Eleanora Petrovna Chernyaeva, Ilya Vladimirovich Belchenko, Evgeny Yurievich Andrusenko, Karine Anatolyevna Paladyan, Zhanna Anatolyevna Fomchenko, Irina Borisovna Larina. (2021). Didactic Conditions for the Building and Implementation of Individual Educational Trajectories of Students Using an Interactive Educational Platform. *International Journal of Early Childhood Special Education (INT-JECSE),* 13(2): 1183-1189. DOI: 10.9756/INT-JECSE/V13I2.211165

Received: 28.06.2021 Accepted: 02.10.2021

Eleanora Petrovna Chernyaeva[1]
Ilya Vladimirovich Belchenko[2]
Evgeny Yurievich Andrusenko[3]
Karine Anatolyevna Paladyan[4]
Zhanna Anatolyevna Fomchenko[5]
Irina Borisovna Larina[6]

Didactic Conditions for the Building and Implementation of Individual Educational Trajectories of Students Using an Interactive Educational Platform

Abstract

The article discusses the didactic principles and requirements for the design of electronic educational resources. The requirements are supplemented with new principles and conditions that should be observed when designing an electronic educational resource, contributing to improving the quality of education and its individualization. The principles of metered assistance, control of initial knowledge, interactivity, purposefulness, completeness of the provision of educational material on the discipline, optimal and integrated use of modern computer tools, electronic summary have been described. The didactic conditions necessary for the successful operation of an electronic educational resource, the characteristics of internal and external requirements for learning tools have been indicated, the real didactic possibilities of learning tools have been taken into account.

Keywords: Electronic Educational Resource, Individualization of Learning, Didactic Conditions, Individual Educational Trajectory.

Introduction

Global trends in the development of education indicate a shift in emphasis from traditional passive learning towards an active position of students in the educational process and the individualization of its educational route (from Teaching to Learning). At the current stage of society's development, the question of modern ways of individualization of the educational process is acutely raised, which provide the possibility of forming a flexible and individualized educational trajectory of students (Herzen, Sukhareva, Skorokhodova, 2019). The active introduction of digital educational technologies into the educational process makes it possible to increase the quality of the educational process and build an individual educational trajectory through the use of competently designed and developed electronic learning tools. The most studied problem in pedagogy is the development of principles, pedagogical conditions for the creation and use of electronic educational

Eleanora Petrovna Chernyaeva[1], Armavir State Pedagogical University, Armvir, Russian Federation.
Ilya Vladimirovich Belchenko[2], Armavir Institute of Mechanics and Technology (Branch) of FGBOU BO "Kuban State Technological University", Armavir, Russian Federation.
Evgeny Yurievich Andrusenko[3], Armavir State Pedagogical University, Armvir, Russian Federation.
Karine Anatolyevna Paladyan[4], Armavir State Pedagogical University, Armvir, Russian Federation.
Zhanna Anatolyevna Fomchenko[5], Armavir State Pedagogical University, Armvir, Russian Federation.
Irina Borisovna Larina[6], Armavir State Pedagogical University, Armvir, Russian Federation.

resources, including interactive educational resources.

Many studies have been carried out on this problem. T.N. Romanchenko (2005) put forward didactic principles and requirements for designing electronic educational resources. Yu.S. Ivanov (2004) believes that an electronic resource developed following modern general pedagogical and methodological requirements is the optimal computer tool for individualizing learning. L.V. Oreshkina (2005), A.A. Andreev (2001) formulates a didactic condition as a circumstance of the learning process, which is the result of purposeful selection, construction, and application of content elements, methods, as well as organizational forms of learning to achieve certain didactic goals. Concerning teaching aids, as B.S. Gershunskii notes (1998), didactic conditions shall be considered as an interconnected set of internal requirements and external characteristics of their functioning. L.I. Studenikina (2007) identified conditions that provide high-quality professional training of future specialists using elements of e-learning.

Although sufficient attention is paid to the study of this problem, there are currently no uniform didactic principles for the design and development of electronic learning tools taking into account individual educational trajectories.

The effectiveness of e-learning tools is largely determined by the nature of the functional content and interface. The design of programs has a direct impact on the motivation of students, the speed of perception of the material, fatigue, and several other important indicators. Therefore, the functionality and interface of the training environment should not be developed on an intuitive level. A scientifically based, balanced, and well-thought-out systematic approach is required.

Methods

The following methods were used in the study: analysis of the methodological foundations of individualization of learning, generalization of pedagogical experience in designing and using electronic educational resources as one of the means of individualization, surveys on this research problem.

Many scholars have been dealing with this problem in recent years. Thus, as a result of a theoretical study, T.N. Romanchenko (2005) put forward the following didactic principles and requirements for designing electronic educational resources. The interactive educational platform, in her opinion, inherits the basic didactic principles.

Firstly, it should reflect the goals, content, forms, and methods of organization as a model of a pedagogical system.

Secondly, the content part of the interactive educational platform should be developed following the didactic principles: scientific, consistency, systematic, the connection of theory with practice, consciousness and independence of learning, the unity of the concrete and abstract.

Thirdly, the content of the material should ensure the development of procedural skills and abilities of logical and imaginative thinking, the creative potential of students.

First, let's look at the terminology related to e-learning. A digital educational platform is an information space that unites participants in the learning process, which provides an opportunity for remote education, provides access to methodological materials and information, and also allows testing to control the level of knowledge of students.

An electronic educational resource is an educational resource presented in electronic and digital form, for the use of which computer equipment is necessary.

The popularity of electronic educational platforms with interactive learning opportunities is growing, especially in conditions dictated by modern reality. The transition to remote learning requires the introduction of modern teaching methods into the process using not only computers but also other modern equipment.

T.N. Romanchenko (2005) supplemented these requirements with new principles and conditions that should be observed when designing an electronic educational resource.

The principle of nonlinear presentation of the material assumes in the structure of electronic courses presented on the platform of invariant (basic) and variable (of increased complexity, professional orientation) modules, blocks of tasks, and practical tasks of different levels of difficulty and complexity. This trend also applies to all educational courses hosted on the platform.

The electronic resource should be designed in compliance with the principle of completeness of the presentation of educational material on the discipline, which implies the inclusion of electronic programs, textbook materials, teaching aids on the discipline in the electronic resource.

The principle of purposefulness is considered as the purposeful provision of the learner with information about the global, stage-by-stage, and operational goals of studying the discipline; the degree of achievement of the goal by the learner as the stimulation of the types of cognitive activity of the trainees.

The principle of interactivity. The organization of the learning process using an interactive educational platform is carried out by setting up scenarios for the independent development of educational material and lesson scenarios that allow changing the structure of the didactic process displayed in the construction of an electronic course. Monitoring, correction, and assistance are implemented based on feedback, which involves providing a two-way dialogue, allowing the student to ask questions.

The principle of metered assistance means that the assistance system should be multi-level, adaptable, or configurable by the teacher following the pedagogical tasks and the level of training. The measure of assistance should not exceed the level of the student.

The principle of control of initial knowledge is justified by the need to diagnose the student before starting the course to ensure differentiation or individualization of training, to determine the measure of assistance.

An interactive educational platform should be built taking into account the principles of openness and flexibility, which means providing the possibility of modifying both the subject material and modifications in terms of managing the learning process (Semushina, Boldyreva, 2004; Yurlovskaya, Guchmazova, 2016).

The principle of optimal and integrated use of modern computer means of visual representation of information, the possibilities of modeling processes and objects, conducting complex calculations, drawing up graphic schemes are aimed at increasing the understanding of the material, developing creative abilities.

The principle of electronic summary means providing the student with the opportunity to create electronic notes based on the textbook material and the results of completed practical tasks, saving them to files or printing them on paper. The main conditions for the effective use of an electronic textbook are the presence of a hyper dictionary system and reference indexes, search tools, a convenient navigation system, for online textbooks – providing access to additional educational materials posted on the Internet, as well as the presence of a reflection block – a special block with the ability to accumulate the results of reflection in the learning process, which ensures independence and activity of the teaching. A new condition is the provision of means of folding information through various means of semiotics, which contributes to the development of memory and imaginative thinking.

It is desirable to include a block of motivation in the design of an electronic textbook, which can be carried out based on stimulating students through a visual representation of the degree of achievement of the goal, subject visibility of the content of the topic being studied, problematicity, examples of the social significance of the material being presented.

Finally, when designing an electronic educational resource, it is necessary to observe the psychological principles of working with screen information (window size, color and font selections, background, organization of "relaxation minutes", etc.).

Yu.S. Ivanov (2004) believes that an electronic resource developed following traditional (accessibility, visibility, problematicity, activity and consciousness of students, systematic and consistent learning, the strength of knowledge assimilation, the unity of educational, developmental, and educational functions of learning) and specific (taking into account and implementing individual characteristics of students, adaptability, and iterativity of the training program, completeness, and continuity of the didactic cycle, systematic and structural-functional connectivity of educational material) general pedagogical and methodological requirements, acts as an optimal computer means of individualization of learning.

In his opinion, the quality and effectiveness of individualized training based on an interactive educational platform are determined by a set of conditions: content-oriented, expressing the target orientation of the educational process and the implementation of an individual approach to learning; organizational, including computer literacy of the participants in the process, the material base and the availability of appropriate software pedagogical training tools; psychological and pedagogical, reflecting the motivation of the learning process, maintaining a comfortable emotional climate in the classroom and using methods and means of teaching adequate to the process of individualization; methodological and technological, aimed at creating software taking into account the heterogeneity of the student population, a variety of forms and ways of presenting educational material, interactive mode of operation of the software with adaptation of educational influences to individual characteristics of students.

L.V. Oreshkina (2005) notes that there are various definitions of the "didactic conditions" concept in the scientific literature. In her opinion, a specific feature of the concept of "didactic conditions" is that it includes elements of all components of the learning process: goals, content, methods, forms, and means. A.A. Andreev (2001) formulates a didactic condition as a circumstance of the learning process, which is the result of purposeful selection, construction, and application of content elements, methods, as

well as organizational forms of learning to achieve certain didactic goals. In other words, didactic learning conditions should be understood as an environment in which the components of the educational process are presented in the best relationship and which allows the teacher to fruitfully lead the educational process, and the trainees to study successfully. "Pedagogical conditions" are considered as broader, more capacious, providing optimization of the entire complex of content and means of training future specialists.

Concerning teaching aids, as B.S. Gershunskii notes (1998), didactic conditions shall be considered as an interconnected set of internal requirements and external characteristics of their functioning. The didactic conditions for the effective use of teaching tools reflect the relationship between external (scientific and technical) characteristics and internal (psychological and pedagogical, didactic and methodological) requirements for teaching tools, take into account the real didactic capabilities of the relevant teaching tools, their orientation to comprehensive methodological support of the educational process at all its stages.

L.V. Oreshkina (2005) defined the following didactic conditions for creating educational electronic manuals:

1. Implementation of careful selection, structuring, and dosing of educational material following the expected contingent of trainees.
2. Visibility or visualization of information through the use of multimedia technology.
3. Ensuring the availability of educational material as an opportunity for each student to achieve the learning goal.
4. Ensuring adaptability, i.e. adjustability to the individual characteristics of the student, the implementation of individual opportunities to perceive the proposed material.
5. Ensuring systematic and consistent teaching and assimilation of knowledge in a certain sequence.
6. The pragmatic orientation of tasks, i.e. the connection of learning theory with practice.
7. Orientation to intersubject relations.
8. Implementation of high-quality diagnostics and control of the professional development of trainees.
9. Creating a constructive environment in which knowledge, skills, and abilities are mastered.

L.I. Studenikina (2007) identified conditions that provide high-quality professional training of future specialists using elements of e-learning:

- Identification of the stages in the educational process at which the use of e-learning elements is most appropriate;
- Compliance of software products used in the educational process with psychological and pedagogical, didactic, health-saving requirements, and reflection of the originality and features of a particular educational subject, the specifics of the relevant science, its conceptual apparatus, the features of the methods of studying its laws, etc.;
- The conditionality of the choice of a software tool by the need to solve professional and pedagogical tasks of training a specialist;
- The readiness of teachers, which consists both in the need for professional growth in terms of the use of NIT, and the ability to structure the content of training that corresponds to the most didactic possibilities of using computer technologies, i.e. a reasonable combination of traditional and e-learning;
- Providing the university with an information educational environment to support the educational process, including information resources necessary to meet the needs of participants in the educational process, and electronic tools for working with them.

Observations show that the effectiveness of computer training programs is largely determined by the nature of the program interface. The design of programs has a direct impact on the motivation of students, the speed of perception of the material, fatigue, and several other important indicators. Therefore, the design of the learning environment interface should not be developed on an intuitive level. A scientifically based, balanced, and well-thought-out systematic approach is required.

There is a significant number of studies proving that digitized information has significantly different properties than the information presented in books, films, etc. The peculiarities of the development of the design of automated training systems allow speaking of it as a special type of creative activity, the main part of which is the functional organization of the communicative learning environment. Visual material is not just some information in the sensory form of representation, but an information model of a certain pedagogical experience that shall meet the requirements of aesthetics, ergonomics, design, etc.

Results

Summarizing the pedagogical experience, the main organizational and pedagogical conditions for the construction and implementation of individual educational

trajectories of students using an electronic textbook are the following:

- Compliance with the didactic principles and requirements of designing an interactive educational platform for higher education, both basic and specific (the principle of non-linear presentation of the material, the principle of purposefulness, the principle of interactivity, the principle of metered assistance, the principle of control of initial knowledge, the principle of optimal and integrated use of modern computer means of visual presentation of information, the principle of electronic summary);

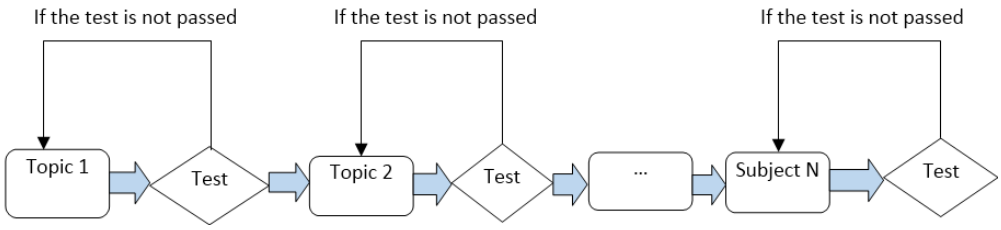

Figure 1.

Example of the trajectory of studying an electronic textbook

- The optimal choice of the method of creating the shell of an electronic educational resource that provides the opportunity to build individual educational trajectories of students;
- Compliance with pedagogical and ergonomic requirements for electronic means of educational purposes (optimal choice of interface, structuring of the content of educational material in its text, graphic and illustrative representation, optimal organization of search, navigation and hyperlinks systems, taking into account the physiological characteristics of human perception of colors and shapes).

A survey of teachers and students was conducted in the course of the research to identify the respondents' attitudes to the use of electronic textbooks in the educational process. The number of respondents – 150.

Table 1.

Survey template 1

Question	No	YES
Is the electronic textbook (ET) complicated?		
Does the ET increase the motivation of students?		
Does ET develop new competencies?		
Does the ET increase academic independence?		
Are the forms of research activity used?		
Is the level of individualization of training increasing?		
Is the learning process intensified when using ET?		
Is the workload of students optimized?		

Table 2.

Survey template 2

Question	Very good + good	Average	Very bad + Bad
Is it convenient to use the ET?			
Is it convenient to store ET?			
Is it convenient to understand what have been read?			
Is it convenient to remember?			
Is the level of individualization of training increasing?			
Is it convenient to read and perform tasks?			
Do you like the appearance of the ET?			
Is the ET reliable?			

The survey results are shown in the diagrams below.

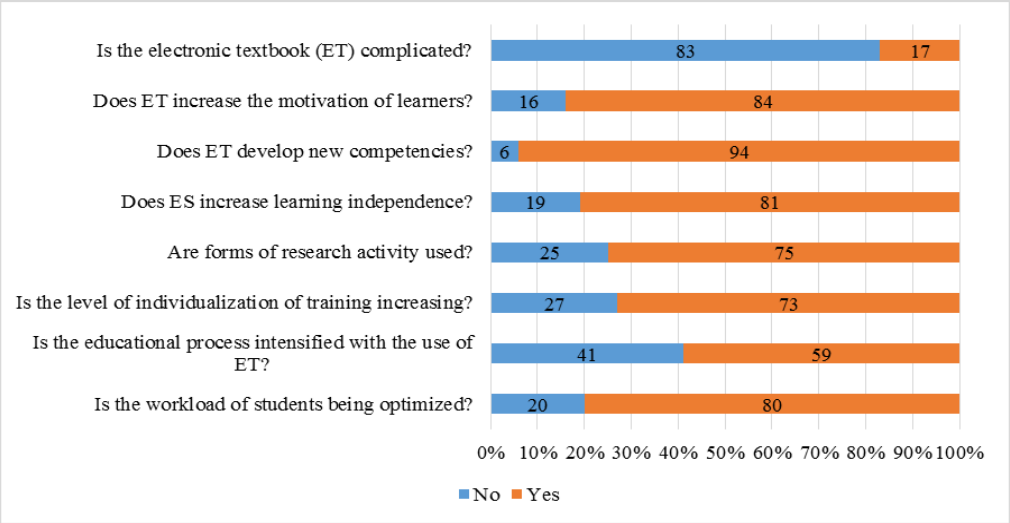

Figure 2.

Survey results 1

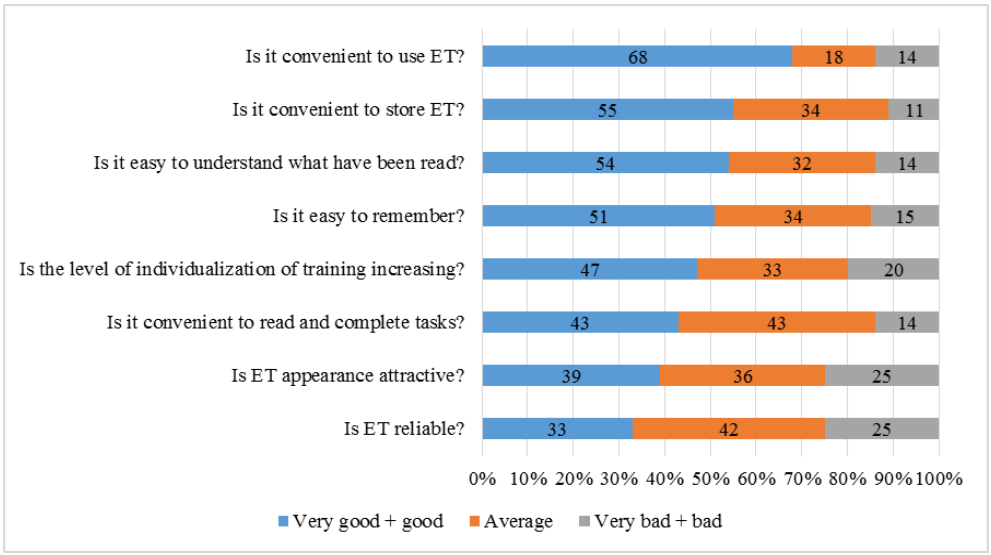

Figure 3.

Survey results 2

Almost all respondents note the ease of using an electronic textbook, increased motivation and interest in studying the discipline with the help of a technical device, pleasure when using an ET, activity in studying and using all its functions. There is also an increase in independence and individual pace of work with an electronic textbook.

According to the results of the survey, two groups of wishes can be distinguished: wishes for the development of the functional capabilities of devices and wishes for the quality of information and educational materials of the ET.

Conclusion

The analysis of Russian and foreign experience in the field of design of automated training systems allows identifying several features of interface construction that shall be taken into account when developing computer training programs.

One of the initial requirements when building training programs is the requirement of conciseness. One of the ways to individualize learning is to provide the student with the opportunity to choose the speed, volume of material delivery, and learning strategy following his/her individual psychological characteristics.

When evaluating the quality of electronic educational tools, it is necessary to take into account all the above requirements. The use of pedagogical software tools in the educational process that meets these requirements will make it possible to increase the productivity of the educational process, avoid unjustified time losses, and create an environment of psychological comfort for the student. When designing an independent learning environment, it is necessary to remember that strict adherence to the listed canons at the first steps of independent activity will allow the developer to fully realize his/her creative potential in the future.

References

Andreev, A.A. (2001). Computer and telecommunication technologies in the field of education. *Shkolnye tekhnologii, 3,* 145-160.

Gershunskii, B.S. (19980. *Philosophy of Education: A Textbook for Students of Higher and Secondary Pedagogical Educational Institutions.* Moscow: Moscow Psychological and Social Institute.

Herzen, S.M., Sukhareva, O.E., & Skorokhodova, L.V. (2019). Individual educational trajectories as an innovative technology for the development of higher education. *Vysshee obrazovanie segodnya, 28*(10), 57-61.

Ivanov, Yu. S. (2004). *Individualization of teaching schoolchildren in the process of using an electronic textbook (based on the educational field "Technology"):* Dissertation of the candidate of pedagogical sciences. Kursk.

Oreshkina, L.V. (2005). *Didactic conditions for the creation and use of electronic learning tools: Dissertation of the candidate of pedagogical sciences.* Yaroslavl.

Romanchenko, T.N. (2005). *Electronic textbook as a means of forming students' information culture: abstract of a thesis of the candidate of pedagogical sciences.* Saratov.

Semushina, L.T., & Boldyreva, N.N. (2004). Study of the problems of student-centered learning in the context of secondary specialized educational institutions. *Spetsialist, 4,* 22-25.

Studenikina, L.I. (2007). *Pedagogical conditions for the effectiveness of the use of e-learning elements in university professional training of students on the material of mathematical training:* Dissertation of the candidate of pedagogical sciences. Kursk.

Yurlovskaya, I.A., & Guchmazova, K.P. (2016). Individual educational route of students as a mechanism for the individualization of the educational process of a modern pedagogical university. *Internet-zhurnal "Mirnauki", 4*(2). http://mir-nauki.com/PDF/24PDMN216.pdf

Lundqvist, J., & Sandström, M. (2019). A bioecological content analysis: An analysis technique rooted in the bioecological model for human development. *International Journal of Early Childhood Special Education, 11*(2), 194-206.