

Creation of Adaptive Educational Environment of Learners' Personal Development

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Abstract

The article states the modern requirements to the educational environment on the basis of provisions of the State programme of the Russian Federation "Development of education" for 2013-2020. The analysis of these requirements has been carried out. A key property of the educational environment – adaptability – is allocated. The main processes, realized by the educational environment for ensuring adaptability (reflection and fixing of external conditions are described (in particular, needs of the subjects of the educational process, society and economy) and development and realization of response decisions). The main factors of adaptive educational environment within three groups – the educational environment, professional environment and social environment – are listed. The interrelations of the key requirements are allocated. The main technology, ensuring their realization, – formal modelling – is considered. It is shown that the formal modelling and corresponding using new information technologies allows to realize the following purposes and tasks: forming the educational network reflecting changes in the requirements of economy and demands of the population and forming the single educational environment; forming the educational network ensuring equal access for the population to the services of preschool, general education and additional education of children; ensuring flexibility and individualization of the teaching process using new technologies; ensuring equality of access to the high-quality education and updating of its contents and technologies; essential increasing of scale and effectiveness of using resources of nonformal and informal education; creating systems of ensuring quality based not on control but on receiving timely and substantial information for taking administrative decisions, on involving the social governing bodies; developing the individualized mechanisms of storage and use of the results of teaching, creating a support system for collection and analysis of information on the individual educational achievements.

Keywords: adaptive educational environment, formal modelling, informal learning, individual educational trajectory, distance learning technology, inclusive learning.

1. Introduction

At present the strategic task of the development of education consists in updating of its contents, methods of teaching and achieving new quality of its results on this basis. This fact is reflected both in the scientific researches and in the programme state documents. The state programme of the Russian Federation "Development of education" for 2013-2020, in particular, sets a task of forming a flexible, accountable to society system of continuous education, developing human potential, providing the current and perspective requirements of social and economic development of the state [A state programme of the Russian Federation "Development of Education" for 2013-2020, 2013].

One of the main methods of solving this task is developing the educational environment, giving new properties to it. Further we will consider some of these properties and will reveal the interrelations among them.

The study objective is the analysis of the modern requirements to the educational environment, revelation of their interrelations and technologies ensuring their realization.

2. Material and Methods of the Study

To solve the set tasks and check the basic statements in the study a complex of methods of theoretical nature taking into account specifics of each stage of work was used: the method of systematic and structural analysis; methods of pedagogical designing, modelling, projecting; the theoretical analysis and generalization of pedagogical, psychological, methodical works on the study problem; studying the scientific periodicals on the study subject; studying and generalizing the innovative pedagogical experience.

3. Results

The state programme of the Russian Federation "Development of education" for 2013-2020 points out, in particular, the necessity of achieving the following purposes and tasks [A state programme of the Russian Federation "Development of Education" for 2013-2020, 2013]:

1. Forming the educational network reflecting changes in the requirements of economy and demands of the population and forming the single educational environment.
2. Forming the educational network ensuring equal access for the population to the services of the preschool, general education and additional education of children.
3. Ensuring flexibility and individualization of the teaching process using new technologies.
4. Ensuring equality of access to the high-quality education and updating of its contents and technologies.
5. Essential increasing of scale and effectiveness of using resources of nonformal and informal education.
6. Creating systems of ensuring quality based not on control but on obtaining timely and substantial information for taking administrative decisions, on involving the social governing bodies.
7. Developing the individualized mechanisms of storage and use of the results of teaching, creating a support system for collection and analysis of information on individual educational achievements.

We will note the given above purposes and tasks are substantially interconnected. We believe the effective way to their achieving consists in realizing the key property of the educational environment – adaptability by means of new information technologies.

Adaptability is a system property which consists in the ability of a system to adapt to the changed conditions [Ya.Z. Tsyarkin, 1968]. As it was mentioned earlier, adaptability of the informational educational environment is expressed in the ability of a system to change scenarios of interaction with environment [D.A. Boyarinov, 2011]. Proceeding from such understanding of adaptability the educational environment must provide realization of two main processes:

1. Reflection and fixing of external conditions (in particular, needs of the subjects of the educational process, society and economy).
2. Development and realization of response decisions.

Accordingly, there must be components, responsible for realization of these processes, in the structure of the educational environment. The algorithms of their realization are also necessary.

The adaptive educational environment needs to interact with numerous subjects. It is natural to allocate several groups of such subjects.

1. Educational environment:
 - educational institutions of higher professional education;
 - educational institutions of general education;
 - educational institutions of secondary professional education;
 - education governing bodies.
2. Professional environment:
 - employers.
3. Social environment:
 - learners;
 - learners' parents;
 - network communities;
 - public organizations.

The adaptive educational environment represents, in particular, the information system built with use of modern information technologies. Interaction of such system with the main subjects (people, external systems such as society, economy), operations with educational material and similar scenarios of functioning must be based on the certain models stored in the system and processed by it. Naturally, there is a question of type of similar models, principles and technologies of their building and ways of their use, that is of algorithms of solving specific relevant tasks. The models, meeting the put requirements, must have mathematized nature since only in this case it is possible to build effective algorithms on their basis. Thus, the formal modelling acts as a necessary condition for realization of a property of adaptability. As it was shown [D.A. Boyarinov, 2011] earlier, at present there are all bases for successful developing such models and algorithms by means of modern discrete mathematics, in particular, of the theory of graphs, frames and production systems. At that, flexibility and individualization of the teaching process is provided. As the main tool of individualization the individual educational trajectory appears [E.P. Emelchenkov, D.A. Boyarinov and S.V. Kozlov, 2011]. As individual educational trajectory we understand a specific substantial and operational educational structure and the

sequence of its acquisition selected under a concrete educational learner's demand according to his capabilities. The individual educational trajectory reflects a unique way by which a personality of a learner moves to the educational objectives (representing a peculiar synthesis of desirable and possible, that is of educational demand of a personality and restrictions imposed on a personality of a learner by its current level of development, knowledge, etc.). At the individualized learning an important problem is choosing optimal sequence of studying theoretical teaching material and fixing this material by means of the specially picked up set of educational tasks. Thus, the formal modelling, being a necessary condition of realization of property of adaptability, provides both flexibility and individualization of the teaching process by means of building individual educational trajectories.

One of forms of integration into the school society of children, having various deviations in development, means organization of distance learning for such learners. At some types of deviations (first of all, connected with the musculoskeletal system and hearing disorder) distance learning on the basis of new information technologies becomes a dominating form of learning and integration into the society and gives an opportunity of:

- operational transfer of information of any volume, any kind (visual and sound, static and dynamic, text and graphic) at any distances;
- storage of information for the necessary amount of time in the memory of a computer (e-mail), possibility of its editing, processing, printing;
- interactivity by means of multimedia information, specially created for these purposes, and operational feedback with a teacher or with other participants of a tutorial;
- access to the various sources of information including to the remote and distributed databases, numerous worldwide conferences through the Internet system, works with this information;
- organization of joint telecommunication projects, electronic conferences, computer audio- and videoconferences.

The purposes of distance education of "special children" are [N.A. Novruzova, 2014]:

1. To give an opportunity to learners to improve, enhance their knowledge in various areas within the active educational programmes including in studying foreign languages.
2. To give a certificate of education.
3. To give the high-quality education.

2 categories are distinguished among the criteria of effectiveness of distance learning:

1. Interactivity – a key notion of educational programmes of distance learning. The distance learning courses must provide the greatest possible interactivity between a learner and a teacher, feedback between a learner and educational material, to give an opportunity of group learning.
2. It is extremely important to provide the high-effective feedback so that learners could be sure of correctness of their progress on the way from ignorance to knowledge. This feedback must be as step-by-step, operational and delayed in the form of external assessment.

Technically it is possible to solve a problem of distance learning really differently now. The modern information technologies give almost unlimited opportunities in placement, storage, processing and delivery of information to any distances and any volume and contents [A.V., Andreeva and N.A. Maksimova, 2013].

In distance learning a learner must have not only the user skills of work with a computer but also modes of work with authentic information with which he meets in various Internet resources. The question is that learners must master different types of reading well: reading for detail, reading for specific information, exploratory reading, must work with electronic reference books and dictionaries which can be given to the course or exist independently on various servers. Therefore, it is important to have courses aimed at teaching these specific types of reading, working with electronic reference materials.

The control system of acquiring knowledge and ways of cognitive activity, ability to apply the acquired knowledge in different problem situations must be systematic, be built as on the basis of the operational feedback (put in the text of the educational material and also in organizing an operational request to a teacher or to a course advisor) and of the delayed control (for example, when testing).

The model of distance learning must provide a flexible combination of independent cognitive learners' activities with different information sources, educational materials specially developed for the course, operational and systematic interaction with leading course teachers, with consultants-coordinators, provide group work on a learning type in cooperation with participants of the given course, using all variety of problem, research, search methods during work on the corresponding course modules, provide joint telecommunication projects of participants of a course organizing discussions, presentations of groups and individual presentations of intermediate and total results during electronic teleconferences, exchanging opinions, information with participants of a course and also if necessary with any other

partners through the Internet network.

In the latest time for such purposes the special Web pages, which each learner or cooperation group can organize for themselves, are more and more used. Work with such pages considerably facilitates all interaction process.

Using computer telecommunications as a technological basis of distance learning is especially obvious if there is a chance of using videoconferences. The matter is that in the language education the factor of "presence" is extremely important, the factor of communication, of creation of the language environment and use of a videoconference can be very attractive if a lesson is led, for example, by a teacher-tutor.

At that it should be borne in mind that replication of educational materials is much cheaper than by a traditional way. Learners have opportunities to transfer the received materials to the diskette or a memory card, to print them and work with them as it is most convenient for them.

The distance learning technologies represent a set of methods, e-learning tools and administration of the educational procedures providing carrying out the educational process at distance on the basis of use of the modern information and telecommunication technologies [D.A. Boyarinov, 2014]. Using distance technologies assumes special organization of the educational process based on the principle of independent learning. The educational environment is characterized by the fact that learners are generally, and often absolutely, are distant from their teacher in space and (or) in time, at the same time they have opportunities to maintain dialogue with the help of the means of telecommunication at any time. Distance learning uses modern interactive information technologies: modular, network, TV, case-technologies. Currently distance learning on the basis of the Internet technologies wins the increasing popularity. The telecommunication environment Internet has a number of specific peculiarities (openness, availability, variability, interactivity, etc.) which need to be considered when designing, creating and holding the distance learning courses. The experience of distance learning organization for disabled people shows the success of this idea and today a rather large number of invalids is learned in such a mode.

At that it should be noted that new technical and technological means of network communications can give fundamentally new methodical opportunities for distance learning of children with special needs in particular within the general education. Firstly, an opportunity to build an individual trajectory of advance for each child due to the possibility of choosing the level and type of representation of material depending on the peculiarities (disabilities) and individual development, to organize independent advance for a well advanced child on the course subjects and an opportunity for a lagging behind child to return to the neglected material is given. The possible irregular attendance of studies in mass or specialized school, connected with transportation restrictions, is replaced by learning in time, convenient and suitable for a child. Flexibility of the structure of the educational process allows taking into account needs and possibilities of each child, his interests and individual tempo of advance on the studied material.

The main advantage of distance technologies in disabled children's learning consists in lack of strict binding to a place and time of studies, in individualization of learning due to adaptation of a level and form of the educational material, appropriate settings of services proceeding from the individual peculiarities of each learner [N.A. Novruzova, 2014].

Secondly, there is an opportunity to organize the sparing learning mode reducing hours of an academic load, normalizing the amount of time spent at the computer, repeatedly returning to the studied material if necessary. Compensation of lack of some functions occurs, for example, if a child cannot press keys by the fingers, he adapts – takes a pencil in a mouth and works at the computer with its help.

Thirdly, distance technologies in a certain degree resolve the main problem of "special" children which consists in shortage of communication with other people and, in particular, with their counterparts. Despite the physical remoteness of educational subjects from each other there is a real opportunity of mutual communicating of children within the course and thematic joint studies as vertically (teacher – learner) and horizontally (between learners, in the mode of e-mails, conferences, chats, virtual seminars, etc.).

Certainly, for organization of distance learning of disabled children it is necessary to take into account specifics of a psychological-pedagogical factor of network communication as a special type of communication appeared in the conditions of the modern information environment [N.A. Novruzova, 2014]. Novruzova N.A. notes in her works that the specific barriers, arising in the process of human communication, which have social or psychological nature, disappear absolutely or their importance decreases at distance communication. For example, most of the children, studying in mass schools, have stress: fear and depression because of discrepancy to a teacher's expectations, uncertainty at the public answer, "unhealthy" rivalry when comparing with others [N.A. Novruzova, 2014].

A distinctive feature of distance learning of children with special needs is replacement of personal, direct interaction with a teacher by different means of mediated educational communication assuming active interaction and realized by means of various electronic and communicative systems: direct dialogue communication in the mode of a forum, chat, all-group studies in the mode of a virtual class, using an "interactive board", consulting in the on-line mode.

Fourthly, learning distantly child's possibilities of using electronic libraries, information funds, channels extend and ways of access to them increase. Therefore, a child's informative-cognitive field, allowing to maintain the motivation, interest and intellectual development, expands [N.A. Novruzova, 2014].

Fifthly, distance technologies are oriented at using different forms of independent learning. Transition to learning, where an initiative party is not only a teacher but also, first of all, a learner himself, leads to destructing the educational stereotypes and to a learner's possibility to choose both forms and ways of learning, time and forms of interaction with a teacher. Development of skills of independent learning expands a child's possibilities and can cause its professional interests later on.

Sixthly, effectiveness (of speed, fullness and, the main thing, of objectivity) of checking learners' activities and control of acquisition thanks to various check forms, easily realized in networks, increases.

At organization of distance learning of children with special needs the certain difficulties arise: restriction of possibility of developing children's creative abilities; restriction of a teacher's information and illustrative opportunities in the teaching process; restriction of a teacher's direct emotional influence on a child for the purpose of maintaining its interest and educational motivation; matters of technical and methodical supply of the educational process.

Besides, learning "special" children it is necessary to take into account difficulties of each separately taken child. Difficulties, which have disabled children in the educational process, can be caused as by shortcomings of attention, emotional and strong-willed regulation, self-control, low level of educational motivation and general cognitive inactivity (i. e. weakness of regulatory components of educational-cognitive activity) and by underdevelopment of separate mental processes – perception, memory, thinking, speech defects, dysmotilities in the form of insufficient coordination of motions, motional disinhibition, low working capacity, limited store of knowledge and ideas of the world around, nonformation of operational components of educational-cognitive activity.

When developing the distance courses in subjects the main load lays down on a teacher who must take into account all learning children's peculiarities and by means of carefully thought over educational methods include a learner's different mental structures, different levels of his activities in cognitive activity. Naturally, it is required to strengthen the psychological component of learning distance courses [N.A. Novruzova, 2014].

It is obvious that distance learning gives great opportunities for children with special needs. Thanks to rather developed technical opportunities of modern computers and also of the software, allowing, for example, to enter information by ear, different categories of disabled children and not only with problems of the musculoskeletal system can be involved in distance learning. Especially there are specialized technical means of adaptation allowing children with various disabilities to interact with a computer fully.

In general, the main idea of distance learning is to take into account the capabilities and interests of each learning child with special needs, i. e. to assist in the development of individual educational trajectory orienting at the effective combination of different educational modes including distance learning. Besides, not less important purpose is to provide its cultural development, socialization, to develop creative abilities and skills of independent activities. The educational environment must be aimed not only (and perhaps not so much) at actually educational purposes but at the fact that each disabled child should find his optimal way to successfully adapt in life [N.A. Novruzova, 2014].

Within the adaptive educational environment, realized on the basis of telecommunication technologies, the effective distant computer educational support of disabled children will be provided. Thus, the bases for ensuring equal access for the population to the services of the preschool, general education and additional education of children are created. At that equality of access to the high-quality education and updating of its contents and technologies is also ensured.

To the main tasks of modernization of the educational system, noted by us above, also a problem of creating systems of ensuring quality, based not on control but on receiving timely and substantial information for taking administrative decisions, on involving the social governing bodies, is referred [A.V., Andreeva and N.A. Maksimova, 2013]. This problem is closely connected with application of the new information technologies ensuring adaptability. For effective management of quality, operational taking reasonable administrative decisions it is necessary to possess solid and reliable information about the course of the educational process. Procedures of monitoring within the traditional management scheme are a source of such information: planning – activities – monitoring – rendering the administrative influences. Monitoring in this case is understood as purposeful, specially organized, continuous tracking the change of the main properties of education quality in order to timely take the adequate administrative decisions on correction of the educational process on the basis of the analysis of the collected information and pedagogical forecast. There are many approaches to the description of properties and technologies of monitoring but continuous monitoring is represented to us as the most productive one [A.V., Andreeva and N.A. Maksimova, 2013]. As a functional basis of continuous monitoring as a technology is operating with information streams in real time, the problem of automation of its functions on the basis

of new information technologies arises absolutely naturally.

Thus, in the conditions of adaptive educational environment monitoring keeps a role of the leading link in the process of management of the education quality. Moreover, it acquires some new properties, and the main property, in our opinion, of them is ensuring information integrity of all environment, continuity of internal information processes. In the conditions of the information educational environment it is most fully possible to achieve the solution of a question of filling the needs of the subjects of the educational process in operational receiving information on the current parameters and results of the process of education of learners, ensuring continuous control of their quality on the basis of use of new information technologies.

At the heart of such monitoring are the formalized models of the subjects and objects of the information environment. The monitoring system interacts with the subject environment (learners, teachers, schools, education governing bodies, public organizations, associations of employers, etc.) by means of these models. Thus, realization of one more task – development of the individualized mechanisms of storage and use of the results of learning, creation of a system of support of collecting and analysis of information on individual educational achievements – is provided. The results of learning, reflected in formal models, can be stored, be transferred and be processed by means of the modern information technologies. And in this case we can state that the technologies, providing adaptability of the information environment, allow to create conditions for solving other tasks.

One more important task is essential increase of scale and effectiveness of use of the resources of nonformal and informal education. The considerable potential of new information technologies in this aspect is obvious. The researchers of this problem point: "Development of nonformal and informal distance learning is promoted by mass use of the Internet communications and its services in the educational environment, emergence of virtual communities ... on different questions" [A.V., Andreeva and N.A. Maksimova, 2013]. The adaptive educational environment provides a platform for realization of the certain types of social activities, interaction with reference social groups, self-actualization for learners. Thus, the conditions for realization and spread of both nonformal and informal education are created. The nonformal education will take place in different clubs, circles, during studying various courses, taking trainings in the course of studies. All the rest social and information activities within the services, provided by the educational environment, is referred to the informal education.

4. Conclusion

On the basis of said above we can conclude that the property of adaptability is a key one in development of the educational environment meeting the contemporary requirements and answering the key purposes and tasks of modernization of the educational system. Ensuring this property is based on wide use of new information technologies. In turn, a necessary condition for it is creation, storage and processing of formal models of the subjects of the educational process. Thus, the prerequisites for achieving other purposes, including ones considered in this work, are created. As the main technology of achieving them the formal modelling appears.

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