
ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ В ОБРАЗОВАНИИ

УДК 372.881.111.1

DOI: 10.17853/1994-5639-2021-6-216-245

THE DEVELOPMENT OF FUTURE FOREIGN LANGUAGE TEACHERS' DIGITAL COMPETENCES IN CREATING MULTIMEDIA TUTORIALS

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Abstract. *Introduction.* The article considers the problem of the development of future teachers' digital competences in creating foreign language multimedia tutorials and presents the results of the corresponding research conducted by the authors. In the context of the digitalisation of education, the foreign language multimedia tutorials represent an effective means of organising and integrating authentic audio-visual materials into the learning process. Nevertheless, FL (foreign language) teachers today face the problem of the lack of the competences, including digital ones, necessary for the development of effective multimedia tutorials, which cannot be created without the awareness of the methodological foundations of their designing, mastering of the relevant software tools and obtaining the corresponding level of digital skills of their usage.

Aim. The current research is aimed to identify the effectiveness of the training course for future teachers in the development of foreign language multimedia tutorials based on authentic audio-visual materials. The training course was conducted at Academician E. A. Buketov Karaganda University among 30 graduate students.

Methodology and research methods. The research work was based on the determination of four levels of training in the field of development of multimedia foreign language tutorials: recognition-based, reproductive (adaptive), heuristic, creative.

Results and scientific novelty. The developed training course proved its effectiveness in increasing the level of development of digital competences of future FL teachers in the field of designing multimedia educational resources. The research results demonstrated that 80 % of the participants achieved the heuristic level in the field of the development of digital education-

al resources, namely multimedia tutorials, getting the required 60 % and more points (according to Bepalko V. P.) in the final assessment of academic achievement.

Practical significance. The corresponding authoring experimental training course contributes to solving the problem of the development of the future FL teachers' competences when creating multimedia educational resources, and to the problem of skills formation when using appropriate software to create multimedia educational resources.

Keywords: digital competences, multimedia, multimedia tutorials, foreign language multimedia tutorials.

Acknowledgements. The authors express their gratitude to the Editorial Board of the Education and Science Journal for their support in publishing the research results. Moreover, the authors would like to thank the reviewers, whose comments helped to improve the structure and the content of the article.

For citation: Smagulova G. Zh., Sarzhanova G. B., Tleuzhanova G. K., Stanciu N. The development of future foreign language teachers' digital competences in creating multimedia tutorials. *The Education and Science Journal*. 2021; 23 (6): 216-245. DOI: 10.17853/1994-5639-2021-6-216-245

РАЗВИТИЕ ЦИФРОВЫХ КОМПЕТЕНЦИЙ БУДУЩИХ УЧИТЕЛЕЙ ИНОСТРАННОГО ЯЗЫКА В ОБЛАСТИ РАЗРАБОТКИ МУЛЬТИМЕДИЙНЫХ УЧЕБНЫХ ПОСОБИЙ

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Аннотация. Введение. В статье рассматривается проблема развития цифровых компетенций будущих учителей в области разработки мультимедийных учебных пособий по иностранному языку, а также представлены результаты соответствующих исследований, проведенных авторами. В контексте цифровизации образования мультимедийные учебные пособия по иностранному языку представляют собой эффективное средство для организации аутентичных аудио- и видеоматериалов и их интеграции в учебный процесс. Тем не менее в настоящее время учителя иностранных языков сталкиваются с проблемой недостаточного уровня развития компетенций, в том числе цифровых, необходимых для создания эффективных мультимедийных учебных пособий, которые невозможно спроектировать без знания методологических основ их разработки, а также владения соответствующими программными инструментами.

Цель исследования состоит в выявлении эффективности курса подготовки будущих учителей к разработке мультимедийных учебных пособий по иностранному языку на осно-

ве аутентичных аудио- и видеоматериалов, проведенного среди 30 студентов выпускного курса на базе Карагандинского университета им. академика Е. А. Букетова.

Методология и методы исследования. В основу исследования положено выделение 4 уровней подготовки в области разработки мультимедийных учебных пособий по иностранному языку: распознавательного, адаптивного (репродуктивного), эвристического (продуктивного), творческого.

Результаты и научная новизна. Разработанный авторский курс доказал свою эффективность в повышении уровня развития цифровых компетенций будущих учителей иностранного языка в области разработки мультимедийных образовательных ресурсов. Результаты проведенного исследования показали, что 80 % участников достигли эвристического уровня в области разработки цифровых образовательных ресурсов, а именно мультимедийных учебных пособий, набрав требуемые 60 % и более баллов (по В. П. Беспалько) в итоговом оценивании учебных достижений.

Практическая значимость. Экспериментальный учебный курс в рамках исследования вносит вклад в решение проблемы развития цифровых компетенций будущих учителей иностранного языка в области разработки мультимедийных учебных пособий и формирования навыков использования соответствующего программного обеспечения для создания мультимедийных образовательных ресурсов.

Ключевые слова: цифровые компетенции, мультимедиа, мультимедийные учебные пособия, мультимедийные учебные пособия по иностранному языку.

Благодарности. Авторы выражают благодарность редакционной коллегии журнала «Образование и наука» за оказанную поддержку в публикации результатов исследования, а также рецензентам, чьи замечания помогли улучшить структуру и содержание изложенного в статье материала.

Для цитирования: Смагулова Г. Ж., Саржанова Г. Б., Тлеужанова Г. К., Станчу Н. Развитие цифровых компетенций будущих учителей иностранного языка в области разработки мультимедийных учебных пособий // Образование и наука. 2021. Т. 23, № 6. С. 216–245. DOI: 10.17853/1994-5639-2021-6-216-245

Introduction

The modern stage of digitalisation of education is characterised by the transition to a qualitatively new level associated with the active use of information technologies in the educational process. The development of information and digital technologies leads to significant restructuring of the information environment of the modern society, opens up brand-new opportunities for social progress, development of e-learning and distance learning technologies. For foreign language (FL) teachers, the process of digitalisation creates both new possibilities and challenges, including mastering new teaching methods and proficiencies. Nevertheless, teachers are in great need of support when developing their digital competences to realise the opportunities of modern digital technologies in the educational process.

In the context of digitalisation, for a modern teacher, the ability to use new information and digital technologies effectively becomes highly important, and it is worth noting that at present educators are focused not only on the use of existing software and technical products but also on the development of their multimedia educational tutorials aimed at solving specific educational tasks.

The digitalisation of education creates both problems and positive aspects that contribute to the effective management of the learning process. Today, a growing number of jobs require a high level of digital competences, and many new vacancies are based on specialised digital skills [1]. In the social sphere, digitalisation can widen the gap between people, who possess only basic skills or do not possess them at all, and those, who have higher-level digital skills, and thus contribute to the exclusion of some parts of the population from some aspects of social life [2]. According to Cachia R., in the field of education, the correct and pedagogical use of digital technologies is of great importance [3]. The digital environment requires teachers to have a quite different mentality, as well as a different picture of the world and innovative methods and forms of work with students.

Bulman G. and Escueta M. prove that the results of the impact of the use of digital technologies in the educational aspect and for the organisation of effective learning process are still few and the results are still mixed [4, 5]. Nevertheless, Blossfeld H. P. and Süss D. state that the use of digital technologies can provide innovative and stimulating learning conditions, and improve individual learning strategies and positively affect students' motivation [6, 7].

Literature Review

The problem of the development of multimedia tutorials. The main problem of the development of effective multimedia tutorials is associated with teachers' insufficient readiness and unwillingness to integrate digital and multimedia technologies in their professional activity. Redecker C. notes that teachers need several specific competences, which will allow them to realise the potential of digital technologies to transform their educational activities [8]. Conrads J. states that digital technologies represent a means of achieving certain learning outcomes. The integration of digital technologies into the educational process opens up new opportunities for creative learning, for strengthening the position of innovative learning and for improving student learning outcomes. However, to ensure the positive impact of digital technologies, certain conditions must be met, including the possession by teachers of both relevant competences and a positive attitude towards the necessary changes [9].

Bransford J. mentions that through integrating technology into the learning process teachers get the opportunity to refer to the authentic materials, vi-

sualise and analyse information together with the learners, thus getting benefit from electronic reflection [10].

Integration of ICT (Information and Communication Technologies) into education and curriculum can facilitate and improve the learning process; however, teachers still need support in implementing digital technologies into their professional practice [11]. Marsh D. and others underline the benefit of implementing ICT into the educational process both on the part of a teacher and a pupil basically as a result of the changes and advances in teaching theories [12].

Defining digital competences. In the context of the digitalisation of education, a modern teacher's digital competences, which characterise his/her ability to use concrete knowledge and modern ICT in the professional sphere, communication and software products in practice, are becoming important for his/her further development as a specialist.

It becomes clear that not being specialists in the IT (Information Technologies) sphere and not having the specific digital competences, FL teachers face the problem of selecting optimum and convenient software products to create an effective educational multimedia tutorial, which allows providing feedback, to adapt to the student's characteristics, and to provide interactivity and automation of control. The development of multimedia tutorials will allow an EFL (English as a Foreign Language) teacher to integrate multimedia content into the educational process using applied and instrumental programs. To create such multimedia digital resources, teachers apart from the universal digital skills necessary for everyday life, need specific digital skills to apply digital technologies in their professional practice and be ready to get adapted to technological changes and requirements. Particularly, The DigCompEdu framework defines six different areas organising teachers' digital competences (total 22 competences), one of which – namely, “digital resources” – implies educators' proficiency in developing and applying digital resources and responsibly choosing and integrating digital content to support their professional activity [13].

The overview of the definition of the term “digital competence” has indicated that the understanding of the given notion is closely related to the use of modern technologies and constantly changing characteristics of ICT that require appropriate skills development needed for their applications. This understanding is expressed in the general definition of digital competence given within the European e-Competence Framework, according to which digital competence is regarded as “*a durable concept and although technology, jobs, marketing terminology and promotional concepts within the ICT environment change rapidly, the e-CF remains durable requiring maintenance approximately every three years to maintain relevance*” [14, p. 5].

Digital competence is also defined as digital literacy, which includes several basic digital skills comprising online collaboration, network communication,

digital media production, security and problem-solving. Digital competence is the ability to use mentioned digital skills in a reasonable, effective and responsible way in a specific context (education). Since 2006, digital competence has been included in the list of eight key competences for lifelong learning in terms of EU [15].

The key point in the definition of digital literacy given by UNESCO is the abilities to apply digital devices and social networks to search for, contribute and share information. These abilities are supposed to allow people to produce and manage digital media content, collaborate and find solutions to the problems in an effective way thus improving and reaching self-fulfilment in different areas of their life [16].

Studies show that the need of the provision of teachers' pedagogical and technical support to apply effectively digital technologies becomes a decisive factor in the development of teachers' digital competences. Thus, according to the studies of the European Commission and Education, Audiovisual and Culture Executive Agency (EACEA), teachers' ideas about the benefits of digital technologies in the educational process also confirm that the right skills and a positive attitude are crucial for the effectiveness of these technologies. According to the 2nd school survey, which examines "*the progress in the field of ICT in education*" along with "*factors related to equipment*", it becomes clear that teachers consider the lack of appropriate skills and competences and pedagogical models to be an important obstacle to the effective use of ICT in the educational process [17]. The problem of teachers' digital attitudes and competences was studied by several researchers, who interpreted teacher digital proficiencies in a professional context [18, 19]. Krumsvik R. states that teachers' digital competence can be identified as their proficiency in applying ICT in professional practice with the awareness of their implications for learning strategies [18]. Milliner B. tried to identify the overall level of teachers' digital competence and the problems to be solved concerning their skills of performing in the digital environment [19].

The methodological basis of the present study is composed of the numerous works devoted to the problem of digital competences development regarded in the different aspects, including the proper use of ICT technologies and digital media in the educational process both on the part of teachers and learners. Gushchina O. M. in her review discusses a competence-based approach in creating information – educational environment [20]. Yachina N. P. highlights the necessity for the development of teachers' skills in the field of designing electronic textbooks [21]. Põldoja H., Väljataga T., Laanpere M., Tammets K. in their work presented a model of a teachers' digital competence development. The model includes five basic areas of professional digital competence, such as preparing students in a digital environment, designing learning experiences and environment, modelling work environments, promoting digital democracy, and, finally, active participa-

tion in the professional development process [22]. Ferrari A. in her overview analysed various frameworks concerning digital competence. Ferrari A. contributes to the notion of “professional digital competence” and the way digital competence can be used in teacher education by adding into problem-solving category into the Norwegian general framework of digital competence consisting of information, communication, production and digital safety [23].

Quarles A. M., Conway C. S., Harris S., Osler J., Rech L. [24] in their work prove the fact that the digital environment of the classroom should include modern teaching strategies to provide learners’ interest and their use of the latest digital and mobile technologies in the process in the educational process. Shmakova A. P. [25], Fedotova E. L. [26] underline the importance of proper use of modern ICT in the teacher’s professional activity. Maxwell A., Jiang Z., Chen C. [27] state that the teaching style normally changes from generation to generation and for the modern generation of learners the proficiency in digital technologies is of great importance. Demarle-Meusel H., Sabitzer B., Sylle J. [28] in their review show the necessity of creating a digital laboratory at the universities as the means of digital competences development both of teachers and students.

Blake R. exploring the new trends in using technology, namely computer-assisted language learning in foreign language teaching, states that: “*CALL researchers are increasingly finding that teachers’ lack of experience with using technology – that is, their inability to take into account its affordances as well as its engrained cultures of use can often present the most serious barrier to its successful integration into the language curriculum*” [29].

Jones A. and Bennett R. [30] devoted their research to the problem of the recession of the quality of traditional methods of teaching as the result of the tendency to digitise the aspects of higher education to satisfy an increasingly diverse and large-scale university market.

Thus, after analysing the approaches to the interpretation of the term, we consider teachers’ digital competences not just as the ability to work with computers, but the skills of communicating in social networks, searching for information online, applying and sharing digital content, and creating digital and multimedia educational resources for solving educational tasks. We also propose completing the notion of teachers’ digital competences with the following skills: understanding the general structure and interaction of computer devices; understanding the innovative potential of digital technologies; basic understanding of the reliability of the information received; the ability to use programs for the development of digital educational resources. The content of the notion of digital competences comes down to understanding that if there is clarity in the structure and content of digital reality, then there will be clarity in the control and interaction with digital technologies.

Defining multimedia and multimedia tutorials. At present time, modern teaching aids are used in the new multimedia format, which allows teachers to combine different types of information, such as texts, audio, video, graphics and animation elements in one product.

The term “multimedia” is used quite widely and ambiguously; there are several different approaches to the interpretation of this concept:

- multimedia as an idea is a new approach to the storage of information of various types. Multimedia is considered as a generalising type of information that combines both traditional static visual (text, graphics) and dynamic information of various types (speech, music, video fragments, animation, etc.).

- multimedia is a technology based on the simultaneous use of various means of presenting information and representing a set of techniques, methods, and means of collecting, accumulating, processing, storing, transmitting and producing audio-visual, textual, graphic information. The basis of multimedia technology consists of two main components – hardware (a complex of hardware tools, which makes it possible to work with the information of different types) and software (computer software aimed at processing and presenting information of various types), used to develop multimedia products. Further development of multimedia goes in the direction of combining heterogeneous types of data in digital form in one medium within the same system;

- multimedia as a product is an organised collection of multimedia elements, at least two of which are of various kinds, connected by a certain scenario, equipped with navigation tools and designed primarily for visual and auditory perception.

Due to the difference in approaches, there are various definitions of this term. Berk E. and Devlin J. define multimedia as “*a combination of different content forms (text, audio, video, images, and interactive content) which can be recorded and played, interacted with or accessed by computerised and electronic devices. Multimedia is opposed to outdated text displays or printed hand-outs. Multimedia devices represent electronic devices applied for storing and displaying digital multimedia content*” [31]. Fox E. notes that to be regarded as multimedia a program should combine at least two different constituent elements such as graphics, video/audio content and text [32].

There is no doubt that the effective use of multimedia in the process of creating an authentic foreign language learning environment greatly enhances language acquisition. Mayer R. in his work explains that watching videos, though may seem to be passive, includes high cognitive activity necessary for active learning. The content of audio and video materials included in multimedia tutorial is an important element for involving students in the educational process as active participants and should be consistent with the educational goals,

as well as the age and skills of the students. In his work, Mayer R. founded twelve principles of multimedia design on the theory of multimedia learning and cognitive load theory [33].

Gilakjani A. P., Ahmadi S. M. state that multimedia by itself does not imply high learning and teaching results and environment. Providing teachers with benefits of updating the learning and teaching process, multimedia does not solve the tasks of resourcing and motivation in education. Technology should be applied in an effective way [34].

The common point in the definitions given above is that when it comes to multimedia, it is a question of combining text, graphics, animation, video and sound, which allows various methods of structuring, integration and presentation.

Thus, most definitions of this term agree that multimedia includes text, graphic, animation, video and sound information that allows various methods of structuring, integration and presentation. In our opinion, “multimedia” denotes computer technology that uses not only text but also graphics, colour, sound, animation, video images in any combination to represent information. Accordingly, we consider the “multimedia tutorial” as an educational tool, which is created using computer multimedia technology, that is, technology for transmitting video, sound, colour, graphics, etc. in any combination.

The use of multimedia technologies allows the teacher to manage the demonstration of visual material, organise group work and effectively create their innovative developments, not violating the usual rhythm and style of work.

Thus, multimedia technologies provide such a way of presenting information in which a person perceives it at once by several senses simultaneously, but not sequentially, as is done with traditional training. With a combined effect on a student through vision and hearing and his/her involvement in active actions, the proportion of acquisition of educational material can reach up to 75 %. LeLoup W. J. and Ponterio R. state that multimedia in terms of the foreign language classroom has associated the use of authentic materials which facilitates students’ understanding of the target language culture. LeLoup W. J. and Ponterio R. affirm that “*Digitising the images, sound, and video that represent multimedia can facilitate their distribution*” [35].

The experimental course designed by the authors of the present research is aimed to contribute to the solution of the problem of future EFL teachers’ digital competences development in the field of creating multimedia educational resources. The results of the experimental work held to prove the effectiveness of the designed course may be applied in similar investigations associated with creating digital educational content and application of digital technologies in the educational process.

Materials and Methods

Methods

The following research methods were used in the present research: analysis, generalisation of existing scientific provisions and derivation of new knowledge; conduction of an experiment; statistical analysis of the data obtained. This article describes practical observations and experimental data gained during an experiment based on students' learning outcomes and their independent development of multimedia educational tutorials.

Research hypothesis

The hypothesis of the research was as follows: the implementation of the course content, which is based on an integrative approach to the development of multimedia foreign language tutorials, combining the theoretical and methodological foundations of designing the corresponding multimedia educational resources in combination with the development of digital skills in mastering software tools for their creating, will allow the prevailing number of students to get the required sum of points (corresponding to 60 % and more for final assessment testing) and achieve a heuristic (productive) level of training in the field of creating of the mentioned above multimedia products.

Limitations

The research was carried out on the basis of Academician E. A. Buketov Karaganda University among 30 graduate students majoring in teaching English. The corresponding training course was organised to prepare future EFL teachers to develop multimedia foreign language tutorials based on authentic audio-visual materials. The course also included the objectives of increasing future EFL teachers' awareness of methods of selecting, applying and editing authentic audio-visual materials within the designed multimedia tutorial; developing their digital competences in using corresponding course authoring software to compile selected audio-visual materials and developed a set of exercises into one single educational resource.

The training course can be implemented for future and present FL teachers to increase the level of development of their digital competences in the sphere of creating multimedia educational resources.

In the process of investigation, the assessment and analysis of 30 initial test samples and final works of 30 graduate students majoring in teaching English at Academician E.A. Buketov Karaganda University was carried out.

Procedure

At Stage I (an ascertaining stage), the initial level of students' training in the field of the development of multimedia foreign language tutorials was deter-

mined. As a method for determining the initial level of training, we have chosen the test aimed at revealing students' competences in the field of the development of foreign language multimedia tutorials, in particular, questions concerning the theoretical background of constructing multimedia course and the ability and competences in using applied and instrumental software. The test consisted of two parts, each comprising 10 questions (0,5 points for each correct answer):

1) the theoretical basis of the development of foreign language tutorials, the stages, methods, principles and requirements;

2) IT and digital competences allowing participants to learn to design multimedia tutorials.

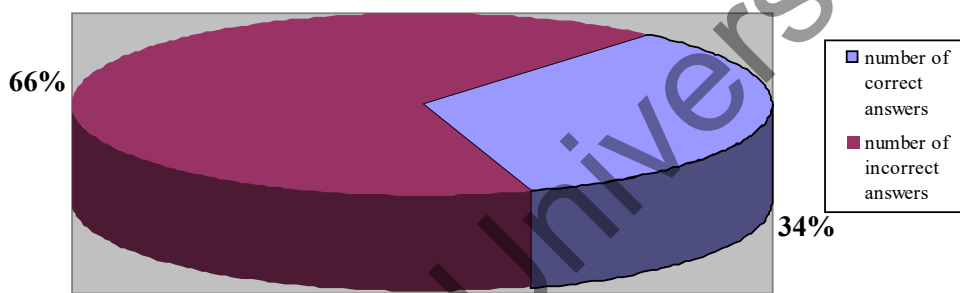


Fig. 1. The correlation of students' correct and incorrect answers of the entrance diagnostic test, reflecting the initial level of their competence in the field of the development of multimedia foreign language tutorials

The results of the test have shown that the students do not have sufficient knowledge of the development of foreign language multimedia tutorials, the number of correct answers composed less than 34 % (Fig. 1). It can be stated that the level of theoretical knowledge of most students corresponds to the reproductive level of training and does not imply the necessary digital skills for the development of foreign language multimedia tutorials.

Stage II (a formative stage) consisted of organising classes on the course "Technology of the development of foreign language multimedia educational tutorials based on authentic audio-visual materials".

The content of the course is reflected in Table 1.

The use of a block-modular structure of training content within the framework of our research should improve the quality of student training due to the structured composition of the educational material and the completeness of sections fulfilment.

Table 1

The content of the course “Technology of the development of foreign language multimedia educational tutorials based on authentic audio-visual materials”

Block 1. Theoretical aspects of the development of foreign language multimedia educational tutorials based on authentic audio-visual materials.
Module 1. The concept of a multimedia educational tutorial.
Module 2. The types of foreign language multimedia educational tutorials based on authentic audio-visual materials.
Module 3. Authentic audio-visual materials as the basis of media content of foreign language multimedia educational tutorials.
Module 4. Psycho-pedagogical and technological requirements for the development of foreign language multimedia educational tutorials.
Module 5. The stages of the development of foreign language multimedia educational tutorials.
Block 2. Multimedia technologies of processing audio-visual materials.
Module 1. Searching, preparing and technical adaptation of audio-visual materials in multimedia educational tutorials.
Module 2. Programs for processing and non-linear editing of audio-visual information.
Block 3. The technology of the development of foreign language multimedia educational tutorials based on authentic audio-visual materials and on authoring course software.
Module 1. The review of applied and instrumental software of the development of foreign language multimedia educational tutorials based on authentic audio-visual materials. Possibilities of authoring course software (Adobe Flash, ISpingSuite9, TurboSite, SunRay BookOffice).
Module 2. Development of foreign language multimedia educational tutorials based on authentic audio-visual materials on the base of ISpingSuite9.

The course was organised in three stages:

- theoretical stage: students consider the concept and types of multimedia foreign language tutorials and the possibilities of their development including authentic audio-visual materials, as well as the principles and stages of their designing and compiling; techniques of creating tasks and exercises based on authentic audio-visual materials as part of their methodological adaptation; the students study methodological foundations and get acquainted with the stages of the development of multimedia foreign language tutorials;
- technological stage was aimed at students' skills development to work with multimedia technologies for linear and non-linear editing, processing and compiling of standard formats of authentic audio-visual information. As part of

this block, students learn to process and edit authentic audio-visual information using multimedia editors, such as Ulead MediaStudio Pro, Windows Movie Maker, Adobe Premier Pro, Sound Forge, etc., to create simple interactive tasks, and to link information objects of multimedia tutorials;

- professionally-oriented, aimed at forming students' knowledge of the technology for the development of multimedia foreign language tutorials. Within the framework of this block, future teachers select authentic audio-visual materials, which are most suitable for being applied in a multimedia foreign language tutorial, considering its type and goals, selecting authoring course software to create a multimedia foreign language tutorial, and to develop and process the training material into separate sections and modules; as well as to develop a convenient software shell and navigation of a multimedia tutorial based on selected software tool (course authoring software iSpring Suite 9). The students were supposed to design and develop the structure of their own multimedia foreign language tutorials.

While creating an independent project, the students were expected to work according to the following stages of the development of a multimedia foreign language tutorial:

1) Designing a project of a multimedia tutorial based on setting its educational goals and objectives (the author defines the concept and the purpose of the future educational resource, its objectives and scope of usage). For example:

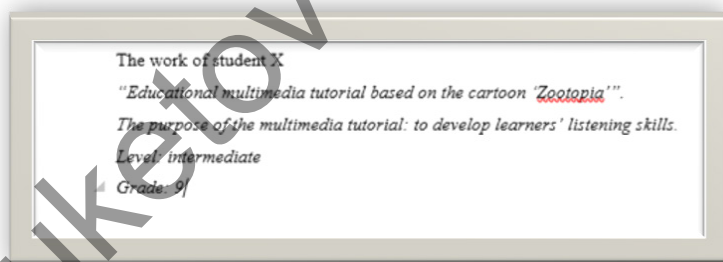


Fig. 2. Defining the purpose and the concept of the multimedia educational tutorial

The phase of designing a project of a multimedia tutorial implies the preparation of its programme. The programme of the tutorial provides the main idea of the multimedia product, its educational goals and possible scope of usage. A clear definition of the goals and objectives of the tutorial allows the user to realise the essence and functions of the resource, to determine its correspondence to his/her cognitive interests, needs and opportunities. The degree of this correspondence determines the level of own cognitive activity motivation, which

performs an incentive and sense-forming function in the further usage of the multimedia tutorial.

2) Selection and preparation of the content (including text, graphics, audio and video episodes) of educational materials to be included in a multimedia tutorial (here the student divides the content into parts and episodes if necessary and develop a set of exercises by the purpose and tasks set). At this stage, authentic audio-visual materials are selected following the curriculum of the discipline (Fig. 3).

Zootopia.
Episode 1 (00.00-00.05.50)

1. Pre-viewing stage
Task: Look through the following words and word combinations. Give their Russian equivalents:

English word	Meaning	Russian equivalent
A predator	an animal that kills and eats other animals	
A prey	an animal, bird that is hunted and eaten by another animal	
A hunter	person who hunts wild animals	
A mammal	a type of animal that drinks milk from its mother's body when it is young	
to give up	to stop trying to do something	

2. While-viewing stage
Task: Fill in the missing words:
 A world where were _____ predators.
 One day the world was divided in two _____ predator and _____ prey.
 I don't _____ be a lonely hunter anymore.
 I can make the world _____.
 I am going to be a police _____.

3. Post-viewing stage
Mark the sentences T (true) or F (false):
 1. Bunny is going to be a hunter.
 2. The world was divided in two: vicious prey and meek predator.
 3. Zootopia is a place where our ancestors first joined together and declared that anyone can be anything.
 4. Judy's mother and father want Judy

Fig. 3. Sample of development of a set of exercises to the authentic English video (on the example of "Zootopia" cartoon)

Selection of authentic audio-visual content should be carried out under the principles and requirements for this type of educational material, if necessary, methodological adaptation can be carried out with the assistance of constructive editing that does not affect the originality of the language content and is aimed at shortening the plot or highlighting the necessary audio-visual episodes. Such editing can be done in the programs UleadPro, FrontPage, SoundForge. The stage of selection and preparation of multimedia tutorial content requires the choice of textual, audio-visual material corresponding to the goals set. Meanwhile, the selection of the content is determined by the curriculum and the level of learners' language acquisition.

3) Compiling and editing a multimedia tutorial based on chosen software (the students identify the structure, the content of the tutorial and compile it in the appropriate software).

The stage of compiling materials into a single software package is understood as the process of connecting all course materials presented in electronic form using special software tools. As a result, we get the corresponding modules combined into a single application (tutorial) the students work with. The choice of software tools is significantly determined to be the format of the data presentation, location of the information modules and the way of access to the material.

When compiling materials into a ready-made multimedia tutorial, it is also important to consider the author's participation, which is possible in three ways:

1) as a consultant, which performs the analysis and discussion of the structure of the tutorial with the programmer; the author does not need special skills of working with software tools, however, knowledge of the capabilities of the computer technologies used are necessary for him/her to understand what can be done with their assistance;

2) personal participation implies that the teacher develops the multimedia tutorial himself (independently) using programming software tools that generate program code automatically, thus eliminating the necessity of the knowledge of programming languages. The author should master the usage of the course authoring software, the purpose of which is to design interactive and multimedia electronic tutorials (courses) and embed the ready multimedia product in formats convenient for presentation (HTML, Flash), as well as teaching material formats (such as SCORM, AICC, IMS) to download it in the distance learning systems;

3) combination of the author and the programmer in one person: this option requires the author to know programming languages (such as Pascal, Delphi, etc.).

During the course the students work within the second approach using the course authoring software (iSpring Suite 9):

4) preparing the documentation for the multimedia tutorial. At this stage of the development of a multimedia tutorial, the corresponding documentation should be prepared: abstracts, imprints, user's manual, an authorship certificate, an agreement of using authentic audio/video if needed, etc.

5) testing of the developed multimedia educational tutorial (the students carry out beta – testing of the developed multimedia tutorial within among the groupmates, correct mistakes and eliminate drawbacks). Testing is an important stage of the technological cycle, allowing the author to adjust and improve the multimedia tutorial. Alpha testing is done by course developers to identify errors in the program. Thus, the shortcomings of the tutorials in production conditions are identified. Beta testing is carried out by a group of real users who

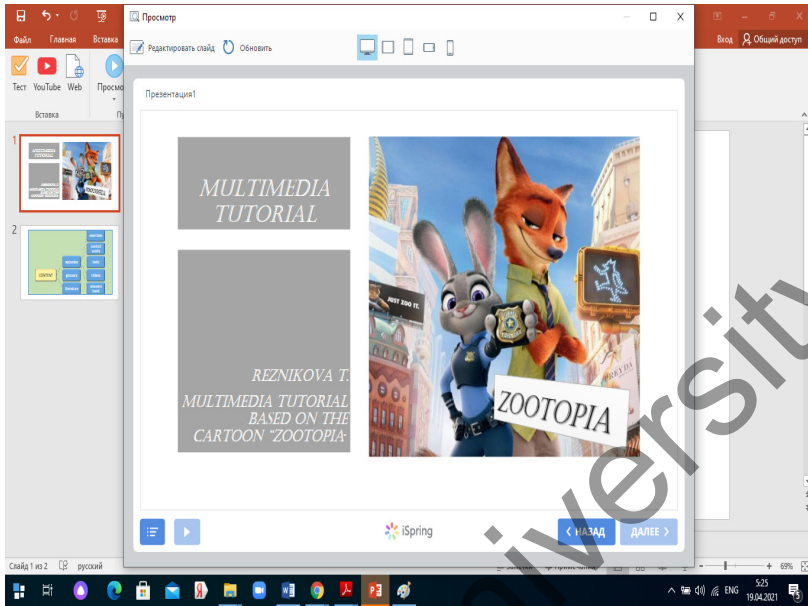


Fig. 4. Multimedia tutorial interface sample compiled in iSpring Suite 9

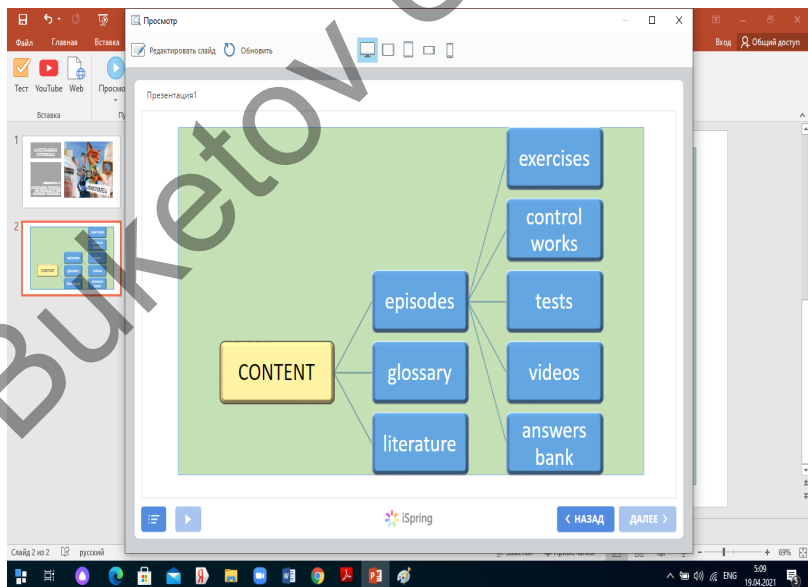


Fig. 5. The interactive list of the content of the multimedia tutorial compiled in iSpring Suite 9

also detect errors and give their description; in addition, they can also prepare general comments and recommendations on the multimedia tutorial. Testing educational multimedia tutorials in a real educational process can be part of beta testing. The results of such testing are aimed at improving the developed multimedia tutorials.

At Stage III of the research (a control stage), we evaluated the level of training achieved by the students using two types of final assessment: the test containing complex multi-level questions, and the independent training project – a multimedia foreign language tutorial developed by the student.

Results and Discussion

The concept of the research work was based on distinguishing 4 levels of training (according to Bepalko V. P.) in the field of development of multimedia foreign language tutorials: recognition-based, reproductive (adaptive), heuristic (expert) and creative [36].

The model of training levels:

1. The level of recognition.

At this level, the student can distinguish between the studied objects, formulas, models, devices in their direct presentation. It is the initial level of mastering the activity in the process of training in a certain area (the level of familiarity). The main feature of assimilation (interiorisation) at this level is the inability of the student to reproduce and apply the assimilated information independently, without outside assistance (hint, instruction and algorithm).

2. The level of reproductive algorithmic action.

The student reproduces the material studied based on previously learned algorithms (supports), which are applied from memory; it is the level of initial professional activity. At this level, the student can reproduce previously learned information from memory and apply the learning algorithms of activity (without outside assistance) to solve typical problems. No new information is created at this level of activity.

3. The level of productive (heuristic) action.

The student completes an educational task based on a combination of previously studied algorithms and methods of action; solves atypical tasks by performing productive actions of a heuristic type. It is the level of highly qualified professional activity, the achievement of which allows solving a wide range of atypical (real) tasks. Activities at this level enrich the student's personal experience with information that is new only for him, increasing his/her professional skills.

4. The level of creative productive action.

The student is in a situation where he/she knows only the general goal of the activity and has to solve a problem in conditions of uncertainty, the absence of algorithms, when a person creates a solution himself/herself, showing ingenuity, independence, research culture and finding a new product as a result of the solution (as a rule, objectively new, not having analogues).

The four levels of training demonstrate the stages of development of professional skills and competences.

The criteria for assessing the levels of training were as follows:

Training, corresponding to the 4th level (productive creative action), is the highest and is evaluated by a score of "5" (the success of assimilation coefficient is 100 %);

Training, corresponding to the 3rd level (productive action of the heuristic type), is advanced and is assessed by a score of "4" (success rate of assimilation coefficient composes no less than 60 %);

Training, corresponding to 2nd (algorithmic action from memory), is minimally sufficient (satisfactory) and is assessed by a score "3" (the success rate of assimilation coefficient is 36 %);

Training corresponding to the 1st level is not satisfactory (assimilation coefficient is less than 16 %).

Thus, *at the initial level of students' training* in the field of the development of multimedia foreign language tutorials, we have taken the test aimed at revealing students' competences in the field of the development of foreign language multimedia tutorials, consisting of questions concerning the theoretical background of constructing multimedia course and the ability and skills of using applied and instrumental software. The results of the test have shown less than 34 % of correct answers, which conditioned the necessity of implementing the course for the development of the future EFL teachers' digital competences in the field of creating multimedia educational tutorials.

The *control part of the experiment* was aimed to assess students' progress with the help of two types of the final assessment: the test containing complex multi-level questions, and the independent training project presenting a multimedia foreign language tutorial developed by the participants.

The final test consisted of two parts, each comprising 10 questions: The maximum score for the test was 10 points. The average number of points scored by all students for the control test was defined according to the following formula of the arithmetic mean. Here we have applied the simple (i.e. not weighted) arithmetic mean. It is used when the calculation is carried out on non-grouped statistical data, where we want to get the average term. The arithmetic mean is such an average value of a feature, upon receipt of which the total volume of a feature in the aggregate number remains unchanged:

$$\bar{x} = (x_1 + x_2 + x_3 + x_4 + x_5 + \dots x_n) \div n = \frac{\sum_{i=1}^n x_i}{n} = 7,63, (76,3 \%) \quad (1)$$

where n is the aggregate number of participants, and x_i the number of points scored by the i -st ("i" stands for the order number) student.

Here, the average number of points scored by all students was equal to 7,63 which corresponds to 76,3 % of the correct answers in total.

In addition to the test, the students' experience on the developed multimedia educational tutorials has also been investigated through an independent final training project. For this, the students were asked to develop their own multimedia foreign language tutorial in the iSpring Suite 9 program. During the implementation of the training project, the students independently developed the multimedia foreign language tutorials, taking into account the psychological, pedagogical, technical, technological and ergonomic requirements for their development. Each multimedia tutorial was assessed on a 10-point scale according to the developed criteria reflecting the general requirements for its development.

The average point number scored by all students for the educational project was

$$\bar{y} = (y_1 + y_2 + y_3 + y_4 + y_5 + \dots y_n) \div n = \frac{\sum_{i=1}^n y_i}{n} = 7,9, (79 \%) \quad (2)$$

where n is the aggregate number of participants, and y_i was the number of points scored by the i -th student.

Here, the average number of points scored by all students for the educational project was equal to 7,9 which corresponds to 79 % of the correct answers in total.

At the same time, all students received more than 5 points (50 %) (more than a half of the number of correct answers), which indicates the formation of the basic necessary knowledge, digital skills and abilities for the development of multimedia teaching resources.

Interpretation. Thus, analysis of the data derived from the given formulas shows that the average number of points got by the students for the final test is equal to 7,63 which corresponds to 76,3 %, while the average number of points obtained by them for the independent educational project (multimedia educational tutorial) comprises 7,9 % which corresponds to 79 %.

The quantitative correlation of the students' final test and independent project results can be seen in Fig. 6.

As indicated in Fig. 6, the results of the experiment are very positive. The diagram shows that 25 students (83,3 %) gained 7 points and more in the final test, and 29 students (96 %) got 7 points and more for the independently

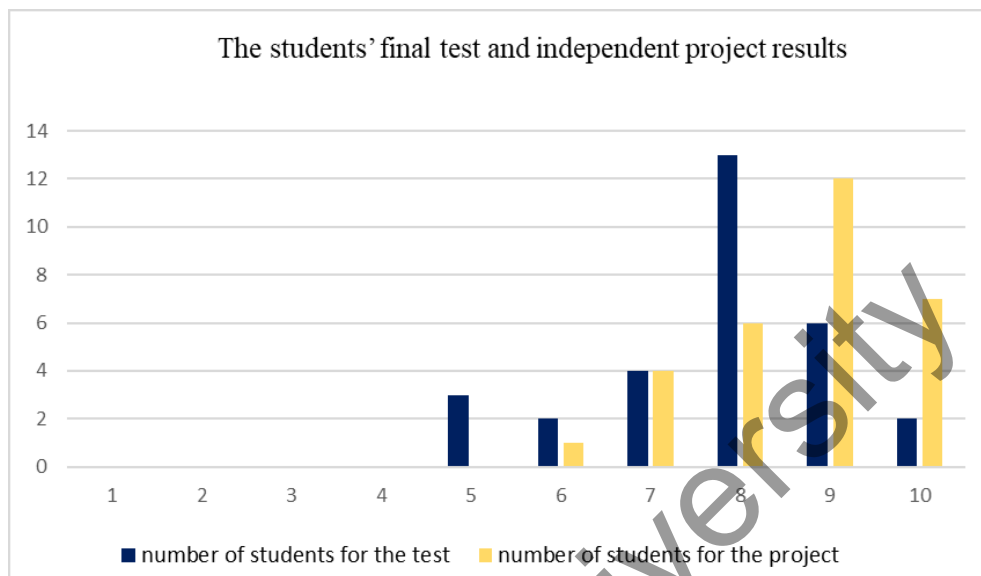


Fig. 6. The diagram, reflecting the students' final test and independent project results

developed multimedia educational tutorial, the fact that allows us to state that the coefficient of knowledge assimilation composing required 60 % is obtained and the level of productive (heuristic) action is correspondingly achieved by the prevailing number of participants. Within the frame of the present research, this level indicates highly qualified professional activity associated with the development of future EFL teachers' digital competences in the field of creating multimedia educational tutorials on the basis of authentic audio-visual materials and enriches the students' personal experience with information that is new for them, thus increasing their professional skills.

The results of the experiment allowed us to conclude that the necessary theoretical knowledge and digital skills in the development of future teachers were formed, allowing them to create their own multimedia foreign language tutorials. At the same time, the study of the main blocks of the course became a system-forming factor that focused on all components of training.

Thus, the number of students, who received more than 60 % points (indicating the heuristic level) in the final assessment for an independent project and the test, composed correspondingly 24 students out of 30, which composed 80 % of the total number of participants. This suggests that as a result of Stage II of the research, most students reached a heuristic (productive) level of training

and got the necessary digital skills for the development of multimedia foreign language tutorials.

The qualitative characteristics of students' digital competencies developed in the result of the experimental course are presented in Table 2.

Table 2

Experience, skills and digital competences acquired upon the completion of the course "Technology of the development of foreign language multimedia educational tutorials based on authentic audio-visual materials"

Experience got during the course	Skills acquired	Digital competences developed
Development of a foreign language multimedia educational tutorial	Searching for and selecting the appropriate media content (authentic audio-visual materials, textual information, pictures etc.) for the designed multimedia educational tutorial	Ability to select an appropriate authoring course software to develop the designed multimedia educational tutorial in accordance with its goals and type of the content
Technical adaptation and edition of the selected authentic audio-visual materials	Carrying out constructive editing of the audio-visual content aimed at shortening of the plot or highlighting of the necessary audio-visual episodes without affecting the originality of the language content and its educational value	Ability to use multimedia editors, such as Ulead MediaStudio Pro, Windows Movie Maker, Adobe Premier Pro, Sound Forge, etc. for technical processing (shortening, cutting out and compiling separate audio-visual episodes)
Creation of a set of exercises to the selected authentic audio-visual materials	Creating digital educational content based on the combination of the selected audio-visual materials, developing structure and types of tasks and exercises to be done by the learners	Ability to design an educational environment through multimedia educational resources
Development of the structure of a designed foreign language multimedia educational tutorial	Developing and organising the educational material into separate sections and modules and provide linear and non-linear links between them	Ability to compile separate units into a single product with the convenient software shell and navigation within a tutorial with the assistance of the selected software tool

Provision of interactivity and automation of control within a designed foreign language multimedia educational tutorial	Creating interactive tasks, animations, link information objects of multimedia tutorials	Ability to use the possibilities of the authoring course software chosen (for example iSpring Suite 9)
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It should be stated that the initial stage of the research showed the correspondence of the students' knowledge and skills to the reproductive level of training and did not imply the presence of necessary digital skills for the development of foreign language multimedia tutorials.

At the heuristic (productive) level achieved by the most students upon completion the course, they get deep and solid knowledge and competences in the field of theory, technology and methodology of the development and use of multimedia foreign language tutorials; consciously and independently apply the acquired knowledge, methods of the development of multimedia foreign language tutorials; they can independently and effectively use the capabilities of multimedia technology, flash-technology, etc., correctly identify the technological capabilities of particular software for the development of a multimedia tutorial. Students have a focus on self-education in the field of digital technologies in order to develop multimedia foreign language tutorials.

It should be noted that the creative level is the highest degree of the students' training in the field of the development and use of multimedia foreign language tutorials. Not every student can normally achieve this level. At this stage, students can independently set the tasks necessary to be solved employing the developed multimedia foreign language tutorials, choose the forms and methods of their use in the educational process and evaluate the results of using multimedia foreign language tutorials. At this level the students have a focus on the creative activity.

Reaching the heuristic (productive) level of training by the students engaged in the experimental work has proved the effectiveness of the course aimed at preparing future EFL teachers to develop multimedia foreign language tutorials both in the aspects of the development of their digital competences necessary for this activity and mastering the theory and practice of creating effective multimedia educational resources. The level of training achieved is enough for independent development of multimedia foreign language tutorials corresponding to all methodical, didactic and technical requirements.

Conclusion

The process of preparing future EFL teachers to the development of foreign language multimedia educational tutorials based on authentic audio-visual materials is impossible without mastering digital competences in this field. The training course organised to increase the future EFL teachers' awareness of technology of the development of multimedia educational resources proved its effectiveness by providing the growth of their knowledge and digital skills in the corresponding sphere. Upon completion of the course the students attained independent experience in developing and testing foreign language multimedia tutorials based on authentic audio-visual materials. The final assessment of their achievements allows us to conclude that the students obtained the necessary knowledge and digital competences in designing multimedia educational resources and using the corresponding software tools.

In accordance with the goals of the course the following stages should be included in its content:

1) the theoretical stage which includes the basic aspects of the development of multimedia educational resources based on authentic audio-visual materials: the concept and types of multimedia tutorials, methodological foundations of their development; concepts and principles of their usage, selection criteria and technical adaptation of authentic audio-visual materials;

2) the technological stage which provides mastering of the authoring course software for designing and editing foreign language multimedia educational resources based on authentic audio-visual materials. This step implies the development of the students' necessary digital competences in this field;

3) the professionally-oriented stage which involves the following steps:

- the students assess and select instrumental and applied software for designing and editing foreign language multimedia educational resources based on authentic audio-visual materials;

- each of the students independently creates his own foreign language multimedia educational resource based on authentic audio-visual materials. The designed resource should meet the requirements of the foreign language course curriculum;

- the students test the developed foreign language multimedia educational resource based on authentic audio-visual materials.

The given course was based on the theoretical and methodological foundations of designing the multimedia educational resources and the development of future EFL teachers' digital skills in mastering software tools for their creation. In the result of its implementation the prevailing number of students (24 out of 30, which corresponds to 80 %) obtained the necessary sum of points, which composed over 60 % for the final assessment testing. These indicators

approve that the students have reached the heuristic (productive) level of training in the field of creating of multimedia tutorials. As was previously mentioned, the heuristic (productive) level of training provides the development of necessary digital skills of designing and editing of multimedia educational resources with the assistance of authoring course software.

The results of the experiment made it possible to prove the suggested hypothesis. We can state that upon the completion of the described course the students have enlarged the necessary basic stock of knowledge necessary for creating multimedia educational resources and have developed the digital competences in this field. The results of the research can be applied as the methodological support in increasing educators' digital competences. The course foundations can be used by the teachers of different subjects to develop their digital skills of creating multimedia educational recourses.

Thus, the course preparing future EFL teachers for creating foreign language multimedia educational tutorials based on authentic audio-visual materials contributes to the development of their professional digital competences in the field of application of digital technologies. What is more, special attention should be paid to the issues of methodically correct use of authentic audio-visual materials in all aspects of the educational process.

In conclusion, it should be noted that the training process aimed at the development of future EFL teachers' digital competences in creating multimedia educational tutorials should include students into the process of designing a fragment of the pedagogical activity. In other words, training should ensure their activity- and professionally-oriented position in teaching and implement the principle of connection between theory and practice. The competences acquired in the learning process have a well-defined professional focus and are closely related to the students' strong motivation to create effective multimedia educational products.

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Conflict of interest statement. The authors declare that there is no conflict of interest.

Received 08.02.2021; accepted for publication 12.05.2021.

The authors have read and approved the final manuscript.

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Информация о конфликте интересов. Авторы заявляют об отсутствии конфликта интересов.

Статья поступила в редакцию 08.02.2021; принята в печать 12.05.2021.
Авторы прочитали и одобрили окончательный вариант рукописи.