

SOCIO-ECONOMIC BASICS OF SCHOOLCHILDREN'S POLYTECHNIC TRAINING IN THE MODERN INDUSTRIAL ENVIRONMENT

^aGIZATULLA IMASHEV, ^bBAYAN KUANBAYEVA,
^cMAIRAGUL RAKHMETOVA, ^dAIGUL UTESHKALIYEVA,
^eAKMARAL KARIMOVA, ^fASSET TURKMENBAYEV,
^gZULFIYA ZHANUZAKOVA, ^hAINAGUL SHYGANAKOVA

^{a-d,g,h}*Kh. Dosmukhamedov Atyrau State University, 060011, 212 Studenchesky Ave., Atyrau, Kazakhstan*

^e*Atyrau Oil and Gas University named after Safi Utebayev, 060000, 45A Baimukhanov Str., Atyrau, Kazakhstan*

^f*Yessenov Caspian State University of Technology and Engineering, 130000, 32 Microdistrict, Aktau, Kazakhstan*

email: ^a77gz5ag@mail.ru, ^bbayan_kuanbaeva@mail.ru, ^cmaira_12_05@mail.ru, ^eakmaral0167@mail.ru, ^fasset.turkmenbaev@yu.edu.kz, ^gzh.zulfiya@mail.ru, ^hainagul-81-81@mail.ru

Abstract: The article considers the socio-economic and pedagogical basis for improving schoolchildren's polytechnic training in the modern industrial environment. The article reveals the social and economic importance of modern scientific achievements for the shaping of a comprehensively developed personality. According to the requirements of scientific and technical progress, the article defines the important place of the basic awareness of technological objects, technological, and industrial processes in the maintenance of schoolchildren's polytechnic training. The article considers organizational pedagogical ways and means of the optimization of polytechnic training under the conditions of the further economic and social development of Kazakhstan.

Keywords: scientific and technological progress, social development, personality, education, polytechnic education, training, technology, industry, methods, professional training.

1 Introduction

Modern scientific, technological and social progress is making great changes in all areas of human activities. It requires further improvement of workers' cultural and technical training in various sectors of the national economy of Kazakhstan. The social and economic transformations taking place in society at present have put everyone in a rather harsh environment when one has to look for internal reserves, opportunities for the realization of available knowledge, skills, and experience rather than rethink and psychologically adapt to market conditions. The development of society is inextricably linked to the development of education, which at different stages was determined by specific forms, means and models of relations between teachers and pupils, and, more broadly, between knowledge carriers and knowledge users. In the modern context, the main problem of education is no longer so much the search for ways to enable a person to master a huge and constantly increasing amount of knowledge, or at least orientation in an ever-increasing flow of information, as the obtaining and creation of a new intellectual product. One of the most important goals of modern education is to train people in a timely manner for new life conditions. The paper considers the socio-economic and pedagogical basis for improving the polytechnic training of students in secondary general education. (1, 2) The problem of polytechnic training of school students is one of the problems, the relevance of which is determined by socio-economic changes in society. In today's conditions, it is amplified by the following factors: technological revolution and the emergence of post-industrial society have led to the fact that an employee is now required both well-developed production functions and abilities, and skills to design, make decisions and perform creative work. These qualities should be formed since childhood and be constantly developed during both learning and working life. Modern civilization is going through such a critical turning point period of development when the future is not strictly deterministic but variable. Moreover, what scenario will be realized depends on many influences and factors including the manifestation of scientific and social activities. It is now that such activities can be truly both useful and effective, acting as the lifesaving impetus that guides the further development of civilization. An analysis of practice shows that we underestimate the economic impact that an enhanced

polytechnic training can have on schoolchildren. If we take into account that such training involves learning the scientific basis of modern technology and methods of using knowledge in it, the social and economic importance of polytechnic education becomes clear. (3) In this article, an attempt was made to build a structure of polytechnic materials related to physics in accordance with the main areas of scientific and technological progress.

1.1 Purpose of the Research

The goals and objectives of polytechnic education are conditioned by the socio-economic development of society. The technical intensity of labor and its intellectual content requires not only a high level of workers' general educational, polytechnic and professional training but also systematic improvement of this level in accordance with objective changes in industrial technology.

The purposes of the research are

- Students' training for transformative activities in social production;
- The shaping not only of natural scientific and socio-historical but also a technological vision of the world in their consciousness;
- The development of such qualities as transformative thinking and creativity;
- The creation of optimal conditions for personal development in the process of participation in various types of educational and labor activities.

The demands of life dictate the need to study work issues at a new quality level. Students' knowledge of industries should include the main provisions of the strategy of the government to accelerate the socio-economic development of the country. (4, 5) It means that schoolchildren should be familiarized with the main areas of scientific, technological and organizational renewal of industries, with the economic aspects of production, with the issues of increasing the quality of production, labor productivity, saving of natural resources, and integrated use of raw materials, i.e. with the main ways of industrial intensification.

The scientific novelty of the work is as follows:

- The social and economic importance of polytechnic education when shaping a comprehensively developed personality is revealed at the present stage;
- The social, economic and pedagogical principles of modeling of organizational forms and methods that ensure the effectiveness of polytechnic education in the modern industrial environment are defined.

The practical significance of the study is:

- The development of organizational and pedagogical ways and means of optimizing polytechnic education in the context of further economic and social development of the country;
- The preparation and publication of the monograph "Innovative aspect of polytechnic education";
- The implementation of methodological recommendations to improve the polytechnic training of students when studying natural sciences.

The study of natural science subjects provides an opportunity to introduce students to quantitative and qualitative physical and technical properties of materials. (5, 6) In this case, it is appropriate to tell pupils about the creation and wide implementation of new constructional, magnetic, and semiconductor devices; superconducting and other materials, and technically valuable crystals. One of the main objectives of the

polytechnic principle is the mastery of the system of knowledge about the scientific basics of modern technology and industries. This system includes general scientific, technological, industrial, social, economic knowledge, and respective skills. Polytechnic education as an integral part of the cultivation of a comprehensively trained personality is conditioned not only by the development of technology but also by social conditions of human activities. Thus, the polytechnic education of students develops in them a conscious and creative approach to their activities, primarily in the field of technology, enriches the area of their social relations and means of activities, and provides norms of conscious behavior, as well as a broad basis for choosing a profession related to material production. (7, 8) All this helps young people to define their place in social life according to their abilities, which is a condition for further shaping of a comprehensively developed personality. The implementation of the objectives in the multilevel system of polytechnic training provides for the definition of the pedagogical objective, i.e., the setting of goals and the selection of educational content adequate to the prospects of socio-economic, scientific, and technological development of a renewed society.

2 Materials and Methods

The analysis of numerous studies devoted to the problem of implementation of the polytechnic principle in the educational process of secondary schools gives a basis to outline the main theoretical and methodological provisions of the basics of polytechnic education, both in general and in view of the specifics of regional features of the process of socio-economic development of Kazakhstan. In this regard, the State program, which determines the main priorities of reforming country's schools and their integration into the world educational space, has been developed. Scientists reveal the social and economic importance of polytechnic education. P.R. Atutov notes that three factors or three categories were of primary importance:

- Economic category - the law of change in labor caused by the revolutionary nature of the large technological industrial businesses;
- Scientific-technological category - common polytechnic basics of different industries and industrial processes;
- Social category - the need to overcome professional unilateralism for shaping a comprehensively developed personality. (7, 9)

A comprehensive student's personality development based on student's inner potential and in accordance with the best cultural and historical traditions of society and technological achievements of humankind is the primary goal of education. It determines the main areas of modernization in education oriented not only to the student's mastery of a certain amount of knowledge but also to the development of the student's personality-related nature, his/her cognitive and creative abilities, his/her creative self-realization for the benefit of society and his/her personal benefit.

The new conditions of humankind's existence in the XXI century and the necessity to solve many problems including, first of all, socio-economic and ecological ones, require changes in the scale of priorities and moral values existing in the society at present. It is necessary to pay much more attention to the problem of moral education. Today there is an urgent need for a new philosophy of education that would be adequate not only to the already changed conditions of human existence in the modern social, economic and to the information environment but also to the new problems facing humanity. (10, 11)

The necessity of the comprehension of the problem of schoolchildren's polytechnic training at a new theoretical and methodological level is conditioned by the change of social and economic conditions of society's development. The following factors have placed greater emphasis on the problem of the harmonization of general educational, labor-related, and technological training of the young generation:

- The entry of the modern world community in the period of accelerated social, economic, scientific, technological, and cultural changes;
- The emergence of the post-industrial civilization, the hallmark of which is the universal and highly effective use of information and scientific knowledge as a creative force of society, its strategic resources, and factors of development;
- The subjects and results of labor, and, in turn, the responsibility of the education system in these conditions for the introduction of humans to the knowledge about the world of labor, the formation of their attitude to the world, the definition of their worldview and moral position in this world.

This implies a respective growth of theoretical knowledge and practical skills aimed at ensuring the effective use of modern technology. At present, the requirements for the content, methods, and organizational forms of labor and professional training of students are toughening. They are called upon to actively participate in accelerating the country's social and economic development based on scientific and technological progress. Its objectives cover a wide range of issues including the development of education. (11)

In areas of the economy not related to highly concentrated industries, scientific and technological progress is related to automation. Automation's fundamental element is microprocessors based on large integrated circuits. These are compact computing devices made with one or more semiconductor crystals and carrying out various functions of object control based on a tunable program. It can be a CNC machine, a car with an electronically controlled fuel supply, a washing machine with automatic sequence control, a pilot unit for scientific research functioning in accordance with the given program, etc.).

Competitiveness on the labor market must be ensured by the high quality of general education, economic, technological, and entrepreneurial training of young people whose systematic integration ensures the development of a person capable of working under market conditions and who is ready for the full and creative realization of his or her potential in the chosen professional activity. The level of training should ensure not only compliance with the level of technology development but also the ability to respond flexibly to the alternatives offered by society thus ensuring the stability of the educational system development. (12, 13)

3 Results and Discussion

In view of the scientific and pedagogical analysis of the theory and practice of polytechnic training in secondary comprehensive schools, the necessity to enhance the polytechnic training of pupils when studying the main areas of the scientific and technical progress at the present stage is shown. In recent years, two following aspects have become increasingly important in polytechnic education: socio-economic and environmental. The experience of working in the school reveals that more often teachers explain to pupils the major technical and economic problems of the national economy, and the social importance of modern scientific achievements along with studying technological units and areas of technological progress in certain industries. (13, 14) Thus, when studying the use of nuclear energy, the social significance of nuclear energy development, the importance of the integrated approach to design and construct hydraulic structures, and the problems of electric power transmission over ultra-long distances are shown. It can be shown especially brightly when studying nuclear physics by raising the topic of the use of particle accelerators, and tools used for registering elementary particles in computer engineering. It should be emphasized that such two-way communication between physics and technology is an important consequence of the scientific and technological revolution. Competition on the labor market, its multiplicity and instability, and possible unemployment impose increased requirements on school leavers related to their personal and business qualities, the

manifestation of independence and enterprise in professional self-determination and realization of their potential in the chosen professional activity.

One of the poorly solved problems of modern pedagogy is the construction of a structure of general education that would be able to ensure broad functional literacy and professional mobility of an individual. Technological culture can be regarded as an integrative parameter for the professional mobility of future industrial workers. It is an essential element of working culture and has a structurally formative status in a complex and dynamic system. One who possesses technological culture is a creative person with developed creative, communicative, social, research-related, information-related, cultural, and general professional skills. (15, 16) He or she is able to think and act unusually. Since the qualitative indicators of human labor are ultimately determined by the culture development level, when mastering technological culture, high school students have the following functions proper to such a culture:

- The general knowledge building;
- The transfer of knowledge and skills from one area to another;
- Aesthetic approach to the students' activities;
- The development of demand for one's own work;
- Flexibility in thinking, the ability to improvise.

At physics lessons, schoolchildren are introduced to the most important areas of scientific and technical progress, to the principles of operation of objects in modern technology, get an explanation of the basics of some labor processes; gain many practical skills and abilities necessary for work. The definition of technical objects (techniques, technological processes, and materials) for the familiarization of students with them during polytechnic training is made in view of the analysis of the tendencies of development of modern industries, and, first of all, mechanical engineering (including machine manufacturing, electrical engineering, instrumentation, etc.). With this regard, it is necessary to consider the following areas of development of mechanical engineering:

- The maintenance of the required quality of production;
- Reduced production cost;
- Increased level of labor productivity;
- The achievement of high accuracy of processing (including working out of new kinds of cutting tools);
- The search of low- and non-waste technologies, working out of respective techniques (including powder metallurgy, processing by pressure, electrophysical and electrochemical methods of processing);
- Reduction of human labor costs, the economical use of human resources (integrated mechanization and automation of industrial processes based on the use of microprocessor technology, robotic systems, the creation of flexible automated processes, improvement of the ergonomic performance of equipment). (17)

An important application of physical research is to obtain new materials. A decisive role in the creation of materials with predetermined properties is played by physical methods of exposure to matter including electronic, ionic, ultrasonic, and laser beams; ultra-high pressures and temperatures; ultra-strong magnetic fields. Great importance is attached in Kazakhstan to the automation of industries that transforms jobs and helps to make labor more productive, creative, and attractive. The modern stage of automation is based on the revolution in electronic and computing equipment, on the development of electronics in the national economy that has taken place thanks to the achievements of solid-state physics, radio-electronics and other sections of modern physics.

Thus, physical research enables further development and qualitative transformation of productive forces, creation of new types of equipment, materials, and technologies. The constant increase of science contribution to industries is the main condition for further economic and social development of Kazakhstan. (18, 19) The content of schoolchildren's

polytechnic training based on personality-centered and activity-oriented approaches comprehensively and multidimensionally reflects the industrial activities with a leading role of humanitarian, social, environmental, and other factors, and includes worldview-related scientific, technological, economic, environmental, and creative readiness. Such an approach is essentially an achievement of the content of polytechnic training regarding new world-view positions since the acquaintance with the process of expanding its activities and influence on human nature is aimed at overcoming the anthropo-egocentrism in the subject-related activity of students. This provides for the formation of students' personal qualities that give them the opportunity to work successfully in the new conditions of management, a deep understanding of the public importance of work, its creative nature, the desire to increase its productivity. The educational system faces an extremely complex task - to ensure a constant adaptation of a person to changes in the world around him or her. Technological education plays a significant role in the implementation of these objectives of comprehensive schools. To reveal the mechanisms of development and functioning of the process of students' technological training as a system, it is necessary to highlight the system-forming basics of the numerous subsystems in which the shaping of personality takes place. (19, 20)

One of the most important generalized tasks of students' technological training is the development of their technological thinking in its modern understanding as synthetic and integrating the characteristic features of modern technical, economic, environmental, and humanitarian thinking. Such thinking provides the ability of a functional approach to technical phenomena, the ability to synthesize various knowledge in solving complex practical problems, the ability to see and evaluate production phenomena in all their versatility and complexity of their components, factors affecting them, and the ability to see and understand their place in the system "society - nature". With this regard, the most justified are those innovative models of learning, in which the learner is considered not only as of the actor mastering an academic subject but also as an actor changing the very foundations of subject-related activities, that is, as the creator of new norms, relationships, and values. Thus, technological education at school is designed to contribute to the harmonization of personal abilities and aspirations with social needs and interests.

4 Conclusion

The demands of life dictate the need to study industrial issues at a new qualitative level. Students' knowledge of industries should include basic provisions on the strategic line of the state and government to accelerate the socio-economic development of the country. (19) It means that schoolchildren should be familiarized with the main areas of scientific, technological, and organizational renewal of industries, with economic aspects of industries, with the issues of increasing the quality of production, labor productivity, saving of natural resources, and integrated use of raw materials, i.e. with the main ways of industrial intensification.

Thus, at the lessons of natural sciences students receive polytechnic training and are introduced to different types of labor activities of people, which helps them to choose the right future profession. The scientific and theoretical level of school subjects is being raised, the systematization of training courses is being enhanced, the polytechnic orientation of secondary education is being deepened, the distribution of teaching material by class is being optimized, inter-subject relations are becoming closer, the content of programs and textbooks is being coordinated and the necessary methods are being developed. Thus, new opportunities open up for teachers who want their work to meet better social, scientific, and technical progress, and life requirements.

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Primary Paper Section: A

Secondary Paper Section: AM, JA