MULTIMEDIA AS AN ESP TEACHING AID AT TECHNICAL UNIVERSITIES

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У статті зазначено складові, функції й переваги мультимедіа як засобу навчання англійської мови студентів технічних спеціальностей. Охарактеризовано особливості процесу вивчення іноземної мови за допомогою мультимедіа, зокрема принципи когнітивної теорії навчання. Робота містить пояснення навчання за допомогою перенесення знань і характеристики структури розумової моделі, об'єму робочої пам'яті, а також розуміння

Ключові слова: *мультимедіа, англійська мова професійного спрямування, аудіовізуальні засоби, технічний університет, навчання*

1. Introduction

At present, it is impossible to avoid the impact of multimedia on our lives, both at home and workplace; thus, this means of information presentation is steadily becoming irreplaceable in education. Many lecturers state the fact that students, especially at technical universities, do not express much interest in studying English, which is not their specialty. This is mainly due to the lack of motivation in lessons and partially because of a somewhat outdated scheme of work in foreign language lessons that often is reduced to listening to a record or reading a text and doing some typical exercises to check understanding of a new language material afterwards.

Therefore, university lecturers turn to multimedia to teach foreign languages at technical faculties.

2. Literature review

More and more researchers are now studying the influence of the use of multimedia on students' academic achievement. Aloraini (2012) [1] explores the impact of multimedia use on students' academic achievement. According to the researcher, the use of a computer for teaching has a positive influence on cognitive and academic achievement, as well as new materials understanding and further application. Austin (2009) [2] examines the features of the cognitive theory of multimedia learning. The study specifies 5 cognitive processes in teaching with the help of multimedia. They are:

1) choosing suitable vocabulary,

2) selection of proper pictorial material,

3) organization of the chosen lexis into a comprehensive verbal representation,

4) arranging the selected images into a coherent visual material,

5) integration of the aforementioned verbal and pictorial representations and students' prior knowledge.

Crosby & Stelovsky (1995) [3] study the efficiency of multimedia instruction in teaching students in two computer science classes. The results suggested that multimedia aids enhance computer science instruction and improve students' performance in class. Mayer (2001) [4] analyses the advantages of multimedia presentations in which students learn from both words and pictures, not just texts. The researcher calls such a process multimedia learning. One of the main focuses of Mayer's investigation is the cognitive theory, which bases on the dual-channel perception of information.

Yamauchi (2008) [5] studies the effects of multimedia instructional material on students' learning and instruction perception. Results showed that students' knowledge was greatly improved after viewing the instructional DVD, which provided factual data and reinforced instructional information.

All of the above-mentioned authors share the idea that the standard study procedure in class should be supplemented with audiovisual materials. Nevertheless, the role of multimedia at technical universities, i.e. in the ESP (English for Specific Purposes) lessons, still has the potential for further and more in-depth research.

3. Aim and research problems

Aim – the comprehensive examination of multimedia and its use in English for Specific Purposes lessons at technical universities.

Research problems:

1) to determine the constituents of multimedia;

2) to find out the advantages of authentic multimedia use in ESP lessons;

3) to ascertain if there may be any negative outcomes of multimedia usage at technical universities;

4) to clarify the course of educational material learning with the help of authentic multimedia;

5) to outline the principles of cognitive theory of multimedia learning;

6) to identify the meaning of transfer learning;

7) to study the ways of transfer learning activation in English lessons;

8) to examine if there are any hinders of transfer learning in ESP lessons;

9) to investigate the influence on transfer learning;

10) to define the role played by authentic multimedia in ESP lessons;

11) to verify experimentally the importance of the use of multimedia at technical university.

4. Multimedia and its Use in ESP Lessons

Multimedia is a union of all elements of technology (sound, image, video, inscriptions, text, high-quality graphics, and interactive environment) [1, 6]. It is considered one of the best educational techniques since it sets in motion multiple senses (sight and hearing) simultaneously. Therefore, multimedia means have the potential and functionality to make the foreign language study more comprehensive and enjoyable than

that with a textbook [7]. Audiovisual aids include various incentives to pay attention to educational information presented.

Any multimedia means comprises at least 3 elements of the following [1]:
1) audio (speech, background sounds);
2) digital video;
3) text (subtitles, captions);
4) graphics (drawings, maps);
5) photographic images;
6) data (graphs);
7) animation.

With multimedia, English teachers can mix the above-mentioned elements to provide their students with comprehensive authentic information to reach definite course results. Another positive influence of the educational means in question is demonstration of visually complex processes in a highly interactive way. And last but not least important aspect is interconnection of the new educational material with other correlated topics in a more natural manner [3, 5]. Beichner (1994) [8], among others, ascertained that multimedia has a positive influence on the knowledge retention and feelings of the students who study scientific subjects at universities. The importance of multimedia for students' cognitive and academic achievement, comprehension and new knowledge application should also be noted [1].

In the course of English for Specific Purposes teaching at technical faculties, multimedia in authentic foreign language provides the following advantages [1]:
– making the educational process dynamic;
– attraction and raising of attention to the lesson's topic and English as a whole, as well as looking at the subject matter from a broader perspective;
– communication of information, clarification of concepts and technical processes, connection of the knowledge received in the students' specialty lessons in the native language with the new material provided in the English language lessons;
– great stimulus for students' further feedback, interaction, and discussion of the issue presented in the video;
– creation of the connection between the study material and the real life;
– ability to present an educational matter of different complexity level corresponding to students' knowledge and expertise;
– combination of the received information (language and content) with students' prior knowledge, and further storing it in the long-term memory.

However, multimedia is beneficial in class only while it is used properly. Worth remembering is the fact that it must not be utilized as some form of entertainment but as an educational means – with tasks to ensure the foreign language learning prior, during and after watching audiovisual aids. Failure to present multimedia in the proper way may lead to negative outcomes concerning students' understanding, memorizing and achievements as a whole. Too much multimedia stimulation may harm the deeper cognitive processing without which learning becomes complicated [9].

4.1. Cognitive Theory of Multimedia Learning
Learning combines comprehension, transfer, and retention of new information and is defined as a change in (students') knowledge due to new experience [10].

It is vital to specify the process of educational material learning with the help of multimedia. Mayer (2001) [4] explains the cognitive functioning of students' learning from multimedia. According to the researcher, when students process a video simultaneously with an on-screen text (subtitles), their visual information processing channel may become overloaded. Whereas when the words are presented orally (along with the video), they can be perceived and processed via the verbal channel. Consequently, the cognitive load in the visual channel reduces.

The human information processing system includes dual channels for auditory and visual (i.e. verbal and pictorial) processing, each of which has limited processing capacity. For successful work with multimedia in the English language lesson, it is needed to integrate the new (audiovisual) material, which is being presented, with the students' prior knowledge. To do that, the cognitive theory of multimedia learning (CTML) outlines 7 standards of multimedia usage [2] – the principles of:
1) multimedia (it is easier for students to study using pictures and words than only the latter);
2) spatial contiguity (when related words and pictures are in close proximity, people study a material better);
3) temporal contiguity (it is more useful if pictures and words are presented on the video close together in time);
4) coherence (the results of study will be enhanced if irrelevant scenes and words are eliminated from educational video materials);
5) modality (students learn foreign languages better when they are viewing a clip and hear audio than while watching a video and concurrently reading a text);
6) redundancy (study using video and narration is more effective than with video, audio, and text);
7) individual differences (while studying some new topics, the learning progress of people with low prior content knowledge may be seen more clearly than of those who have been better previously informed about the subject matter).

The modality and redundancy principles are considered the bases that should be taken into account when a teacher is developing an English language lesson using multimedia. This is due to the fact that the combination of visual and hearing aids is an undeniable prerequisite of a successful lesson and students' positive results.

4.2. Transfer Learning
When teaching students of technical specialties, it is vital to know that transfer learning is possible and even necessary. This way of study means that the prior knowledge has an influence on new learning. An English teacher can trigger students' earlier gained expertise with the help of such transfer problem-solving questions as [2]:
– redesign (changing the design or function of some device): students will use their knowledge of parts of machines and their functioning to discuss and propose (in English) how to make their properties better;

– troubleshooting (logical analysis of some problem according to students' specialty);

– prediction (these questions comprise the knowledge of possible cause and effect of something);

– conceptual questions (their purpose is to determine and subsequently broaden students' general knowledge of concepts and components corresponding to the topic, which is being learned).

Transfer learning, undoubtedly, has the potential to prompt students' knowledge through connecting concepts learned in both English and technical subjects, but there are some negative sides to it, too. Student's previously acquired knowledge (meaning of a concept, order of some technology process, principles of a device/machine work) and attainments may hinder the comprehension of new information in the new context, and obtaining new skills. In this case, transfer learning becomes an obstacle for the students of technical specialties, and they may be unable to apply the received information properly [11].

With the transfer learning correlates directly mental model construction, working memory capacity, and comprehension.

Mental model construction is an internal mental picture of concepts or situations that supports comprehension, prediction, inference, and problem solving [12]. Each student's mental model construction distinguishes them from their group mates in terms of correctness and completeness of understanding of concepts' features and relationships with other ideas.

Working memory capacity is responsible for keeping information necessary for task performing in a highly active state and in the amount required. The capacity of the working memory is limited, that is why it can quickly become overloaded. As long as the working memory is needed for the control of the short-term memory, which, in its turn, is responsible for information processing, disposal, and retrieval, individuals whose working memory capacity is higher perform better on transfer tests [4, 13].

The last but not least element that influences transfer learning is comprehension. It is the ability to understand literal messages present in communication [14, 15].

4.3. Experimental verification

In order to demonstrate the role of multimedia in the ESP teaching at technical universities in practice, an experiment was conducted at the Institute of Energy Saving and Energy Management (IEE) of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" in April, 2017. Two groups of the third-year students were selected for a 4-week experiment. The experimental group was studying with the use of authentic multimedia aids (mostly videos) in English, and the control group was using only printed materials (books, handouts) during their study. For the accuracy of the experiment, an equal number of students (15) were chosen for each group from different departments of the IEE: Department of Power Supply, Department of Electric-Complexes Control Automation, and Department of Electromechanical Equipment for Energy-Consumption Industries.

The students of the IEE are future engineers and at the same time specialists in the fields of electricity, fuel, energy, and environmental protection. Thus, multimedia materials were chosen specifically among audio- and video recordings corresponding to the students' specialty, i.e. engineering, ecology, and energy saving and energy management.

The students' previously retained knowledge of English for Specific Purposes was checked with the help of a pre-study quiz, which included exercises on listening, reading, grammar, and speaking. The aim of the study was to improve the IEE students' listening and speaking skills; thus, their writing skills were not tested.

At the beginning of the ESP lessons, authentic audio recordings were used to put the students in the mood for work and perception of new information in English. Short fragments of Hollywood films were prepared to serve as lessons' video aids and the main teaching materials. Each of them lasted for 3–5 minutes and presented topics directly connected with the aforementioned specialty of the IEE students. The following movies were used as the sources: 'Erin Brockovich' (2000), 'A Civil Action' (1998), 'The China Syndrome' (1979). They all deal with different ecological issues: water pollution, safety hazards at a nuclear power plant, etc.

It should be mentioned that in the ESP lessons the clips of the Hollywood films, and so multimedia, played the roles of:

1) basis (at the stage of a topic presentation);

2) support (serving as an example during fulfilling conditionally communicative tasks of receptive-reproductive and productive character);

3) stimuli (used during the development of students' speaking skills with the help of conditionally communicative and communicative-productive exercises).

Various exercises were used to promote students' topics understanding, study of terminology and grammar, as well as development of communication skills. All activities were always linked to film fragments. The level of tasks' complexity was changing gradually from the simplest (with props and handouts) to the most complex (self-prepared monologues and dialogues on the lesson's subject matter).

Among the educational tasks of the experimental ESP lessons with multimedia aids at the University were enhancement of the technical students' understanding of English, both technical and general, and advancement of comprehension of specialty-related topics presented in the ESP lessons. In addition to that, simultaneous vocabulary enrichment, communication skills perfection, and improvement of the overall academic achievement and attitude to the English for Specific Purposes studying were important.

5. Results of the research

As the result, the IEE students of the experimental group became more responsive and involved in ESP lessons. Their proactivity in studying with multimedia means was one of the reasons of the academic achievement advancement in vocabulary, grammar, and overall understanding of specialty concepts and topics presented. After the four-week study, the statistical data showed that the number of tasks performed correctly by the students

of the experimental group was 33 % bigger than that of the control group. Thus, substantial difference could be seen between the two groups concerning students' performance during the experiment and in the post-study test (in comparison with the pre-study test results) in favour of the experimental group.

The research has shown that multimedia-based ESP teaching can be effective because it enhances students' interaction with the course materials making them easier to process and remember. This is due to the fact that audiovisual data have much more potential than any other educational aids to be kept in the long-term memory of students, regardless of their age.

From the perspective of an English for Specific Purposes lecturer, it can be seen that with multimedia students have much more stimuli and interest in studying English, better understanding of concepts and technology processes taught in English, a constant desire to enrich their knowledge and share their thoughts on various topics of foreign language lessons. What is more important, students are not afraid to make some mistakes–lexical or grammatical–as long as they understand that the communication they are in is between the peers, whose support they feel every step of the way. Thus, the class work becomes not only a student-teacher conversation or passive listening to others but attention shifts to students' actions. In this case, the English teacher becomes a consultant and regulator, who sets the students on the right track. That is an obvious and undeniable proof of the importance of multimedia implementation for improvement of modern ESP lessons at technical universities.

6. Conclusions

The following research results have been obtained:

1. Multimedia consists of various elements of technology: audio, video, images, inscriptions, text, graphics, animation, and interactive environment.

2. The advantages of authentic multimedia use in ESP lessons are: making the educational process dynamic; attraction and raising of attention to the lesson's topic and English language as a whole; looking at the subject matter from a broader perspective; communication of data, clarification of concepts and technical processes; joining of prior knowledge in the native language and new information in English, as well as the study material and the real life; provision of a great stimulus for students' feedback, interaction, and discussion; ability to present an educational matter of different complexity level corresponding to students' knowledge and expertise; combination of the received information (language and content) with students' prior knowledge, and further storing it in the long-term memory.

3. Negative outcomes of multimedia usage at technical universities may occur if the educational means in question is utilized in the form of entertainment, i.e. just for the purpose of viewing without any tasks. Among disadvantages are: students' misunderstanding of foreign language vocabulary and topics, problems with memorizing, and poor achievements as a whole. In addition to this, too much multimedia stimulation may make learning complicated.

4. In ESP lessons, the educational material is learned with the help of authentic multimedia in the way stated below. People perceive information through two (dual) channels–for auditory and visual processing–simultaneously. Then, the received verbal and pictorial data are joined together in the mind, and eventually transferred to the short-term and the long-term memory. The information processing channels have limited processing capacity. With authentic multimedia, they do not become overloaded. When students watch a video record, and words are not written but presented orally (along with the video), they can be perceived and processed via the verbal channel. Therefore, the non-verbal (visual) channel does not have to handle all the information on its own.

5. The principles of cognitive theory of multimedia learning are: principles of multimedia, spatial contiguity, temporal contiguity, coherence, modality, redundancy, and individual differences.

6. Transfer learning is the influence of prior knowledge on the new educational material learning.

7. The ways of transfer learning activation in English lessons are such transfer problem-solving questions as redesign, troubleshooting, prediction, as well as conceptual questions.

8. Student's previously acquired knowledge and attainments may hinder the comprehension of new information in the new context and obtaining new skills, i.e. transfer learning in ESP lessons.

9. Students' mental model constructions, working memory capacity, and comprehension influence transfer learning.

10. In ESP lessons, multimedia can play the roles of basis, support, and stimuli during the fulfilment of tasks with various levels of complexity.

11. The four-week experimental verification of the importance of multimedia in ESP lessons at the technical university has shown that the final results of the experimental group (using authentic multimedia directly connected with their specialty) were 33% higher than those of the control group (using printed materials).

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ІНФОРМАЦІЙНО-ТЕХНОЛОГІЧНЕ ЗАБЕЗПЕЧЕННЯ ФАХОВОЇ ПІДГОТОВКИ ВЧИТЕЛІВ У СИСТЕМІ ПІСЛЯДИПЛОМНОЇ ОСВІТИ

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У статті досліджено інформаційні технології як об'єкт професійної педагогіки, розкрито сутність процесу інформатизації системи післядипломної освіти вчителів, На основі аналізу зроблених висновків можна стверджувати, що використання інформаційно-технологічного забезпечення фахової підготовки вчителя в системі післядипломної освіти відкриває значні можливості щодо створення неперервної освіти вчителя відповідно до сучасних освітніх вимог
Ключові слова: інформаційно-технологічне забезпечення, післядипломна освіта, інформатизація освіти, інформаційні ресурси, інформаційно-комунікаційні технології

1. Вступ

Застосування інформаційних технологій в усіх галузях життя визначає сутність змін в системі освіти. Тому поняття освіти, відкритої освіти впродовж життя, інноваційний характер освіти в інформаційному суспільстві, її віртуалізації, є актуальними як для учених, так і для вчителів-практиків.

Наразі спостерігається стала залежність між ефективною діяльністю науково-педагогічних працівників та рівнем їх професійної компетентності, що здебільшого визначається не обсягом засвоєного змісту знань, а рівнем розвитку мислення, умінням самостійно навчатися впродовж життя, здійснювати самоконтроль діяльності, безперервно самовдосконалюватися. Разом з тим посилюється невідповідність між результатом діяльності викладача та потребами випускника, що призводить до науково-педагогічної діяльності, покращення інформаційно-технологічного забезпечення навчання як підготовки в умовах післядипломної освіти.

Усі проблеми проявляються у недостатньому рівні знань, умінь і навичок більшості випускників педагогічних ВНЗ у роботі з базами даних, комп'ютерними програмами як прикладного характеру так і спеціальними, здійснення інформаційно-аналітичної діяльності [1].

Головним завданням сучасного педагогічного вишу є підготовка творчого педагога, який уміє використовувати новітні досягнення в галузі педагогіки, психології, інформатики, управління, формування в нього вміння здійснювати фахову інформаційно-аналітичну діяльність що значно підвищує результат