

Renewal of the Educational Process Technology Based on the Knowledge Economy

Renovación de la tecnología de procesos educativos basada en la economía del conocimiento

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Contents

- [1. Introduction](#)
 - [2. Results and Discussion](#)
 - [3. Conclusion](#)
- [Bibliographic references](#)

ABSTRACT:

This paper justifies the knowledge economy as a newly "invented" innovative teaching method, by giving specific examples that explore the market value of educational materials. A new non-traditional approach to renewing the educational process, based on modern requirements for the development of a competitive global economy, is outlined. The purpose of this teaching method is to transform knowledge into capital and form an entrepreneurial personality so as to enable learners to turn acquired knowledge into capital or into new technological products in future. New didactic concepts, such as the knowledge economy, the market value of educational materials, the market lesson, and the formation of an entrepreneurial personality, are considered and disclosed.

Keywords: Knowledge economy, market values, entrepreneurship, market lesson, market value of educational materials, competitiveness, educational process

RESUMEN:

Este documento justifica la economía del conocimiento como un método de enseñanza innovador recientemente "inventado", dando ejemplos específicos que exploran el valor de mercado de los materiales educativos. Se describe un nuevo enfoque no tradicional para renovar el proceso educativo, basado en los requisitos modernos para el desarrollo de una economía global competitiva. El objetivo de este método de enseñanza es transformar el conocimiento en capital y formar una personalidad emprendedora para permitir a los alumnos convertir el conocimiento adquirido en capital o en nuevos productos tecnológicos en el futuro. Se consideran y divulgan nuevos conceptos didácticos, como la economía del conocimiento, el valor de mercado de los materiales educativos, la lección de mercado y la formación de una personalidad emprendedora.

Palabras clave: economía del conocimiento, valores de mercado, iniciativa empresarial, lección de mercado, valor de mercado de los materiales educativos, competitividad, proceso educativo

1. Introduction

In the context of globalization, the level of development of a competitive economy is determined by the quality of knowledge in the country and the degree of the intellectual potential of the nation. This is due to the fact that knowledge gradually becomes a source of value: the effective use of knowledge, science and technology provides the greatest profit for the state. Therefore, developed countries have begun to compete not only with goods and services, but also with the education system and various forms of education.

In recent years, competitiveness has acquired a new dimension – a qualitative indicator of the knowledge economy. For example, in the conditions of the transition of the global economy to market-based production, only 15% of the population in the western world have direct relationship to the production of goods, the remaining 85% add value in the process of creative work and information transfer.

In the modern world, educational services are becoming a rapidly developing segment of the economy. For example, in the US it is called "one hundred billion-dollar business". It is about 3 percent of gross domestic product, which is about 7 billion dollars. In Australia, education is in third place in terms of revenue for the budget. It trails only to coal production and tourism. This country earns more than \$ 3 billion a year in the export of educational services to the countries of the Pacific Rim.

Thus, in the conditions of the development of a global market economy, the process of knowledge commercialization has already begun. Consequently, the production of knowledge becomes a full-fledged market resource for the developed world. Therefore, the modern development process of globalization makes high demands on the competitiveness of the national economy of the states of the world. This circumstance requires the correspondence of the learning experience to the modes of the development of a modern innovative market economy. In our opinion, the main ones are:

- 1) students should receive the basics of market knowledge;
- 2) youth should form the basis of business qualities of an entrepreneurial personality;
- 3) future specialists should be able to organize and conduct their own entrepreneurial activities, etc.

It is known that the planned and constant interaction between the pupil and the teacher determines the pedagogical mechanism of instruction. The educational process is carried out on the basis of the activity theory. For the market society, the most important is the formation of previously little-known entrepreneurial activity among youth. Modern entrepreneurs are considered the locomotive of the development of an innovative market economy.

We believe that the school should teach students the knowledge economy so as they understand the economic importance of knowledge acquired in school subjects. Thus, knowledge and science will serve as a support for the intensive development of the market economy.

2. Results and Discussion

2.1. The knowledge economy as an innovative teaching method

Currently, in the period of information development of society, the essence and function of education in human life is changing. The sphere of influence of knowledge in society is expanding. If previously knowledge served as a means of wealth and innovation, today in the information society it becomes a market resource, being a source of value and profit. Now knowledge is assessed as the key to increasing the competitiveness and intellectuality of the nation.

In Kazakhstan, in accordance with this direction of knowledge development, a new spectrum of learning has taken place, contributing to the renewal of the teaching process in university and school subjects. Thanks to this innovation, didactics considered the knowledge economy as an innovative teaching method. Such a new didactic interpretation of the concept of the

knowledge economy subsequently allowed for the creation of a new educational system – a market training system. This approach has completely changed the entrenched and long-obsolete form of education in schools and universities (Kudaykulov 2010).

The proposed new system of market training corresponds to the requirements of the currently developing market (entrepreneurial) society based on the global economy.

The term "knowledge economy" is one of the "new types of knowledge" of our era. The new concept of the knowledge economy first appeared in F. Machlup's book *The Production and Distribution of Knowledge in the United States*, published in 1962 (Machlup 1962). The category of the knowledge economy is now most widely interpreted in economic, political, scientific, educational and technological aspects. The knowledge economy is understood as "knowledge management", "new economy" and "creative economy". These terms specifically refer to the ability to produce, develop, store, distribute, collect, sell and structure knowledge (Dryden and Vos 2003).

As a result of our research, we have revealed the following didactic prerequisites, corresponding to the contemporary demands of a competitive market economy.

1. The main condition for the implementation of this teaching method is to be able to disclose the market values of educational materials studied in school disciplines.
2. To prepare subject teachers for the technology of the "knowledge economy".
3. To develop a methodology for conducting a new type of lesson – a "market lesson".
4. The content of school textbooks and curricula should be market-oriented.
5. The main task of the market-based process of teaching and educating students is the formation of their entrepreneurial personality.

Under such conditions, a new market training system will be better implemented through the introduction of the knowledge economy method in school curricula.

Our special analysis shows that so far more than 30 different systems and training methods have been applied. For example, learning through dialogue, the classic lesson system, labor learning, polytechnic learning, production learning, problem-based learning, credit-based learning and many others. Each form of training was created on the basis of the social order of certain socio-ecological formations.

The President of the Republic concluded that knowledge is becoming the main source of value in the information society. Knowledge, innovations and methods of their practical application are increasingly serving as a source of profit. The knowledge economy was previously understood as a knowledge-based economy. Nowadays, it is understood as a special type of economy, in which knowledge plays a decisive role. For example, in the field of macroeconomics, the term "knowledge economy" is used to refer to a society of the future. Experts test the concept of the knowledge economy as a method of knowledge management. It should be noted that the term "*knowledge economy*" has alternative concepts, such as "*information society*", "*information technology economy*", "*creative economy*", etc. In fact, the new category of the knowledge economy, which appeared about 50 years ago, made a breakthrough leap forward only in the economy, while progress in pedagogy leaves much to be desired (Nazarbayev 2006).

2.2. Production of a new didactic knowledge system

As a result of many years study of the market society development features, we have created a study guide "Market Training System and Technology." In this guide, we tried to develop a new market training system, as well as its conceptual and technological foundations. In order to introduce it into the practice of schools and universities, we had to create an additional study guide "Didactics of the Knowledge Economy" as an innovative market training method. In this guide, the knowledge economy was examined as a market necessity, a didactic method of teaching academic disciplines, the market value of studied knowledge, the means of market lessons, the conditions for market-based teaching and educational processes. The methodology for conducting market lessons in physics, programs

for elective courses to improve the qualifications of teachers and a special course for undergraduates of the Abai Kazakh National Pedagogical University was developed (Drucker 1992).

In addition, in order to increase the market literacy of teachers and pupils of 4th-11th grades, according to the order of the Ministry of Education and Science of the Republic of Kazakhstan, optional courses "Economic and Financial Literacy" have started to be held since 2009. Our manuals provided valuable assistance in organizing and conducting such a new training course for both schoolchildren and teachers.

As our experience shows, the application of the study guide "Didactics of the Knowledge Economy" in schools and universities of Kazakhstan turned out to be successful. They were used as a market training method on the basis of other teaching aids, such as the laboratory and excursion method of teaching physics and chemistry, Shatalov's "supportive notes", the method of conducting a lesson without homework, the interactive method of teaching, etc. The application of the knowledge economy as one of the methods of teaching academic disciplines allowed for the realization of the market-based educational process. The form of transformation of knowledge into capital was developed. The economic category of the market values of studied subjects was developed. With the purpose of forming the fundamentals of business qualities of students' entrepreneurial personality, a methodology for conducting a new type of a market lesson was developed. Students received an opportunity to choose between market specialties. Consequently, the knowledge economy becomes an innovative market training method, which facilitates the renewal of the process of teaching disciplines in educational institutions. It should be emphasized that the production of the new concept of the knowledge economy helped to renew the forms and methods of teaching. Namely, new knowledge is produced in order to change, develop, and improve the phenomena or events under consideration. Table 1 shows the system of new market-cognitive knowledge produced.

Table 1
Production of a new market-cognitive knowledge system

Separation of new knowledge	Systematization of new market-educational knowledge	Market-target content of a new produced cognitive knowledge
I. As a resource	Information-resource knowledge	1. Market resource; 2. Strategic resource; 3. Resource of the intelligent potential of the country (nation); 4. Capital resource; 5. Innovative science industry; 6. Resource of high technology economy.
II. As a source	Socio-economic knowledge	7. Source of wealth; 8. Source of a billion-dollar business; 9. Source for the development of the national economy; 10. Capital source; 11. Source of the well-being of the family and each individual; 12. Source of income (budget) of the state (company); 13. Source of the accumulation of commodities;

		14. Business profits source; 15. Source of product value;
III. As a means	Market-cognitive knowledge	19. Means of teaching and educating 20. Means of creating new forms of learning; 21. Means of developing the creative ability of teachers and pupils; 22. Means of the workplace learning of youth; 23. Means of the competitiveness of countries, companies, individuals; 24. Means of strategic partnership in the production of new knowledge;
IV. As a method	Market-didactic knowledge	25. Method of determining the methods and forms of teaching and education; 26. Method of innovation; 27. Market-based educational process; 28. Identification of the market values of educational materials; 29. Methods of conducting market lessons;
		30. Teachers training courses; 31. Heightening the pupils' interest in learning; 32. Definition of the innovative knowledge economy teaching method; 34. Method of the commercialization of educational systems and educational materials.

This pattern was observed in the process of a special study of the system of newly produced market-cognitive knowledge (Table 1). As our analysis shows, new knowledge produced in the sphere of market-educational processes can be divided into 4 groups according to the functional feature: **as a resource** → **as a source** → **as a means** → **as a method**. These new market-educational knowledge types are systematized in four main directions:

- 1) information-resource,
- 2) socio-economic,
- 3) market-cognitive,
- 4) market-didactic.

Their market-business content consists of 34 positions (see Table 1).

In a particular case, we managed to reproduce new didactic knowledge such as "crisis in education", "market training system", "knowledge economy as an innovative teaching method", "market-based learning", "market value of educational materials", "market lesson", "market service of students and teachers", "market of entrepreneurial interests of youth", "market knowledge", "market literacy of schoolchildren and teachers," etc.

Thanks to the introduction of new didactic knowledge in the educational process, we managed to implement and conduct anti-crisis measures in training, renew the form and methods of teaching, introduce the market-based process in training, and conduct market-oriented studies.

In this respect, new types of educational institutions – "intellectual schools" and "Nazarbayev University" – should play a special role in the development of the knowledge

economy and in enhancing the efficiency of Kazakhstan's industrial-innovative competitive economy (Kudaykulov and Nurpeissova 2010).

Currently, the process of transforming knowledge into capital proceeds according to the following scheme: **knowledge** → **applied science** → **technology** → **product** → **profit** → **competitiveness**. With due account for this system, students should be trained in the knowledge economy in classrooms and in extra-curricular activities at school. Subsequently, this principle of education will increase the interest of students in the study of school disciplines; promote their understanding of the market value of acquired knowledge; improve technology and the quality of goods; and increase the company's revenues.

With the use of the knowledge economy as a new innovative teaching method, a new market training system was developed. We have developed programs for teachers training courses and introduced this teaching method into school practice. The practical implementation of these programs in schools №145, 146 and 119 of Almaty produced good results (Kudaykulov 2007).

The previously proposed scheme for the implementation of market training: **knowledge** → **applied science** → **technology** → **production** → **goods** → **income** → **competitiveness** can become a didactic device of the knowledge economy. Here a number of examples in various subjects are given: an electric generator (in electrical engineering, physics); grain wastes – bioethanol (in chemistry, biology, physics, technology, ecology); nanotechnology – non-alcoholic beer (in physics, chemistry); "Great Silk Road" – market expansion (in history, literature, and geography), etc.

The purpose of the knowledge economy teaching method was to identify the economic importance of educational materials in school disciplines. The experience of using this method in university and school practice has shown that the transformation of knowledge into capital ("knowledge → capital") turned out to be a complex structural formation consisting of several components. Therefore, we studied this process as a new didactic issue.

The results of our studies conducted on this didactic principle allowed us to identify the following 9 components of the innovative teaching method "knowledge → capital":

1) *Knowledge* → 2) *Fundamental Science* → 3) *Applied Science* → 4) *Technology* → 5) *Production* → 6) *Marketing* → 7) *Product* → 8) *Value* → 9) *Capital*.

Based on the experimental check of this didactic chain of the new teaching method "knowledge → capital" in universities and schools (in the subjects of the natural cycle), we identified (approved) 5 groups of the structure "KL → CP" (KL – knowledge, CP – capital):

1st group. KL → FS → TN → PD → CP;

2nd group. TN → KL → PC → PD → CP;

3rd group. PD → KL → PC → PD → CP;

4th group. MT → KL → PC → PD → CP;

5th group. PC → KL → AS → PD → CP,

where, FS – fundamental science, TN – technology, PD – product, PC – production, MT – marketing, AS – applied science.

In the experimental work, these groups of the structure "KL → CP" were analyzed and verified according to didactic and production principles. **The didactic principle** of analysis was carried out according to the types of lessons, the methods of presentation of the educational material, the nature of the content of the studied educational material and the subjects of study (the corresponding branches of science). **The production approach** was carried out by the types of products manufactured, the technology of product creation, the types of production and marketing research. The validity of the interconnection of these components was checked by *radial-circular and network* graphs (Figure 3).

In the process of developing this innovative teaching method, we managed to create a system of new didactic knowledge, such as "market-oriented educational process", "market

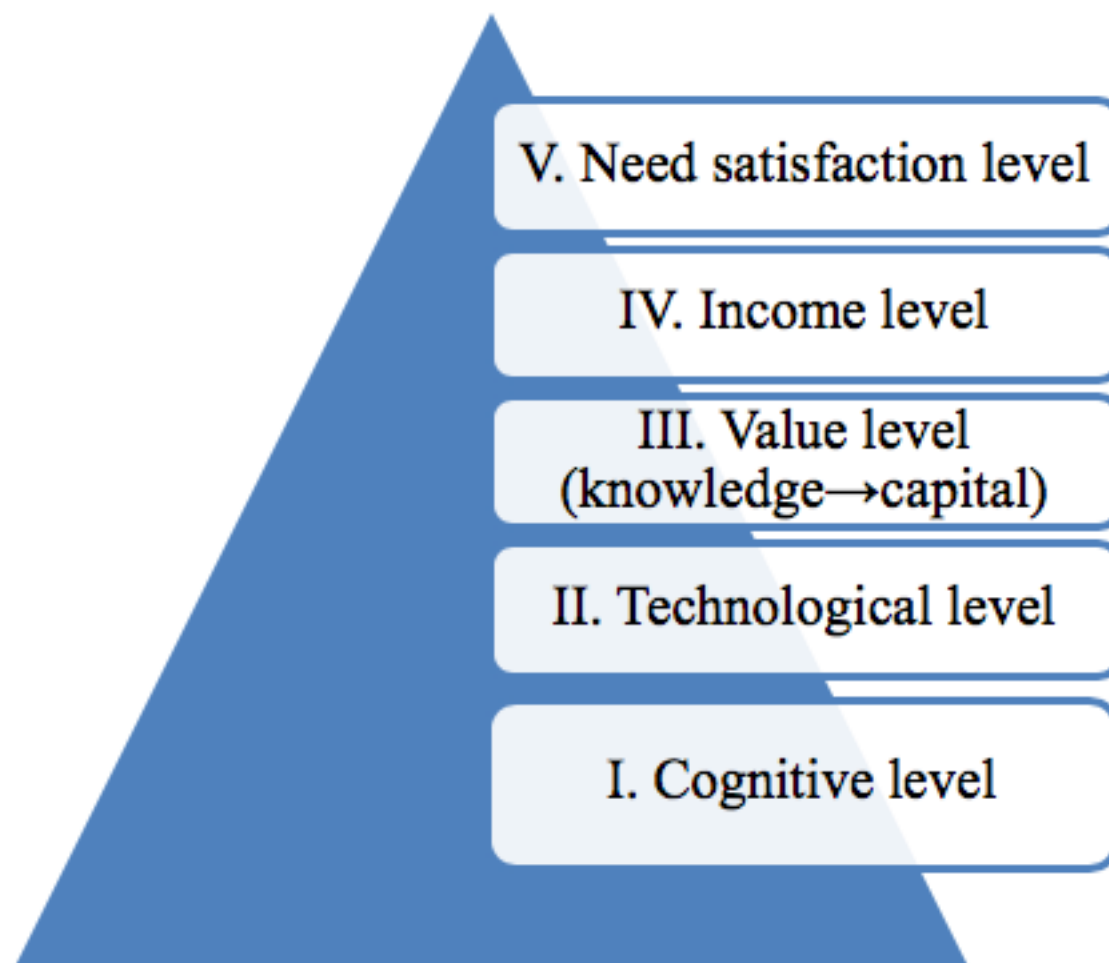
training", "market value" of the educational material, "market lesson" and the innovative knowledge economy teaching method, "teaching method – knowledge → capital", "the system structure – knowledge → capital," "the transformation of knowledge into capital," and so on.

2.3. Methods of transforming knowledge into capital

As a result of our special studies, we managed to determine the levels hierarchy of the transformation of knowledge into capital. The pyramid of these hierarchies is shown in Figure 4.

Figure 1

The "knowledge→capital" pyramid (I level: training, knowledge, science, applied science; II level: technology, resource, production; III level: product, demand, value; IV level: profit, competitiveness, marketing; V level: need satisfaction)



The first cognitive level of the hierarchy of the process of transforming knowledge into capital begins with training, as a result of which students acquire knowledge in various academic disciplines. For example, if we determine the relationship of this knowledge with a particular branch of science and reveal their applied nature, then it is possible to explain the cognitive-practical significance of knowledge acquired in school. This can easily be done with a new market training system. For example, in the process of studying physics and chemistry schoolchildren are taught the phenomenon of electrolysis. The concept of electrolysis must be associated with the science of physical chemistry, and as an applied science – with the galvanization process.

At the second level of the hierarchy, schoolchildren should be familiarized with the process of technological knowledge. This happens according to the scheme: **"technology → finding a natural resource → production organization"**. For example, when studying the phenomenon of electrolysis (in physics and chemistry), we explain its use in the process of gilding spoons, earrings and other items. In this particular example, the electrolytic dissociation was selected as the technology, the gold solution – as the resource, and the galvanizing room of the factory – as the manufacturing facility. Giving students a tour for this facility shall be the best way to realize the technologization of knowledge.

At the third level of the pyramid, knowledge becomes a product. It is necessary to determine the reasonable purchase cost of this product. To determine this, we need to study the demand of competitors; with regard to this information, the price of the product is

established. At this stage, as can be seen in Figure 2, the market value of knowledge is revealed. This required ten stages of the process of transforming knowledge into capital (Kudaykulov and Nurpeissova 2011).

This process has three phases: **cognition** → **technology** → **value**. This didactic scheme has important methodological knowledge for subject teachers:

- In the first phase, the teacher must determine the meaning of knowledge and reveal its applied nature;
- The second phase passes through the system: **technology** → **resource** → **production**;
- In the third phase, it is necessary to explain how the product is created and how the product price is set.

Further, it is necessary to describe ways of the improvement of product quality (marketing) and need satisfaction.

At the fourth level, the values of income and profit are calculated. Depending on this and taking into account the competitiveness of the manufactured product, marketing research is conducted. On the basis of this, the products with the necessary quality and quantity are manufactured, so that no unrealized products remain. Thus, marketing finally determines the amount of profit. Therefore, marketing is considered the most modern market.

At the fifth level, the degree of needs satisfaction of people and society is determined, which is the main social goal of a market economy. A person's striving for profit, which is the "invisible hand" (A. Smith) of the market, always provides people with the necessary products, which is one of the advantages of market relations in all countries.

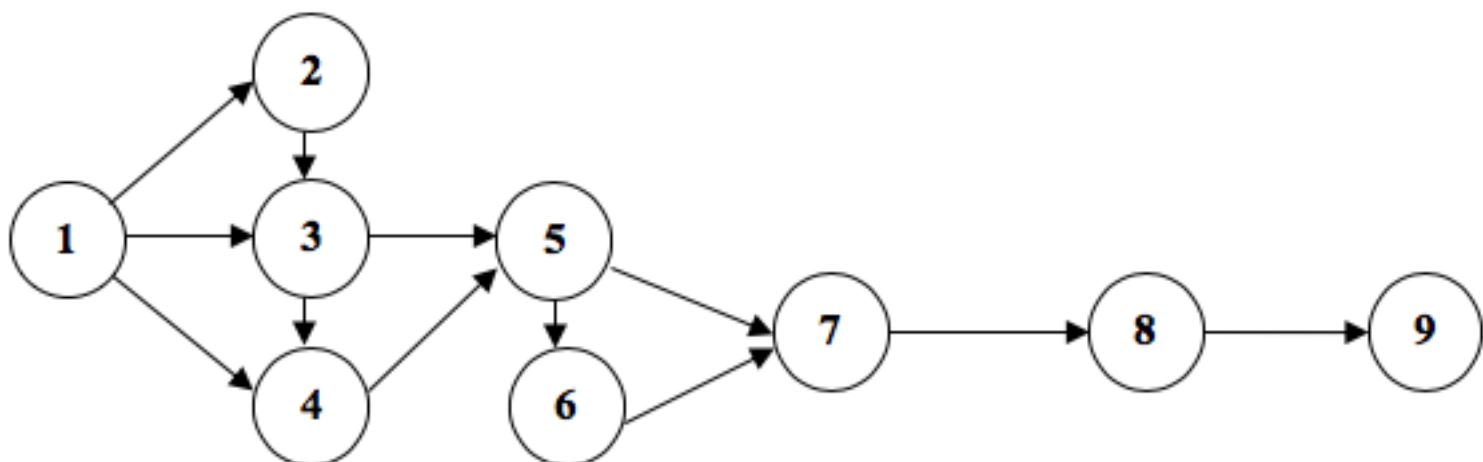
Such a market approach to teaching technology allows the teacher to explain educational materials on the principle of the created pyramid during lessons – the levels of the process of transforming knowledge into capital. Then learners get the most necessary knowledge, which could be converted into money or material values. This circumstance requires carrying out so-called market lessons. This is the goal of the knowledge economy as an innovative teaching method. Then school education will serve the development of Kazakhstan's industrial-innovative economy, as it has been done for a long time in the developed countries of the world.

On the basis of the proposed pyramid, the teacher can easily disclose the market values of educational materials studied in school and facilitate the organization of market lessons. This involved the need to produce and disseminate new knowledge in the US and other developed countries.

Our experience in conducting market lessons has shown that the market values of educational materials are disclosed taking into account many factors that make up the structure "KL → CP". The systematicity of the structure is well manifested on the basis of the network graph theory (Figure 2).

Figure 2

Network relationship of the structure "KL→CP" (1 – knowledge (KL); 2 – fundamental science (FS); 3 – applied science (AS); 4 – technology (TN); 5 – production (PC); 6 – marketing (MT); 7 – product (PD); 8 – value (VL); 9 – capital (CP))



The complexity of the "KL → CP" structure is clearly expressed in the form of a radial-circular relationship, shown in Figure 3. As a result of the practical use of the structure "KL

→ CP" in the process of conducting market lessons, we managed to identify its three basic groups of components:

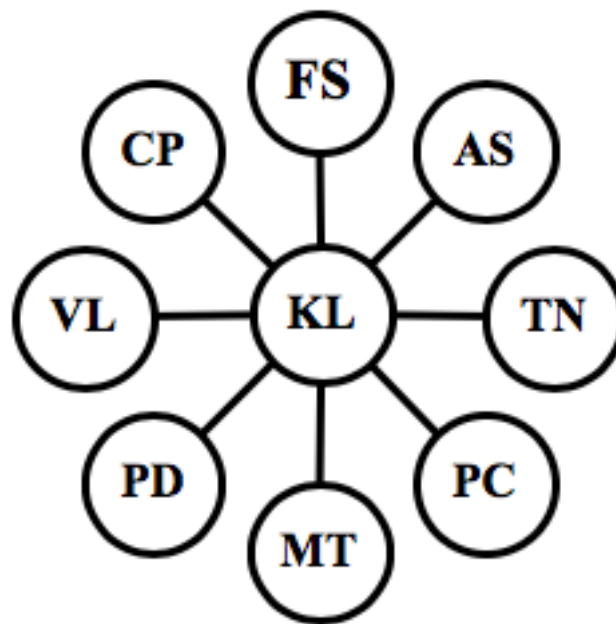
- First group. Knowledge → Fundamental Science → Capital;
- Second group. Product → Knowledge → Capital;
- Third group. Technology → Knowledge → Capital.

The test case for the first group is the development of the theory of Maxwell–Faraday electromagnetic phenomena. For example, although a dynamo machine was created in 1856, and Edison invented an electric lamp in 1878, the electro-radio engineering industry did not develop for a decade. This task was realized after the development of Maxwell's theory as the scientific and technical basis of the corporation on electro-radio engineering.

The second group of components of the structure "KL → CP" was realized by the system "product → knowledge → capital". For example, the use of a diaper (capillary phenomenon).

The third group of components allowed for the transformation of knowledge into capital through technology. As an example, the technology of beer ("DERBES") purification from alcohol can be considered.

Figure 3
Radial-circular relationship of the structure "KL → CP"



In the future, other combinations of components of the structure "KL→ CP" can be revealed.

3. Conclusion

The formation of an entrepreneurial personality is the ultimate goal of the newly introduced system of market training, which is absent in the current form of the educational process. As it is known, each socio-economic formation prepared the corresponding personalities for itself. For example, feudalism educated the feudal lord, capitalism – the capitalist, socialism – the builder of communism. What kind of personality is the current market society preparing?

The results of our long-term research show that for the market society an entrepreneurial personality is best suited. This is explained by peculiar features of the development of our market society. All riches and property of the state are privatized on the principle of market relations, i.e. all resources of the country are redistributed among members of society. The basis of our market formation is private property. Consequently, our society is called an entrepreneurial society.

Entrepreneurs are considered the driving force of our economy. The more wealthy entrepreneurs – businessmen, the more powerful the country is. For example, the US is famous for its more than 20 million billionaires. This is not the only example. By their nature, entrepreneurs are creatively thinking people and competitive specialists. They possess self-confidence, talent, efficiency, high ability and many other qualities.

Entrepreneurs are also the most advanced and conscious detachment of the population.

They are not divided on national and racial grounds. To the same extent, they refer to religious beliefs, party positions, geographic locations, economic and technological spheres, the governing hierarchy, etc. They are called to qualitatively engage in the chosen favorite kind of entrepreneurship, promoting the increase of the state and family budget with their knowledge, skill and mastership.

That is why educational institutions should form entrepreneurial qualities among youth, so that they become well-known businessmen, which promotes the renewal of education, and positively solves the most complex issues of the crisis in the educational process in schools and universities.

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[Index]

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