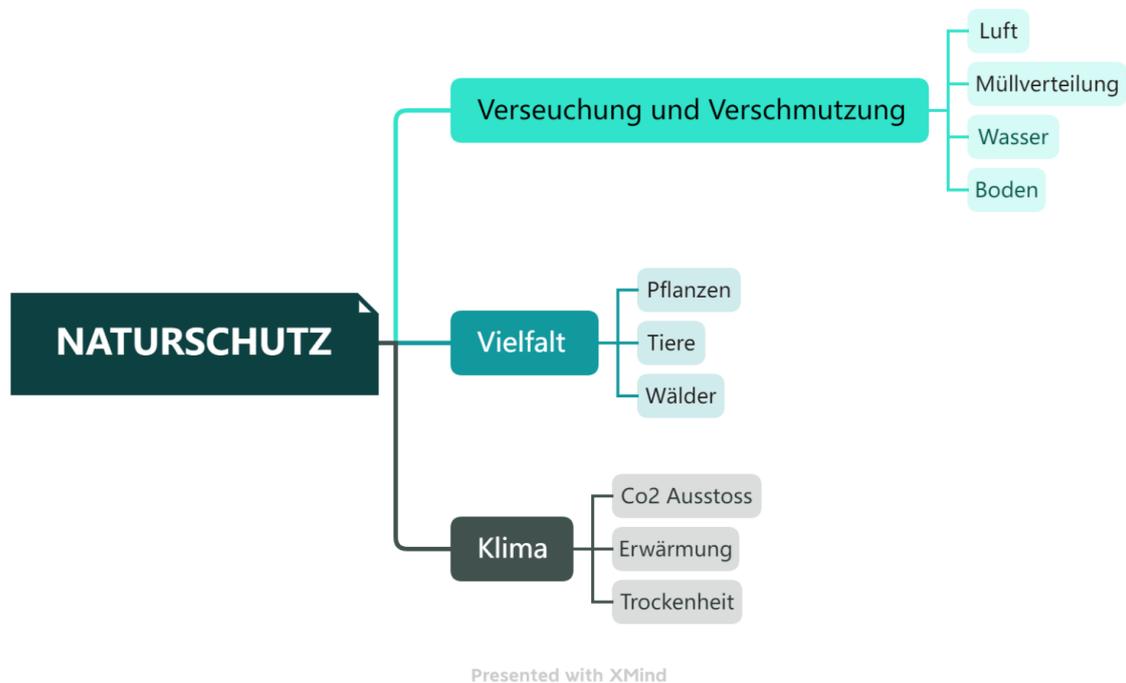
Figure 2: Representation of the thematic field "Nature protection" (German) in the Xmind mind map.

Writing an essay is a more complex task than the ones discussed above. However, mind maps can make it easier and speed up the realisation of one's own ideas. When preparing to write an essay, it is important for the author to form a general idea of the topic he or she is going to cover. We can recommend that the author first record all the ideas he or she will have on a mind map. Having received such a visual representation of the ideas, the author can select one or more of the main ones and subordinate the rest to them or abandon some of them at this stage. After choosing the main idea of the future essay, the student places it in the central field and then connects the ideas and arguments to support them that he or she has chosen. It is also possible to have the main concepts depicted on the mind map as a basis for the essay content, while the details (arguments, subjective opinion, etc.) are left off the map. But it is also possible to display the content of arguments, even quotes, selected for the text of the essay.

It is worth noting that some mind mapping tools allow for additional use of external sources, as well as the use of video. Of course, in this case, we are talking about paid versions of services offered by developers, so in this article we do not consider these tools, as the students did not use them in their work. We have only familiarised them with the availability of such services in general.

Figure 3 shows an example of how the components of an essay are represented in an Ayoa mind map. Unlike the above, this mind map was created by a student as a scheme for writing an essay. This map helped him to follow the logic of essay writing, identifying its main components – introduction, main part, conclusion and references. The shape of this mind map is interesting, as it reflects the unity and completeness of all components. Since each of the
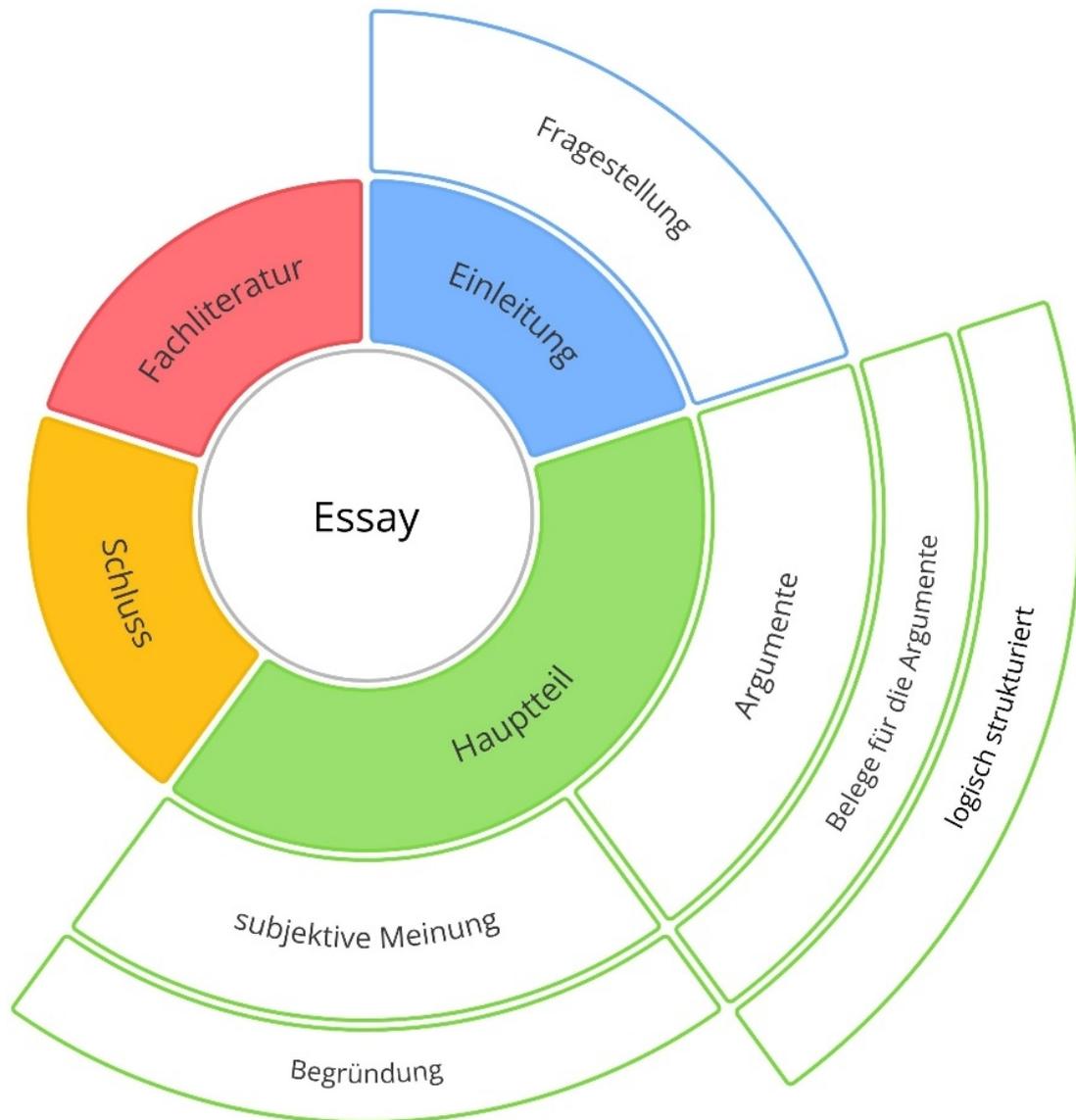
Figure 3: Representation of essay components (German) in the Ayoa mind map.

components has its own specific content, we see that it is reflected in the form of movement from the centre to the peripheral elements, which mean further detailing and disclosure of the content of the identified traditional parts of the essay.

When discussing the use of mind maps for essay writing, we also drew students' attention to the fact that a mind map similar to the one shown in figure 3 can be used not only for writing various types of texts, including essays. It can also serve as a visual support for speaking in a more complex way than it did when learning vocabulary, when it came to speaking within a certain topic. When presenting one's thoughts during a speech, for example, at a student

research conference, it is useful to have a visual representation of the structure of the upcoming speech.

In order to identify students' attitudes towards the use of mind maps in foreign language learning, we conducted a survey, the results of which are presented in table 2. Students of one academic group of 28 people took part in the survey.

Table 2
Results of student survey on the effectiveness of cloud services used to create mind maps, %.

Question	Ayoa	Miro	Xmind	Smartdraw	Mindomo
Which cloud service do you think is best for creating mind maps for grammar tasks?	10.7	32.1	14.3	17.9	25.0
Which cloud service do you think is best for creating mind maps for learning vocabulary?	17.9	14.3	21.4	21.4	25.0
Which cloud service do you think is best for creating mind maps for essay writing?	28.6	10.7	14.3	21.4	25.0
In your opinion, which service's mind map templates are the most suitable?	21.4	10.7	17.9	14.3	35.7
Which of the cloud services do you consider to be the most optimal for you?	28.6	14.3	21.4	14.3	21.4

When asked which cloud service students thought was best suited for creating mind maps for grammar tasks, the majority of responses were that Miro and Mindomo were the best. For creating mind maps for vocabulary learning, students preferred Mindomo, but Xmind and Smartdraw were also highly rated. Ayoa was the most frequently chosen by students to create mind maps for essays. Since students were mostly guided to use templates available in cloud services when creating mind maps, it was interesting to find out their impression of them in terms of effectiveness in achieving the purpose. The most successful among them were Mindomo templates. Despite the divergence of opinions on different aspects of using cloud services to create mind maps, in the last question, which was a summary, students preferred the Ayoa service.

In addition to the questionnaire, we tried to find out whether the limitations of the free versions of the cloud services under review were critical for them, in particular, the number of mind maps generated, the time spent using the free version, and the option to export the results as files.

As for the restrictions on the number of possible maps, students were absolutely satisfied with the conditions set out in all the services under study. In particular, these restrictions were either absent or allowed for no more than three maps. Therefore, they did not create any obstacles to the work on achieving the goals. However, the time limit on the use of free versions of some cloud services created significant discomfort during the assignments. Students considered the restriction on exporting the results of their work to be much more important, as it deprived them of the opportunity to work with the created mind maps in the future.

4. Conclusions

The study shows that there are quite wide possibilities of using mind maps in the process of learning foreign languages at different stages, taking into account the level of students' language proficiency. It is important that their use is possible for any language level of students. In addition, mind maps contribute to the individualisation and differentiation of tasks offered by the teacher in a foreign language course.

A number of advantages of mind maps have been identified, including

- visualisation of vocabulary material related to the subject being studied, which contributes to its better memorisation;
- systematisation of vocabulary by semantic fields, which helps to understand the relationships between synonyms;
- organising grammatical material to facilitate learning of grammatical structures (e.g. word order for sentence construction)
- structuring terminology according to the sectoral principle, which realises the dual purpose of mastering it and using it in translating texts;
- control and self-control in the process of listening and reading comprehension testing, which speeds up the testing process;
- selection of basic concepts for writing and speaking, which creates a visual support.

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