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Innovative Changes in Education of the 2010s: Pro and Cons

Abstract: The article offers a theoretical analysis of the advantages and contradictions of innovative changes in modern education. The author uses the data presented in the UNESCO and Council of Europe programmes, reviews in the main areas of innovative development, but also information from the websites of international organizations, implementing innovative educational models. The ideas of life-long learning, inclusion and open education in the 2010s are meanwhile developing in conditions of "liquid modernity" (Bauman, 2000). Metamodern culture, the capitalization of knowledge, digitalization and network socialization are presented as the main external sources of the innovative boom in the education world of the 2010s. Against the background of the technological development one can see serious risks of forcing the humanitarian values and basic foundations out of pedagogic processes. In this regard, the need for constant critical reflection on the results of innovative education changes is emphasized.

Keywords: Education, innovation, metamodern, educational capitalism, educational technology, digitalization, learning networks, humanitarian values

摘要 (Irina A. Kolesnikova: 2010 年代教育的創新變化:利與弊):本文對現代教育中創新變化的益處及矛盾進行了理論分析。作者利用聯合國教科文組織和歐洲理事會的計劃及報告文件中提供的數據,檢測在教育主要領域中的創新發展及實施創新教育模式的國際組織網站的相關信息。在"流動的現代化"的條件下,終身學習,融合和開放教育的思想在2010年代得到了發展(Bauman, 2000)。超現代文化,知識資本化,網絡的數字化和社會化被視為2010年代創新教育熱潮的最重要的外部來源。在技術發展的背景下,人們看到了其人道主義價值和意義被教育進程所取代的嚴重風險。在這種情況下,強調了對教育創新變化的結果進行不間斷批判性反思的必要性。

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Zusammenfassung (Irina A. Kolesnikova: Innovative Veränderungen im Bildungswesen der 2010er Jahre: Pro und Kontra): Der Artikel bietet eine theoretische Analyse der Vorteile und Widersprüche von innovativen Veränderungen in der modernen Bildung. Die Autorin verwendet die Daten, die in den Programm- und Berichtsdokumenten der UNESCO und des Europarates präsentiert werden, überprüft in den Hauptbereichen der Bildung innovative Entwicklungen, auch Informationen von den Websites internationaler Organisationen, die innovative Bildungsmodelle umsetzen. Die Ideen des lebenslangen Lernens, der Inklusion, der offenen Bildung in den 2010er Jahren entwickeln sich unter den Bedingungen einer "flüssigen Modernität" (Bauman, 2000). Die metamoderne Kultur, die Kapitalisierung von Wissen, die Digitalisierung und die Sozialisierung von Netzwerken werden als die wichtigsten externen Quellen des innovativen Bildungsbooms der 2010er Jahre dargestellt. Vor dem Hintergrund der technologischen Entwicklung sieht man ernsthafte Risiken, die humanitären Werte und Bedeutungen aus pädagogischen Prozessen zu verdrängen. In diesem Zusammenhang wird die Notwendigkeit einer ständigen kritischen Reflexion über die Ergebnisse innovativer Veränderungen im Bildungswesen betont.

Schlüsselwörter: Bildung, Innovation, Metamodernität, Bildungskapitalismus, Bildungstechnologie, Digitalisierung, Lernnetzwerke, humanitäre Werte

Резюме (Колесникова Ирина А.: Инновационные изменения в образовании 2010-х: pro et contra): В статье дан теоретический анализ преимуществ и противоречий инновационных изменений в современном образовательном пространстве. Автор использует данные, представленные в программных и отчетных документах ЮНЕСКО и Совета Европы, теоретические обзоры по основным направлениям инновационного развития образования, а также информацию с сайтов международных организаций, внедряющих инновационные образовательные модели. Идеи непрерывного обучения, инклюзии, открытого образования продолжают развиваться в новых условиях «текущей современности» (З.Бауман). Культура эпохи метамодерна, капитализация знаний, цифровизация и сетевая социализация становятся основными внешними источниками инновационного бума в образовании 2010-х годов. В статье анализируются основные направления трансформации практики обучения с их плюсами и минусами. Подчеркивается, что стремительное развитие цифровых технологий обучения и социальных сетей сопровождается рисками вытеснения гуманитарных ценностей и смыслов из педагогических процессов. В связи с этим подчеркивается необходимость постоянного критического осмысления результатов инновационных изменений в образовании.

Ключевые слова: образование, инновации, метамодернизм, академический капитализм, образовательные технологии, цифровизация, учебные сети, гуманитарные ценности

Introduction

According to Professor Donald Clark, in the last decade there were as many changes in education as in the previous thousand years (Clark, 2012). Currently in the educational space both existing innovative trends and completely new ones are represented. Some of them are ambiguous and even contradictory in their pedagogical and socio-cultural consequences. **Lifelong education** remains relevant (Conceptual Evolution, 2011). The documents of the European summits proclaim it as the main political programme of civil society, social cohesion and employment. Lifelong learning became one of the key topics of the World Education Forum held in May 2015 in the Republic of Korea. The UN member states adopted the Sustainable Development Goals, according to which it is planned by 2030 to reduce the negative indicators to "zero" by parameters: i.e. hunger, poverty and AIDS, the discrimination of women and children (Transforming our world, 2015). An important role in this is assigned to education. On the way to the learning society, there is a tendency to expand the spacetime of the continuing education by attributing its beginning to an earlier age point, by involving older people in various types of education and developing non-formal and informal education practices. The popular McLuhan slogan "The world - is a global village" has now been supplemented with the following theses "The One World Schoolhouse" (Salmon Khan) and the call: "Want to live - learn to learn!" (Manifest..., 2015).

The important step in a common terminological base for formal education design was taken by the International Standard Classification of Education adopted by UNESCO. Here education is presented from zero (pre-school education) to eighth (doctoral studies or its equivalent) level (ISCED, 2011). The practice of multi-level training is permanently improving, as well as the access to higher education for student groups poorly represented in this learning segment. Around the world different forms of **inclusive education** are developing. The history of its evolution and the current state are presented in the 2020 GEM Report: inclusion and education (Inclusion and Education, 2020). The academic pedagogical community is searching for principles and procedures to recognize learning outcomes obtained through non-formal or informal learning. Very important is the activity of international non-governmental organizations whose mission is an improvement of the world through lifelong education and its humanization. Two examples are the work of the Swiss Nonprofit Private

Educational Foundation "International Baccalaureate" (IB site), or The International Academy for the Humanization of Education (Golz, 2012; Golz, Graumann, & Whybra, 2019).

Against the background of total digitalization, the concept of lifelong education is being transformed. The chronicle of the IT revolution is presented in detail in the work of Professor B. Karryev (Karryev, 2016). Thanks to PC and ICT humankind has real technical prerequisites for the realization of Y.A. Komensky's idea "to teach everyone everything." Education has stepped over the temporal and spatial barrier of classrooms, pushing out the boundaries between people, countries and knowledge areas. Digital technologies bizarrely integrate with traditional forms of learning. In the global information space new forms of open education have appeared. Among them there are different online learning activities. For example, on YouTube learning channel one can find educational playlists with video and "tutorials" on various subjects and topics, including maths, science, music and foreign languages. Materials offered by educational projects like Khan Academy, TED-Ed, Crash Course and Coding Train, are much demanded around the world.

Open education became one of the most important democratic achievements at the turn of the 20th and 21st centuries. It provided academic and professional mobility, access to general and higher education for new student contingents and equality of education in different countries. An important consequence of such openness is **the internationalization of an education space** manifested in various forms of pedagogical knowledge and an exchange of best educational practices, but also in the development of transnational and cross-border education.

These processes are accompanied by the creation of common standards, agreements, general requirements for the educational and training systems. For example, in 2016 a new edition of **International Standards ISTE** appeared as a framework for innovation in education (ISTE, 2016). It offers most general requirements in five areas: students, teachers, supervisors, computer science teachers and educational technologies. Emphasis for all categories is put on digital citizenship, the thinking properties which ensure the implementation of systemic changes and team collaboration. When compiling ISTE standards, the experience of teachers from dozens of countries was used, so they can be adapted to the needs of education in any region of the world.

The international documents on education development strategy offer several **new groups of educational goals**:

- Adaptation to life in modern, complex and democratic societies.
- Coordination of the results of school and university education with the requirements of employers.
- Acquisition of universal competencies in the field of innovation and creativity
- Development of the ability to cooperate in training and work.
- Providing various types of mobility - geographical, professional, intellectual and emotional.
- Personal development based on a wide knowledge base.
- The ability to learn during a life.

But nowadays the historical background of educational space development is changing drastically. In the 2010s, the development of existing educational trends continued under the new conditions. A rapid change in the spatiotemporal context of public life with the rethinking of the basic categories "time", "space", "information", "energy" led to the transformation of educational realities and their theoretical interpretations.

What is the novelty of our time?

The fundamental novelty of our time is reflected in the concepts of **the metamodern, digimodernism** (Kirby, 2009) and **"liquid modernity"** (Bauman, 2000). These concepts are associated with the properties of complexity, variability, uncertainty. The culture of the metamodern era contains a desire for oscillation (Turner, 2011) "between...a modern enthusiasm and a postmodern irony, between hope and melancholy, between naivety and knowingness, empathy and apathy, unity and

plurality, totality and fragmentation, purity and ambiguity" (Vermeulen and Van den Akker, 2010). In such oscillation, the possibility of pivotal changes is laid. In modern pedagogical consciousness there is also oscillation: from humanistic educational models of the 19th-20th centuries to global digitalization, robotization, student chipization or a self-learning process. At the intersection of ideas, concepts and paradigms differ in their nature, innovations are born. Here adjoin the "hasty culture" of megalopolis schools (as the Singapore Teaching Practice) and the rural "culture of slow learning" (e.g. "barefoot schools"). Digital technologies are woven into archaic forms of education. There is an opportunity to teach religion on the Internet using modern computer technology. Robots become full members of university departments. A lot of things happen that yesterday seemed paradox. A wide panorama of views on educational diversity and its innovative development can be found in Lisa Chesser's article (Chesser, 2013).

For thousands of years, educational institutions remained the guardians of cultural traditions and they were distinguished by constancy and conservatism. But in the third millennium the world for the first time in history faces permanent non-linear and non-directional changes, taking place in the "space of flows" as it was defined by Spanish sociologist M. Castells. 'Liquid Modernity' (the metaphor of the Polish-British sociologist Z. Bauman) is also associated with the concept of flow. A modern pedagogical reality can be classified as one of liquid cultural and psychological phenomena. Its "liquidity" manifests itself in:

- Rapid change of educational standards, norms and requirements
- Blurring teaching and learning objectives
- Uncertainty of the content of education
- Transformation of the teacher professional position
- Avalanche-like growth of innovations in education
- Latent transformation of the nature of knowledge and learning.

A liquid is a physical property denoting the ability to flow and take the shape given from the outside. Basing on physical analogy, let us try to analyze what is "eroding" millennium-old foundations of educational institutions, forcing them to quickly fit into new organizational and pedagogical forms set from the outside. Among the main sources of external "pressure" in the second decade of the 21st century there are: further capitalization of knowledge; total life digitalization and an innovative technological boom. If we analyze these sources of fundamental changes in education, we find a number of pros and cons.

Educational (Academic) Capitalism

After in the mid-1990s the World Trade Organization listed education in the services sector, it began to be interpreted in terms of demand and consumption. The concept of "human capital" is widely used in pedagogical works. In the 2010s, the transferring of market methods to solving educational problems continued to expand. In the new phase of capitalism (cognitive capitalism) a "general intellect" became the source of surplus value. Knowledge is regarded as a means of accelerating economic growth and increasing competitiveness. Various forms of extracting "cognitive power" from people lead to the exploitation of the mind (Peters, 2009 and Peters and Bulut, 2011). This is accompanied by the emergence of concepts of educational (or academic) capitalism and ***an entrepreneurial university***.

In the logic of cognitive capitalism information is perceived as intellectual raw materials. Cognition (including the educational process) turns into a kind of labour activity (with digital performance - into digital work) (Foray, 2000). Educational institutions are called upon to supply students with the necessary raw materials and "tools" for their processing. Data on the cognitive potential of a person and his ability to learn become a commodity in the acquisition of which elite educational institutions and employers are interested. Within the global educational market, a plurality of decisions on the provision of information and educational services to the population is allowed. Until

recently, in the field of education software, an organization of the learning process or design development served as a commodity. But now education is interpreted not only as a service, but as a profitable investment in the future (of a person, corporation, etc.), and the criterion for the value of specific knowledge is the possibility of its conversion into promotion in the labour market or life success. The pedagogical publications use the concepts of investment choice, ROI (return on investment) and ROR (rate of return) - a financial coefficient that illustrates the level of profitability or loss-making of training, taking into account the investments made in it. The signs of the new economic system also are clearly visible at the level of educational practice transformation.

Cognitive capitalism features in the educational system look like this, highlighted by the French economist Yann Moulier-Boutang (see italics in the text):

- *The complex work turns into simple one.* The learning process is simplified as it is converted to digital forms and test control options; also due to the use of comics, animations, etc.
- *Action fragmentation in accordance with the concept of reducing training time.* This feature corresponds to the transition from a long educational discourse and fundamental courses to mini-learning (mini-lectures, applied short-term courses, educational blogs)
- *Transition to small-scale production of "niche" products and services with increasing uncertainty in demand.* A manifestation of this property was: the orientation of education to labour market dynamics and the specific requirements of employers; use of the idea of "orientation towards the consumer" in the content and methods of training; the formation of an extensive market for writing and selling ready-made academic texts "on order" for all education levels.
- *A product differentiation through its quality and innovativeness.* A dissemination of innovations becomes an indispensable criterion in assessing the quality of the teachers and educational institutions' activities. (Moulier-Boutang, 2012).

The strategic intangible assets of cognitive capitalism, says Dominic Foray, professor at the Lausanne Federal Polytechnic School, include: *flexibility* as the ability to adapt to market changes, and a *brand* that is associated with the specificity and quality of a product presented by publicity. These signs are also present in the modern education system as mechanisms of its transformation. To verify this, just go to the "branded" sites of the world's leading educational institutions or specific countries and regions.

Professor Michael A. Peters interprets the specifics of "educational capitalism" as the gigantic enterprise – the centre of economic knowledge, where all improvements are based on economic theories and technological innovations (Peters, 2009). Modern universities are seen as the driving economic growth force due to the accumulation of knowledge. It is believed that their role in economic development is largely based on the commercialization of scientific research. Activities focused on entrepreneurship include industrial research on a contract basis, intellectual property commercialization, paid continuing education programmes, the rental of premises for exhibitions or conferences, etc.

A new direction in the university's activities was given by the so-called "*third mission*" - a strategy focused on the development of lifelong education for different strata of the population, the transfer of technology and innovation and involvement in social life. In the wave of academic capitalism universities and schools are learning to earn money on their own, as well as raise funds for the development of science and education on the basis of patronage and endowment.

Against the background of the active introduction of economic and technological innovations, pedagogical meanings are to be gradually supplanted from school and university life. According to the inspirer of many international socio-pedagogical projects, Dr. Alan Bruce, modern educational institutions are forced to exist in an environment where alternative views are limited by the power of the market and its endless cycles of consumption.

An academic science serving the cognitive economy is step by step losing its unique intellectual specificity. Universities, distinguished for centuries by the freedom of scientific thought, are forced to adapt to market fluctuations, changes in public opinion and the political situation. Scientific research is increasingly limited to the project frames of an applied and custom-made nature. Z. Bauman convincingly shows with numerous examples how in this situation, university teachers turn into "a tool" with one or another consumer value (Bauman, & Donskis, 2013, pp.131-168). Even in studies confirming that modern students retain the "intangible" personal benefits of higher education, such concepts as investment and acquired goods appear.

So, the past decade has shown that the transfer of the cognitive capitalism realities to the field of education, in addition to the development of its new socio-economic functions, lead to some **negative consequences**. Among them are:

- *The pragmatization of educational goals*
- *Displacement of a fundamental university science not oriented to momentary economic benefits to the background*
- *Distribution of "precocious" products which Z. Bauman wittily calls "academic fast food" at all levels of education*
- *New society stratification on the basis of the presence / absence of access to educational information adequate to the modern world complexity*
- *Expansion of the sale market for the products of intellectual labour and "academic ghostwriting" (Kolesnikova, 2017)*
- *Market thinking cultivation in the academic environment.*

All this testifies to the decline of the era of the Humboldt higher education model, with its demand for academic freedoms and the independence of university studies from ideological, economic and political influences.

EdTech and Digital Revolution in Education

The information culture of the second half of the 20th century in the third millennium is being transformed into a digital one. To indicate the specifics of this period, Alan Kirby introduces the concept of "digimodernism" (Kirby, 2009). Computerization combined with digitalization creates fundamentally new technologies and forms of learning. The possibility of the rapid overcoming of geographical expanses and borders in search of knowledge, contributes to the development of academic mobility and scientific / educational nomadism. In the past two decades, the development of education has largely been determined by the concept of EdTech.

Ralph Müller-Iselt is the author of "*The Digital Revolution in Education. A Radical Change in Learning and How We Can Design It*". His analysis of extensive international material shows the changes in the learning system under the influence of digital resources (Müller-Eiselt and Dräger, 2015). Among directions of change there are:

- a) *New types of educational spaces and environments* (for peer-to-peer training, tutor support, escape classroom etc.
- b) *New sources and carriers of educational information:*
 - Open content (OER, MOOC, open licenses, educational channels, YouTube -videos)
 - Electronic libraries
 - Cloud educational systems and Internet services (Web 3.0)
 - Virtual narrative in VR systems
- c) *New management systems:*
 - Automated systems for educational management
 - Student electronic portfolios
 - Personal electronic accounts
- d) *Wearable Technologies.*

A comprehensive analysis of digital technologies and their impact on 21st century students is provided in the OECD series of working papers (Graafland, 2018, also Tiven, Marjorie, & Fuchs, 2018). Let's dwell in more detail on innovative pedagogical potential and possible risks of the most important digital resources.

Augmented Reality, Mixed Reality and Virtual Reality

The use of AR, MR and VR in education can be regarded as the development of the principle of visual instruction on a fundamentally new technological basis; as an educational strategy of virtual immersion; as a way to create innovative environments for pedagogical interaction and to a real-virtual continuum design. The ability to create own 3D virtual worlds in the learning process by using AR, MR and VR, contributes to the development of creativity at any age. In the training system virtual simulators create the illusion of being in an unfamiliar working environment or empathizing with a client, etc (Christou, 2010 and Fourtané, 2019). In a number of countries, the practice of virtual training of children with mental development problems is emerging. Students with autism or sensory integration problems get a chance to adapt to an unfamiliar environment.

Artificial Intelligence

At the Gothenburg Summit (2017), the European Commission's report on the state of the European educational space and the plan for the development of digital skills and competencies using artificial intelligence were presented. Emphasis was placed on:

- Effective use of digital technology for teaching and learning
- Digital competencies and skills development for the digital transformation of society
- Improving the quality of education through foresight based on Big Data.

At the ELForum 2017 conference, it was said that the use of AI will mainly concern routine pedagogical processes: increasing the adaptation level, motivation and student support; monitoring their emotional, physical and moral state. In 2018, Ilkka Tuomi from Institute for Advanced Technology Research (Finland) presented an analytical report on the results of AI use in education (Tuomi, 2018). One of the most successful areas was video processing. Classrooms use AI video systems and data from social media and IoT platforms. AI systems are effective in gathering informal evidence of skills, experience and competency from open sources, including social networks and student portfolios. In different countries there are online courses on artificial intelligence. The discipline of AI education is included in school curricula. For example, more than 40 Chinese schools are engaged in a pilot programme in which *SenseTime*, one of the country's largest AI companies, is participating. Last year, China published its first school textbook on AI.

At the same time, the integration of AI in educational processes creates new ethical and regulatory problems. In particular, this concerns the protection of student data and the absence of guarantees that the machine algorithm will not offer an erroneous solution. An important topic is the propaedeutics of a dissocial use of AI. In addition, there is a fear that the introduction of AI without a fundamental review of the essence of education may contribute to the expansion of outdated teaching practices.

Robot teachers

The development of robotics also has its impact on the innovative change in learning practices. According to a UK Government report (Future Jobs, 2010) the list of future professions will include virtual teachers (avatar managers). Today, the reality is the use of bots (programmes based on artificial intelligence) to communicate with students. There are some examples. An artificial intelligence system powered by IBM Watson has been helping Georgia Tech students work on projects under Prof. Jill Watson for six months. At the US Military Academy, Android *Bina48*, together with a

real professor, gave a few lectures on the course of moral philosophy, including the topic of AI use in society.

Since February 2015, the post of Deputy Head of the Robotics Department in the Moscow Technological Institute has been occupied by the *Alantim* robot, developed by the Promobot Perm Company. It gives students lectures on robotics, studies people's reactions to robots, and takes part in advising guests and employees of the institute. In South Korea robot English teachers are working with audiences. French robot teacher *Nao Evolution*, with modules for emotionality, autonomy and support for communicating with people, is used in schools and universities around the world etc.

The interaction of students and teachers with AI is a promising sphere of research and investment. But there is a risk of future competition between the "machine" and men/women as teaching professionals. In any case, the harmonization of the capabilities and functions of human and artificial intelligence is necessary.

Big Data

In the last decade, the ability to work with huge arrays of information was technologically realized. The collection and Big Data processing are used to increase the efficiency of management and increase competitiveness, including in education and training. Two points associated with Big Data use seem especially significant for the development of education and pedagogical thought in the next decade. The first concerns the speed of the mass introduction of innovations in the educational field. The second opens up prospects for optimizing the individual educational path.

The technological revolution is accompanied by the emergence of international initiatives related to the study and dissemination of educational innovations. Such as the *Edutopia* network, for example, a resource funded by the George Lucas Educational Foundation which looks for the best lifelong learning strategies and practices. There is a unique experience in digital representation of *the Global Learning Landscape* by the analytical firm HolonIQ, working on the taxonomy of educational innovation (Global Learning Landscape, 2020). This organization is building, investing and mapping educational innovation, working with entrepreneurs, educators, institutions, and governments around the world. More than 50,000 educational organizations were analyzed: 500,000 applications, the work of millions of schools, colleges and universities. As well as a huge amount of data on educational startups, technologies, deals, research, patents, etc. Open access to successful educational initiatives creates unique opportunities for cooperation, removes barriers to the spread of innovation, allowing analysis of trends within and between innovation clusters.

But in the "era of hacking humans" there are some serious risks in Big Data use by the education system. The Big Data technologies permit obtaining a complete "educational profile" of a particular person by using global networks information on educational requests through test assignments, social networks and blogs and site preferences, thereafter to build an educational trajectory, taking into account personal information about the student. Experts in the field of the psychometrics of online learning believe that student behaviour data in the virtual learning environment provides more information about the content and level of their knowledge than traditional test results. Fundamentally new is the idea of moving from grades that record past educational achievements to assessing future opportunities and the level of training. Computer programmes capable of recommending a student's personal training programme on the basis of Big Data, have already been created. They can predict with a high degree of probability (over 90%) whether the student will successfully complete a particular programme before he/she starts their studies. Also, there is a technological prospect of tracking the student's emotional state in order to provide an appropriate psychological background for learning. With the possibility of the total manipulation of the construction of an educational trajectory, and to a certain extent, of a professional and life path, any idea of the educational independence of a person in a network space becomes illusory.

Blockchain in Educational System

However, block storage of data avoids the manipulation of certificates, diplomas, scientific papers and articles due to their unconditional verification. For scientists, researchers, teachers and students - this is an opportunity to safely present in the public domain and maintain authorship of works and to receive information about current developments in any field. For the first time in the educational system, the blockchain technology was officially applied at the University of Nicosia in 2017 in order to simplify the search and storage of documents on specialization: diplomas, certificates, etc. There also Bitcoin was first accepted for training payment.

The European Commission dealt with introducing blockchain into the education system. It initiated a study of the benefits, risks, possible problems, and the feasibility of its application at different levels of education (schools, colleges, universities, postgraduate education). The results are described in detail in the report "Blockchain in Education", which shows the possibilities of this technology for changing institutional standards and expanding the students' capabilities (Grech, & Camilleri, 2017).

The analysis revealed eight areas of application of the blockchain in the training system:

1. To protect certificates
2. To verify multi-stage accreditation
3. For automatic recognition and transfer of educational loans
4. As a passport for lifelong learning
5. To track intellectual property and to reward the re-use of this property
6. To receive payments from students
7. For financing with blockchain in the form of vouchers
8. To identify students within an educational organization.

Internet of Things (IoT)

According to Cisco analysts, by 2009 the number of different devices connected to the global network exceeded the number of global population and spawned a new reality called the Internet of Things (IoT). A rapid spread of "epistemic things" which change a person (primarily PCs and gadgets) fosters revolution in the learning system. The range of IoT use in the training system is quite large. These are ID cards for students, electronic diaries, interactive whiteboards, virtual classrooms, robot teachers, cameras that broadcast lectures online, electronic bracelets to control attendance, biometric bracelets that measure "student engagement", sensors that monitor students' brain activity, "smart" desks with a touch screen for teamwork. This list is constantly expanding.

A separate place in it is occupied by messengers installed in phones and PCs. By the end of the second decade, programmes for the online exchange of text, sound and video messages had overtaken social networks in traffic volume. Direct messaging became an organic part of learning, training and professional communication. Now any participant in the educational process can use messengers to create their own channel for "connected learning". Connecting a computer and gadgets arouses the desire to produce and post content for general viewing. This is facilitated by numerous online training programmes for media creativity, blogging, programming, etc.

The use of new models of information changes our way of thinking and communication. The transition from a linear presentation of thought to multidimensional, hyper-text is accompanied by an increase in the speed of information exchange, the emergence of specific network communication languages (texting, tweeting, posting). But where Elon Musk calls mobile phones "brain expanders," the Italian psychiatrist Vittorino Andreoli writes about "mind prostheses," about the danger of having "double brains": a real one and the other "in your pocket," which leads to a split identity (Andreoli, 2019).

Smart-education

The concept of "smart-education" characterizes flexible learning in an interactive educational environment based on open access to content from around the world. This is not just about new digital technologies, but about a change in the philosophy of education and learning theory in general. New realities give rise to new pedagogical terminology (e-learning, e-school etc.). At the intersection of the psychological, pedagogical, engineering and technical fields, "hybrid" areas emerge, such as cybernetic pedagogy, e-didactics, the psychometrics of learning, ontological engineering in training etc. The smart education system is already partially implemented in many countries, allowing students to move from university to university without re-examination and teachers to develop personalized training programmes. As an example, we refer to the "Move2Learn, Learn2Move" initiative funded under the Erasmus + programme for Europeans aged 16 to 19, who are entitled to purchase travel tickets for educational travel to other EU countries.

But the English word "smart" is ambiguous. Among its meanings are not only the adjective "clever" but also the nouns "sadness, pain", the verb "to suffer". Such semantic conjugation is symptomatic. An impartial analysis of the results of global computerization and digitalization of education also reveals their sad side.

Contradictions and Risks of Learning Technologization

As it turned out, in contrast to the largest technological upheavals in industry caused by innovations, the informatization and digitalization of education does not make fundamental changes in teaching and learning. A. Krol, entrepreneur and founder of the Serendipity University Project draws attention to the fact that almost 100% of educational start-ups are not directly related to the learning process, referring only to logistics and process management:

- Packaging and distribution of educational content
- Providing remote access
- Group work organization and interaction of participants
- Testing
- Learning analytics
- Dating services for students, teachers and tutors
- Provision of media libraries, monetization services, educational marketing, etc.

The French researcher J. Frayssinhes who has analyzed the nature of educational innovations in the digital age, also notes that the modern learning process is more techno-centric than pedagogic-centered (Frayssinhes, 2016/4). In other words, the pedagogical component itself in educational innovations is poorly represented.

OECD states that, despite the fact that billions of dollars are spent on technical support in the world from laptops to tablets, this does not affect the learning outcomes. As international experience shows only 5 - 10% of students are able to independently complete online training. There is no country so far where widespread adoption of computers and the Internet in education has led to improved academic performance. Moreover, against the background of technologicalization and digitalization, the socio-economic gap between students is not narrowing, but growing, as is the financial burden on students. There is one another problem. The mastering of the technical innovations by middle-aged and older teachers is often difficult. Thus, the heterogeneity of the education community with regard to their individual integration into the digital environment still remains. Digital inequality is also observed among peers in different countries, since not all children and adolescents have access to the Internet.

Some problems are associated with the excessive technocratization of educational processes. A number of technological advances which initially seemed to be a competitive advantage, began over time to show their opposite side. It is useful to listen to the voices of philosophers, futurologists and

psychologists telling us to pay attention to the risks of the intensive digital technology use in the education system.

There is a growing amount of scientific data that digital innovations contradict the neuro-physiological nature of personality development. As recent studies show, with prolonged stays inside computer networks, the psycho-physiological parameters of the personality are transformed. Active gadget users undergo some changes in their social interaction, a decrease in emotional intelligence, quality of memory, and the ability to build images of the future. Because of the predominance of clip thinking and the "click-based" way of obtaining information, the ability to solve complex problems is reduced (Carr, 2011). The classical understanding of information as a measure of reducing uncertainty is no longer relevant, as the random accumulation of information uncertainty only increases. At the same time the hyper-informational environment is capable of destructively affecting the personality. Denoting the consequences of such destruction, Russian psychologist A. Kurpatov uses eloquent diagnosis metaphors: "informational obesity", "informational pseudo-debility", "digital autism" (Kurpatov, 2020). The psychological implications of modern technologies are analyzed by Romanian researcher M-E. Osiceanu within the fluctuation between 'technophobia' and 'technophilia' (Osiceanu, 2015).

British publisher J. Bridle expressed his concern that the promise of a new technologically-supported enlightenment could turn into its opposite. Using the metaphor "The New Dark Age" he complains that Enlightenment dispelling the darkness of past centuries is unable to help the new generation because "computational thinking" weaned them from real thought (Bridle, 2018). American researcher M. Anderson criticizes "creeping technophilia" in education with its constant innovations. According to him, the "hegemonic discourse of innovation" embracing education justifies the constant and often uncritical adaptation of new technologies (Anderson, 2018). He underlines that only the positive features of technology are fixed in the terminology, but there are no ethically neutral ones. This position is complemented by the thought of J. Bridle "about the ingenuous adoption of technology as a tool neutral to value." He calls for carefully choosing the words used to talk about one or the other technology (Bridle, 2018).

As we see, euphoria from the introduction of technology into the educational process is being replaced by an awareness of its humanitarian consequences. Increasingly, schools and parents in different countries raise the question of the prohibition of the gadgets being used. Also, the use of applications blocking children's access to potentially harmful sites is expanding. But prohibitive measures in this case seem to be ineffective. It may be worth considering internal intellectual and moral barriers. Philosopher M. Epstein introduces the concept of "*techno moral*" to denote the new possibilities of morality arising from the development of science, technology and means of communication (Epstein, 2001). There is a need for: a) special training for the creators and users of digital learning support to take into account its possible risks (physiological, psychological, ethical, etc.); b) educating children towards "digital resilience", c) the monitoring of the humanitarian risks of educational innovations. And these are historically new pedagogical tasks. Partially, the pedagogical community has begun to tackle these tasks. One example is the Digital Citizenship Website, which provides training materials for students, children and technology users to know how to use technologies appropriately [Nine Elements].

Learning Networks as Innovative Education Space

The 21st century is called the network century. Global networks generate a new type of sociality and social inheritance and replace linear and hierarchical types of interaction with nonlinear discrete ones. In addition, they provide communication "transparency" and increasingly a complexity of social systems. All this means considering learning networks as an innovative information source. In an ever-changing world where the only correct answer is often missing, a person tries to find the

necessary knowledge in communities, networks or databases. Global networks fulfill the function of informal learning, providing an answer to any request. As M. Epstein figuratively remarked, "in electronic conciliarity the picture is drawn by the crowd." This phenomenon also was described by D. Cormier in his "Making the community the curriculum" (Cormier, 2018).

Referring to network teaching relationships we must take into account both their technical and moral dimensions. It is network interaction that becomes the catalyst for the destruction of the familiar hierarchy of educational processes due to the effects of participatory interaction and social stigmery. The old pedagogical tradition of the long-term storage and transfer of socio-cultural experience from older to younger generations is being replaced by the spontaneous creation and appropriation of network information "here and now" with free distribution "upon request". The expansion of network communication takes learning interaction from the reality of educational texts into the reality of communication. In fact, the pedagogical idea of "embedded content" is transferred to the communication system.

But the information which a student finds in the public domain does not always turn into reliable knowledge. The question is about the quality of content obtained through network synergy. Since ancient times, mankind in its scientific research, training or education was guided by the summit achievements of thought and acts represented in the life of outstanding people. The online knowledge is averaged to the simple everyday opinion. In the chaos of net interaction, the original message contexts that determine its meanings and values often disappear. Instead of interest in objective evidence-based knowledge, the importance of personal production and consumption of data is cultivated. This contains the risk of loss of learning content depth and "illusory erudition" demonstration.

Network Learning Theories

Against the background of the practice of network learning, the discussion does not stop among theorists about the legality of using digital networks for academic education. They search for principles that allow this to be done, ensuring reliability and the scientific nature of network content. The conditions under which network learning is more effective than the classical model are being studied. On the basis of our knowledge about chaos, about complexly organized and self-organizing systems ***connectivism*** (a theory of learning in digital networks) was formed. In the education model proposed by Dave Cormier the image of a rhizome is used where the knowledge roots are interwoven into a network (Cormier, 2012). In accordance with his thesis: "the best education is one that prepares for uncertainty," these roots can grow from anywhere, in all directions, "to the touch" finding the best options for advancement in a particular context. Another basis for the theoretical justification of the success of training in digital networks appeared in the form of ***mathetics***, a new pedagogical direction developing ways of independently organized learning. It is based on transdisciplinary ideas about neuro-pedagogy, meta-cognition, learning styles, self-learning motivation, different types of attention, efficiency and pleasure from learning (Frayssinhes, 2016 -1).

There are some contradictions in joint activities, overlooked by network learning supporters. These contradictions were noted by American programmer Eric S. Raymond (Raymond, 2001), and then later by American writer Nicholas Carr, who analyzed the possibilities and limitations of network cooperation in the production system. According to their observations, it is effective for collecting and grouping information, intensifying the implementation of innovative tasks at the level of processing the source material. But the crowd is not suitable for turning all this into a final innovative product. Here the intellectual impulse from highly knowledgeable people is required.

These above organizational and economic considerations are applicable to the assessment of the effectiveness of network educational cooperation. A network is not a guarantee of obtaining the optimal learning outcome or creating an innovative educational product. Often in network communication, a person deals only with the illusion of involvement, but not real progress in updating

knowledge. There is a significant emergence of studies on cognitive entropy as a phenomenon of avalanche-like errors accumulation, and that includes the process of network cognition.

Social and pedagogical cooperation in the network

Despite the ambiguity of educational results, global networks became a source of quite new types of socio-pedagogical relations. In 2006 - 2010 several books on Wikinomics were published, where it was shown how the use of the principles of open-source software, mass cooperation and peer production provides new ways of communicating and creating values in the global market. It turned out that these economic principles operate in the educational space. Since the end of the first decade of the 21st century, educational structures have been activated in the world based on the principles of peer-to-peer learning, networking and horizontal pooling of resources and knowledge. An example is *Peer-2-Peer University*, a non-profit, online, open-learning community funded by the Hewlett and Shuttlesworth Foundations. Education here is based on crowd-sourcing. Self-organizing training materials (texts, images, videos) are posted and discussed in chat rooms. The DIY principle has become the foundation for the Edupunk movement with its negative attitude towards the commercialization of instruction. The "Edupunk Manifest" appeared in 2010, proclaiming: "*Be hypertextual and multilinear, heterogeneous and heterodox. Think of yourself as a part of a collective work*" (Manifesto EduPunk, 2010).

Informal learning in its network forms is increasing constantly. Besides the forums for applied (sometimes naive) issues there are sites for those who think deeply and seek the truth. There, important problems are posed and discussed. For example, mechanisms by which modern education subordinates a person are studied or the ways to make fundamental changes in the education system of the third millennium. It is through network interaction that new types of educational and pedagogical cooperation are formed and the subjects of changes in education become apparent: i.e. educational "Internet communities", learning organizations, educational clusters and ecosystems. For example, hackathon forums became a specific form of cooperation in educational efforts, bringing together specialists from different fields to work on a specific problem and engage in mutual learning. In the education field the ideas of networking significant for the successful organization of certain activities have also taken root.

In many universities the content of vocational training includes training in the ability to establish useful contacts, build contact bases, maintain effective communication, using the capabilities of the Internet. Meetings are held with graduates who have achieved success as potential sources of positive experience and connections. The Commission for the Implementation of the "New Priorities of European Cooperation in the Field of Education and Training" strategy (2015) focused on the development of ecosystems at all levels of education and training. Numerous descriptions of network associations of educational institutions can be found in international publications. When analyzing the combination of rivalry and cooperation in the knowledge market, Russian economist G. Klejner determines the ability to interact in the new conditions through the concepts of concordance; "co-competition" and "co-cooperation" (Klejner, 2006).

Sustainable changes in local education systems require the emergence of pedagogical leaders rooted in the local culture knowing its problems and opportunities, believing in the potential of young people. The activities of international network communities for the training of teachers, the carriers of positive changes, aim at this. For example, the global Network Teachers & Alumni "Teach for All" brings together over 50 partner organizations around the world. Each of the network participants has access to successful international experience in eliminating "systemic injustices" in education. The Global Learning Lab collects and disseminates the learning experiences of classes and communities that have made the most progress, both within and outside the network (Teach for All).

Global Network Risks

Along with innovation potential, networks can be a threat. Some publications of recent years analyze the mechanisms of manipulating the user's behavior for commercial and other purposes. Against the growing tendency for network self-learning the problem of fake information is becoming more and more acute. Quite recently, an article by the Dutch researcher of network culture G. Lovink with the eloquent title "Requiem for the Network" appeared. Comparing the logic of building up network contacts with the capitalist imperative of expanding influence in the market sphere, he critically assesses the "garbage" quality of the content thus formed. G. Lovink cites the work of researchers from different countries who call for the use of network technologies to support alternative values of cooperation and common use while in the real world individualism and competition dominate (Lovink, 2020). Perhaps the appearance of such statements indicates the beginning of a mass awareness of the contradictory nature of the network educational potential.

Worth mentioning is one more important consequence of network development. It is the transfer to the virtual space of some typical socio-pedagogical problems due to the globalization of sources and forms of anti-social behaviour. As a result of aggression in society, the number of acts of violence has increased dramatically both inside the real educational space and in cyberspace. The network is multiplying videos of teenagers' attacks on peers and teachers. In recent years, alarming data are on the increase regarding the level of network aggression. It is reflected in terms such as cyber-bullying – the Internet harassment of children and adolescents, cyber-stalking etc. On the initiative of the European Commission in 2004 - within the framework of the EU Safe Borders project, the Safer Internet Day was established, celebrated on the first Tuesday in February.

Learning Content Transformation

By the end of the 2010s, the contradiction was identified between the development of ideas about "how to teach" (the technological side) and the lack of a clear understanding of "what to teach", what to include in the content of formal education. The structure of education content traditionally included knowledge, skills, experience activities and value system. Each of these components undergoes innovative changes. In a situation where the knowledge volume doubles every 18 months, the time interval between the moment of knowledge acquisition and the moment it becomes obsolete has significantly decreased. Because that knowledge changes from a normative to a probabilistic type, the value of factual knowledge has decreased. Standardized, fixed content is rapidly depreciating.

Training texts also change under the influence of the digital technologies. New perception formats initiate a hyper-textual presentation of learning material with a preference for figurative information. It can be anime, comics, dance etc. There is a shift in the methods of cognizing the world: from theoretical understanding to direct spontaneous action, which is not always conscious. The discourse of the new culture is forming through an appeal to emotions, personal beliefs and personal experience. The time has come when, as stated in the "Metamodernist Manifesto" of Luc Turner, any information, regardless of its true value, becomes the basis for empirical or aphoristic knowledge (Turner, 2011). When evaluating learning outcomes, the question arises of distinguishing between information, data, opinions and knowledge itself. However, the complexity of the modern world requires meta-cognition based on interdisciplinarity and transdisciplinarity (Kolesnikova, 2018). Therefore, around the world a transition is taking place from the STEM (natural sciences-technologies-engineering-maths) system to the STEAM (natural sciences-technologies-engineering-art-maths) one.

In the last quarter of the previous century, in addition to new types of literacy, attention was paid to universal and flexible (soft) skills. But in recent years the central place in the structure of education content has been taken by **21st Century Competencies** (the Deloitte Report). They are associated

with the development of information literacy, communicative culture, creativity, critical thinking, emotional intelligence, complex problem solving, but also with collaboration, self-organization and the ability to teach others. Innovative models of teaching "skills for the future" are being actively developed primarily in the field of IT and nanotechnology. An example is the international network «Ecole42» and the Russian School League RUSNANO. In different countries, training practice is focused on "Education for a World of Unscripted Problems". Their methodology is based on the idea of learning as a creative project process, with a free choice of disciplines, schedule of classes and educational trajectory.

With the total technologization of life and learning the question arises of combining abilities required on the labour market with those allowed to remain human (Shape of Jobs to Come). In this sense, the importance of such a component as humanistic values is increasing. In liquid modernity, where everything is possible and permissible there is the problem of correlating the meaning and goals of learning with values necessary to preserve our planet and maintain peace. What values should we talk about? First of all, about the values relating to the phenomenon of Life: the life of nature in its ecological state and human life in its existential sense. The environmental protection and ecology subjects are becoming more distinct in modern education. Many pedagogical publications appear on this score. In recent years, it is adolescents who have attracted the attention of adults to the environmental problems of their future. Suffice it to recall the Greta Thunberg phenomenon or the Canadian Teen Movement *#NoFutureNoChildren*.

But, up to now, pedagogy has paid too little attention to human life values, as defined above. Several aspects relevant to all ages are important here. We can talk about the propaedeutics of suicides among young people, the promotion of a healthy lifestyle etc. Let us dwell only on one innovative direction, which has become more apparent in recent years. The problem of aging, death and immortality more and more actively fits into the context of lifelong education, forming a new segment of the scientific and educational industry. The spread of healthy longevity and immortality ideas led to the emergence of programmes on the biology of aging, old age diseases, genetics and the epigenetics of aging. For example, the Buck Institute for Research on Aging specializes in the study of aging processes, offers training for researchers in this field, and implements programmes for graduate students, teachers, and adults. According to the gerontologist Aubrey de Gray and inventor Ray Kurzweil, by 2050 everyone will get a chance to achieve immortality by regularly taking courses for renewal and rejuvenating their body. However, it is worth noting that much in this direction is still ambiguous in terms of morality. In particular, this concerns the idea of creating immortal beings.

Social Criticism of Formal Education

Despite all our efforts, both school and vocational training have so far had little interest in unlikely, but theoretically possible situations. The human factor in the form of the inability to act professionally in unexpected circumstances is increasingly the cause of disasters. No matter how impressive educational innovations related to the technological breakthrough of the third millennium are, many voices are now increasingly heard announcing the end of education in its accustomed form. Once again, with an interval of half a century (after I. Illich "Deschooling Society", 1971), the image of a "school-prison" pops up in the public mind. The question arises of the tyranny of formal education, where "students acquire fear of and dependence on the teacher and the system, learn conformism and submission.

French teacher and sociologist Jean-Pierre Lepréy writes about this in his book called "The End of Education? Commencement" (Lepri, 2012). Tony Wagner from the Harvard Innovation Laboratory convincingly proves in his books that the current model of education is outdated and has nothing to do with the life and work of most people (Wagner, 2008). Similar views are reflected in the book of

the American teacher with 30 years of experience, J. Gatto, "Weapons of Mass Instruction. A School-teacher's Journey Through the Dark World of Compulsory Schooling" (Gatto, 2010).

The world feels the need for a radical education renewal. In the 2010s, a new round began in the development of the unschooling philosophy, which considers the experience of freely chosen activities, travels and the implementation of creative projects. The pedagogical community is trying to answer the question of how to use education to unleash creative talent and initiative in a global, knowledge-based civilization inextricably linked to the Internet. More and more educators and psychologists believe that, in order to raise children who can flourish in an ever-changing world, they should be entrusted with managing their own learning and development.

Awareness of the mismatch of formal education with modern life trends leads to the expansion of family initiatives in the training and education of their children. As specific options for network integration, such flows as "conscious parenting", "positive parenthood" arise. Around the world homeschooling has become more and more popular. The emergence of a new generation of autodidacts scooping up information on the Internet from an early age together with online learning allows them to create a "self-directed learning design". In addition to that, many young people are ready to take on teaching functions. A call "Unschooling Yourself" is accompanied by the appearance of net recommendations on how to engage in lifelong self-learning, how to find one's own educational path. Some personal sites provide numerous links to relevant tools, possible areas and methods of self-training. Some students upload videos that capture the routine of their learning activities. There is a new type of "bloggers-influencers" who talk about the life and events of the institution they study. Such stories are popular with those who lack educational motivation.

The Role of the Younger Generation in the Changes of Learning Design

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The idea of preparing the younger generation for the world renewal (Wagner, 2012) led to the emergence of adults' associations who decided to raise children who are ready for life, positive, with the right to vote in solving the ambitious tasks of building the future. In different countries and continents, special educational centres are being created that attract young people able to respond to global challenges. As an example, we can refer to *The Singularity University*, the *Shanghai American School*, *United World Colleges* or the Russian Educational Centre "Sirius." The research laboratories offer open training in creative solutions to real problems by creating networked local hubs that provide children with access to the latest technology from an early age. The organizers of such laboratories are convinced that many complex problems of our time can be solved through empathy, curiosity and game.

In the modern world, there are about 2 billion young people aged 10 to 24 years old. Each of them has great human potential and is adapted to modern digital technologies. Already the first fully digital generation in history has grown. The leading role in positive changes of education is increasingly shifting to them, who have a quite new mentality. It is the youth environment where online learning communities are increasingly emerging and ideas of a society of self-directed learners are put into action. Here one can talk about the phenomenon of highly motivated, digital, intercultural, personalized youth learning.

At the beginning of the 21st century, four students from the American University of Paris created the *Global Nomads Group*. This group united young people who believe in the power of communication, youth and common humanity. Now this virtual initiative brings together more than a million young people in 60 countries on all continents. They share their stories, empathizing with previously unknown people, imbued with a sense of a mankind community. This requires certain network communication skills, the ability to engage in storytelling and listen to the stories of others. The Global Nomads Group's activities are an example of training by concrete actions with the following

logic: "Learn through mini-lessons on the network - expand knowledge through global resources - explore - share your creative stories" (Global Nomads Group). Over the past decade, an extensive innovative space has been formed for training peers from different countries on the basis of "virtual exchange". The Virtual Exchange Coalition and the Saxelab Laboratory of Social Cognitive Neurobiology at the Massachusetts Institute of Technology are developing evaluative tools for measuring attitudes and skills that are acquired through virtual sharing. The tasks of professionalizing and supporting the best innovative practices of peer training have been established.

Some Conclusions

The volume of this article does not allow for analyzing the array of innovative changes in education. Based on information offered, we can propose the following conclusions.

1. Everything is mixed up in the global educational space of the 21st century. Everywhere in the education system one can see the ambiguity and inconsistency of innovative results as characteristic of a metamodernism culture and liquid modernity. In international pedagogical publications and discussions of recent years, the metaphor "Uncertainty School" is increasingly found. In accordance with this, modern pedagogy faces the innovative task of conceptualizing uncertainty in the context of permanent changes in the education system. It can only be solved at an interdisciplinary and transdisciplinary level.

2. We see that innovative changes in education are first of all based on the integration of new economic and technological potentials. By the end of the 2010s, knowledge capitalization combined with the digitalization of education allowed a global market to form with a huge financial turnover. The influence of certain economic principles has been transferred step by step to the field of education. The capitalization and digitalization of knowledge, the introduction of technological innovations as the main engines of the development of education in addition to positive transformations (democratization, internationalization and openness) has produced a number of side effects. One of them is the new type of education inequality between generations and within generations – the digital divide.

Despite technological progress, good intentions and efforts undertaken by the international community, the possibility of learning for all on the planet is still very problematic. In addition to socio-economic reasons, the political situation influences the level of education. In a number of countries, a generation is growing up, whose childhood and youth passes under permanent violence and wars. This interrupts the usual course of formal education, making the survival experience a priority source of activity for young people to learn, socialize and be socialized. An increasingly acute global problem is the training of migrants. According to Global Migration Indicators 2018, over 30 million school-age children are international migrants, and this number will increase.

Even so international educational policy is largely focused on the requirements of economic development, labour market conditions, and the development of new technologies. Humanitarian tasks related to the upbringing of the young generation, capable of positive global changes, are undertaken mainly at the level of community and private initiatives, covering the field of non-formal education.

3. In the digital age technologies become direct participants in the constitution of knowledge. The American philosopher Don Ihde defined this phenomenon as "technological intentionality." Digital forms of communication, the transfer of the learning process into virtual space transform the function of the teacher, who is not now the main carrier of educational content, but the mediator or facilitator in student communication with the information space. Students no longer adapt to the content of the teaching, but the content and teaching process adapt to them. This change in the logic of the educational process was named the "flipped classroom."

The starting point in a non-linear learning process can be found by a freely cognizing person who is able to combine his/her efforts with an unlimited number of people according to the network principle. And there is a trend to transition from simple net groups to online communities and techno-social digital associations. The development of new educational practices raises such important issues in the digital and network age like the quality of collective intelligence, collective actions and joint design of democratic goods.

4. In the past two decades, the task of technological support for educational innovations came to the fore. But it's obvious that the task of bringing education into line with the challenges of time cannot be solved only at the technological level. On the one hand, technological development has created the prerequisites for the implementation of lifelong learning for everyone. On the other hand, society is addressing more and more claims to formal education institutions. In connection with the spread of non-formal education, learning networks, self-education practice and homeschooling the following question arises whether it is possible to study effectively without an institutional framework.

5. Pedagogical science and official teaching practice cannot keep pace with the permanent changes in educational reality and the rapid development of transdisciplinary knowledge. Only a fresh look at the training and education of a new generation in the context of liquid modernity can help. In addition, it is worth noting that the 21st century demonstrates a combination of fundamentally new technological capabilities with the pedagogical ideas and narratives of past centuries. In fact, does the "*Teach for All*" movement not return to the Comenius idea of "teaching everyone everything"? Does home-schooling not resemble the situation of Pestalozzi's famous book "How Gertrude teaches her children"? Does academic nomadism not develop the practice of educational travels dating back to the Middle-Ages? Is the principle of "peer2peer education" not close in meaning to the Lancasterian System? Is modern video storytelling not another historical variation of the didactic stories of the past? The same can be said about the method of projects, game methods or tutoring. Such examples can be continued. All this testifies to the need for the humanistic ideas and succession of experience in the course of innovative changes of the education system. Exactly this is constantly emphasized by educational scientists and representatives of other disciplines of human and social sciences, e.g. by participants of the biennial conferences on "Educational Innovations in Countries Around the World ..." under direction of A.K. Ellis (Ellis, 2019; see also Ellis, & Bond, 2016).

6. The concept of sustainable development integrates economic, technical, social and environmental approaches. Also, it presupposes a keeping of the ecosystems' ability to self-heal and adapt dynamically to change. However, along with the self-renewal of education as a kind of ecosystem there are signs of its systemic self-destruction. Primarily it's a loss of the pedagogical (humane) meaning of innovations (Kolesnikova, 2019) and risks for student health. To prevent any negative effects from the introduction of innovations on the education system, pedagogical monitoring and humanitarian expertise are required. Also, there is a need to teach each person the "rules of digital hygiene" and "digital sustainability", as well as protection of the self and others from the negative impact of technologies.

7. In recent months educational institutions all over the world have been forced to rapidly adapt to the corona virus situation. This is more evidence of "liquidity" and the unpredictability of our time. As it turns out, the technical opportunity for online learning or training is invaluable in situations of mass epidemics, when schools and universities are closed for long periods of quarantine. Also, museums, art galleries and theatres are developing educational work on their sites. It is difficult to predict what else innovative teaching and learning in this connection will have to develop. But in any case, it is important not to lose sight of the humanistic principles of pedagogical interaction.

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