Implementing smart technologies for teaching Ukrainian language across secondary and higher education: Case studies and practical recommendations

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Abstract The article is dedicated to exploring SMART technologies in the process of teaching the Ukrainian language to students in general secondary and higher education institutions. Specifically, methodical recommendations are formulated to enhance the effectiveness of utilizing these technologies in the modern educational process. The significance of SMART technologies is substantially increasing in the innovative paradigm of the educational process under the influence of integration, globalization, and the transition to an information society. The article employs a comparative and content analysis of distance and electronic learning of the Ukrainian language. It delves into the theoretical foundations of computer-assisted language teaching as a distinct methodological approach based on “smart” technologies. The authors emphasize the effectiveness of using interactive whiteboards and multimedia presentations to implement the principle of visualizing language elements and structures, facilitating students’ acquisition of lexical-grammatical material. It is identified that creating mental maps is an effective SMART teaching technology for the Ukrainian language. To this end, computer services such as MindMeister, Mindomo, Cliffy, Spinscape, Bubbl.us, MAPMYself, SpiderScribe, and others are recommended. The research concludes that the use of SMART technologies by students in general secondary and higher education institutions contributes to increased motivation for language learning, improved literacy levels, facilitates independent research efforts aimed at enhancing professional-communicative competence, and streamlines the process of knowledge assessment by educators.

Keywords: SMART technologies, information and computer technologies, Ukrainian language, interactive whiteboard, distance learning, mind map

1. Introduction

The information society is defined by the transmission and storage of electronic information, as well as the use of SMART technologies in various aspects of human life, including education. SMART technologies play a crucial role in the development of SMART education, which in turn contributes to the formation of a SMART society. Therefore, education should be mobile, facilitating the processes of internetization and virtualization of the educational space. Learners should be instilled with the skills of self-education based on the use of SMART devices and intelligent technologies. The significant impact of the actualization of SMART technologies in the educational process has been driven by the implementation of distance learning formats due to the epidemiological situation and the Russo-Ukrainian war in Ukraine. The traditional reproductive educational paradigm has been replaced with an innovative one that utilizes computer technologies. This allows for the individualization of learners’ education by creating personalized educational trajectories (Tkachuk et al., 2018).

The acronym SMART is translated as “intelligent”, emphasizing the use of advanced technologies in the educational process. On the other hand, this acronym is decoded based on attributes of the educational process, such as self-direction, motivation, adaptability, resourcefulness, and technology. The etymology of this concept can be traced back to 1954 when Peter Drucker introduced it into scientific circulation. He used this methodology to describe goal-setting criteria, and this technique was deciphered as Specific, Measurable, Achievable, Realistic, and Time-Based. The interpretation of this acronym...
has evolved from a goal-setting methodology to the use of technological teaching tools in the educational process, modernizing and virtualizing it (Cebrián et al., 2020).

SMART technologies are used in different formats for teaching the Ukrainian language, including electronic, distance, and classroom formats. They are also applied for organizing online courses, seminars, and conferences. Various educational platforms have been created at both international and national levels to implement distance learning. For example, the UNESCO program “Life Long Learning” was represented internationally. Nationally, lesson plans for language learning were developed for secondary school students. Universities created individual internet resources based on their specializations. In the study of the Ukrainian language in a distance format, audio and video resources, electronic books, and computer programs for self-assessment are crucial (Yermachenko et al., 2023). SMART language learning technologies should be multichannel, incorporating audiovisual, graphic, textual, gaming, and animation elements to activate the creative-cognitive activities of learners. It is important to note that e-education significantly expands the possibilities of inclusive education, as it can help integrate learners with disabilities into the educational process. The current generation of learners, commonly referred to as “millennials” or “digital natives”, prioritizes digital technologies in their lives. This poses new challenges for the educational system, which must quickly adapt to the development of computer technologies and integrate them into the learning process by altering and adapting methods, principles, approaches, forms, tools, and types of learning (Osadcha et al., 2023; Chen et al., 2020).

The research aims to analyse methodological principles and approaches, examine specific cases, and develop methodical recommendations for the application of SMART technologies in teaching Ukrainian language to students in general secondary and higher education institutions.

Research Objectives:
- to outline the semantic boundaries of the concept of SMART technologies in the educational process, particularly exploring their possibilities in teaching the Ukrainian language;
- to describe the methodological peculiarities of applying SMART technologies and formulate practical recommendations for their use in teaching the Ukrainian language in general secondary and higher education institutions;
- to investigate the potential of internet resources for the development of phonetic, lexical-grammatical, syntactic, and communicative skills of learners;
- to identify the advantages and disadvantages of using SMART technologies in language teaching.

2. Literature review

In Ukrainian linguodidactics, several researchers have explored the use of SMART technologies for teaching the Ukrainian language in general secondary and higher education institutions. Among them are V. Bykov, O. Blazhuk, M. Hreb, M. Yeshchenko, S. Karaman, H. Ivanyshyn, O. Kucheruk, S. Lytvynova, O. Malykhin, V. Semenoh and M. Tsurkan. Ukrainian researcher Zh. Ragrina emphasizes the importance of using “smart” technologies for both offline and online learning. She suggests that the use of these technologies should be systematic and include a structured presentation of the “Ukrainian Language” discipline according to educational standards. Furthermore, the focus should be on learners’ search and creative activities. The proposed educational product for learning Ukrainian should have a non-linear, multilevel hypertext structure (Ragrina, 2017, pp. 117-118). It is important to note that innovative technologies should not replace the teacher’s personality, but rather complement their role. Teachers, especially language teachers, inspire students to be creative and moderate the educational process.

Researcher I. Nesterenko (2023) in his recent review of SMART education highlights its main advantages, including the continuity of the learning process and easy access to educational information, independence from time and place, mobility, and the autonomy of both the educational practitioner and the student. He also notes that students are expected to master four levels: knowledge, skills, attitudes, and values.

In their 2019 study, Martín AC, Alario-Hoyos C, and Kloos CD investigated the term “SMART education”. They found that while the term was introduced to signify progress in technological education, it lacks proper methodological grounding and is vague and blury. However, the researchers acknowledge that there are several available developments that can make educational technologies more adaptable to learners and facilitate smarter learning.

Zhu, ZT., Yu, MH. and Riezebos, P. (2016) state that the new educational paradigm, known as “smart” learning, is based on “smart” devices and intelligent technologies. This introduces technology-enhanced learning (TEL), providing flexibility and mobility to the educational space and process. The development of mobile devices has led to mobile learning becoming the primary paradigm of technology-enhanced learning. Its fundamental principle is that learning can occur without restrictions on time, place, or environment. The goal of SMART education, according to these researchers, is to shape a workforce with the knowledge and skills required to meet the needs and challenges of society in the 21st century. Such education encompasses various learning styles (formal and informal, personal and social), providing personalized learning services to students, along with adaptive content based on their (learning) context and personal abilities and needs.
The authors, S.J. Miah, and J. G. Gammack (2014), criticize SMART education for its lack of proper theoretical and technological foundations. However, it is agreed that intelligent education is a rapidly evolving scientific field that is complemented by the application of various advanced technologies. By combining these technologies, a new innovative structure of the intelligent educational artifact allows learners to manage their education and career development for a better future.

3. Methods

The study employed the following methods:
- analysis and synthesis to examine scientific literature and evaluate the benefits and drawbacks of using SMART technologies in the teaching of Ukrainian in both general secondary education and higher education institutions;
- a comparative method to compare computer technologies and their effectiveness in developing students' language and speech skills;
- a historical method was used to study the genesis of the concept of “SMART” in scientific discourse;
- a structural method was employed to systematize and classify SMART technologies in the modern educational process;
- a generalization method to make scientific and theoretical conclusions and methodological recommendations on the use of SMART technologies in the process of teaching the Ukrainian language.

4. Results

The Ukrainian language is taught using mobile education, which involves the use of portable technologies such as smartphones, tablets, and laptops. Computer-assisted language teaching (CALL) is actively developed within virtual internet environments, which serve as information educational resources. This method employs algorithms for language learning in a virtual environment instead of a real one. The online courses, language and speech activity control, and assessment criteria through SMART technologies form the basis for developing language and speech competencies in learners. The study explored the integration of multimedia educational material into the Ukrainian language learning process and investigated the specifics of group communication when organizing individual activities of learners, such as blogging, chatting, and participating in webinars.

Modern SMART technologies play a significant role in the Ukrainian language learning process due to their multimedia nature. They compensate for the lack of a real language environment by providing virtual linguistic and extralinguistic visibility.

It is important to note that the teaching of the Ukrainian language in higher education institutions varies according to specialties and directions of training. The main directions for learning the Ukrainian language can be distinguished as follows:
1. Ukrainian language for philological specialities.
2. Professional-oriented Ukrainian language for non-philological specialities.
3. Ukrainian as a foreign language.

The development of language and speech skills through online resources involves three levels of analysis: pre-textual, intertextual, and hypertextual. Pre-textual analysis involves studying the lexical, grammatical, and stylistic features of the language material, filling in the blanks with the correct grammatical form, and reconstructing the text. Intertextual analysis involves gathering information from thematically related texts. Hypertextual analysis allows for the study of the vertical context of a linguistic phenomenon based on indirect information (Popov et al., 2021). This helps learners develop skills in professional virtual communication and compensates for the lack of a real language environment.

Thus, the innovative education paradigm, primarily applying SMART technologies, involves intelligent use of electronic resources, working with extensive textual materials, virtual interaction among learners, and integration into a unified information-intellectual educational space.

When exploring the websites of general secondary and higher educational institutions in Ukraine for proposed digital education models, they can be classified into the following categories:
1. Open educational platforms such as Moodle, Zoom, and Teams allow learners to come together in virtual classes and access educational materials and testing programs.
2. Open online courses for adults, regardless of their educational background, are often initiated and implemented by the state or sponsors.

When learning Ukrainian as a foreign language in higher education, the use of SMART technologies offers several advantages. The use of virtual communication with native speakers facilitates integration into an authentic language environment. Personalized language learning is implemented through the creation of an individual educational trajectory. Feedback is provided by the teacher and blended learning is utilized. Learning is made more accessible and mobile. One disadvantage of using SMART technologies to learn Ukrainian as a foreign language is the lack of direct communication between the teacher and the learner (Dudnik et al., 2020).
The key SMART technology tools for learning the Ukrainian language in secondary and higher educational institutions include:

1. SMART textbooks;
2. electronic systems (platforms) for learning the Ukrainian language as a foreign language;
3. webinars and conferences;
4. blogs and social networks.

There is a growing interest among learners in SMART language textbooks, also known as educational content, integrated into an interactive learning environment with graphical, video, and audio materials, interactive tools for teacher interaction, a testing system, and a content evaluation system. The primary benefit of SMART textbooks is the collaboration between teachers and learners, which generates new knowledge and facilitates synchronous learning of the material, along with the practical application of acquired skills (Rzhevskaya et al., 2023).

The use of SMART technologies to organize online conferences and webinars plays a significant role in developing communicative skills for general secondary and higher education learners. Web applications are an effective means of intercultural communication that does not require additional financial resources. They facilitate interactive dialogue with students, allowing them to ask questions in real-time, receive competent guidance from the teacher-researcher, collaboratively process information, and even obtain webinar recordings for further distribution or material reinforcement. Webinars cannot fully replace classroom sessions due to several drawbacks, including the lack of self-discipline among learners, the inertia of some participants, the absence of live communication, and difficulties in maintaining attention during prolonged durations of webinars or conferences (Shytyk et al., 2020).

In the realm of social media, blogs occupy a unique position as a platform for sharing educational resources on the Ukrainian language and as a means of communication between educators and students. Blogs are distinguished by their linear structure and limited set of functions in the learning process, which include creating interest-based groups and analysing and discussing lexical-grammatical material. However, it is important to ensure that the use of a blog aligns with the goals and tasks of the lesson and motivates learners from a didactic perspective.

The use of interactive multimedia boards is an effective tool for teaching the Ukrainian language, particularly in the classroom setting. However, it may not be as suitable for distance learning. Unlike traditional boards, multimedia boards allow for saving and future use.

The most commonly used multimedia board today is Miro, which enables the uploading of textual information and images, as well as non-standard features that are important for language learning, such as connecting objects with arrows. This function is essential for tasks such as matching synonyms, antonyms, terms, and their definitions. Miro can integrate with other collaborative applications, has built-in video conferencing and chat, and supports both individual and group work. The primary types of tasks for secondary education learners are:

1. Filling in contextual words in the text.
2. Constructing sentences based on randomly arranged words.

The Miro board can be used by teachers to introduce students to the structure and formatting rules of business documents. This is particularly relevant for programs such as “Ukrainian Language for Professional Direction” and “Business Ukrainian Language”.

Additionally, the board allows for the inclusion of videos, enabling learners to analyse public speeches, observe discussions, and complete integrated tasks with other teachers in the group. Jamboard and Aww app are both multimedia boards that allow users to insert illustrations, notes, and textual information. Besides, Aww app allows for the uploading of PDF files and slides.

The use of a multimedia board in teaching Ukrainian language has several advantages. It helps in developing communicative skills, fosters collaborative problem-solving in language-related issues, encourages interaction among learners, provides experience in peer-to-peer learning, stimulates creativity, and increases motivation and lesson pace. However, it is important to note some drawbacks of using a multimedia board, including the potential for deterioration of learners’ eyesight, rapid fatigue, possible technical issues, and the necessity for teachers to invest time in preparation and acquire technical proficiency with new software (Kubitsky et al., 2022; Iatsyshyn et al., 2020).

To effectively visualize language as a system and individual speech, multimedia presentations based on PowerPoint can be a useful tool. This feature enables the creation of slides containing animated elements, sound accompaniment, video demonstrations, photos, and hyperlinks. Presentations are particularly effective in the study of the academic discipline “Business Ukrainian Language” as learners can become familiar with samples of business document formatting. The advantages of multimedia presentations, as noted by researchers N. Dementievskaya and N. Morze (2006), lie in their multifunctionality, which allows for real-time use during classes.

Every Ukrainian language program, whether in general secondary or higher education, includes topics for developing public speaking skills. Learners create presentations on specific topics as individual projects to effectively overcome the fear of...
public speaking and develop skills in working with text. This includes composing speech outlines, identifying theses and arguments, structuring and selecting information, and formulating conclusions and generalizations (Nesterenko et al., 2023).

To facilitate distance education, many general secondary and higher educational institutions have opted for electronic learning platforms such as Moodle, Teams, and Zoom. These platforms share the common feature of allowing the monitoring of distance courses’ results, and teachers are provided with tools to create their own courses. The Moodle platform at Bukovinian State Medical University includes a content module titled “Basic Principles of Ukrainian Morphology” which is intended for the discipline of “Ukrainian as a Foreign Language”: Topic 1. Adjective and its morphological features; Topic 2. The verb and its morphological features; Topic 3. Numeral and its morphological features; Topic 4. Functional parts of speech in the Ukrainian language and their meanings. Preposition and conjunction in the Ukrainian language.

A useful tool for teaching the Ukrainian language is the creation of mind maps using computer services such as MindMeister, Mindomo, Cliffy, Spinscape, Bubbl.us, MAPMYself, SpiderScribe, and others. Mind maps are particularly effective when studying topics such as Internal Word Structure, Word Formation, Etymology, and Terminology. The most efficient method of creating mind maps is through group work, where each member can contribute their ideas, ensuring the continuous development of the map. For instance, a mind map on the topic of Medical Terminology can illustrate the systematic nature and interdependence of each element in the terminology system.

![Mind map on the topic of Medical Terminology.](image)

The Digital Ukrainian Philology 2024 online courses, organized by foreign universities, provide an interesting case of teaching the Ukrainian language. These courses will take place from January to June 2024 on the online platform of Friedrich Schiller University Jena. Ukrainian students (bachelors and masters) interested in applied aspects of linguistics will participate. The university offers the following course topics: Mathematical and Computer Linguistics, Fundamentals of Quantitative Linguistics for Philologists, Corpus Linguistics, Sociolinguistics, and Dialects in the era of Computer Technologies. Each course
is assessed in ECTS credits, and upon successful completion, participants receive a certificate that may be considered a basis for credit transfer for an equivalent course at a Ukrainian educational institution (Tserklevych et al., 2021).

One of the forms of SMART learning is the creation and operation of a virtual learning environment, which is available to students of a particular higher education institution. For example, Lviv Polytechnic National University is a vivid example of the implementation of this educational idea. This is a network service designed for daily use, which includes various forms of control and self-control of the student’s learning achievements, and most importantly, contains all the necessary elements of theoretical and practical knowledge. The developers of this virtual learning environment emphasize that the software system they have created is not just for managing the learning process in distance learning, but is designed to support online learning with an emphasis on the learning process itself (Shyt’yk & Akimova, 2020).

The virtual educational environment is available to students through authorization and login through a personal account, which provides access to the required courses. The course topics are clearly structured in accordance with the curricula and programs. As a rule, the topic of a practical lesson includes a text document (lecture text), which the applicant must study in order to successfully complete the following practical tasks and read the texts. Test checking is automated and allows you to monitor your own progress trajectory, which undoubtedly contributes to motivation in learning. In addition to the lecture material presented, the applicant receives links to important resources, for example, if it is a course in Ukrainian (for professional purposes), such resources are electronic dictionaries.

5. Discussions

We agree with N.M. Kompanets (2019) that the development of critical thinking in learners can be facilitated by the creation of a “smart” educational environment that incorporates appropriate technological innovations and tools. Such an environment can enable learners to shape their individual educational trajectory as both creators and implementers. The use of “smart” technologies enhances the learner’s motivation to study the language, visualizes information, and saves time in the learning process or information search. It is important to note that this does not negate the use of traditional means and forms of teaching. A harmonious combination of traditional and innovative methods and means is appropriate for ensuring the educational process (Yermachenko et al., 2023; Mizin et al., 2023).

However, we disagree with T. Tkachuk’s suggestion in the article “World Trends and Prospects for the Development of SMART Education in Ukraine” (Tkachuk, 2018, p. 52) that the modern educational process in Ukraine should be maximally transferred to the electronic environment. This approach may be more suitable for teaching learners in technical specialties. When studying languages, we may experience educational losses in developing competencies in direct communication. This is a fundamental task of university courses.

6. Conclusions

In summarizing the research on the effectiveness of implementing a “smart” educational environment in teaching the Ukrainian language, it can be concluded that the application of SMART technologies in general secondary and higher education is appropriate both during classroom sessions and in distance or online learning. Additionally, it is beneficial for organizing independent work of learners. These measures not only contribute to the development of language skills but also diversify the learning process, increasing the interest and motivation of learners.

This proposal aims to enhance the use of “smart” technologies in the study of the Ukrainian language. To achieve this, we suggest the following measures: 1) to balance electronic learning with live communication with the teacher; 2) to create online platforms for organizing distance learning and facilitating independent student work; 3) to establish an electronic repository with test databases and creating conditions for educational integration of language learners from different institutions is recommended.

However, the use of SMART technologies in the process of learning the Ukrainian language has some drawbacks. Firstly, lectures and presentations prepared by the teacher lack full copyright protection. Secondly, when studying a language, whether native or foreign, it relies primarily on the use of a communicative approach. This approach is challenging to implement through “smart” technologies because no devices or software can fully replace live interaction between the teacher and the student. Thirdly, there is a need to integrate digital educational material with the current curriculum. Fourthly, the use of digital technologies requires technical and software support, both from the teacher (having technical devices, high-speed internet, licensed programs, etc.) and from the student outside the classroom. Providing this support can be challenging, especially during times of war, which can disrupt equal access to educational services for learners.

Ethical considerations

Not applicable.

Conflict of Interest

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