

# Smart-education as the Factor of Sustainable Development

Nataliya Burmistrova  
*Financial University*  
 Moscow, Russia  
 bur\_na\_a@mail.ru

<http://orcid.org/0000-0003-1328-7541>

Natalia Simonova  
*Financial University*  
 Moscow, Russia  
 sim\_nu\_a@mail.ru

<http://orcid.org/0000-0002-3726-8962>

Irina Kalnitskaya  
*Financial University*  
 Moscow, Russia  
 IVKalnitskaya@fa.ru

<http://orcid.org/0000-0002-4800-4014>

Elena Ivanova  
*Financial University*  
 Moscow, Russia  
 Iva-ev@yandex.ru

<http://orcid.org/0000-0002-2744-1805>

Alexandra Shmakova  
*Financial University*  
 Moscow, Russia

shmackova.alex@yandex.ru  
<http://orcid.org/0000-0002-5886-9732>

**Abstract** — The following modern trends in the development of society (high rate of world variability, informatization of living environment, global communication) raise the problem of quality of training of university students. At the same time, the development of an education strategy for sustainable development is of great importance. The essence of the strategy is to build a willingness to live and act in a changing environment, to plan socio-economic development, considering the limitations of activities and the consequences of decisions for us and future generations. The article examines the impact of the Smart-education concept on formation of strategic guidelines of education for sustainable development in relation to quality of university graduates training. The discussion of this issue is due to the ambiguity of the content of theoretical provisions and the difference in results of the practical application of Smart technologies in education. The authors identified the principles of education for sustainable development. The role of the principle of informatization in the context of improving the quality of education is shown, which is impossible without development of a technological base for interpersonal communications in the global information educational space.

**Keywords** — *sustainable development, smart-education, informatization, quality of education, university students.*

## I. INTRODUCTION

The problem of the quality of university students training is important because of new socio-cultural conditions that determine the need for rapid adaptation of graduates, as development of the industry is faster than the full cycle of training for it. The following modern trends in development of society and education can be identified: high rate of world variability, informatization of living environment, and global communication. In turn, informatization plays an important part in the context of acceleration in socio-economic development and globalization processes.

For this purpose, the Smart-education concept, which is based on a combination of technical, scientific and pedagogical resources for training in an interactive learning environment, includes three main ideas: mobile access, knowledge acquisition and the formation of a Smart-environment.

In this study, we are interested in the role of Smart-education as a driving factor for sustainable development of civilization. In order to characterize the concept «sustainable development», it should be noted that the term was first used in 1987. At the UN General Assembly, the speaker G.H. Brundtland described sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [1]. The modern interpretation of the term underlines the necessity to cater to the most important needs of the public through sound management of physical, natural and human capital [2].

According to the strategic guidelines for sustainable development, the problem of education is one of the most important tasks for further comprehensive human development. The introduction of ideas and principles of sustainable development in the content of education and learning technologies ensures the formation of moral standards, social norms and ecological responsibility. The interpretation of the term "education for sustainable development" defines a developing concept aimed at acquiring knowledge, skills and values that are necessary for people to build a sustainable future in conjunction with the components “man-society-nature” [3]. This, in turn, contributes to the solution of global problems of civilization: the relationship between nature and society, the environment and the economy, global requirements and national interests, existing stereotypes of human needs and reasonable needs for self-development and personal growth.

The research results in the field of theory and practice of education for sustainable development and global education are being widely discussed at symposia of Environmental and Sustainability Research Network (ESER). Johan Öhman states that ESER is developing fast – today it consists of more than 170 researchers from 23 countries [4]. Higher education institutions are actively involved in global discussions and actions to address sustainable development issues as key players and interested parties [5]. The importance of the role of universities in shaping and implementation of the strategy of education for sustainable development is confirmed by discussions of the following issues in research studies:

- The possibility of adjustment of strategic benchmarks for sustainable development as a guiding framework for development of the university to different cultural, political, economic and social contexts outside the university [6].
- The change in educational programs according to the strategy of sustainable development [7].
- The integration of sustainable development ideas into current pedagogical standards [8].

The results of the analysis of the studies confirm that nowadays universities do not have the fullest opportunities to integrate an education strategy for sustainable development into practical training. In this regard, it seems appropriate to pay attention to the position of researchers who emphasize that information and communication technologies aimed at improving the educational process can greatly contribute to the implementation of sustainable development of higher education. This is possible due to the availability of interactive communication and contextualization of knowledge, as well as flexible schedule and pace of learning [9].

Taking into consideration the above, we should note that the proposed in this study the authors' approach to the definition of the role of Smart-education as a driving factor for sustainable development of society is aimed at the formation of strategic guidelines of education for sustainable development in conjunction with the quality of university graduates training.

## II. MATERIALS AND METHODS

This study is based on the discourse analysis of research articles in the field of Smart-education and education for sustainable development, documents regulating the educational process.

The aim of the study is to investigate the impact of the concept of Smart-education on formation of strategic guidelines of education for sustainable development in conjunction with the quality of graduates training.

The hypothesis of the study is that the promotion of the concept of Smart-education is a driving factor of sustainable development of society.

We formulate the objectives of the study:

- to identify the ESD principles for the system of higher education.
- to assess the role of the Smart-Education concept in the implementation of these principles.
- to study the key characteristics of the quality of higher education in the development of global information educational space.

## III. RESEARCH QUESTIONS

As previously noted, modern trends in the development of society and education (the rate of world variability, informatization of living environment, and global communication) determine the necessity to promote the Smart-education concept as a key component of the modern

educational paradigm - "lifelong learning" [10]. Let us turn to the potential of Smart-education in ensuring the quality of education from the perspective of education strategy for sustainable development.

### A. Education Strategy for Sustainable Development

In the context of increasing requirements for university graduates training, the problem of developing an education strategy for sustainable development (ESD) is of great importance. The essence of the ESD strategy is to build a willingness to live and act in a changing environment, to plan socio-economic development, considering the limitations of activities and the consequences of the taken decisions for us and future generations.

The results of the analysis of the most important international documents (UNECE Strategy for Education for Sustainable Development, Vilnius, 2005; the Bonn Declaration of the UNESCO World Conference on Education for Sustainable Development, Germany, 2009; Aichi-Nagoya Global Action Programme on ESD, 2014; Incheon Declaration "Education-2030", Korea, 2015; Recommendations on the Implementation of the Global Action Programme on ESD, Khanty-Mansiysk, 2015) allowed us to identify the principles of ESD for the higher education system. These principles are divided according to their functions.

The first group includes the principles that determine the full development of the human personality:

- continuity of all education levels focusing on self-study and self-development;
- professional culture of interaction in the context of globalization;
- effectiveness of education considering the criteria for solving professional problems.

The second group contains the principles that provide conditions for personal enhancement:

- education fundamentalization as a basis for the formation of normative strategies of productive activity;
- openness of education as the expansion of its opportunities in the conditions of dialogue and parity considering the stakeholders' requirements;
- proactive education focused on the development of transforming intelligence as a synthesis of intellectual abilities and personal qualities;
- active learning with the use of project-oriented technologies;
- informatization of education under the conditions of creation of Smart-society;
- monitoring the learning outcomes in the context of ESD requirements.

The analysis of the content of the ESD principles shows the importance of the principle of informatization for graduate development. This, in turn, determines the necessity to create a shared IT environment that provides mobile

access, new knowledge and creation of a Smart-environment as a part of the Smart-education concept.

**B. Smart-education Concept**

When we analyze the role of Smart-education as a driving factor for sustainable development, it is important to note the problematic character of the formation of this area.

This is due to the ambiguity of the content of theoretical provisions and the difference in results of practical application of Smart-education. The analysis of studies in the field of Smart-education allows us to make the conclusion that their content includes a description of certain system solutions and technologies in the education sphere and doesn't give the characteristics of Smart-education in the context of sustainable development [11-12].

The term Smart-education contains two components: smart and education. The understanding of "smart" in relation to education characterizes technologies that are based on a combination of technical, scientific and pedagogical resources for training in an interactive educational environment. In a roadmap for development of education for the period up to 2035, presented by Global Education Futures, smart technologies are in each trend. At the same time, it is predicted to enhance their number and complexity in the future, the increase of the importance of global values, network culture, automation of routine intellectual operations, and functioning of a new knowledge model.

The abovementioned confirms that "smart" characterizes the property of education that is necessary for its development in accordance with expectations and needs of society, as well as changes in science, economy and production technologies.

We share the opinion of researchers that the essential content of Smart-education in relation to higher education should be aligned with the individual needs of students in their commitment to make the world a better place [13]. In this regard, it seems relevant to highlight the Smart-education goals in the context of sustainable development, which includes three aspects: ensuring sustainable development of society in accordance with the changing environment; creating conditions for the maximum level of competitiveness of education through the development of students' knowledge and skills necessary in modern society; the formation of a person who is capable of continuous development and has transformative intelligence as the ability to assess the consequences of decisions made in conditions of diversity and uncertainty [14]. The content of these aspects is presented in Table I.

TABLE I. GOALS OF SMART-EDUCATION.

| Aspect   | Content  |
|--|--|
| 1. Ensuring sustainable development of society in accordance with the changing environment                     | -Formation of social responsibility.<br>- Development of critical thinking.<br>- Development of system of values.<br>- Improvement of soft skills. |
| 2. Creation of the conditions for the maximum level of competitiveness of education through the development of | - Expansion of temporal and spatial boundaries of learning.<br>- Possibility of an individual educational path.                                    |

|  |  |
|--|--|
| students' knowledge and skills which are necessary in modern society   | -Use of interactive teaching methods.<br>- Growth of communicative activity.<br>- Increase of the information capacity of training.  |
| 3. Formation of a person who is capable of continuous development and has transformative intelligence as the ability to assess the consequences of the decisions made in conditions of diversity and uncertainty | - Development of psychological stability of an individual.<br>- Adaptation of participants of the educational process to changing circumstances.<br>- Availability of intellectual environment of lifelong learning. |

Analyzing the information that is given in the table, we summarize the assessment of the role of Smart-education concept in implementation of ESD principles. As these aspects characterize the role of technological innovations in the modern information society, the Smart-education goals are focused on ensuring the quality and availability of education through creation of a unified information environment that performs educational functions.

**C. Quality of Education**

The study of the key characteristics of higher education quality in the context of development of the global information educational space is associated with the internationalization of this concept. The analysis of scientific publications, statutory documents shows that the practice in the field of quality of education is of international nature [15].

The importance of higher education quality is defined in the Berlin communiqué taken by the Ministers of education of the Bologna Process on 19 September 2003. The communiqué said that the Ministers are responsible for strengthening their efforts to promote effective quality assurance systems at the university, national and European levels and establishing common criteria and methods of quality assessment.

The Yerevan communiqué of the Ministers of education of the Bologna Process, published in May 2015, emphasizes that the improvement of the quality of education is the main mission of the European Higher Education Area. The communiqué defined the idea of the student's personal transformation as the main goal of higher education. It is stressed that higher education is contributing effectively to build inclusive societies, founded on democratic values and human rights. Such education will provide the competencies and skills required for European citizenship, innovations and employment.

The UNESCO Incheon Declaration on Education 2030: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all pays special attention to the improvement of education quality. It is underlined that the quality of education is impossible without development of a technological base that provides interpersonal communication in the global information educational space.

Nowadays, the quality of higher education is the result of interaction between teachers, students, scientific and educational environment of the university, employers and partner universities. From the perspective of interested parties, the quality depends largely on what they see in the context of a potential quality problem. The quality assurance

system meets the social definition of the problem to be solved by higher education. This, in turn, means that the problem statement is very important to determine the quality [16].

In recent decades, there has been widespread interest in results of educational experience, its compliance with various social needs [17]. Whereby, the most problematic is the choice of methods for measuring the quality of higher education [18]. The methods used to assess the quality of education have to be recognized as insufficient because they do not make it possible to determine exactly how the student changes in the process of acquiring educational experience. In this context, the following questions are relevant:

- Is it possible to compare the quality of education in different universities?
- How can this comparison be made to reflect the role of higher education in granting students access to the necessary knowledge?
- Is the development of new methods for assessing the quality of education appropriate in terms of time and resources, as opposed to timely quality improvement?

The search for answers to these and other questions related to the improvement of the quality of higher education leads to the necessity to develop a technological base of the modern information society as the basis of the Smart-education concept.

#### IV. RESULTS AND DISCUSSION

In the course of the study, the influence of the Smart-education concept on formation of strategic guidelines of education for sustainable development was examined. The principles of education for sustainable development, which are grouped according to their functional orientation, were identified. The role of the principle of informatization in the context of improving the quality of education is shown, which is impossible without the development of a technological base of interpersonal communications in the global information educational space. The role of the Smart-education concept in implementation of the principle of informatization was estimated.

The key characteristics of the quality of higher education in development of the global information educational space were studied.

#### V. CONCLUSION

The results of the study confirm the importance of the problem of formation of strategic guidelines of education for sustainable development in conjunction with the quality of graduates training.

The methods used to assess the quality of education have to be recognized as insufficient, which leads to the necessity to develop a technological base of the modern information society as the basis of the Smart-education concept.

The study of the goals of the Smart-education concept shows the possibility of improvement of the educational process through the availability of interactive

communication, the creation of a unified information environment that performs educational functions.

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