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SMART EDUCATION IN THE TRANSFORMATION DIGITAL SOCIETY

Summary. The issue of smart education in the transformation digital society is highlighted. The smart society formation as the next stage of the digital society development is studied. It is established that in the smart society there is a transition from the traditional learning model to e-learning, and then to smart education. Smart education allows students to generate new knowledge and form a personality who is well-versed in the information and computer technologies for searching, analyzing information and creating innovations. The pecularitis of the smart education and the technologies with which it is implemented are considered. It is noted that the concept of smart education assumes the elements in the

education system that ensure rapid adaptation of the entire system to changing requirements, not only the educational process. This is a complex development of educational services, including personnel support, administrative and legal management, material and technical base and pedagogical design. The elements, characteristics and conditions of the smart education implementation are given. The key task facing the smart education is identified, which is to ensure the sustainable development of the society and the economy in accordance with the changing environment, providing opportunities for creating a new level of efficiency in the economy and public administration. An important factor of smart education is the organization of feedback, in order to motivate students, save educational materials and records, also it is necessary to create a cyber space for further joint use of resources.

The concept of smart technologies and the list of the main smart learning technologies used in higher education are characterized. The requirements for smart technologies (availability, efficiency, economy, aggregativity, complexity) are given.

The concept of a smart textbook, which should be the basis for a smart educational process, is characterized, and the scheme of its development is given. The requirements for the technology of creation and the foundations that are the basis of the smart textbook, the requirements for its content and its structure are highlighted. The interactive environment of the smart textbook is defined.

It is concluded that smart education expands the perception of education in comparison with training; goes beyond the technical developments; solves a greater number of educational tasks and satisfies more diverse needs of social subjects.

Key words: smart; smart society; smart education; smart learning; smart technologies; smart textbook.

1. INTRODUCTION

Formulation of the problem. The contemporary world is characterized by a state of constant systemic global changes. The role of the information communications, products and services in the socio-economic and cultural life of a person is growing. A breakthrough in the development of the information and system technologies determined deep, meaningful transformations in all spheres of human activities. Currently, there is every reason to claim that the information society is undergoing an evolutionary transformation and is moving to a new level – a smart society, the main idea of which is to improve all aspects of life through the use of digital technologies. The smart society formation is the next stage of the digital society development, because now the technologies that were previously based on information and knowledge are being transformed into the technologies based on interaction and exchange of experiences – smart technologies.

It is assumed that in the smart society there is a transition from the traditional model of learning to e-learning, and then to smart education. At the same time, the role of educational institutions is also changing, which are not intended to "provide knowledge", but to create the best conditions for students to acquire their own experience and skills.

We can state with certainty the fact of the existence of a new generation, namely the digital generation, for whom mobile phones, computers and the Internet are as necessary components of their living space as nature and society. The influence of human capital is no longer enough for the development of modern education. It is necessary to change the educational environment itself, not just to increase the volume of labor resources formation, and to change the content of education, its methods, tools and environment. Therefore, higher education institutions face a new global task: to train personnel who has creative potential, who can think and work in the new world, who can work "beyound the framework" and are ready to implement changes.

In this regard, the main function of the teacher is not to give the "ready-made truths", but to navigate through the information and computer technologies and global information resources. Smart education allows students to generate new knowledge and form a personality that is well-versed in the information and computer technologies for searching, analyzing information and creating innovations. The pace and level of development of electronic education technologies have initiated a new worldwide phenomenon of smart education. This is not only a system of innovative technological solutions, but also a new philosophy of education [1, p. 5].

Implementation of smart education is a real practice in schools and universities. Smart education should be considered as a set of technologies that allow individuals to carry out

educational activities taking into account the latest intellectual solutions. This understanding of smart education expands the perception of education in comparison with learning; goes beyond the technical developments; solves a greater number of educational tasks and satisfies more diverse needs of social subjects. The research capabilities of educators, as well as the participation of students in this process, are directly proportional to the size of the city and its cultural importance. In academic smart education, an important issue is to reduce the gap between the time formation of the "personal product" (of a graduate) and its demand. Smart education, in our opinion, should help both in the situation of excess information and in the situation of data lack.

Analysis of recent research. Researches on smart education appeared several years ago, they present the key trends in the education development and create prognostic realities of further changes in the education system. This situation creates notional and conceptual uncertainty, which does not allow to clearly attribute this or that phenomenon to the field of smart education.

The works on information society and innovative education by such authors as D. Bella, Z. Bzhezynskyi, E. Giddens, M. Castells, J. Masudi, A. Toffler present the evolution of the information society into the post-information society. The researches of V. Bykov, R. Gurevich, M. Kademia, N. Dniprovska, M. Levin, M. Rosenberg, O. Semenikhina, V. Tykhomyrova and others testify to the trend of transition of the post-information society into the smart society.

Ukraine has the necessary prerequisites for the formation of a new information society, as evidenced by the achievements of domestic scientists in this field: V. Bykov, R. Gurevich, A. Gurzhii, M. Zhaldak, M. Kademia, N. Morse, O. Spirin, V. Lapinsky, V. Voronkova and others. According to these reseaches, the technologies based on information are transformed into the technologies based on interaction and knowledge. That is, development is the society development of knowledge of digital technologies, digital society, all that is called the digital era of the development of civilization, which is based on the smart society [2, p. 122]. The mentioned issue is also highlighted in the studies of V. Bykov, A. Gurzhii, N. Tikhomirova, and V. Tikhomirov.

The purpose of the article is to cover to highlight the issues of smart education, smart technologies and smart learning in the transformation digital society.

2. RESULTS OF THE RESEARCH

In the conditions of constant growth and updating of knowledge, the continuous development of competencies throughout the career becomes the most relevant in the system of modern education.

The influence of human capital is no longer enough for the education development. It is necessary to change the educational environment itself, not only to increase the amount of labor resources, but the very content of education, its methods, tools and environment must change qualitatively, that is, a transition to smart education is necessary.

Smart is a pecularity of a system or process that manifests itself in the interaction with the environment, and endows the system and/or process with the ability to:

– immediate response to changes in the external environment;
– adaptations to changing conditions;
– independent development and self-control;
– effective achievement of results.

The key feature of the "smart" is the ability to interact with the environment. This feature has an independent meaning and can be applied to such categories as city, university, education, society, etc. More than 40 years ago, when this feature was identified, the level of technology development did not allow to achieve this feature in most systems or processes. However, modern achievements in the field of ICT make it possible to build extremely complex systems, for example, such as a smart city.

The contemporary level of ICT development allows to achieve the "smart" feature in processes, subjects, objects and even subjects. In modern society, which is dynamically developing and/or changing, the "smart" feature is the most demanding both in everyday life (judging by the prevalence of smartphones) and in scientific and professional spheres.

The concept of “smart" in education arose as a result of the penetration of various smart devices that facilitate the process of professional activity and personal life (smartphone, smart home, smartcar, smartboards, smart system of hard disk self-diagnosis). “Smart” refers to increasing the level of intelligence of devices that form an environment for a particular type of activity.

Smart is an acronym for the words Self-directed, Motivated, Adaptive, Resource free, Technology embedded, which denotes the orientation of education to the individual, motivation, adaptability, free access to resources, and the use of technologies [3, p.19].

Smart education is flexible learning in the interactive educational environment using the content from around the world that is freely accessible, which allows to expand the boundaries of learning, not only in terms of the number of students, but also in terms of temporal and spatial indicators: learning becomes available everywhere and always [3, p. 23].

Smart education is self-governing, motivated, flexible, technological learning, which is based on digital resources and technological learning methods [4, c. 10].

The ultimate goal and vision of the smart education strategy is to promote the development of creative, global human talents through a “revolution in time”, which is expected to bring updates to the content of education, teaching and assessment methods, and change the educational environment in accordance with the new educational paradigm.

The content of smart education concept is interpreted differently in each country, but in all cases it boils down to a number of new effects, meeting the needs of stakeholders in terms of a new type of society.

Smart education provides: flexibility of learning in the interactive educational environment; personalization and adaptation of training; free access to content worldwide.

Smart education is implemented with the use of technological innovations and the Internet, which provides students with the opportunity to acquire professional competences based on the systematic multidimensional vision and the study of disciplines, taking into account their multifaceted nature and continuous updating of content.

Education in smart educational institutions should be maximally included in the student’s life, be informal in nature, and also be based on the technologies that are advanced and available to everyone today. In order to keep up with the growing needs of students and smart educational institutions, it is necessary to meet the following requirements: flexibility, adaptability, quality indicators, innovations [5, c. 67].

So, what do we mean when we label any technology as smart technology? Perceiving smart technologies as something “intelligent”, we expect them to imitate the intelligent behavior. Accordingly, from the smart technologies, we expect the ability to some intelligent functions along with ease of use. Due to this, artificial intelligence systems and smart technologies cannot be equated.

Smart technologies are a “visualization” of intelligent systems, so we can say that they are born at the intersection of the disciplines “Artificial intelligence” and “Human-computer interaction”. Therefore, their “intelligence” is subject to the same limitations that underlie the intelligent systems. Among such limitations is the algorithmic nature of the work, which, even in the case when the system is “learning” (if it is not a neurocomputer system), limits the ways of its learning. The intelligent systems automate the routine actions for searching and systematizing information, but, surely, do not perform “spontaneous” intellectual functions that require human intelligence. They “accelerate” its work, but not the actions of any smart system require correct organizational decisions and non-trivial intellectual procedures. At the same time, they contribute to the creation of special organizational structures that become the basis of smart education.

The significant and rapid pace of the scientific and technological progress has revolutionized the digital education sector, as the modern information society needs fundamentally new approaches to quality the education starting from preschool age. In this context, new ways, means and methods are used to train highly qualified specialists who will have the basics of digital literacy and will be able to develop, implement and disseminate the digital education. This task can be achieved through a well-established educational process. [6, p. 76].

Smart technologies in education are the technologies that provide dialogue, that is, an active exchange of messages between the user and the information system in real time. The emergence of smart learning tools provides such new types of educational activities as registration, collection, accumulation, storage, processing of information about researched objects, phenomena, processes, transmission of rather large volumes of information presented in various forms, management of display on the screen, models various objects, phenomena, processes. Smart dialogue is carried out not only with the learning environment, but also with learning tools that function on the basis of information and communication technologies [7, p. 20].

The concept of smart technologies was added to the element of communication and it emerged in the 2000s. Currently, smart includes hardware (computers, servers, etc.) and software (operating systems, network protocols, search engines, etc.). Their capabilities are widely used during the educational process, hence smart can be considered a pedagogical technology. Any pedagogical technology is an information technology, since the basis of the technological process of learning is the acquisition and transformation of information [3, p. 15].

The importance and necessity of introducing smart technologies in education is substantiated by international experts and scientists. Smart technologies affect all spheres of human activity, but, perhaps, they have the strongest positive impact on education, as they open up opportunities to introduce completely new methods of teaching and learning [8, c. 159].

Smart technologies are used in the implementation of educational programs, which consist not only in instrumental technologies for conducting the educational process (Smart board, etc.), but also in innovative curricula and disciplines. It is smart technologies that make it possible to develop revolutionary teaching and methodical materials, as well as to form an individual learning trajectory for students.

The basis of the development of smart technologies is the Internet, and therefore the global global network should be considered the starting point of the process of forming smart education. The transition to significantly new market conditions of business presents the higher school with the new conditions for training specialists. Accordingly, the requirements for scientific and pedagogical personnel are much higher [9, p. 12].

The growing attention to the issue of improving the qualifications of pedagogical personnel is explained by the following reasons: the growth of scientific information; progress in the field of engineering and technology; integration of education, science and production; globalization processes [10, p. 523].

Thus, we can note that smart technologies are an interactive educational complex that allows to create, edit and distribute multimedia educational materials, both in the classroom and outside the classroom.

The definition of the abbreviation “smart” is as follows: self-managed; motivated; adaptive; resource-rich; technological [11].

Therefore, these technologies are designed primarily to save time and resources to achieve the learning goals of both students and educators. The main smart learning technologies used in higher education are the following: conducting classes with the help of multimedia presentations; Smart boards; interactive displays Sympodium [12, p. 72].

The key task solved with the help of smart technologies is present maximum the educational material to the user [7, c. 20].

The main requirements for these technologies are:

– accessibility – all participants in the educational process should be able to use certain technologies;

– effectiveness - can be defined as an increase in the level of perception of educational information, improvement of academic performance, increase in initiative and scientific activity of students;

– economy – saving time and resources;

– aggregativity;

– comprehensiveness – the principle of comprehensiveness should be followed, under which a synergistic effect is possible.

Taking into account the characteristics of the new generation, the tasks of modern education should be transformed to meet the requirements of the 21st century by searching for new technologies and modernizing the educational environment.

The concept of smart education correlates with the latest educational trends announced by FORBS magazine [7, p. 28].

Unlike e-learning, the concept of smart education assumes the elements in the education system that ensure the rapid adaptation of the entire system to changing requirements, not only the educational process. Smart education includes accumulated and developed approaches to learning in their traditional sense and with the use of electronic technologies, but is not limited to them. None of the previously used approaches in education envisaged an immediate reaction of the learning process itself to the changing conditions of the external environment.

The concept of smart education provides for the comprehensive development of educational services, including personnel support, administrative and legal management, material and technical base, and pedagogical design. To build a conceptual map, a central concept is chosen, which in this case is smart education. Other concepts included in the concept are connected by a system of certain relations with the central concept. Types of connections between concepts can be different (Fig. 1).

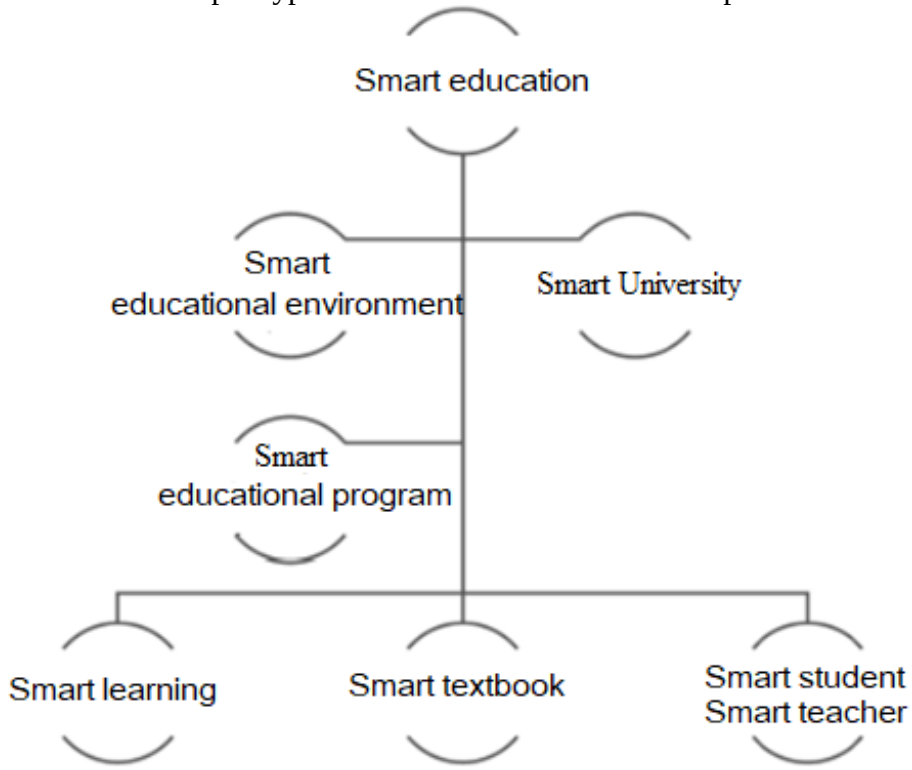

Fig. 1. Elements of smart education

The prerequisites for developing the concept of smart education are:

1) technological factors that provide new means and technologies for learning in the modern information and telecommunication environment;

2) social factors, including society's need for a new quality of educational services;

3) economic factors, which consist in the fact that education has always made a significant contribution to the development of the macroeconomics. And in the conditions of an unformed information society, the relevant education system determines the place of the university in the development of the innovative economy.

The key task facing smart education is to ensure the sustainable development of society and the economy in accordance with the changing environment, providing opportunities for creating a new level of efficiency in the economy and public administration.

Thus, the following trends are currently distinguished in the world practice of education:

– distance education becomes the leader of educational technologies;

– video courses on Your Tube and iTunes are becoming not only popular, but also in demand by the younger generation, the number of electronic educational materials and their rapid growth in popularity indicate that by 2050 there will be only a few dozen universities in the world, which due to network technologies and IT tools will teach millions of students;

– personalization of education is an alternative to unified approaches in education, which require the same results from all subjects of education;

– individual psychological characteristics of a person should become the basis for personal educational programs, the basis for which the motivation of learning will appear and will gain a new impetus in the development of intelligence, creativity and creativity;

– gamification (introduction of game technologies into non-game situations) as a technology of rewards for what has been done can contribute to increasing the motivation of learning and improving its quality – formally, education is gamified, as it uses a system of incentives (positive evaluations and transition to the next class or course as a new level up), but the modern trends of deterioration of the general state of education indicate the need for changes in such "gamification";

– interactive textbooks should fundamentally change the "traditional" presentation and interpretation of educational material – the linear structure of courses and their textual presentation cannot ensure the multidimensionality of the modern educational process, which is supported by multimedia technologies (color photos, audio and video support, interactive infographics, etc.);

– learning with videogames which provide knowledge about the real world through interactive immersion in the virtual world [7, c 28].

The main characteristics of smart education are the following:

– Free – ensuring compatibility between software developed for different operating systems. Free of charge allows to provide equal opportunities for learning, regardless of the devices used, providing the opportunity to implement the continuity of the educational process and the integrity of educational information.

– Independence from time and place, mobility, continuity and ease of access to educational information.

– Teacher and student autonomy due to the use of mobile devices to access educational information.

– Definition of different motivational models.

– Interrelationship between individual and organizational goals of employers and educational institutions.

– Evaluation of the demonstrated changes in competences – the effectiveness of the educational process is measured not so much by the acquired knowledge as by the opportunity to apply it in practice.

– Flexible training from the point of view of the student's preferences and individual capabilities (the possibility of adjusting the training to the individual parameters of the student, including such things as: the result of knowledge, experience and skills; learning style; up to the physiological and psychological state at each specific moment of training).

The conditions of the realization are:

1. Recognition of non-formal and in-formal education.
2. Use of neuroagents to collect and process information.
3. Competency-oriented training – updating its content based on the models and competency profiles defined by employers and other stakeholders.
4. Necessary systematic changes in the technical architecture and the introduction of smart devices into the educational process that provides the opportunity for continuous management of competencies by all participants in the educational process.
5. Implementation of self-diagnosis tools of the interactive educational environment to ensure the stable functioning of all elements of the educational environment, both hardware and content.

6. To implement the principle of continuity, it is necessary to implement a cross-platform approach and use software for organizing the educational process that is adaptive to all existing operating systems, including based on the use of cloud technologies, content design based on uniform data description standards, for example, based on SCORM specifications.

7. High speed of updating educational content due to the use of micromodules, the possibility of updating content from different devices.

8. Use of educational content development tools that provide the opportunity to create objects in device formats used in the integrated intellectual environment.

9. In the assessment system, it is necessary to shift the focus to the effectiveness of training by reducing its duration.

10. Accurate metrics are needed to determine competency before and after training.

11. All metric measurement results are placed in the electronic portfolio as data for learning style analysis.

It should be especially emphasized that for the successful implementation of smart education, it is important for scientific and pedagogical workers to adhere strictly to the existing intellectual technologies and their implementation, which should be implemented taking into account the personal requirements and preferences of the learner. To do this, it is necessary to use an individual study schedule, to maintain constant contact between a student and a teacher, to follow the study system for learning, to use a convenient time and place of study. All this will allow students and teachers to save money and time [13, p. 268].

Smart education is education that promotes the development of students' creativity, cooperation, problem-solving abilities, and communication skills. To develop optimal models of teaching and learning, teacher-researchers from experimental schools have developed various models that use Web 2.0 for data collection, Google Docs and Google Apps for organizing collaboration and working on projects, SNS (social networks) for discussion . Educators work in the SMART Classroom for the successful implementation of smart education at the level of school, vocational training, universities improving lessons in the classroom, laboratory, workshop and providing solutions to students' educational problems.

Online learning expands the boundaries of education, ensuring the connection of educational institutions in cyberspace, where students can take part in the implementation of practical tasks, video conferences, and attend online classes. In addition, online education provides equal rights to education for students of different categories. Online classes allow students who cannot attend the educational institution due to limited physical capabilities, illness, to continue their studies [14, p. 63].

An important factor of smart education is the organization of feedback, in order to motivate students, save educational materials and records, also it is necessary to create a cyber space for further joint use of resources. The system, based on the cloud technologies, allows for the integration of separate educational services and resources, provides greater convenience for the user's work, saving data, expanded access to data and collaboration.

Currently, teaching using the traditional technologies does not fully contribute to the motivation to study of students who are already used to the use of learning technologies in educational processes. At the same time, the teacher should make every effort to emphasize, and not diminish, the role of live communication between the communicator and the listener, who already has the opportunity to learn the information given by the teacher from other sources. In order to develop sustainable motivation for learning, the teacher should be able to recognize the reaction of students, provide timely feedback and apply an individual approach as much as possible. No less responsible here is the role of the student who learns with the help of smart technologies, because the significant volumes of information that the student can cover do not yet mean their 100% reliability, quality and proper systematization [15, p. 104]. In connection with this, the problem of "intellectual limitations" of vocational training students is relevant. The majority of modern students do not read scientific and even fiction literature, they actively use IT, but in rather narrow areas (social networks, games, etc.), as a rule, are unmotivated to study and at the same time do not expand their own range of interests.

Smart technologies create the illusion of constant availability of knowledge, as a result of which the student does not lose interest in memorization and can be interested only in those messages that are accompanied by bright pictures or modern special effects. Information that is not always important for perception can be accompanied by special effects, which is why effective learning with the help of smart technologies involves no less effective self-education and skillful control of the intensity of learning and rational use of free time. At the same time, it is almost impossible to interest a modern student who has access to numerous electronic materials with simple text manuals, it is necessary to create such a scenario that would captivate and encourage creative and scientific activity [13, p. 269].

We present an example of using one of the types of smart technologies – a smart textbook, during the use of which you can have full access to the proposed materials from absolutely any gadget.

A smart textbook is a comprehensive educational material that is created and updated based on the use of technological innovations and Internet resources, containing a systematic presentation of knowledge in the subject area with various links to resources and functions to support learning at any time and from any location places.

Implementation of the smart textbook concept outside the learning environment is impossible. A smart textbook should be the basis for the smart educational process (Fig. 2), include the advantages of a paper textbook, the technical capabilities of electronic courses (primarily SCORM), and also have a number of advantages compared to the above.

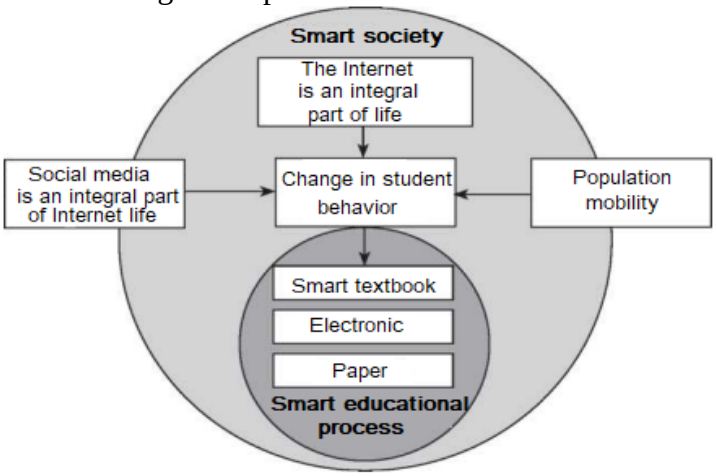

Fig. 2. The place of the smart educational process in the smart society

The scheme of the smart textbook development is presented in Fig.3.

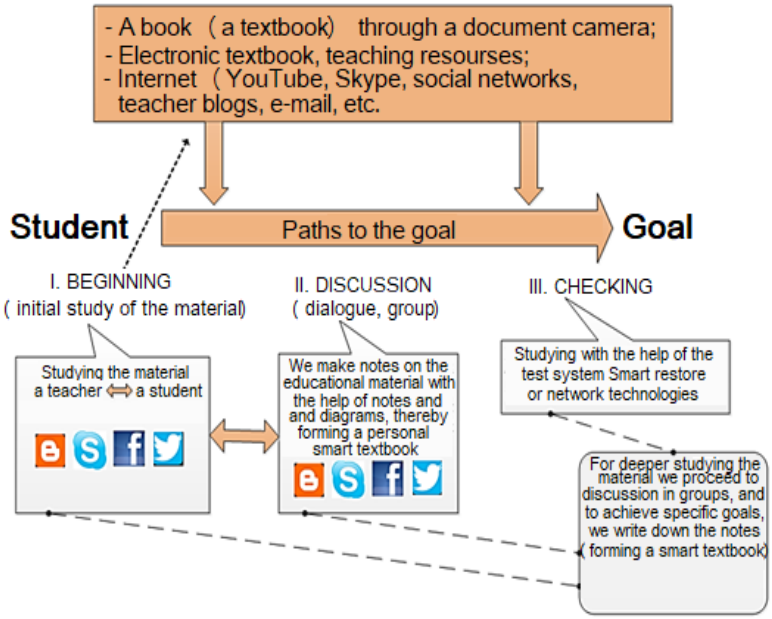

Fig. 3. Scheme of the smart textbook development

The requirements for the technology of creating a smart textbook are the following: the use of cloud technologies; use of advanced multimedia capabilities; interactivity of educational tools; automatic filtering by the level of assimilation of educational material (knowledge rating); subscription to access and use; group work of co-authors and readers in the Internet space; creating content through the student's personal account.

Fundamentals that form the basis of the smart textbook are: smart educational environment; clear setting of goals and tasks for students; step-by-step and short, but maximally informative and convenient for perceiving the presentation of new educational material; activity approach in education; availability of special exercises for practicing theoretical material; fixation and control of each step of work execution (usually in the form of tests); support of two-way "student-teacher" communication. Smart textbooks are free for all users.

Here are the requirements for the content of the smart textbook: clearly structured educational material; availability of course navigation, annotation; structure of the database on the server; availability of links to relevant sections of the course; necessary educational information; the possibility of choosing information in the course; links to other useful resources. A repository is an area of memory on a server in the form of a library of educational materials on a topic. Each teacher can add to the library and edit the provided materials. The purpose of the repository is to collect in one place all materials (from the Internet, home collection, etc.) for learning the topic.

The structure of a smart textbook is formed by the teacher on a certain subject for a specific class or group of students. The main goal is to create an educational space for successful study of the topic. Since the textbook should, on the one hand, provide an individual learning trajectory, and on the other hand, lay out the program material, it should be algorithmically built and have a clear, flexible structure [16, p. 283].

The optimal structure of the smart textbook is the following: a block for studying new material; a block focused on assimilation of educational material; block of practical material; discussion block; control unit.

All blocks can be arranged in any order, according to the requirement and need of the teacher. Each of the blocks can be included in or removed from the textbook, and some blocks can be included more than once. The textbook should be modeled "vertically": new material, tests for understanding and studying the material, practical work, discussion, control work, and "horizontally" – the presence of a choice from each module of the textbook. Therefore, it makes it possible to ensure the variability of the textbook. The scheme of organizing a smart lesson is presented in Fig. 4.

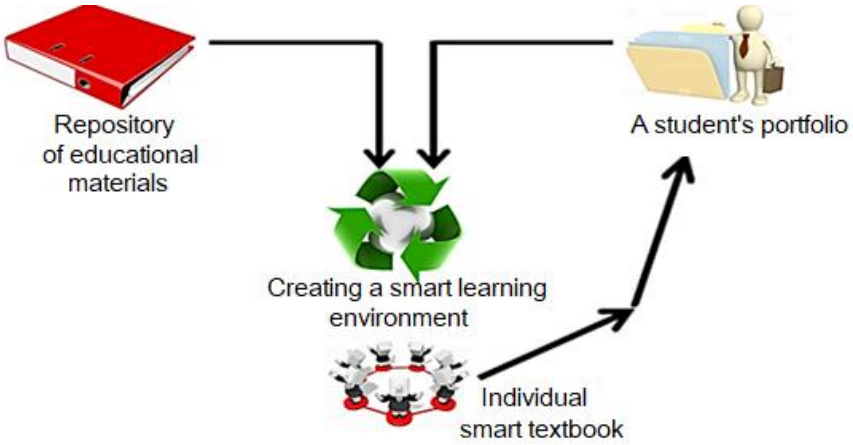

Fig. 4. Scheme of organizing a smart class

Sections of the textbook should contain:

– *Section for learning new material* (new material should be prepared for students of different levels of training. This requires the availability of a large number of educational sources on the topic in various forms: video lectures, electronic text, electronic textbook, presentations, audio files, etc.).

– *Section for assimilation of educational material* (the course should be made adaptive to the perception of students, and for this it is necessary to introduce elements of knowledge control into it and ensure the return to those objects that have not been learned, i.e. have navigation, provide students with a large number of demonstration examples, contain material from other sources or links to the sources).

– *Section of practical material* (includes creative, laboratory or practical works).).

– *Discussion section* (holding in this block a discussion on questions arising from students as a result of studying a new topic. The arrangement of this space is the personal choice of the teacher).

– *Control section* (supposes the preparation of tasks of different levels by the teacher. Students get the opportunity to learn, the opportunity to choose educational material according to their own level, which makes it possible to ensure an individual learning trajectory).

– *Personal account* (the materials chosen by the student automatically go to his personal account. In this space, the student studies the chosen educational material. Access to the personal account is available to both the student in read/write mode and the teacher who teaches this course, but only in reading mode, for the purpose of monitoring the student's work).

For smart learning, a smart environment should be created, as well as a smart textbook with authorization that usies an account and the construction of an individual learning trajectory. (Fig. 5).

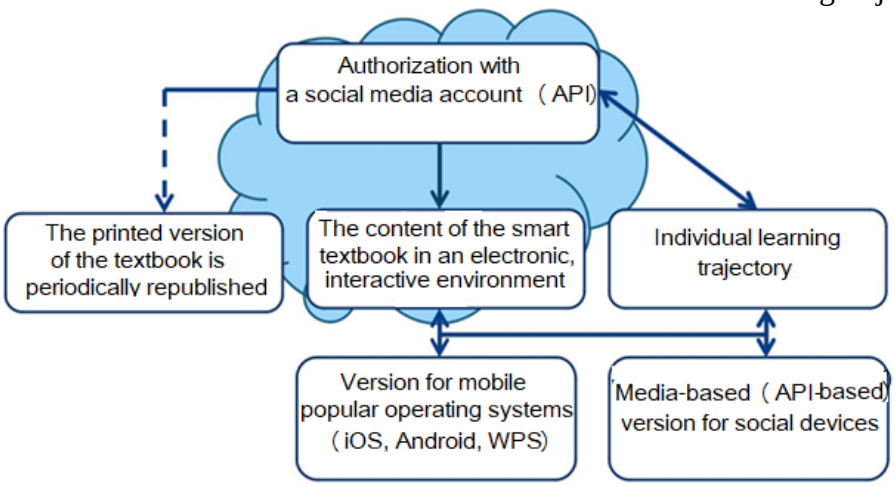

Fig. 5. Interactive environment of the smart textbook

The use of a smart environment provides an opportunity for learning to acquire new qualities: in addition to ensuring the assimilation of knowledge, skills and abilities, they should also motivate learning, and classes should be interactive in nature, i.e. include multimedia fragments, external electronic resources, animations to which the student can have access using smart devices. The development of teaching methods that use smart technologies is of great importance here, since the application of modern knowledge requires a clear structure of teaching and proper information content.

The introduction of smart technologies and smart learning tools is a qualitatively new direction in the field of computer technologies and education in general, which is rapidly developing and thus ensures an increase in motivation and the formation of cognitive interest in learning of modern students.

The main advantages of using such new technologies in education [17, p. 307]:

1) Smart services provide researchers and scientists with the ability to instantly process huge amounts of information with low cost of computing resources and the ability to instantly distribute and share analysis results with other researchers around the world;

2) Smart technologies create an opportunity for continuous learning with the support of mobile technologies and social network services and make the learning process interactive, that is, students can access educational materials at any time, in any place where there is an opportunity to connect to Internet networks;

3) Smart technologies provide an opportunity to conduct interactive online counseling of students with the teacher and instantly receive answers to their questions;

4) Smart technologies make it possible to store data in clouds (data processing centers) without the need to transfer them from device to device (for example, from a computer at an educational institution to a home computer), that is, there is hardware independence from equipment.

3. CONCLUSIONS AND PROSPECTS OF FURTHER RESEARCH

The use of smart learning technologies ensures the activity in learning and is characterized by a high level of motivation, the perceived need to acquire knowledge and skills, effectiveness, and compliance with social norms. This kind of activity by itself rarely occurs, it is the result of purposeful interaction and organization of a smart environment, that is, the use of interactive learning technologies.

So, in contemporary conditions, smart technologies are no longer news. The main problem of their implementation in Ukraine is related to the insufficient understanding of the prospects and all the possibilities of this product, as well as the limited technical capabilities of individual educational institutions (providing access to the Internet, lack of necessary technical and software, etc.)

One of the ways to solve this problem, according to some specialists, is the development of an effective strategy for the implementation of smart technologies in practice, which also involves training qualified specialists in this field and improving the material and technical support of educational institutions. This will allow Ukraine to compete with other countries, as well as to produce products not only for improving the learning process, but also for introduction into public life.

Thus, the global implementation of smart technologies in all spheres of activity, the formation of new communications and a highly automated information environment became not only the beginning of the transformation of the traditional education system, but also the first step towards the formation of a new era of the information society, the availability of quality education is a necessary condition for the adaptation of a young person to solving a wide class of vital tasks. Smart education allows individuals to expand the possibilities of personal development in solving these tasks in various situations today. This, in our opinion, forms the creative potential of the future specialist.

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СМАРТ-ОСВІТА У ТРАНСФОРМАЦІЙНОМУ ЦИФРОВОМУ СУСПІЛЬСТВІ

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Анотація. Висвітлюється питання смарт-освіти у трансформаційному цифровому суспільстві. Досліджено, що становлення смарт-суспільства є наступним етапом розвитку цифрового суспільства. Встановлено, що у смарт-суспільстві відбувається перехід від традиційної моделі навчання до e-learning, а потім до смарт-освіти. Смарт-освіта дозволяє студентам генерувати нові знання та формувати особистість, що досконало володіє інформаційно-комп'ютерними технологіями для пошуку, аналізу інформації та створенню інновацій. Розглянуто властивості, що передбачає смарт-освіта та технології з допомогою яких вона реалізується. Зазначено, що концепція смарт-освіти передбачає наявність елементів у системі освіти, що забезпечують швидку

адаптацію всієї системи до мінливих вимог, а не тільки освітнього процесу. Це комплексний розвиток освітньої послуги включаючи кадрове забезпечення, адміністративно-правове управління, матеріально-технічну базу та педагогічний дизайн. Наведено елементи, характеристики та умови реалізації смарт-освіти. Визначено ключове завдання, що ставиться перед смарт-освітою, яке полягає в забезпеченні сталого розвитку суспільства й економіки у відповідності з мінливим навколишнім середовищем, забезпечуючи можливості для створення нового рівня ефективності в економіці та державному управлінні. Важливим фактором смарт-освіти є організація зворотного зв'язку, з метою мотивації учнів, збереження навчальних матеріалів, записів, необхідним є створення кібер-простору для подальшого спільного використання ресурсів.
Охарактеризовано поняття смарт-технологій та перелік основних смарт-технологій навчання, що використовуються у вищій школі. Наведено вимоги, що висуваються до смарт-технологій (доступність, ефективність, економічність, агрегативність, комплексність).
Охарактеризовано поняття смарт-підручника, що має бути основою для смарт-освітнього процесу, наведено схему його розробки. Виокремлено вимоги до технології створення та положення, що покладені в основу смарт-підручника, вимоги до його змісту та його структуру. Визначено інтерактивне середовище смарт-підручника.
Зроблено висновок, що смарт-освіта розширює сприйняття освіти в порівнянні з навчанням; виходить за рамки тільки технічних розробок; розв'язує більшу кількість освітніх завдань і задовольняє більш різноманітні потреби соціальних суб'єктів.

Ключові слова: смарт; смарт-суспільство; смарт-освіта; смарт-навчання; смарт-технології; смарт-підручник.

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