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Analysis of e-learning resources for selected medical topics: content-related, methodological and technical aspects.

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ABSTRACT

INTRODUCTION: In the education of medical professionals, thorough theoretical and practical preparation of future healthcare professionals is highly important. Current developments and technological advances offer considerable opportunities for the design and construction of educational e-resources, including various types of multimedia and interactive materials. As their production is relatively expensive and time consuming, both in terms of content and technology, it is worth developing them for a wider, nationwide audience.

MATERIALS AND METHODS: E-materials, such as decision-based games, educational videos, multimedia atlases, and infographics, were designed and produced for the Integrated Educational Platform of the Ministry of Education and Science in Poland as part of a national EU project for post-secondary education of medical caregivers, medical electronics technicians, and information technology technicians. The materials included topics from anatomy, physiology, life-threatening conditions, first aid, health promotion and prevention, and psychophysical development. The research group consisted of fourth-year medical students who, as part of the subject of scientific research, performed an analysis of e-materials in terms of their educational value and evaluation of their technological aspects. Methods such as interviews, reviews, analysis, and discussion were used.

RESULTS: After the analysis carried out, the main characteristics (advantages) and recommendations considered important by the knowledge recipients in terms of a) content and methodology, and b) technology, were identified. These include: a) the way the information is conveyed, visualisation of the content presented, highlighting, concise delivery of the content, motivation for learning, and b) the way the content is presented, visualization of the message, visual and auditory impact, changing the speed of content playback, ability to work on different devices. Recommendations for the creation of e-resources are: a) accuracy of the presented content, detail of the content, b) navigation, the ability to go back to earlier stages of the game, additional videos, sounds that convey the realism of the situation.

CONCLUSIONS: Feedback from future users of educational multimedia materials is necessary. Their analysis should be taken into account when creating e-resources. 1) Content: content should be appropriately matched to the recipient's knowledge level, and presented in a concise manner. 2) Methodology: Multimedia should enable independent decision-making at different stages of learning, as well as include patterns of behaviour, especially in life-threatening conditions. It is important to highlight and visualise the content, combining visual and auditory cues 3) Technology: the content presented should reflect reality (high production quality), enable proper navigation, and be accessible on various devices.

KEY WORDS: Medical education, multimedia, interactive resources, game, atlas, video.

INTRODUCTION

In the education of medical professionals, the thorough theoretical and practical preparation of future medical professionals is highly important. Current developments and technological advances provide ample opportunities for the design and production of educational e-resources, including various types of multimedia and interactive materials [1]. However, as production of such materials is expensive and time-consuming in terms of content and technology, it is worthwhile to create them on at least a nationwide scale. Traditional education in Poland has been supported for years through the implementation of e-learning based on innovative content. This form of hybrid learning is better and more effective in fully achieve learning outcomes, as indicated by scientific research [1]. It is also what modern knowledge consumers expect from knowledge providers today. E-learning provides, among others, the opportunity for the student to make repeated mistakes in e-resources depending on individual needs, constant access to authorised educational content at a convenient time, and the attractiveness of knowledge transfer, which motivates learning [2].

In particular in the area of education in anatomy, physiology, life-threatening conditions, first aid, and health promotion and prevention, a particular development of e-learning courses could be observed in recent years. Due to the specific nature of these subjects, education is delivered in a blended learning model. This includes education on site, in real-time, in the university premises (e.g., laboratories or medical simulation centres), and remotely via the Internet, usually in asynchronous mode, using e-learning portals. [1, 2].

The aim of the article is to confirm that in the design and production of interactive and multimedia materials are of high importance, including the educational value provided by the appropriate (a) methodology for the design of multimedia and interactive materials and authorised content, and (b) technologies, that is, the technical execution of e-resources.

MATERIALS AND METHODS

This article presents an analysis conducted by PUMS (Poznan University of Medical Sciences) medical students reviewing multimedia and interactive electronic resources for two professions: medical caregiver and medical electronics and information technology technician. These resources were prepared for the Integrated Educational Platform of the Ministry of Education and Science in Poland as part of the nationwide project titled "E-materials for the sectors of: health care, social assistance, security of persons and property" POWR.02.15.00-00-3051/20 co-financed by the European Union under the European Social Fund. As part of this project, electronic materials were prepared for seven medical professions: medical caregiver, medical informatics technician, orthopaedic technician, massage therapist technician, pharmacy technician occupational therapy technician, and medical sterilisation technician. The project was implemented from 2021 to 2023. Access to the materials is free of charge in the asynchronous mode, with the possibility of repeated access to e-materials.

Their main purpose is to support education in the above-mentioned medical professions, with the user or teacher deciding on the mode of their use. The Ministry of Education and Science, as part of the project's guidelines, indicated the types of multimedia and interactive elements to be created for the profession, as well as the professions for which e-materials were prepared in accordance with predetermined standards. The article discusses e-materials related to course topics (anatomy, physiology, life-threatening conditions, first aid, health promotion, and prevention) implemented only for medical caregiver and medical electronics and informatics technician. The choice of these topics was based on the fact that fourth-year medical students have sufficient knowledge of these topics to be able to evaluate the materials in terms of content. These issues are the basis of education in the first years of medical studies. Each e-resource also has interactive revision materials, a glossary of terms, teaching guides for the student and teacher, as well as neographies and bibliographies, but due to the comprehensiveness of the issue, these elements are not discussed in this article.

The students analysed selected e-resources on anatomy, physiology, life-threatening conditions and health promotion. Students related their findings to their experience from earlier years of studies, as participants in interactive e-learning, and thorough analysis of the e-resources. They took on the role of "reviewers", as part of their work in the scientific research course conducted in the fourth years of study. The subject is carried out in small student groups (6 students). The work on the topic of e-learning within this subject and participation in the study was the student’s choice. Their participation in such a research work is justified for several reasons: 1) They are current medical students 2) Knowledge-wise, they are competent to evaluate the content presented in the e-resources - the range of knowledge of medical students is higher than that of participants in post-secondary education; 3) Student education at medical universities is based on modern technologies. Students very often use and seek modern educational materials. 4) Students have expectations regarding the technological development of electronic materials. Furthermore, the students are familiar with the use of modern tools - the "digital generation" for whom technology is a part of everyday life. Given the above, it is reasonable to consult electronic materials with this group of knowledge recipients. Such consultations present the possibility of tailoring of the prepared e-resources to their recipients and the needs of the market.

The materials created as part of the project include, among others: photo galleries, interactive dashboards, infographics, mind maps, e-books and audiobooks, educational videos, instructional videos, film sequences, educational games, interactive scenario-based learning type tools, exercise programmes, 3D animations, multimedia and interactive atlases, simulators, virtual tours, virtual laboratories, and virtual reality materials. This innovative government initiative promotes the creation of good quality interactive e-education, which can also inspire the preparation of standards for education based on interactive and multimedia resources in academic teaching [3]. The results of the implementation of this project will be available on a nationwide scale for future postsecondary education graduates and their teachers from 2024. The e-resources can also be used by other interested parties, such as medical students.

The students worked using the following methods: interview, review, analysis, and discussion. After reviewing the e-materials, each student prepared an individual review taking into account the content and technical aspects. The students indicated the positive and negative features of the electronic materials. The next stage was a joint discussion of the content collected and assembling of final conclusions and recommendations, which were presented in the article.

RESULTS

A. The Use of multimedia in medical education

The chapter presents a brief description of the multimedia that was analysed by the authors of the article:

a) An interactive atlas** (Figure 1,2) **and educational video** (Figure 3,4) **on the topic of anatomy.

Interactive atlases supplemented with an educational video on the structure and function of systems in the human body are an interesting tool for learning anatomy. They make learning more attractive and effective for the student [4]. The student can more easily remember the location of the various organs in the human body and their functions. Attractive visuals play an important role in this process, which encourage the use of such multimedia resources [5]. After working with the atlas and video, the student will possess knowledge of the structure of individual systems with elements of physiology, such as the endocrine, skeletal, muscular, circulatory, urinary, nervous, respiratory, digestive, and reproductive systems. An additional element enriching the multimedia atlas are the infographics that present the types of tissues that make up the human body, as well as the sensory organs (smell, hearing, taste, sight), heart, and skin.

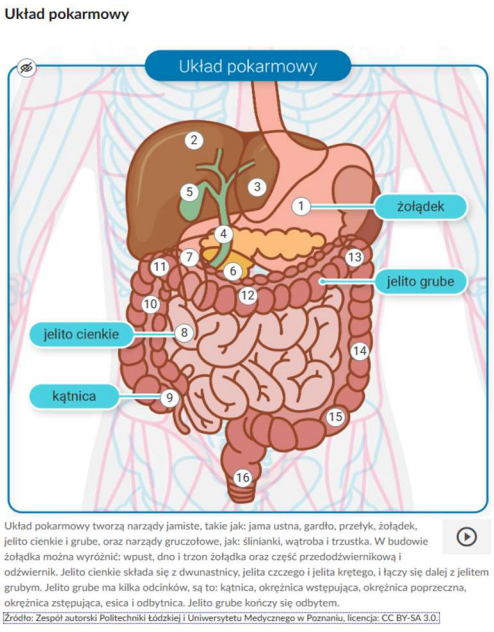

Figure 1. Interactive atlas – Structures of human tissues and systems – gastrointestinal system. *Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.*

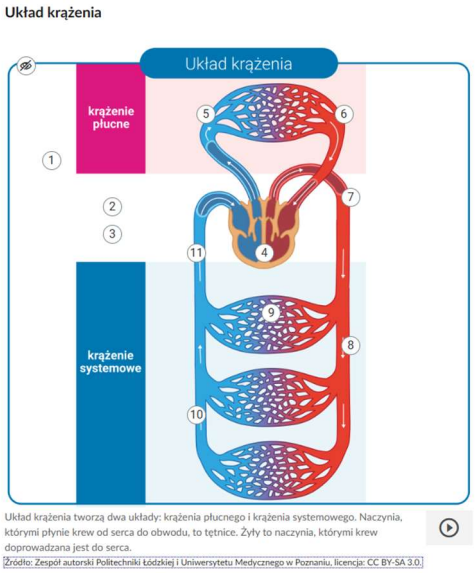

Figure 2. Interactive atlas – Structures of human tissues and systems – cardiovascular system. *Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.*

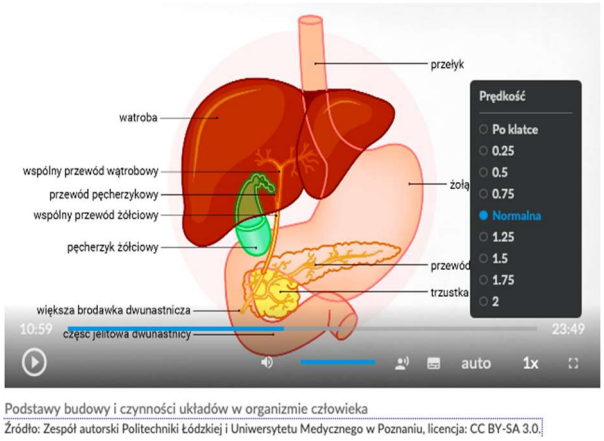

Figure 3. Educational video - Basics of structure and function of systems in the human body, with visible option to change the speed of video playback (right side of the graphic).
Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.

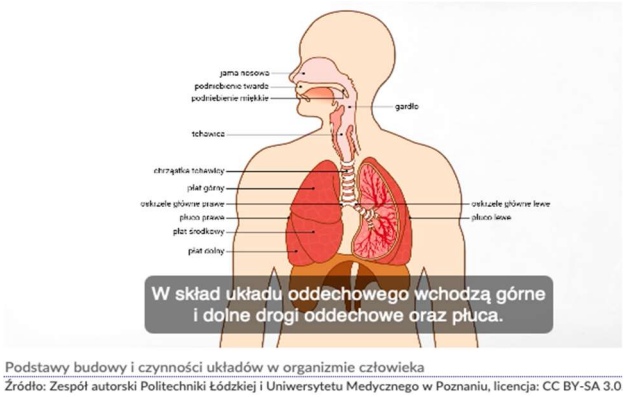

Figure 4. Educational video - Basics of structure and function of systems in the human body, with subtitles enabled (gray box with white text at the bottom of the graphic).
Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.

The educational video contains the basics of the structure and function of systems in the human body. It shows all the organ systems that a future medical caregiver must know, according to educational standards. Individual systems are discussed using diagrams and animations. In addition to a general presentation of the systems, the video also shows the most important organs in the human body with a description of their functions. Mechanisms of action shown in the form of an interactive diagram are also included in the material.

b) ***An Infographic on Organ Physiology*** *(Figure 5,6).*

The resources for the medical carer also include materials on human physiology. These are presented in the form of infographics. The most important systems - circulatory, respiratory, and digestive - are featured. Diagrams of the digestion of individual nutrients are also included. Each system is presented as an infographic and the organs within it are numbered in the correct order. The attached text can be read with a voiceover (when selected by the student), providing information about the organ in question. In some cases, additional graphics are included to explain selected details (for example, the structure of the heart in a diagram of the circulatory system). The infographic on the digestive system is similar, with locations in which individual nutrients are digested highlighted.

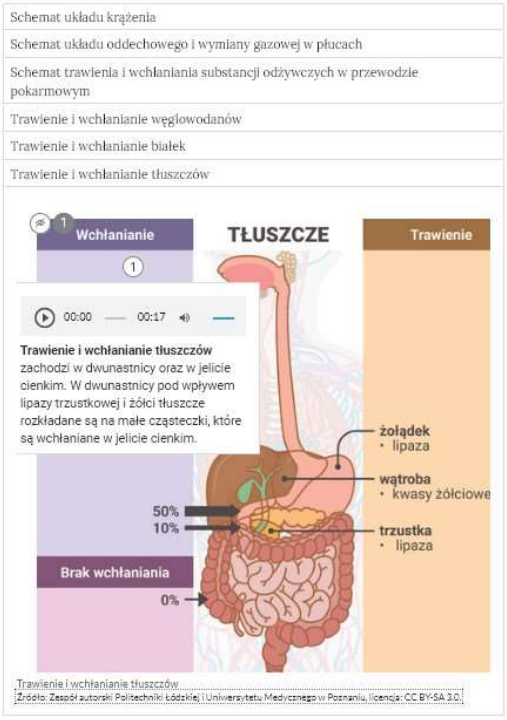

Figure 5. Organ physiology - fat digestion and absorption, with navigation menu for changing accessibility options, adherent to WCAG 2.0.
Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.

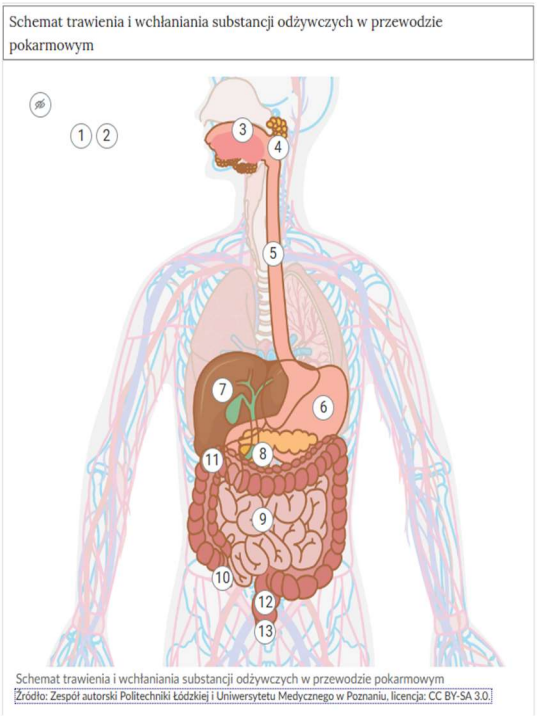

Figure 6. Physiology of the organs - digestion and absorption pattern of nutrients in the gastrointestinal tract.
Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.

c) A scenario-based learning tool for life-threatening conditions (Figure 7,8).

The SBL (scenario-based learning) game in life-threatening conditions is an interesting interactive and multimedia-based teaching tool. The game is based on different scenarios that outline 21 of the most common life-threatening conditions. To complete the game with a positive result, three cases must be correctly solved. Only one mistake can be made in each situation. Cases include, but are not limited to, heart attack, chest pain, stinging, vomiting, epileptic and febrile convulsions, shortness of breath, choking in a child, ischemic stroke, limb injuries, CO poisoning, thermal burns, and fainting. The game is designed to teach students to recognise and respond to selected life-threatening conditions. Scenarios are based on situations that a future medical caregiver is sure to encounter in his career. The scenarios do not include advanced assistance, but the basic management of the given emergencies, which is related to the scope of competence of a medical caregiver.

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Figure 7. Introduction to one of the medical emergency scenarios in a scenario-based learning game. *Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.*

Figure 8. Highlighting of the most important information and visualization of content in a scenario-based learning game on medical emergencies. *Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.*

Each scenario includes a brief description to allow the player to familiarise themselves with the situation. The text introduces the place and circumstances under which the incident occurred, along with the characteristics of the injured person. The player goes through a cycle of decisions to help the injured person. In the course of the game, the player is confronted with a series of questions (decisions), based on which he obtains further information about the condition of the injured person. This allows for a step-by-step assessment of the situation and structuring of knowledge regarding a given life-threatening condition. Each scenario also provides feedback on the correctness of the course of action (the decision the player makes), along with the reasoning behind it. Upon completion of a given scenario, the correct course of action for a given life-threatening condition appears on the screen to summarise and consolidate the student's knowledge.

d) ***An educational video on health promotion and prevention*** *(Figure 9).*

Educational videos on health promotion and prevention follow a similar pattern of information presentation, in terms of both visuals and graphics. However, content-wise, they contain content tailored to a particular medical profession (medical caregiver or medical electronics and information technology technician). The videos are designed to present health promotion and prevention information in the most accessible way. They present information in a clear and straightforward manner, from basic definitions to an analysis of complex processes and their implications.

The content is presented in the form of an easy-to-read table, in which the discussed content is visually highlighted. The role and tasks of the medical technician and caregiver are also highlighted. Various presentation types were used and combined to make the content easier to digest and make the message more attractive and dynamic: tables, charts, statistical data, graphic, and video elements. Videos also include a soundtrack and voiceover, which, according to medical students, makes it easier to follow the presentation and harder to distract. The same function is performed by highlighting the text that is currently being read.

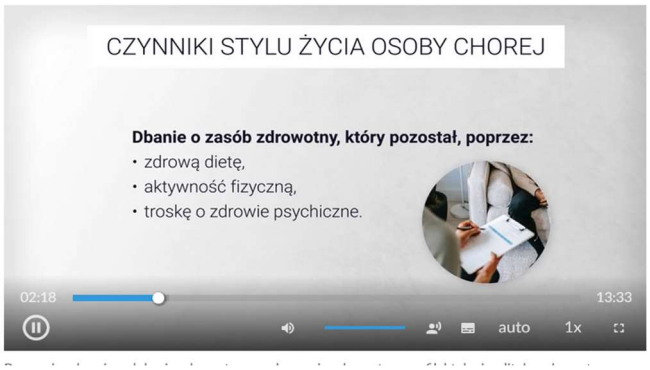

Figure 9. Additional playback features of the health promotion educational video, located in the bar at the bottom of the figure.
Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.

Figure 10. Educational video - Human psychophysical development, with subtitles enabled at the bottom of the screen (option on learner's request).
Source: Project POWR.02.15.00-00-3051/20, license CC BY-SA 3.0.

e) ***Educational video on human psychophysical development*** *(Figure 10).*

The educational video on human psychophysical development is an example of summarising knowledge of the topic and conveying it in the shortest possible time - the video lasts about 11 minutes. The video begins with a few words of introduction about the most important factors that affect human psychophysical development, including genetics, environmental factors like stress, and positive interactions with parents. The stages of human development are then discussed, beginning with the neonatal period, through infancy, childhood, adulthood, and old age. The discussion includes a brief description of each stage in terms of physical development (weight gain, body structure, proportions), independence and acquired skills (sitting up, standing up, walking), adaptive changes affecting organs (maturation of the nervous system, changes in the cardiovascular and respiratory systems) and changes in diet. As each developmental period is discussed, highlights of the most important information appear against a background of scenes presenting the developmental period, making it easier to remember and understand which information is most relevant. The voiceover describes each stage life stage in a calm voice, speaking clearly and slowly, making it easy to understand. Additional technical advantages include the ability to change the speed of video playback [5].

B. Content – methodology

This chapter presents the results of the medical students' research work on analysing the advantages of multimedia in terms of content and methods. The results of this analysis are presented in the form of Table 1, in which the main characteristics (advantages) considered important by the recipients of knowledge were selected. Recommendations presented in Table 2.

Table 1. Advantages of multimedia identified as important by knowledge consumers.

Advantage/feature	Multimedia type			
	Videos	**Atlas**	**Game**	**Infographics**
The method of information transfer (introduction/general description, followed by discussion).	General description of the content of the video, followed by its discussion, making memorisation easier (Figure 3).	Not applicable.	A general description of the situation and the place where the incident occurs, followed by the appropriate emergency measures (Figure 7).	Diagram showing the general structure of the organ and detailed diagrams showing the smaller structures (Figure 5) - such a way of knowledge transfer ensures that there is not too much information on one diagram, which facilitates learning.
Visualisation of the presented content	Easier understanding of the subject (especially when analysing layouts), diagrams, charts, tables, and graphics (Figure 4).	Arrangement of structures, perspective of size, location and appearance of individual structures, simple diagram (Figure 1).	Diagrams referencing anatomy or physiology, to facilitate memorisation of the correct procedure (Figure 8).	Simple diagrams, the most important structures, are highlighted (Figure 5).
Highlights, facilitating memorization	The most important concepts are presented in a diagram and a discussion. The student listens and observes, which facilitates the memorisation of the content (Figure 10).	Accessibility and simplicity (Figure 2).	Revision of the most important information on a separate slide with added diagrams (Figure 8).	Simple presentation of content (Figure 6).
Summary knowledge transfer	Maximum video length: 11-25 min (Figure 10).	The most important structures are presented with a brief description (Figure 1).	The maximum time to work on one case is several minutes.	The volume of diagrams and structures to memorise is relatively small.
Motivation for learning	Short and rich content videos.	aesthetic and colourful graphics (Figure 1, 2).	Variety of thematic scenarios, e.g. seizures, fainting, heart attack, childbirth.	Stylish and colorful graphics.

Source: Authors' own work

Table 2. Recommendations for multimedia identified as important by knowledge consumers.

Recommendation /feature	Videos	Atlases	Games	Static elements (infographic)
Accuracy of presented materials	When discussing the circulatory system, the material does not specify which vessels departing from the heart are arteries and which are veins.	The option to maximise the window is missing, preventing the user from seeing all the content on the screen.	The presentation of a given case in a medical emergency does not clarify all its aspects.	The respiratory system diagram lacks highlighting of the oesophagus, which can be confusing when learning.
Content details	The descriptions could be expanded, making the material easier to understand by the audience. (eg, in the case of the lymphatic system).	Descriptions of graphic elements should be expanded to facilitate assimilation of materials.	Expanding scenarios to include advanced emergency operations, a proposal to expand resources for use in academic education.	It is useful to present the same content with different multimedia, highlighting such connections.

Source: Authors' own work

C. Technology

The first part of this chapter presents the research work of results of the medical students, analyzing the advantages of the technical aspects of multimedia. The results of this work are presented in the form of Table 3, in which the main technical characteristics (advantages), considered important by the knowledge recipients, were selected.

Table 3. Technical advantages of multimedia, identified as important by knowledge consumers.

Advantage/feature	Videos	Atlases	Games	Infographics
Method of content presentation	Text and graphics.	Text and graphics, with particular emphasis on graphics.	Text and graphics.	Primarily for graphics, the ability to expand graphics is crucial.
Message visualization	The structure discussed is simultaneously highlighted on the diagram; e.g. When discussing bones (highlighting the structure in question), the diagrams are clear and accessible.	Ability to enlarge graphics. Ability to remove numbering, resulting in improved clarity of the diagram. Ability to overlay structures.	Highlighting of the most important information.	Ability to enlarge graphics. Ability to remove numbering, resulting in improved clarity of the diagram. Possibility to test yourself while studying by turning off the description of a given element.
Simultaneous impact on vision and hearing	Ability to enable subtitles (Figure 9 and Figure 4), change font size and enable accessibility modes (WCAG 2.0 standard) (Figure 5).	Reading descriptions of organs by voiceover (at the student's request).	Elements of sound design relate to the game scenario (for example, bird sounds in the background). This influences the mood and facilitates participation in the game scenario (simulation of the setting).	A brief discussion of the diagram with a voiceover.
Changing the speed of content playback	The student can set his own pace of voiceover and mode of video playback - adapting to their work style and preferences (Figure 9, 3).	Not available.	Not available.	Not available.
The ability to work with resources in different locations and on different devices, thanks to the option to switch to mobile layout, such as a computer, phone, or tablet (Figure 5).				

Source: Authors' own work

DISCUSSION

CONTENT AND METHOD

Decision-based game in medical emergencies is one of the more attractive forms of learning, demonstrating a given procedure in a specific setting. The scenarios contain concisely presented cases of life-threatening conditions that are most often encountered in everyday life. The possibility of independent decision making by the recipient of knowledge increases the effectiveness of learning, allowing a more easily assimilate the transferred patterns of action [6, 7].

Expanding the game scenarios with advanced activities could create opportunities for other knowledge recipients to use the materials, for example, students majoring in emergency medicine, nursing, or medicine [3]. Educational videos are a very interesting way to present topics such as human anatomy and psychophysical development. These topics are described in a clear and simple manner. The presented systems are shown in broad terms at first, and then in more detail [8]. The content is conveyed concisely, which makes the student more motivated to learn. Graphics and diagrams make it easier to maintain focus for a longer period of time, making the videos less tedious and monotonous. The dynamics of the videos are appropriately selected, not too fast, which could tyre the viewer, but also not too slow, which could make it difficult to maintain attention. This method of delivery certainly makes it easier to remember the material, which contributes to greater learning efficiency [1].

Anatomy presented through interactive and multimedia atlases is an interesting and modern form of learning about this subject. The content presented is at an appropriate level of sophistication, targeted at future recipients. The atlases are combined with infographics, which contain, among other things, additional information about some biochemical processes that occur in the human body. In both components of the course, the material is presented concisely and is not overloaded with information, making the student more motivated to learn and facilitating the assimilation of the material, which also affects the effectiveness of learning [1, 2, 9].

TECHNOLOGY

After analysing the e-resources in terms of technology, the students pointed out that the videos lacked a navigation bar to move directly to a selected topic. On the other hand, the game on life-threatening conditions lacks the ability to go back to previous stages of the game and check, for example, the patient's parameters for comparison, to determine the dynamics of change. Additionally, in the introduction to the given parts of the game, short videos or more sounds could be added to give the cases more realism.

The decision-based game is a great example of the advanced technical content of the learning platform. The setting of each scenario (introduction, relevant sounds related to the location of the scenario) allows for a particular immersion in the situation. This makes it easier and easier to assimilate a given behavioural pattern in a life-threatening situation. This effect could be enhanced by adding a short video to each scenario, with an introduction to the issue or a summary of the actions the player must take in a given to save his patient in a life-threatening situation.

The anatomy video uses a number of tools to facilitate the assimilation of the material. The voiceover discusses the diagrams presented in the film, which relate to the systems and organs of the human body. Animations illustrating the processes of the human body are also shown. There is also an option to adjust the speed at which the video is played and to enable subtitles. With these options, the viewer can personalise the learning experience according to their requirements and needs. This makes learning more accessible and encouraging [11].

Interactive anatomy atlases facilitate the assimilation and consolidation of the material thanks to attractive graphics. They contain many diagrams showing the structure of selected organs and systems of the human body. The same elements are presented using text and graphics, with the additional possibility of listening to subtitles appearing on the screen. Different structures can be superimposed, giving a better idea of the anatomy of the human body. The infographics contain similar content, with additional topics on the various biochemical processes occurring in the human body and a brief overview provided by a voiceover. This makes learning more attractive and accessible for the younger generation [12]. In all of the e-resources analysed, the option to change the font, both in terms of size and contrast, makes it much easier to assimilate the information (according to the WCAG 2.0 standard for electronic materials). This primarily helps people with visual impairments, but it is also an aid for those with normal vision. Such options can make it much easier and faster to assimilate knowledge and new information [3].

Quality and standards for creating e-materials have increased significantly in the last decade [2, 13-17]. This is due to the technological possibilities, as well as the expectations of the recipients of knowledge, a "digital generation" that does not part with their phones, tablets, etc., in which graphics, interactive sounds, and brief transmission of information reign supreme [14, 17]. However, the cost of creating and producing such multimedia resources is still high [18]. Therefore, they should be created on a global scale and placed in central repositories accessible to a large audience [3, 7]. This will allow the construction of high-quality authorised content of high quality both in terms of content and technology, with advanced interactivity of knowledge recipients in the educational process through, for example, virtual laboratories, simulators, and virtual reality.

Limitations of research regarding e-resource analyses include the lack of conversation with content authors, as they were prepared in 2021-2023 by a large team of content experts. Furthermore, there was a lack of research on the needs and expectations of education with advanced multimedia and interactive materials for audiences of postsecondary medical education audiences. Moreover, there is a lack of research on the creation of advanced multimedia resources in medical education in Poland, taking into account the methodological and technological sides of the created electronic materials. Therefore, it is not possible to discuss the issues raised in the article with other researchers, as prepared e-resources are a novel concept in the context of nationwide education. Furthermore, another limitation is the lack of experience in designing and creating multimedia and interactive resources by medical students (lack of competence of knowledge providers while having competence of knowledge recipients).

CONCLUSIONS

The use of well-designed and produced multimedia and interactive materials in education makes the learning process significantly more personalised. This affects the motivation to learn and the effectiveness of learning of the new generation of students. In pursuit of this, it is worthwhile to obtain feedback from future users of such multimedia materials and, after analysing them, to take the gathered recommendations into account when creating educational e-resources.

Such e-resources can be used both as part of the course work in synchronous mode and as part of the learner's self-study and own work. The aim can be to supplement knowledge, repeat material and prepare for exams in asynchronous mode, carried out at any time and place, depending on the individual needs of the learner. The authors believe that further research in the field of e-learning should include an analysis of the needs of future recipients of knowledge and the cost of creating and maintaining the infrastructure for implemented multimedia and interactive resources. Advanced multimedia resources are already a necessity in e-learning today and should become an obligatory element of e-learning courses. It is important to establish multicentre cooperation of experts in the field of e-learning, joint application for grants (including EU-funded), and continuous education of staff and exchange of experience. Therefore, research in the field of implementation of e-resources in education is valuable because it provides a picture of the current state of e-education in Poland, indicating the directions of development and changes depending on the needs of the audience and the changing technological reality.

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Addition: *All the illustrative material (figures) in the article are print screens of the multimedia and interactive material created within the framework of the EU project implemented by the Poznan University of Medical Sciences and Lodz University of Technology, POWR.02.15.00-00-3051/20. Illustrative material is available on the website: https://zpe.gov.pl/szukaj?query=&stage=KZ&subject=bran%C5%BCa+opieki+zdrowotnej (licence: CC BY-SA 3.0).*

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