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## **PROGRAMMED AND AUDIOVISUAL LEARNING – THE STAGES OF INFORMATION TECHNOLOGY IMPLEMENTATION IN THE EDUCATIONAL PRACTICE**

### **Introduction**

The implementation of information technologies in the educational practice has a number of prerequisites. Some prerequisites are related to the implementation of new teaching ideas; other prerequisites are related to the development of information technology resources and technology. Groundbreaking pedagogical approaches of the 20<sup>th</sup> century were based on various psychological theories, in particular, the theories that helped to shape the scientific basis of programmed and audiovisual learning.

### **1. Problem of research, research focus and methodology of research**

*Problem of research:* for educational practice, it is important to realize that these scientific pedagogical approaches (programmed and audiovisual training) are complementary to each other, since they actualize different psychological mechanisms of intellectual information processing, based on the left- and right-hemispheric mental processes. Their joint and complementary use provided the basis for the creation of information tools aimed at a harmonious development of students' intellectual sphere.

*Research focus:* programmed learning as a teaching method emerged from Skinner's behaviorism psychological studies. At its core, programmed learning meant an independent

acquisition of knowledge and skills by a learner through mastering material step-by-step. The role of the teacher was reduced to monitoring the psychological state of the learner and the effectiveness of the gradual mastering of the educational material, and, if necessary, the regulation of the learner's activities. Psychologists, while carrying out their research of human behavior, supported the idea that every human act corresponds to a particular stimulus, so that the behavior can be described by the "stimulus-response" formula. Subsequently, on the basis of these ideas, the scientific theory of the stepwise formation of students' mental actions was formed by Galperin<sup>1</sup> and Talyzina<sup>2</sup>.

Alternative pedagogical ideas of audiovisual learning were based on gestalt psychological research<sup>3</sup>. Audiovisual learning means the use of audiovisual materials (media) with the aim of forming a culture of communication with the media, communicative abilities, critical thinking, analysis and evaluation of media texts, etc. These ideas began to develop actively during the creation of audio-visual educational materials<sup>4</sup>, and during the development of educational television<sup>5</sup> in Russia.

Gestalt psychology changed the old concept of human consciousness by arguing that not individual elements, but holistic mental images (gestalts) are analyzed. The image of this phenomenon (in other words "Gestalt") is not a sum of elements, but a complete structure which occurs in the human mind. This idea was elaborated, among others, by Koffka<sup>6</sup> and Kohler<sup>7</sup>.

*Methodology of research:* the main aim of the comparative analysis of the programmed and audiovisual learning was identifying the stages of information technology implementation in educational practice. Research methodology was based on the retrospective comparative analysis of the programmed and audiovisual learning approaches to the organization of learners' educational activities. Identification of the core concepts of programmed and audiovisual learning approaches made it possible to reveal the possibilities of integration of these ideas into the contemporary concepts of distance learning, e-learning and blended learning within life learning strategy.

## 2. Analysis of the programmed learning ideas development

Programmed learning reflects the education trends that have emerged in the course of scientific and technical progress: a close connection between science and practice; a certain class of human activities have been transferred to machines; management functions are

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<sup>1</sup> P.Y. Galperin, *Psychology of thinking and teaching about the gradual formation of mental actions. Studies of thinking in Soviet psychology. Introduction to Psychology*, Moscow 1976.

<sup>2</sup> N.F. Talyzina, *Managing the process of learning*, Moscow 1975, p. 250–318.

<sup>3</sup> M. Wertheimer, *Gestalt theory*, "Social Research" 1944, no. 11, p. 78–99.

<sup>4</sup> L.P. Pressman, *Basic methods of application of screen-sound media in school*, "Pedagogika" 1979.

<sup>5</sup> A.A. Stepanov, *Psychological principles of didactics instructional television*, Leningrad 1973.

<sup>6</sup> K. Koffka, *Principles of Gestalt psychology*, New York 1935.

<sup>7</sup> W. Kohler, *Gestalt psychology*, New York 1947.

increasing their role in all spheres of public life. To enhance the learning process management, all relevant scientific achievements were involved and, above all, cybernetics – the theory of communication and control.

The theory of programmed learning, one of the founders of which was B.F. Skinner, began to develop in the middle of the 20<sup>th</sup> century in the USA, and then in Europe. The main postulate of Skinner's theory was the idea that the result of a previous action (its psychological effect) affects the subsequent one. Consequently, behavior can be controlled by the selection and reinforcements of actions, thereby stimulating further behavior in the expected way. B.F. Skinner and his followers, being behaviorists, revealed laws that shape behavior, and on the basis-formulated laws of learning. For example, the law of effect means that behavior which is reinforced tends to be repeated (strengthened), and behavior which is not reinforced tends to die out-or be extinguished (weakened)<sup>8</sup>. In addition, Skinner described several approaches to the reinforcement:

- fixed interval schedule: an operant conditioning principle in which reinforcements are presented at fixed time periods, provided that the appropriate response is made;
- variable interval schedule: an operant conditioning principle in which behavior is reinforced based on an average time that has expired since the last reinforcement.

Ratio schedules – based on the ratio of responses to reinforcements.

- fixed ratio schedule: an operant conditioning principle in which reinforcement is delivered after a specific number of responses have been made;
- variable ratio schedule: an operant conditioning principle in which the delivery of reinforcement is based on a particular average number of responses (e.g. slot machines).

Skinner believed that teaching the whole class of students simultaneously had disadvantages because the rate of learning for different students was variable and reinforcement was also delayed due to the lack of individual attention. Since personal tutors for every student were usually unavailable, Skinner developed a theory of programmed learning that was to be implemented by a teaching machine<sup>9</sup>.

A teaching machine is composed of a program which is a system of combined teaching and test items that guides the student gradually through the material to be learned. The “machine” consists of a fill-in-the-blank method either on a workbook or in a computer. If the answer is correct, the student gets reinforcement and moves on to the next question. If the answer is incorrect, the subject studies the correct answer to increase the chance of getting reinforced next time.

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<sup>8</sup> B.F. Skinner, *Programmed Instruction Revisited*, “Phi Delta Kappan” 1986, no. 68 (2), p. 103.

<sup>9</sup> N. Wleklinski, *Skinner's Teaching Machine and Programmed Learning Theory*, [http://people.lis.illinois.edu/~chip/projects/timeline/1954teaching\\_machine.html](http://people.lis.illinois.edu/~chip/projects/timeline/1954teaching_machine.html) [16.11.2014].

The teaching machine is merely a device for presenting the set of frames of which the program is composed. However, it is not supplementary but all-inclusive. The program will do all the teaching through a response / reward mechanism. Skinner also noted that the learning process should be divided into a large number of very small steps and reinforcement must be dependent upon the completion of each step. Skinner suggested that the machine itself should not teach, but bring the student into an indirect contact with the person who composed the material it presented. He believed this was the best possible arrangement for learning because it took into account the learning rate of each individual student. The machine is a laboursaving device because it can bring one programmer into contact with an infinite number of students. Skinner's programmed instruction became a major education and commercial enterprise that still flourishes today.

Once the proposition that reinforcement is essential for learning had been stated formally, a host of experimentation developed which aimed to answer such related questions as, for example, 'How late may the reinforcement occur and still be effective?', Skinner found out that reinforcement with any organism may be quite inefficient unless it is almost immediately subsequent to the response. Another finding emerged early from research, but, unlike the preceding one, was the subject of controversy for a long time, largely because it seemed to contradict everyday experience. This second fact is that one cannot teach anything new by punishment (disapproval, censure, etc.) for an incorrect response<sup>10</sup>. Frequent is the use of punishment for 'unlearning' or wrong responses. However, the apparent fact is that punishment at best suppresses undesirable responses but does not wipe them out or prevent their occurrence in the future (as true learning would). The third fact that became evident was that responses that are wrong can be 'unlearned', by simply withholding the reinforcement after their occurrence. This fact, like the first one, is a trite statement to the effect that the best way of dealing with bores and fools is to ignore them. There were other facts regarding the learning process (and resulting methods for efficient teaching) which were with more or less certainty established in psychological laboratories. But let us pause here and see to what extent we are following the rules these facts generate when we are at work in the conventional lecture hall or classroom. The student is given quizzes, but the knowledge of whether or not the answers he gives to these quizzes are correct is often not given to him until at best a day later-much too late, it appears, to effectively strengthen his behaviour and be of any learning value. Even as the teacher talks in the classroom a student may in his own mind formulate questions (and answer them for himself) without ever being sure that he gave the right answers. Giving a student immediate feedback regarding what he is doing is, of course, nothing new; the ancient Greeks knew no other system of teaching than having a single tutor for each single student. That a good tutor can teach a student efficiently is evident to anybody. In addition, it is just as evident that if this insight (that a single tutor for a single student is better than one teacher for 20 or 30 students) were all that psychologists have to offer to modern educators faced with the task of teaching ever-

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<sup>10</sup> S. McLeod, *Skinner - Operant Conditioning*, [www.simplypsychology.org/operant-conditioning.html](http://www.simplypsychology.org/operant-conditioning.html) [10.06.2017].

increasing numbers of students, such advice would amount to no more than a bad joke. However, psychologists – Ryans<sup>11</sup>, Glaser and Schaefer, and Skinner<sup>12</sup> – working on learning and teaching realized early that because of the importance of providing reinforcement for every correct response on time, it was more convenient and much more successful to invent machines which would provide reinforcement, whenever called for, without tiring.

The technology of programmed learning was based on two main requirements: to move from external control to self-control and to students' self-study. The ideas of programmed learning and algorithmization were developed in Russia by P. Galperin, L. Landa, N. Talyzina.

### 3. Stepwise formation of mental actions

The theory of stepwise formation of mental actions (Galperin and Talyzina) considers learning as a system of specific activities, which guides a student to new knowledge and skills. Each type of learning activity consists of a system of actions, united by a common motive. Together they ensure the achievement of goals. The central point of this theory is an action as a unit of learning activity. All actions that make up learning activity, according to their content, were divided into two groups – general and specific actions.

General actions are: planning, control, techniques of logical thinking. These actions are not dependent on the characteristics of an object. The second group of actions reflects the characteristics of the studied object. Their use is limited by the object's specificity (sound analysis of words, actions necessary to geometric transformations, etc.).

While performing an action, a person is presupposed to have a certain view on the action as well as on the conditions under which it is performed. Every action involves a specific set of operations performed in a certain order and in accordance with a certain rule. A sequence of operations is the process of performing an action. Every subject's action includes two parts: orientation and execution. The orientation of an action serves as the psychological mechanism of any action. The execution depends on the orientation. The orientation may be either full or not. If we can find conditions for the construction of a sufficient (full) orientation basis of an action, a student will solve the task without mistakes from the very beginning and every time later on.

In this theory, the modus operandi and the image of the action are combined into a single structural element, which takes place on the basis of management action and is called the orienting basis of an action. Orienting basis of an action is a set of conditions which draws a person to a successful implementation of the action. Often, a person takes into account only a part of the necessary objective conditions, and sometimes an orienting basis involves redundant conditions.

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<sup>11</sup> D.G. Ryans, R. Glaser, H.H. Schaefer, *Programmed Teaching*, "Journal of Teacher Education" 1961, no. 12, p. 107–113, <http://dx.doi.org/10.1177/002248716101200124> [16.11.2014].

<sup>12</sup> B.F. Skinner, *Programmed Instruction...*, op. cit., p. 103.

Each action consists of three parts, according to its function: the indicative, the executive and the control part. The indicative part involves the use of those objective conditions which are necessary for the successful execution of a given action. The executive part – working part of the action – provides conversion of an object (ideal or material). The control part is aimed at tracking the progress of the action. The obtained results are compared with the given samples in order to make the necessary correction in the orienting and executive parts of the action. Thus, any human action is a micro-system management.c

#### 4. A training program in programmed learning

The main element of programmed learning is a training program which represents a sequence of tasks for an individual learning approach. Each program step consists of three parts: a dose of information about the investigated knowledge and action; a task – work with information for its assimilation; a control task (feedback), indicating the repetition or move to the next step.

L. Landa<sup>13</sup> suggested that this process be “algorithmized”. An algorithm is a rule prescribing a sequence of elementary operations, clearly understood, because of their simplicity, and executed by all; it is a system of instructions (orders) how and which actions to carry out. Not only an educational material is programmed, but also the process of digestion (understanding and learning), and control. A training program performs a number of functions:

- serves as a source of information;
- organizes the educational process;
- controls the degree of mastery of the material;
- regulates the pace of study of the subject;
- provides necessary clarifications;
- prevents errors<sup>14</sup>, etc.

Different types of programs are distinguished in programmed learning: linear programs<sup>15</sup> (Skinner), branched programs<sup>16</sup> (Crowder), mixed programs. Advantages of linear programmed learning are as follows: a small dose of information is assimilated unmistakably, with good results; pace of assimilation is selected by the learner. Disadvantages of linear programmed learning include: not every material can be processed; the student’s mental development is limited by reproductive operations; a lack of communication and emotion in learning.

Criticism of linear programs led to the creation of branched programs. Their creators believed that doses of educational material should be large enough, because the assimilation

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<sup>13</sup> L.N. Landa, *Algorithmization of learning*, Moscow 1966.

<sup>14</sup> V.P. Bepal’ko, *Programmed learning. Didactic principles*, Moscow 1971.

<sup>15</sup> B.F. Skinner, *Teaching Machines*, [in:] *Teaching Machines and Programmed Learning*, ed. A.A. Lumsdaine, R. Glaser, Washington 1961.

<sup>16</sup> N.A. Crowder, *Automatic training by intrinsic programming*, [in:] *Teaching Machines and...*, op. cit.

does not depend on an error-free path of small steps, but on a deep and comprehensive analysis of the content. The important feature of branched programs is a possibility of selective response. Thus, a program provides various ways depending on the responses and errors. This type of programs was criticized for a possibility to guess answers, remember and exclude the wrong ones. According to critics, even a branched program does not give the learner an integral and systematic presentation of the material. Finally, training for any of these programs is artificial and simplistic, while learning is a complex activity.

Therefore different kinds of programs were combined into mixed programming. Complex software products were gradually built, including different doses and types of information, problem-based learning and learning algorithms, different ways of entering students' answers, different degrees of adaptation to the individual needs, and a possibility of individual and group work within the program. The ideas of programmed learning caused a number of new technologies, for example, modular training, in which material is grouped into several blocks (modules): objectives, information, methodology, practice, control and assessment.

What are the advantages and disadvantages of programmed learning? The advantages of programmed learning are the following:

- formation of knowledge requiring abstract logical thinking;
- formation of reproductive knowledge;
- monitoring and evaluation of the reproductive knowledge level during self-control and self-assessment;
- overcoming various kinds of gaps in learning.

The advantages of computer-based training systems, implemented on the principles of programmed learning, include several aspects:

- the time factor: saving time during the monitoring of students' work and results;
- the degree of students' "coverage" in the learning process: the opportunity of mass learning at the stage of the reproductive knowledge and skills;
- the implementation of the individual approach: individual computer-based work;
- the "automation" of pedagogical operations: laboratory and practical work, computer simulations, tutorials.

Methods of programmed learning show the effectiveness in the disciplines built on strict logical knowledge: mathematics, physics, etc. In this case, programmed learning develops logical and formal thinking, the ability to carry out mental activities from simple to complex<sup>17</sup>.

It is clear that programmed learning is not a universal method by which it is possible to solve all didactic tasks – the range of its application is limited. The disadvantages of pro-

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<sup>17</sup> L.D. Eigen, *Applied Programmed Instruction*, New York 1962.

grammed learning are connected with a certain degree of automation that cannot affect students' personal traits and qualities: creative aspirations are reduced, own initiative is suppressed. Programmed learning is of a limited use in humanities. This area is not predominant with a rigorous, logical and typological thinking.

### 5. Analysis of the audiovisual learning ideas development

Disadvantages of programmed learning, to a large extent, can be overcome by audiovisual learning. Audiovisual learning (audiovisual education) is a personality development process based on the use of audiovisual material, mass communication or media, with the aim of developing a media communication culture, communication skills, critical thinking, interpretation, analysis and evaluation of media texts, teaching different forms of self-expression with media technology. The audiovisual literacy, as a result of this process, helps a person to make an active use of the information field of television, radio, video, cinema, and the Internet.

Audiovisual technology has become widespread since television expansion in the '60s of the previous century. The first countries in Europe to have begun using television for educational purposes were France and Russia. However, in France the main focus group was students<sup>18</sup>, and in Russia television found application not only in higher education through local television networks, but also in secondary schools.

The spoken word serves the basis for audiovisual communication, and this brings an audiovisual message close to a traditional pedagogical dialogue. However, the spoken word in an audiovisual form has its own specificity which is associated with the message creation. What is the basic approach to the development and establishment of educational audiovisual messages? While these messages are constructed, the following factors are being taken into account: the basic laws of learning, the expressive possibilities of screen art, and, especially, the communication channel through which the material is broadcasted (air transmission, cable network, direct presentation to the audience). All this requires special training of audio-visual learning material developers in the field of psychological characteristics of the impact of audiovisual messages, expressive means of screen arts, as well as methodological approaches of teaching a particular discipline, drawing on the language of the audiovisual messages.

The following requirements for the creation of audio-visual materials have been identified<sup>19</sup>:

- firstly, audiovisual messages have a figurative structure, i.e. different combination of words and images can form the basis of such messages. A visual image of the investigated object, phenomenon, and process may come to the fore in the message, and then, a teacher's words comment on it;

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<sup>18</sup> J. Gonnet, *Les medias et l'indifference. Blessure d'information*, Paris 1999.

<sup>19</sup> L.P. Pressman, *Basic methods...*, op. cit.

- secondly, the time for perception of audiovisual messages should have a fixed duration. Polymodal structure of audiovisual messages can create concentrated information flows and intensify cognitive and communication processes. In general, the length of a message should not exceed 25–35 minutes (for the younger age groups – 5–7 minutes);
- thirdly, audiovisual messages mainly have a single direction. Feedback organization was complex in the initial stages of audiovisual resources implementation. That is why they were used mainly for the implementation of “direct” information message with fragmentary feedback (questions to the audience, reference). Today, however, the synthesis of computer and audiovisual resources with the possibility of instant feedback has excluded this problem;
- fourthly, messages for teaching certain groups of learners with poorly developed skills of perception of verbal information (children, people with special abilities) should have a different structure. A proportion of words and images in such messages can reach optimal effect of educational material perception.

Accumulated experience of audiovisual educational messages allows identifying the educational effects. These effects are manifested in increased attention, awareness of perception, cognitive activity. Significant improvements can be achieved at the stage of intellectual activity management, and formation of moral convictions. These positive results can be achieved only on condition of certain audiovisual communication construction principles and adequate methods of their practical use<sup>20</sup>.

With the help of audiovisual technologies nearly any educational content can be presented. However, audiovisual technologies are more often used in humanities, because such content requires not only logic, but also emotions, relationships, manifestations of own opinion, interpretation of facts and phenomena. During an audiovisual presentation the emotional aspects, visualization and presentation of different viewpoints are important.

Scientific foundations of film pedagogy<sup>21</sup> and educational TV<sup>22</sup> aimed to define functions, structure, didactic possibilities of screen learning tools and educational telecasts. Pedagogical benefits required strict selection of content and corresponding presentation forms. Artistic expression specifics, furthermore, implied information uncertainty and creative solutions. The search for optimal specific didactics and expressive possibilities combinations of educational television has led to the formulation of framework requirements. Many of the requirements formulated in the ‘30s of last century have not lost their relevance for the present. Here are some of them:

- the content, depth and volume of scientific information must comply with the cognitive abilities and the level of students’ performance, their intellectual level

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<sup>20</sup> G.A. Bordovskiy, T.N. Noskova, A.A. Stepanov, *Developmental features of audiovisual technologies of education*, “Pedagogika” 1996, no. 4, p. 40–43.

<sup>21</sup> L.P. Pressman, *Basic methods...*, op. cit.

<sup>22</sup> A.A. Stepanov, *Psychological principles...*, op. cit.

- and age characteristics. Training material should be available for film adaptation and transmission via the audio series;
- films of solely illustrative character, without educational potential, are considered unacceptable;
  - a film is divided into successive stages. A viewer must be motivated in the beginning of the film and led to their own conclusions. Conclusions should not be given as a finished product;
  - a film should give the opportunity to link theory with practice and real life. Theoretical information should find confirmation in the film in the examples taken from life. A single film should be devoted to a single topic;
  - the rate of film presentation should provide complete assimilation within one viewing. Means of expression in the film should be subordinated to the main objective;
  - speech and music series should help the perception and understanding of the visual series. Visuals and narration should be linked together and present information in an understandable logical sequence of a portions-step method adapted to students' pace.

According to their purpose, audiovisual materials were to facilitate students' systematic scientific knowledge development, to foster their ability of working with information, to create their own system of perception and critical thinking, to develop cognitive activity, to improve the quality and effectiveness of pedagogical work. The forms of audiovisual materials were diverse: lectures, stories, interviews, dramatized presentation with the methods of literary theater, excursions to enterprises, museums. TV programs included a variety of cognitive tasks related to the proposed screen material. The main components of audiovisual materials were both teachers' spoken words and visual images.

Audiovisual materials were used to solve the specific goals of media education – deliver the basics of audiovisual art (types and genres of audiovisual media, audiovisual media function in society, audiovisual media language, audiovisual media history and culture). This idea was developed in Europe by Fransecky, Debes<sup>23</sup>, Alvarado, Boyd-Barrett<sup>24</sup> and Krucsay<sup>25</sup>. In Russian main research was carried out by Fedorov<sup>26</sup>.

Audiovisual imagery, a use of artistic expression methods, a flexible combination of words and images, allow for influencing students' left and right hemisphere development. Thus, audiovisual technologies and programmed learning can complement each other.

In Poland, the pedagogical specialization program includes a subject referred to as *Media education, Technical means of education support*, which contains among most important aims of preparing of prospective teachers – developing competences in the area of effective use of audiovisual technologies. Some universities, for example,

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<sup>23</sup> R. Fransecky, J.L. Debes, *Visual Literacy: a Way to Learn – a Way to Teach*, Washington 1972.

<sup>24</sup> M. Alvarado, O. Boyd-Barrett, *Media Education. An Introduction*, London 1992.

<sup>25</sup> S. Krucsay, *Educating for the Media and the Digital Age*, Vienna 1999.

<sup>26</sup> A.V. Fedorov, *Media education in Russia: history, theory and methodology*, Rostov 2001.

the Warsaw University, develop a special Audiovisual Education and Media program (PEAM) for implementation at its own departments as well as outside (<http://www.come.uw.edu.pl/peam/>). The purposes and objectives of the PEAM program should meet the challenges of the Polish education market in the years 2012 to 2022. The program aims to change the rules prevailing on the market, to increase the efficiency of acquiring knowledge and skills, as well as to change young people behavior on the Web and change the rules of social communication in Poland and Polish citizens communication with the outside world (<http://www.come.uw.edu.pl/peam/>).

## **6. Integration of programmed learning and audiovisual learning**

The long path towards the formulation of scientific ideas and their wide practical implementation was associated with the development of information tools and technologies. This was also connected with the improvement of media and the dissemination of information products and materials. What is important is the fact that due to their lower cost, tools and technologies have become available for general educational practice and for individual students.

Consequently, it is important to explore the information tools and technologies development that has allowed combining the ideas of programmed and audiovisual learning, along with many other ideas of the later pedagogical practice.

Programmed learning started to be used in teaching practice at first as machineless methods ranging from card based tasks, and mechanical devices for reading information. For the purpose of programmed learning training materials were developed on various academic subjects with the learning management process built on the basis of presentation of educational material for students in form of special units corresponding to assimilation steps. In linear programs a step was understood as the smallest information unit in the process of elementary cognitive task solutions. In case of the wrong decision in the subsequent frame (card), the right information was presented that provided immediate error correction.

In branched programs learning tasks were more complex. After the right decision a student received confirmation and an indication of the next school assignment. In case of the wrong decision a student was provided with a short explanation of the error and instructions for re-doing the same or a similar task. As a result of programmed learning implementation a number of tutorials on various academic subjects were developed and used by different categories of students.

Depending on learning objectives, specific educational material characteristics, students' age, various mixed forms of programmed learning materials were developed. Such materials could be used with various training techniques, including television and personal computers. Such systems were called automated training systems.

Today some elements of programmed learning are still used, for example, automated control systems for students' knowledge; various types of simulators.

Important approaches based on elements of programmed learning include the following: creation of adaptive learning systems, problem-based learning, educational dialogue, human-machine interaction. It is important that the development and use of programmed learning has set new theoretical and practical problems of optimal control, provided more intensive use and creation of special training devices.

Examples of computer software, partly or largely using the principles of programmed learning can be found in different areas of knowledge: mathematics, physics, chemistry, history, linguistics, and many others. Automated training courses usually comprise a system of exercises for comprehension and retention of theoretical material. Standard operating modes of such courses include: theoretical material, training, control, and working with dictionaries.

Here is an example of working with one of the simulators in physics, which supports students in theoretical material comprehension and memorization. After each exercise, a student receives a message about the quality of his / her performance, the correct answer and (or) the theoretical material on the subject. There are two types of the simulator mode: the full mode and the selective mode (when a student fulfills a number of own exercises, selected randomly from the database). The control mode is designed for current or final control level of theoretical material mastering. There are two possible types of control: a student either can answer a number of questions that are randomly selected from a database, or receive pre-arranged questions. Glossaries of terms and concepts allow one to apply selectively (by term) to the modes of theory, simulators and (or) control. Information on a student's results is automatically recorded in a log file. The program management log allows for sorting information on various bases, and perform statistical analysis to identify "a difficult" and "an easy" training material.

An automated training course can be a part of an automated training system. An automated training system is an organizational and technical system for processing control of training sessions and implementing a human-computer complex, based on an adaptive dialogue between a user and a software package. The analysis of existing automated training methods allows defining a variety of an automated training course features. The following principles of automated training are applied in this case:

- knowledge development mode;
- knowledge control mode;
- expert-consulting mode;
- skills development mode;
- curricula forming mode with dialog elements.

This list shows that, along with other computer training features, programmed learning is still used, but on a more advanced technological level. An adaptive human-computer interaction model, which partially includes elements of programmed learning, can be built on a linear and a branched principle. The basis for the informational aspect can be formed

as a semantic network, a logical system, a frame structure, and a student model. For example, a variety of computer simulators for language skills development are functional tools for foreign language skills self-improvement.

The ideas of programmed and audiovisual learning, based on multimedia tools, have made possible to integrate into a single system the opportunities of programmed learning with step formation of mental actions and ideas of audiovisual learning with visualization tools, audio, artistic and imaginative methods of training materials presentation. Balanced use of programmed learning, audiovisual learning and multimedia applications in computer training programs have allowed to reach the planned educational effects of information technology. Such a hybrid approach in building multimedia learning systems requires a broad set of goals for knowledge, practical skills, and competencies formation.

The present phase of programmed and audiovisual learning implementation is associated with remote access to electronic educational resources by means of Intranet and Internet technologies.

### **Conclusion**

The integration of programmed learning and audiovisual learning has opened new horizons in the creation and widespread use of information systems and technologies in education. Connected to the cloud and mobile technologies, they form the basis for the functioning of new knowledge, public education systems on the one hand and form the basis for distance learning, e-learning and blended learning technologies on the other. Modern electronic courses, massive open online courses, designed for the simultaneous development of wide student audiences include a variety of elements. Among them there are tutorials and media content with actively developing group interaction technologies. Thus, through the integration of various educational means it is possible to create a prototype of knowledge society educational technology, assuming the life learning strategy with a comfortable, affordable training.

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### **Programmed and audiovisual learning – the stages of information technology implementation in the educational practice**

This article represents an overview of programmed learning and audiovisual learning. This aim will be achieved through the presentation of the historical stages of the implementation of information technology in educational practice. The concepts of Programmed learning are critically analysed from the behaviorism standpoint, while audiovisual learning concepts are presented from the point of view of Gestalt psychology. The summary of the 20<sup>th</sup> century European and Russian scientific research in the fields of programmed learning and audiovisual learning leads to the integration of these ideas into the concepts of distance learning, e-learning and blended learning within a life learning strategy.

**Keywords:** programmed learning, audiovisual learning, behaviorism, Gestalt psychology, media, multimedia, education.

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### **Programowane i audiowizualne nauczanie – uczenie się: etapy implementacji technologii informacyjnej w praktyce edukacyjnej**

Artykuł przedstawia przegląd programowanego nauczania nauki i edukacji audiowizualnej jako historycznych etapów wdrażania technologii informacyjnych w praktyce edukacyjnej. Idee programowanego nauczania – uczenia się są krytycznie analizowane z punktu widzenia podstaw behawiorystycznych, a koncepcje uczenia się audiowizualnego wiążą się z psychologią Gestalt. Podsumowanie europejskiego i rosyjskiego badania naukowego z XX wieku w zakresie programowanego nauczania i kształcenia audiowizualnego prowadzi do włączenia tych idei do koncepcji uczenia się na odległość, e-learningu oraz nauki mieszanej (*blended learning*) w ramach strategii uczenia się przez całe życie.

**Słowa kluczowe:** programowane nauczanie, uczenie się audiowizualne, behawioryzm, psychologia Gestalt, media, multimedia, edukacja.

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