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## Эволюция принципов образования в соответствии со стратегией Smart City

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## Evolution of education principles in accordance with a Smart City strategy

В статье анализируется трансформация современных городов в интеллектуальные системы, подчеркивается роль обучения на протяжении всей жизни. В то же время акцентируется пробел в осуществлении непрерывного обучения, необходимого для новых интеллектуальных ресурсов. Непрерывное обучение представляется как средство реализации стратегии «Умный город» через изменение образования. Принципы непрерывного обучения, подразумевающие интерактивность работы студентов, эффективное управление временем, высокие требования и интенсификацию, представлены в модели перевернутого обучения. Модель особенно эффективна при изучении профессионального английского. Английский язык, как *lingua franca* современной научной и международной занятости, является инструментом успешной карьеры. Предлагаемая модель помогает оптимизировать обучение, повысить уровень иноязычной подготовки и сэкономить ресурсы. Она способствует интенсификации формирования иноязычной компетенции, тем самым приближая общение на целевом языке к требованиям работодателей.

*Ключевые слова и словосочетания:* стратегия Smart City, принципы образования, перевернутая модель обучения, английский язык в профессиональной деятельности.

The paper analyses the transformation of modern cities into intellectual systems, emphasizing the role of life-long format of education. However, there is still a gap in implementation of continuous training, essential for new intellectual resources. Continuous training is substantiated as the means of a Smart City strategy implementation through modifying education. The principles of continuous training, which include reciprocity among students, efficient time management, high expectations, and intense academic activities, are represented in a flipped learning model. The model is especially effective during English for specific purposes instruction. English language, which has the status of *lingua franca* of today's science and international employment, becomes a tool for successful career. The model helps to streamline instruction, enhance ESP competence, and save resources. It enriches ESP training thus fostering the teaching process and bringing the communication in a target language closer to today's employment requirements.

*Keywords:* Smart City strategy, education principles, flipped learning model, ESP.

### 1. Introduction

The modern cities are being transformed into intellectual systems. Digital technologies provide solutions for all the spheres of city functioning: utilities, power engineering, traffic lines, resource management, city planning, healthcare, and education [1].

Municipalities become the communities, in which government, post-secondary institutions, private business, and citizens work as partners to build a better tomorrow.

The goal of this transformation is sustainable development, which means resource savings, efficient environment management and new format of employment. For the Russian Federation, such program can help to resolve the issue of backwardness of some cities and even regions, which use obsolete technologies. It can also help to modernize the infrastructure and create the fundament for the sustainable development.

### 2. Essence of a Smart City strategy and new intellectual resources

The strategy of a Smart City means implementation of the end-to-end technologies in all spheres of the urban life.

It comprises:

- AI (Artificial Intelligence),
- BD (Big Data),
- Blockchain,
- IoT (Internet of Things),
- VR and AR (Virtual Reality and Augmented Reality),
- Information Security (cybersecurity and urban environment security).

The main principles of this strategy are as follows:

1) Participative governance, involvement of all the citizens in the process of urban planning and decision making (any solution must be based on the majority voting principle of the inhabitants of the households, districts, city as a whole);

2) Socialization of the different groups of citizens via digital technologies (for instance, the distant format of employment of the aged and the handicapped);

3) 24 hours availability of any service on any device (electronic utility payments, home delivery, monitoring of the children's academic progress via a cellphone and so on);

4) Mutual urban and business development according to the "win-win" principle (mutual investments and coownership of the services and infrastructure, for example – car sharing. Development of the market niches through digital technologies);

5) Electronic document management (simplification of the administration, paperless administration, urgency of document management);

6) Implementation of the internal solutions in the sphere of IT (reasonable import substitution, creation of the centers of competences).

The aim of a Smart City strategy is to unite all the aspects of urban life as a multifaceted object of management via the digital technologies. The results of this strategy implementation must be as follows:

- competitiveness,
- digital mobility,
- improvement of the quality of life,
- electronic government,
- decline of ecological impact,
- crowdsourcing.

A Smart City strategy is viewed from different angles.

Thus, according to the definition suggested by C. Harrison, a smart city connects physical, social, business, and IT infrastructure to leverage the collective intelligence of the city.

In a Smart City strategy, the traditional notion of a physical city infrastructure is extended to a virtual city infrastructure (an integrated framework that will allow people to collect, optimize data, and make decisions based on the complex analysis of the received information). This infrastructure integrates deployed sensors; both distributed and centralized processing capability, transmission bandwidth, and accompanying software models and presentation logic to support human decision makers [2, p. 2].

A smart city is an intensely developing municipality uniting people, information and elements of urban infrastructure via high technologies for the sake of creating competitive innovative economy, sustainable development and high quality of life [3].

International researchers stressed different aspects of a Smart City strategy in their papers. According to the

dominating meaning of every theory there appeared several synonyms for the term “smart city”: virtual city, global city, intelligent city, information city, digital city, smart community, knowledge city, learning city, sustainable city, and green city. Still there is neither a single template of framing a smart city nor a one-size-fits-all definition of this notion.

In accordance with the mentioned definitions, Russian researchers (A.O. Veselova et al) made a conclusion about heterogeneous nature of the mere strategy of a Smart City. This strategy includes diverse structural elements comprising its essence.

Therefore, the main elements of this strategy are:

- municipal infrastructure,
- extensive implementation of innovations and ICT,
- application of new knowledge,
- decline of the ecological impact on the territory [4, c.79].

Nevertheless, the condition for the uniting the components of a system is digitalization of a socio-economic area of the modern municipality.

The most frequently used definition of a smart city proposed by the Russian researchers is a city, which enables efficient application of resources of the urban setting by all the stakeholders (especially – by the citizens). It means efficient use of the time and finance recourses of all the citizens for creating more comfortable, safe and environmentally friendly life within the city territory [4, c.80].

The final aim of the realization of a Smart City strategy is viewed as the formation of so-called “smart people”, which become catalysts of the social development. Such people must be ready to the challenges of post-industrial world, for instance, they have to face life-long learning, live in ethnically and culturally diverse society, and acquire such characteristics as flexibility, creativity, cosmopolitanism, involvement in social life.

Therefore, a smart city means involvement of intellectual resources in the process of decision making (for the urban development and orientation to the citizens needs and convenience).

Application of new knowledge can be achieved through successive implementation of ideas of anthropocentrism, continuous learning, proximal development, and integrative learning.

The principles for good practice in modern higher education are as follows:

- 1) Development of reciprocity and cooperation among students (cooperative and competing students’ groups, peer tutoring as a flexible, peer-mediated strategy that involves students serving as tutors and tutees);
- 2) Active learning (task-oriented approach, studying and analyzing real-life situations, use of role-modeling, case studies, problem-solving activities);
- 3) Prompt feedback (appropriate reaction on students’ performance);
- 4) Efficient time management (progressive deadlines for students’ projects and assignments);
- 5) High expectations (development of internal motivation, encouraging students to do their best instead on focusing on grades);
- 6) Respect to diverse talents and ways of learning (combination of face-to-face and distant formats of education, implementation of blended learning both for academic curriculum and for retraining courses).

### **3. Implementation of a Smart City strategy in Russia: pitfalls and achievements**

The Russian Federation systematizes the issues and defines the ways of their solutions; consequently, the strategy of a Smart City is very topical. There are successful examples of projects development and implementation. Moscow, Skolkovo, Kazan are the leaders in the process of smart systems development.

Local authorities of the mentioned cities worked out comprehensive programs of urban development.

Moscow, as the capital city, is very consistent in implementing a Smart City project in every aspect of urban life.

Skolkovo is the first science city built from scratch. The city provides special conditions for the companies working in the strategically important areas of economy modernization (telecommunications, space, biotechnologies, power engineering, IT, nuclear technologies and so on).

Kazan aims at the creation of infrastructure for data monitoring and collection in the field of transport and utilities, safety and control of the urban environment.

The most frequent application of a Smart City strategy in the Russian Federation is the implementation of individual intellectual services (which are mostly used as initiatives). For example, Sankt Petersburg, Tomsk realized the projects of intellectual application of utilities. Podolsk, Ulyanovsk started to implement pilot projects of intellectual power engineering. The mentioned examples confirm the fact that there is direct correlation between successful Smart City strategy implementation and good economic potential as well as the sufficient urban budget of a target city.

In Russia, the most profitable areas of intellectual technologies implementation are the fields capable to succeed

due to realization of a new approach. They are energetics and transportation systems, ready to solve complex issues due to sufficient financial potential, shrewd management and intellectual human resources as well as efficient use of budget funds.

“Lean Smart City” is the unique project of ROSATOM, which is a complex of modern technologies for business processes management and digital platforms solutions. The project enhances cooperation of citizens, businesses and local authorities. It customizes the technology of lean production to the needs of small cities to improve municipality performance and reduce costs. The technology uses the ROSATOM approach of Manufacturing System that means culture of lean production and continuous processes improvement for increasing competitiveness. The combination of Smart City strategy and Manufacturing System of ROSATOM creates contemporary urban setting, which is convenient for citizens, businesses and municipality. “Lean Smart City” is a strategic project worked out in accordance with the required principles of information security and import substitution. The platform uses the digital urban infrastructure and does not require installation of the additional digital equipment. The project is implemented in two regions: Nizhniy Novgorod and Murmansk, and is considered the best practice of sustainable development, selected by the experts of the United Nations Human Settlements Program “UN-Habitat” According to the assessment of Sarov (Nizhniy Novgorod region) municipality, the Lean Smart City strategy saves 7% of the budget funds annually. The citizens interact with the website [www.smartsarov.ru](http://www.smartsarov.ru), apply for the certain services and monitor the solutions to their issues online. The city government gets processed data and a set of tools to monitor, control and dispatch the work of the municipal services and subcontractors [5].

The local authorities, which strive to implement a Smart City strategy, face different problems:

- 1) Organizational issues (administrative barriers, lack of coordination and communication among the developers and implementers of the smart city model, inefficient human resources);
- 2) Financial issues (lack of funds and business models determining return on investments);
- 3) Technological issues (disintegration of a Smart City strategy and city development plans);
- 4) Infrastructural issues (absence of transit-oriented approach and as a consequence - inefficiency of transportation system and utilities).

The streamlining of the work stages can be a solution to those issues.

The variants of this work can have different scenarios:

- 1) Working out the comprehensive strategy of innovative urban development;
- 2) Applying certain technologies for specific issues without conceptualization of this process;
- 3) Using synchronous approach of strategy development and implementation of intellectual technologies;
- 4) Developing a smart city from scratch.

The trend selection depends on the strategic goals of the city life improvement.

The strategic goals and methods of their achievement are usually fixed in the programs of urban and regional development.

The Government of the Russian Federation adopted a program “Digital economy of the Russian Federation” in July 2017 [6]. The program presupposes systematic development and implementation of digital technologies in all spheres – urban economics, Public Administration, social life. The program also declares the creation of smart cities as the key objective of the digital economy development.

Citizens of smart cities and other members of the urban community are supposed to focus on realization of their creative potential as well as defining and building a value system for life standards improvement [7].

Value system of any person consists of several parameters: family and social life, professional development and finance, health and wellness mastery, spirituality, personal growth.

The inevitable variant of modern development is lifelong learning, and a Smart City strategy can be very efficient in this respect.

Virtual classes, system of mutual project work, blended learning (as a variant of distant learning) can help citizens to construct their own strategy of education upgrade.

Digital technologies provided the variants of distant professional activity and other duties performance.

The principle of distant work has extended to the autonomous position of the students of higher educational institutions both in real and virtual spaces.

The role of students is transformed from those who perceive instructional information to those who actively search and obtain the instructional material using the distant format of lectures.

The lecturers got many tools at their disposal for distant provision of the instruction and combination of students self-studying pattern with traditional testing of their progress.



The flipped learning model, for example, is aimed at independent work on lectures comprehension before face-to-face tutorial as a variant of interactive contact work with a lecturer and peers.

The model means organization of study through three stages:

- 1) Analysis of video, multimedia or web-material and online communication with the peers on the issues of academic topics (independent distant work according to individual tempo and schedule);
- 2) Face-to-face work with a lecturer and peers for the sake of intensification of material comprehension (a lecturer plays the role of a facilitator and an expert advisor);
- 3) Independent writing of an essay or mutual project work with the peers for the sake of reflexivity and quasi-professional activity relevant for a future employment.

The advantages of this learning strategy for those who study English language are as follows:

- 1) Work in individual convenient tempo and opportunity to use authentic content;
- 2) Availability of a lecturer's feedback;
- 3) In-depth comprehension of the curriculum because of intense teamwork at the final stage of a flipped learning model;
- 4) Switching to the professional solving of the situational problems and case studies, relevant for the future employment.

The model is especially effective during English for specific purposes (ESP) instruction.

During English for Specific Purposes (ESP) teaching lecturers actively use electronic environment and resources of scaffolding (contextual explanation, simulation, video and graphical support, teamwork, and case studies).

The technology is based on the switching to more complex forms of thinking as the result of interiorisation process, which is possible only through collaboration and interaction with peers and the lecturer [8].

The researches distinguish several disadvantages of the method:

- 1) The lack of internal motivation of some students;
- 2) Psychological barriers of introverted students, which are reluctant to participate in interactive work with peers during a classwork [9, p.83];
- 3) Insufficient digital competence of some lecturers (the issue of digital immigrants).

The problem of internal motivation can be solved through active socialization and interiorisation during interactive stage of a flipped learning model.

The specific perception of reality by the introverted students demands correction by additional efforts of a lecturer (the possible way out is the strategy "Think, Write, Share", intensifying efforts of any participating student).

The problem of digital immigrants can be solved by the University administration through organization of further education courses, retraining and equipment upgrade.

Flipped EFL and ESP classes overseas immerse students to digital resources and platforms.

Integration of flipped learning model in the curriculum of the Russian higher educational institutions means selective use of the pattern for certain courses and even certain themes (pointwise model) because the process is not regulated by the Ministry of Education and is insufficiently tested by the practicing lecturers [10].

It is the initiative of some enthusiasts trying to improve the results of the teaching work and enhance the students' progress at full capacity.

Reconceptualization of the teaching and learning and application of instructional material in the actual situations of future employment can be achieved as the result of rethinking of education as a whole. This can improve the dynamic of both teaching and learning processes.

EFL and ESP competence formation under such conditions can make the education more authentic and professional, which brings the communication in a target language closer to the modern requirements.

#### 4. Conclusions

Postmodernism is replaced by the epoch of auto-modernism because of correlation of technological automation and autonomy of a human being. Auto-modernism converges such notions as capitalism, democracy and science. They become interdependent due to technological globalization. Internet becomes the area of their interconnection. Consequently, modern technologies reshape the social relationships and build foundations for remote work and distant studies.

People try to use the possibilities of digitalization in all spheres of life for the sake of savings, intensification and optimization. Education as one of the priorities in a value system of any society is also involved in the transformation process. Logic of teaching and learning changes in order to adapt to the needs of the contemporary students. Present-day education focuses on life-long format due to the transformation of modern cities into intellectual systems.

However, there is still a gap in implementation of continuous training, essential for new intellectual resources of smart cities. Continuous training is substantiated as the means of a Smart City strategy implementation through modifying education. The principles of smart citizens training, which include reciprocity among students, efficient time management, high expectations, and intense academic activities, are represented in a flipped learning model.

The model is especially effective during English for specific purposes instruction. English language, which has the status of lingua franca of today's science and international employment, becomes a tool for successful career. The flipped learning model helps to streamline instruction, enhance ESP competence, and save resources. It enriches ESP training thus fostering the teaching process and bringing the communication in a target language closer to today's employment requirements.

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