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The Role of Lexical Units in Teaching A Foreign Language in The Field of Transport

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Abstract:
The article examines the advancements in teaching a foreign language with a professional focus, focusing on socioeconomic factors and the shift from competency-based to cognitive models. The Department of Foreign Languages at Transport has contributed to this development through the creation of the "English in the field of Railway Transport" electronic educational complex. The article also introduces a multilingual learning environment based on Onto.plus ontologies, developed by the Educational and Methodological Center for Education in Railway Transport. The article emphasises the importance of developing methodologies to enhance students' cognitive abilities in learning a professionally oriented foreign language. This article is relevant to educators and students in transportation studies.

Keywords: English language, hypertext, multilingual learning environment, ontology, knowledge representation, Onto, plus, transport university.

Introduction

Currently, there is a lively debate within the scientific community regarding the challenges posed by the network society, digital economy, knowledge economy, and other related topics. The world is often described as "liquid," signifying its constant state of flux and globalization. Many researchers emphasize that groundbreaking discoveries often occur at the intersection of different fields of study. These ongoing transformations provide ample evidence to support the notion of an "ontological turn" across all areas of human activity, including professional education [1]. The objective of this article is to demonstrate the trajectory of didactic tools' development in teaching specific subjects, using the teaching of a professionally oriented foreign language at a specialized university as an illustrative example.

MATERIALS AND METHODS

Given the aforementioned, it is intriguing to delve into the renowned philosophical and futurological treatise authored by Stanislaw Lemma, a Polish writer, titled "Summa Technologiae" [2]. This treatise explores various events that signify the emergence of the cognitive technology era. These events encompass the information barrier, the proliferation of knowledge worldwide, the enhancer of intelligence, and the construction of language. It is not only prominent IT

companies such as IBM and Google that are proclaiming the arrival of the cognitive computing technology era [3].

Furthermore, experts in psychology and pedagogy anticipate a shift from the competency-based education model to a model that prioritizes the development of an individual's cognitive abilities. This transformation in educational models will be accompanied by the quest for novel approaches to present educational content, aiming to bring about substantial improvements in its transmission and comprehension within educational institutions [4–6], and so forth.

RESULTS AND DISCUSSION

1. Evolution of forms of presentation of educational content

Naturally, the evolution of knowledge representation does not imply distinct boundaries between its various stages. Both linear and nonlinear forms of representation, such as traditional textbooks and hypertext, are utilized simultaneously in the learning process. The limitations of each form are influenced by factors such as advancements in information technology, teaching methodologies, and conditions for effective utilization.

The capabilities of a traditional textbook are widely recognized and require little explanation. Linear text, which has been used for centuries, is the oldest form of knowledge representation and can be found in university libraries in both physical and digital formats [7]. Educators have noted that educational books serve as teaching tools that bridge the gap between industrial and design-technological cultures [8].

Based on survey findings, it is evident that many students and teachers prefer the traditional form of knowledge presentation. Therefore, it can be inferred that well-crafted educational texts will continue to be in demand in the future [9]. The process of teaching a professionally oriented foreign language is consistently supported by didactic materials, including textbooks, workshops, and methodological instructions, which are regularly updated [9].

In addition to traditional educational books, hypertext educational resources are utilized in the learning process, with their capabilities continuously expanding. It is important to distinguish these resources from the digital version of a linear educational text. The primary distinction lies in the nonlinearity of the hypertext representation of knowledge. It is worth noting that nonlinear reading of a book existed even before the emergence of the Internet. This pertains to texts that are typically not read from start to finish, such as reference books, catalogs, encyclopedias, and instructions. An example of this can be seen in books that incorporate inserts from other sources, which themselves contain links. Furthermore, this list extends to include teleconferences, radio and television shows, as well as "live reports from the scene, including video or audio fragments from the archive of previously made broadcasts" [3]. However, with the proliferation of web technologies, the opportunities for interaction among participants in the learning process have significantly expanded. As G. R. Gromov highlights, "The Web is a method (and technology) of creating and developing a global field of WORDS that cross-connect and interact with each other. Again, I mean not only text words, but all other communication symbols (pictures, photos and their animations, sounds, etc.)" [4].

In this study, we will explore the potential of didactic assistance in the context of teaching a professionally focused foreign language. Specifically, we will examine the electronic educational

and methodological complex called "English for Railways" (EUMK "English for Railways") as an example.

2. Electronic educational and methodological complex for teaching English at a railway university

The development of the project began in 2024 with the aim of creating a series of digital teaching aids. However, it was found that expanding the line of educational publications through a similar educational product was not practical. As a result, the project was reoriented towards the educational paradigm 2.0, specifically focusing on network interaction. The EUMK (English for Railways) was then presented as a comprehensive solution for distance learning for railway transport personnel.

The effectiveness of the EUMK in the learning process can be attributed to the capabilities of the software used in its development. To determine the most suitable software environment, a comparative analysis of several modern options was conducted [11]. Ultimately, the decision was made to utilize the iSpring software, which is a modern and multifunctional software environment based on Power Point (1).

The EUMK offers interactive modes for creating educational materials, including "Dialogue" interactivity, which simulates real-life communication with voiced character remarks. These interactive blocks are integrated into modules for independent student work and test control, and can also serve as references for exam preparation and resource location.

iSpring characters have the ability to react to common actions performed by students (Figure 1). For instance, let's consider a scenario where the character asks the student, "Are you prepared to take the test?" If the student responds with a "No," they will be advised to make necessary preparations and come back on another day.

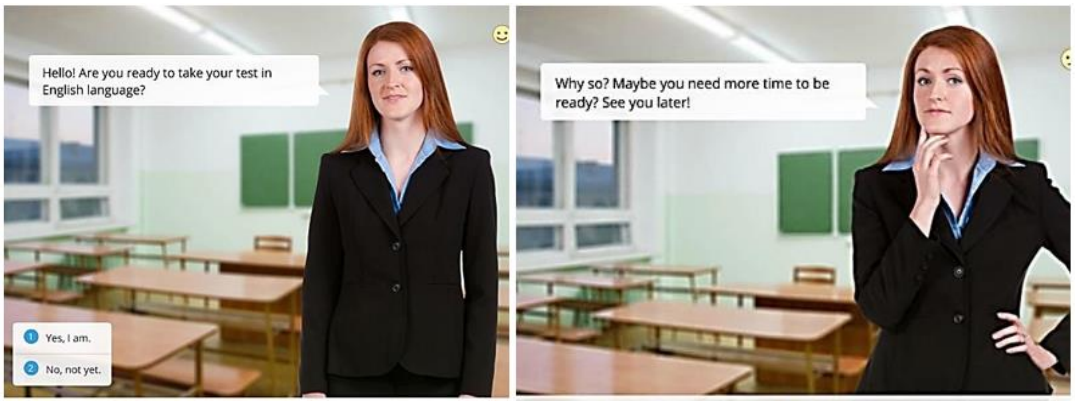

Figure 1. Interactivity character “Dialogue”

An additional form of interactivity, known as "Catalogue," provides the opportunity to develop terminological dictionaries for specific subjects or the entire course. (Figure 2).

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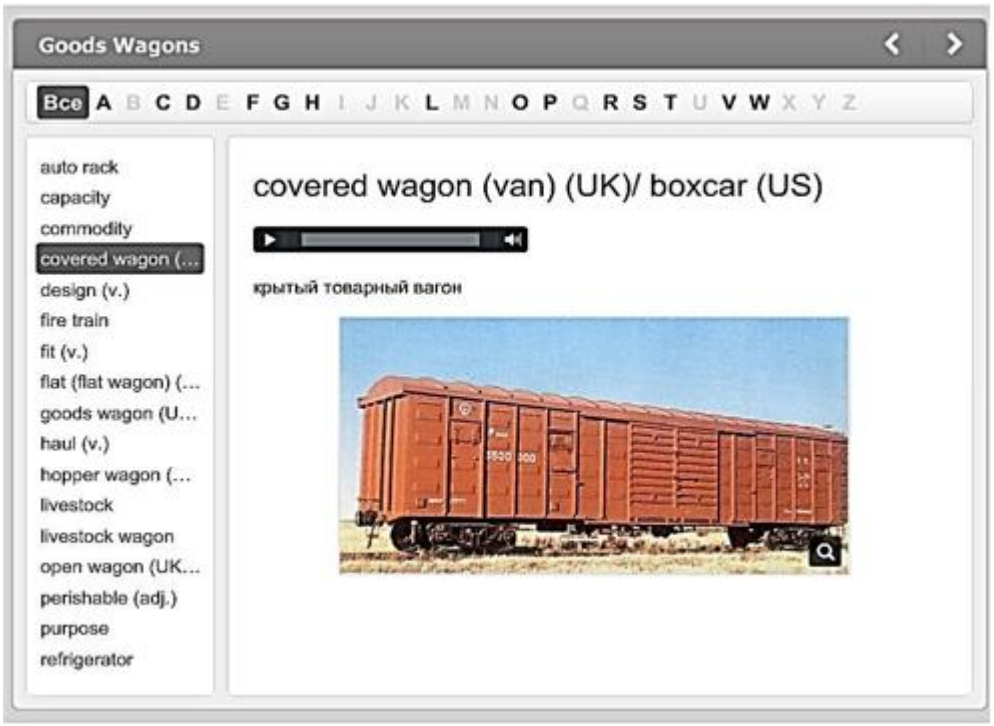

Figure 2. Terminological dictionary in the Catalog interactivity

The "Test" interactivity is utilized to develop software modules that enable students to work independently and have their results automatically checked. Figure 3 displays the initial page of one of these modules. Throughout the process, the program provides feedback to the student regarding their task completion. (Figure 4).

Figure 3. Start page of the module for independent work of students

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Monitoring materials on course topics have been created in this interactive platform. The assessment comprises a range of "closed" questions, including combinations of two parts, ranking, single and multiple choice, among others. Additionally, there is a free response section where students can provide an essay. The vocabulary and grammar simulators have been integrated into the "Test" feature. The test results are automatically forwarded to the teacher's email and simultaneously stored in the LMS database. If required, a copy can be sent to the student's email address, with the option being configurable in the settings.

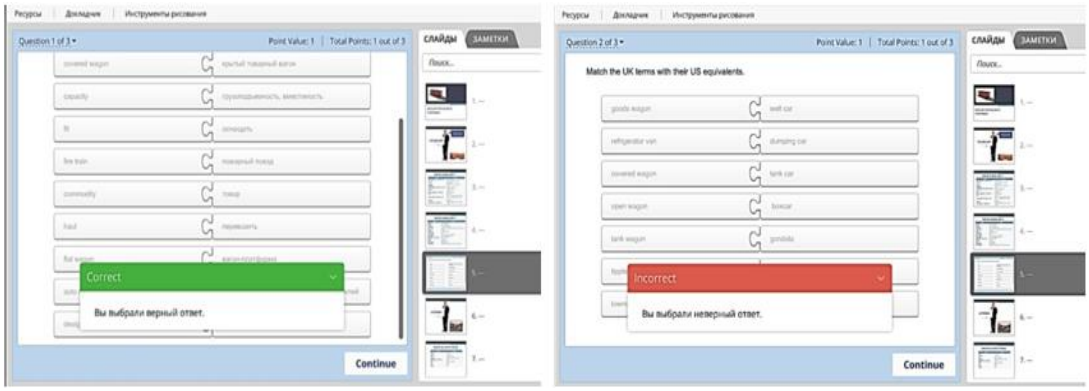

Figure 4. There are various alternatives available for responding to the outcome of a single task in the "Test" interactivity.

The second set of capabilities determines how the learning process is organized in both online and offline modes. The iSpring software shell allows training modules to be downloaded onto desktop computers in computer classes or home PCs, even without internet access. The student's work is saved in separate files, and files can also be converted into SCORM packages for use in popular virtual educational environments like Moodle.

The third set of capabilities focuses on providing constant methodological support to EUMK users. The adaptability of this support is achieved by modifying the content and parameters of program modules based on specific training goals and objectives.

Currently, the EUMK "English for Railways" consists of six parts: Part I. "Railway track and track structures"; Part II. "Locomotives and carriages"; Part III. "Stations and train traffic control"; Part IV. "Railway transportation in the context of globalization"; Part V. "Rational use of transport"; Part VI. "Information technologies in transport." Each part includes three modules for classroom work and three modules for independent student work. In total, EUMK comprises 36 modules. This allows for a flexible selection of content based on the goals set by the teacher and student, including the planned duration of the entire learning process.

Therefore, this didactic tool has the flexibility to adapt to both traditional and innovative teaching methods, as well as different forms and formats of instruction.

3. Multilingual learning environment based on Onto.plus ontologies

The cognitive era, or "age of reason," is characterized by the use of cognitive computing technologies to mimic human thought processes. Hypertext educational resources offer advantages but lack internal structure and compatibility with other resources. They are not suitable

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for creating intellectual support for learning processes like knowledge bases, intelligent agents, and intelligent search engines.

However, these functionalities can be achieved by adopting the modern international standard for knowledge representation on the Internet, as approved by ISO/IEC - ontologies. In the field of computer science, ontologies can be defined as representations of knowledge within a specific subject area in the form of a semantic network. Numerous researchers, both domestic and foreign, have dedicated their efforts to developing didactic tools based on ontologies. One such development is the multilingual learning environment Onto.plus, specifically designed for students in transportation universities. The software for this environment was created under the auspices of the Educational and Methodological Center for Education in Railway Transport.

This particular development proves valuable for teaching foreign languages, as it offers versions of ontologies in multiple national languages. For instance, the ontology "General Course of Railways" is available in Russian, English, and Chinese. Furthermore, it allows users to access various parallel versions of knowledge representation, ranging from less concentrated formats like linear text to more compressed formats like ontographs (Figure 5).

It is important to note that presenting educational content in the form of ontologies does not negate the possibility of hypertext presentation. By clicking on the links associated with ontology concepts, users can navigate to other resources, such as standards, drawings, videos, and internet sources.

The didactic usefulness of the terminological glossary, presented in the form of concept frames, is complemented by the assumption of automatic test generation from ontologies, without the need for human authorship. The size of the ontology determines the number of questions in the test, which can potentially be extensive. Enhancing Onto.plus involves expanding the functionality of the platform, such as automatically identifying gaps in students' knowledge, creating intelligent agents, and conducting searches within the knowledge base. To integrate Onto.plus into the actual learning process, two methodological support options are available for both lecture and practical courses. A specialized methodology has been developed to enhance students' cognitive skills through the use of bilingual ontologies in foreign language instruction.

Figure 5. Versions of educational content in a multilingual learning environment based on Onto.plus ontologies

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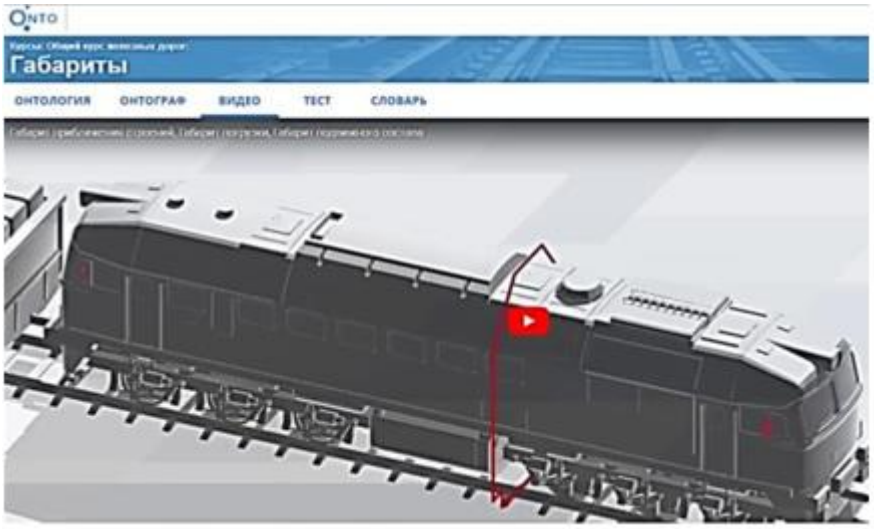

Figure 6: Navigate to videos and industry documents

Foreign language teachers in non-linguistic universities face challenges due to societal alignment with university curriculum requirements and limited time for specialist preparation. To effectively teach students and comprehend native speaker speech, a combination of traditional and innovative teaching methods can be used. Prioritizing communicativeness in instruction and developing teaching materials is crucial. The study of oral scientific discourse should incorporate psychological and methodological research, as well as the communicative aspects of the language specific to the student's area of study. Traditional teaching focuses on reading, comprehension, translation, and syntax in scientific writing. However, a shift towards developing oral communication skills in professional contexts and engaging in scientific discussions is essential.
In our perspective, the approach to teaching oral English in a specific field should consider the following principles:
-Identifying the communicative characteristics of various text types within the field, as described in linguistic literature [1, 2, 6], along with the corresponding means of expressing these characteristics, known as communicative models.
-Determining the communicative features of oral speech and the means of expressing them.
-Comparing and selecting appropriate models for passive and active training based on the means as mentioned earlier of expression.
-Establishing a comprehensive list of communicative signs and models specific to the field of study, and designing a system of exercises to actively train these skills.
-Analyzing different types of communicatively-oriented texts within the field, selecting specific texts for educational purposes, identifying their main communicative features and models, and developing an effective system of exercises to train selected structural units.
-Creating a foundation of "preliminary knowledge" for the development of speech skills, including the selection and training of word formation, vocabulary, and grammatical structures necessary for reading, comprehension, listening, and speaking.

-Developing and automating educational algorithms for all types of speech activities, providing students with step-by-step guidance.

-Promoting oral communication skills through tasks and problem-solving games, facilitating the transition from monologue to dialogue and vice versa.

Contemporary educational principles, such as suggestibility, visualization, and audio and multimedia, should be used extensively in teaching. Oral communication exercises should be organized and varied in difficulty levels, and foreign language instructors should understand scientific and technical texts to effectively introduce students and enhance their communication abilities. In non-linguistic learning environments, foreign language texts serve as knowledge acquisition foundations, and instructors should choose materials based on transmission mode, presentation style, and audience relevance. Effective communication begins with basic descriptions and processing monologues, and instructors should develop a communicative pair algorithm as students progress. Training should cover word formation, lexical and grammatical structures, and vocabulary introduction. English scientific texts have a linguistic economy, using nominative sentences, terminological systems, cliches, and clarity through graphical division.

Oral speech possesses distinct characteristics, such as a more relaxed sentence structure, a prevalence of simple sentences, the presence of incomplete segments within phrases, and a unique emotional tone. These features have been extensively discussed by numerous linguists [4, 5, 7]. Even during the initial stages of speech training, it becomes necessary to compare the communicative aspects of scientific texts and oral speech within a specific field. Some communicative signs and models are introduced at a recognition level, while others are actively practiced. Based on empirical evidence, the grammatical foundation of oral communication should primarily consist of simple sentences and commonly used types of complex sentences, avoiding excessive inclusion of subordinate clauses. Certain structures under study may take the form of clichés and phraseological units. For instance, phrases like "It seems to me, that…" or "It goes without saying…" as well as expressions like "I believe/suppose/think, that…" or "Could you tell me…?" are frequently encountered. In addition to the customary figures of speech and phrasal units found in everyday conversation (e.g., "Good afternoon" or "Sorry for being late" or "May I go out?"), we propose actively incorporating structures that facilitate various speech actions, such as informing, motivating, evaluating, establishing contact, and more, into oral speech within the specific domain., for example:

- negatives:

I can't agree with your statement. In my opinion this saying is wrong.

- causes and consequences:

It naturally follows…

……. that's why…….

- questions and phrases that prompt an answer, for example:

Do you know...?

What do you think of...? Do you agree, that... ?

The process of acquiring fundamental knowledge should be methodical, starting with explicit algorithms and articulating the material. It is recommended to strive for a comprehensive understanding of the information "in one's own voice," using contemporary intensive techniques

like "intonation reading." The integration of modern audio and multimedia tools should be expanded.

The proposed plan of action involves repeating and modifying speech samples. Start with sample 1, a question or phrase delivered in an announcer's voice. Pay attention to the tone and delivery as it sets the stage for subsequent activities. Repeat sample 1, add phrases, or respond to related questions to create sample 2, which will be captured on film.

Compare sample 2, a modified rendition of sample 1, presented in the announcer's voice, with sample 3, and compare your recording with sample 3. Pay attention to any disparities in delivery, emphasis, or overall impact. In conclusion, have three students repeat the sample, showcasing their individual interpretations and comprehension of the material, to reinforce the importance of practice and personal expression in effective communication.

Remember, the work can be tailored to meet specific communication goals, allowing for an abbreviated or extended algorithm.

CONCLUSION

Hence, the trajectory of enhancing didactic support for the instruction of foreign languages in transportation universities is predominantly influenced by the extent of society and education's informatization. Within the framework of altering educational paradigms, modifications may be linked to the conversion of educational material towards condensation - transitioning from linear text to ontology. Consequently, there exists a current necessity for novel didactic instruments that operate at the meta-level and are focused on fostering students' cognitive abilities. These tools are instrumental in facilitating the training of industry personnel with an innovative mindset, capable of executing proficient professional tasks within the digital economy and knowledge economy.

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