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INTEGRATION OF NATURAL SCIENCE AND HUMANITIES KNOWLEDGE IN SOCIAL WORKERS TRAINING

G. B. Khasanova (a)*, N. Sh. Valeyeva (b)
*Corresponding author

(a) Department of Social work, Pedagogics and Psychology, Kazan National Research Technological University, Kazan, Russia, ufkbz58@mail.ru
(b) Department of Social work, Pedagogics and Psychology, Kazan National Research Technological University, Kazan, Russia

Abstract

At present, when the system of socio-economic and cultural interactions becomes ever more complex, specialists of a new type are needed who have accomplished a comprehensive basic training and possess fundamental knowledge. This calls for creation of such a vocational training system which will produce not the pragmatic narrow-minded specialists, but those who have methodologically invariant knowledge which forms an integral scientific outlook on the world and are conducive to personal development and adaptation of the individual to the fast-changing modern life. The main characteristic of the fundamental training is its comprehensive character which can be achieved by overcoming the fragmented contents of educational programs, by introduction of inter-disciplinary courses, by humanization of technical education and introduction of courses in natural science into humanities programs. The authors have developed the contents of an integrated course "The concept of modern natural science" which aims at formation of a scientific outlook in in future social workers. The anticipated result of taking this course should be creation of a scientific view of the world, integrated knowledge about the Nature and humans' place in it, the system of humanistic values.

Keywords: Knowledge integration, social workers, professional training

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1. Introduction

It goes without saying that many problems of the present time originate from the fragmented perception of the world around us, while in reality the world and Nature – are united and integrated. Of course, putting together these fragments is a difficult task. Despite the fact that integrational and inter-disciplinary trends have been going on in modern science for a while already, this problem of fragmentation still persists. Therefore, if we set the goal of creating an integral and comprehensive system of professional education we must approach this task as follows: at first we need to assess the integral character of each fundamental science separately; secondly – integral character of natural sciences and humanities, and finally – lay the foundation of fundamental training of future specialists.

Suhanov (1994) distinguishes the following three levels of the analysis of the integral character of fundamental education.

The top level – integration of all fundamental education. In order to get to that level the existing educational system needs to undergo a lengthy transformation through active interaction of technical knowledge, natural science and humanities, through forging an integrated culture.

Sadly enough, the modern culture draws a clear boundary between the natural science and humanities, forgetting at the same time that these two spheres of knowledge only give two different pictures of the same reality. The natural science focuses on the objective side of this reality which can be described by formal logic. Humanities, at the same time, focus on the very process of creation of the objective reality, or the subjective reality. In the end, the subject matter of both turns out to be the same, albeit from different angles. The pieces of the puzzle are complementing each other, not excluding each other. We may not talk about a separate cultural system – each cultural system is a part of the common cultural system.

In light of this, in order to allow the future specialists to form an integral scientific outlook on life it is necessary to change the contents and the structure of the education, educational technologies, methods and means. Disciplinary and inter-disciplinary courses, which contain most fundamental knowledge, should come to the forefront and form the basis for development of common and professional cultural skills, quick adaptation to new professions and specializations, become the theoretical foundation of applied research. Therefore, we mean here the kind of knowledge which, firstly, can help students to form a broad, integrated and comprehensive outlook on the modern world and the place that humans occupy in it; secondly, can help to overcome the disciplinary fragmentation and isolation of knowledge which hinder the development of the integrated scientific outlook and of perception of human culture as a unity of its natural science and humanities elements.

Synthesis of natural sciences and humanities in interdisciplinary courses is a way of understanding of the true nature of humans and of the society. The main instrument for this should become introduction of natural sciences into the humanities and social sciences programs, and of general humanities – into technical and natural sciences programs.

We can argue that the task of humanization of technical and natural sciences education has been already accomplished. Introduction of humanities into technical curricula allows the students to form the skills for integrated perception of the world, see the human aspects of processes they observe in the world,

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see the negative consequences for Nature and the humanity of certain technical advances and tackle these problems.

However, "naturalization" or adding courses in natural sciences to humanities and social sciences programs has received so far significantly less attention. Under the "naturalization" we understand development of scientific outlook as an indispensable element of the general outlook, reflecting the affinity of one's nature to Nature in general which includes realization that a person is a living creature among other living creatures and natural objects of the Universe, that we need to cooperate, protect, and care for Nature (Khasanova, 2003).

2. Problem Statement

In that regard it is critical to develop such courses in natural science which would give some basic understanding of natural and social catastrophes when a person can lose his bearings due to lack of appropriate knowledge. These should be comprehensive and conceptual courses oriented on development of rational thinking patterns, of a scientific outlook on the world around us, and, at the same time, considering the mentality of students of humanities.

As a possible way of integrating natural science and humanities knowledge could be the synergetics. It is truly interdisciplinary, oriented towards discovery of the laws of the evolution and self-organization of patterns and structures of any nature regardless of the type of elements comprising these structures. The task of restoring the human element in natural science can be accomplished by using a synthesis of the laws of natural sciences, philosophy and synergetics which, on the one hand, allows to avoid eclecticism when combining in one course parts of chemistry, physics, biology, ecology, universal evolutionism, and, on the other hand, takes into account the historical and cultural context of the specific period and sees a person behind a scientist (Suhanov, 1996). For students of humanities, it is a viable way of acquiring knowledge, concepts, and ideas from the cutting-edge natural sciences.

Creation of the integrated education is impossible without ensuring integration on the second and the third levels. We will analyze those taking as an example the courses in natural sciences offered in the curriculum of future social workers.

The second level of integration can be deemed as achieved if courses in natural sciences, which form a part of the training curriculum of these future specialists, create a system where elements are unified by their shared goal, the research object, and the methodology and oriented towards the essential inter-disciplinary links. Therefore, the next step should be to construct an integrated series of courses in natural sciences which should aim to develop in students a general concept of natural world around us.

Making of such a series of courses should be based on understanding the natural sciences as a comprehensive and independent inter-disciplinary area of knowledge with its own subject matter and research methodology. Therefore, when designing this series, one should strive for a synthesis of different educational courses in natural sciences, rather than a simple aggregation of different facts and concepts. In order to achieve this one needs to determine the specific nature of each of the natural sciences and then to understand their universal meaning in Nature. As a result of this approach, we could introduce natural sciences knowledge into the social workers curriculum which would be fundamental and oriented towards students' personalities, and the students would be able to form an integral scientific outlook on life.

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The third level of integration is the level of each separate natural science. Educational disciplines can be called fundamental if they reproduce fundamental ideas and concepts, logic and structure of the respective science from the today's perspective and are not simply reduced to mere increase in volume.

For example, new ideas about physics (its segregation into classical and neo-classical elements) allows to create a clearly structured course, not just an agglomeration of loosely connected ideas, and to combine logical consistency and intensity. That should create the optimal conditions for adequate reflection of the contemporary knowledge of physics in scientific education and forming a integral thinking model based on physics (Golubeva, 1994).

A general course on chemistry should not only supply the minimal necessary information about substances and chemical reactions, but also to show the role of chemistry in human life, develop understanding of the current state of the main areas of chemistry.

When it comes to introducing courses on general mathematics into social workers curriculum, the structure of these courses should help students to develop a mathematical approach to analysis of different objects and processes in all spheres of scientific knowledge, cultivate the mathematical thinking culture and realization of deep connection between mathematics and social sciences (Golubeva, 1994).

Biology has always been interesting to students if only because a human being is a living creature, and his activity is unthinkable outside of Nature. At the same time, by now the society is facing dangerous destruction which is has inflicted to Nature. Therefore, higher education should reflect the current ideas about the unity of the world and about humanity's place in it, give basic knowledge in biology and ecology. The sciences of biosphere and of homo sapience embrace fundamental natural and social education and are needed to every modern educated person.

3. Research Questions

To sum up, the process of "fundamentalization" of higher education in general and of education in natural sciences in particular implies the necessity to solve many interconnected problems at different levels. Preparation for the fundamental higher education should start already at school. At middle and high vocational schools, the foundations are laid for future fundamentalization as separate courses in natural sciences are offered to the extend prescribed by the educational standards. However, this is not enough for future social workers to get the fundamental training because courses in natural sciences almost entirely lack from their higher education curricula. This orientation on narrowly specialized professionals reflects the concept of person's social security which has formed in the past decades. Currently the situation is changing. Only a person with broad training can feel himself socially secure as he can flexibly adapt his professional activities to changes in technology and demands of the job market. Therefore, for humanities students an integral course in natural sciences has been introduced which helps them to develop a comprehensive outlook on the world.

At present, physics, chemistry, biology, and social sciences study different aspects of the Universe, creating fragmented knowledge about the world. Synthetical and inter-disciplinary sciences like physical chemistry, geochemistry, biophysics – approach in a comprehensive way the research of isolated processes of the Universe. Cosmology deals only with physical and physical-chemical aspects of creation. In reality,

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though, the Universe is not separated into isolated natural and social processes, but they appear in the Universe as one, in unity (Volkov, 1995).

4. Purpose of the Study

In order to reconstruct the integral scientific outlook on the world around us we need to master the entire arsenal of the available means of scientific rationality. The integrated course "Concepts of modern natural sciences" helps humanities students to get to know the indispensable component of the unified culture – the scientific knowledge, - to form a comprehensive outlook on life, and to give an overview of the most universal methods and laws of the natural sciences.

There are, of course, certain difficulties related to the peculiarities of humanities students' mentality. Such students as well as scholars of humanities rather often have a tunnel vision of a human being as a purely social creature. How a human personality is formed is determined by social factors, social environment of this person. This approach has traditionally formed the basis for many principles of pedagogics, legal studies etc. However, at present such an approach has become obsolete because it ignores the scientific knowledge about the natural roots of the human race. A human being is a biosocial creature (Nuikin, 1989). He is a part of Nature, its child and offspring; at the same time, he is a creature which actively, consciously and purposefully changes his environment and the world in general through interaction of human individuals. Therefore, we see as purely rhetorical the question: "Why a humanities student will need to study natural sciences?"

In our opinion, such a course should also help students of humanities to form a truly scientific outlook and realization of the inherent principles and laws of Nature – from the microcosm to the Universe and Human. By progressing through this course, the students will learn to substantiate their stance on certain contemporary issues of the natural sciences, to apply the acquired knowledge and modern scientific methods in solving their professional tasks.

5. Research Methods

The methodological backbone of this course is the evolutionary-synergetic paradigm which has been coming to the forefront of modern science. The contents of this paradigm necessitate a harmonious fusion of universal evolutionism and self-organization when analyzing particular phenomena and processes of the physical world. Mastering this method should help students to better embrace the dialectics of the evolving world as a single unified system. As natural science is pluralistic, then it is necessary, on the one hand, describe objective laws and foundational principles of the evolving world, and, on the other hand, show the incompleteness and openness in the current state of solving problems by the modern natural science.

6. Findings

According to the outline of the course methodology, we need to describe the contents of the course. In the beginning students are introduced to the specific features and unity of the natural sciences and the humanities cultures by portraying them as two interlinked components of a single culture. The specific nature of the natural sciences is in its ever increasing stock of knowledge about Nature, in its high level of

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objectivity which allows it to remain the most accurate layer of the mass of human knowledge and to have a significant importance for existence of humans and human society. Moreover, it is a deeply specialized knowledge.

The specific character of the humanistic culture is that the knowledge about the interlinked value judgements in a society is activated depending on the place of an individual in a certain social group. The basis of the actualization often comprises values common to all mankind. All this plays a decisive role in social adaptation of an individual. The problem of verity is solved by considering the knowledge about the object and the value judgment about the object's utility which is made by the consuming or perceiving person. At the same time, value judgements which contradict to the real characteristics of the object cannot be excluded, as well as the presence of certain ideals and future projects.

However, these two components of the culture are interconnected, and this connection is manifested in the following:

- they have the same basis rooted in a person's and humanity's needs and interests aimed at creation of optimal conditions for self-preservation and perfection;
- they exchange the achieved results (natural sciences ethics, rationalization of the humanistic culture etc.);
- they mutually coordinate in the historical cultural process;
- they form independent parts of a single knowledge system of the science;
- they have the fundamental value for a human being as they reflect the unity of Nature and the society.

Further on, we need to analyze the common scientific research methods, the structure of the scientific cognition. We would like to illustrate this section by showing the process of scientific research on the example of a well-known scientific discovery (such as the discovery by Newton of the law of universal gravitation). It is important to show that the scientific method has its limits, that the reality is by far richer and more complex that its image created by science.

Then we need to define the modern natural sciences, the laws of their development, make an emphasis on explaining the prominent specific features of the modern scientific model of the world.

Science does not only study development of the world, but also is a process of its own right, a factor and a result of the evolution. Science moves forward not only through continuous accumulation of new facts and ideas, but also through fundamental paradigm shifts, through scientific revolutions which result in changes in paradigms and in the scientific view of the world.

The picture of the worlds which the modern natural sciences paint is at the same time very complex and simple. It is complex because it can bewilder a person accustomed to classic scientific concepts. At the same time, the principles it is based on give it the simplicity as these principles are aligned with the fundamental laws of Nature – how it exists and develops (Khasanova, 2003):

- systemic character;
- global evolutionism;

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- self-organization;
- historic character.

The systemic character means that the Universe is the biggest of the known to us systems which consists of myriads of interconnected elements (subsystems) of different complexity and orderliness. The systemic way of uniting these elements manifests their principal unity: due to the hierarchical inclusion into one another of systems of different levels, each of the elements of the system is connected to all the other elements of all possible subsystems. For example: human – biosphere – the planet Earth – the Solar system – the Galaxy etc.

The global evolutionism is the acknowledgement that both the Universe and all its lower-level systems cannot exist without constant development, without evolving.

The self-organization is the observable quality of the matter to become more complex and to create more and more orderly structures in the process of the evolution.

The historic character means that each scientific picture of the world is in principal incomplete and unfinished.

After this we should proceed with a more detailed analysis of the natural sciences' view of the world. Particular attention should be paid to the structural levels of matter's organization, with the focus on the unity of the microcosm, macrocosm and megacosm which underlines the principle of the universal evolutionism permeating in the Universe.

One cannot imagine the scientific picture of the world without the attributes of time and space, which concepts should be explained, the universal qualities and specific features of physical space and time should be demonstrated on the different structural levels of matter's organization; here also the peculiar character of biological, psychological, and social time and space should be described.

It is unfathomable how from simple forms emerge more complex ones, how, in the end, from inanimate emerges life itself unless you look first at the biological and chemical forms of matter's organization. Science has proved that life's genesis is a logical step in the evolution of the Universe, although there exist the creationist theories and cosmic theories of the life's origins which, by the way, appeal to the youth.

Biology as the science about life gives a human dimension to the scientific view of the world. The section "Biosphere. Noosphere. Human" should help the students to realize themselves as a part of the whole (of the biosphere), acknowledge the equal right for life of humans and of other living creatures, comprehend the impossibility of humanity's survival and well-being in isolation from all the other species.

Life as a peculiar and very complex natural phenomenon affects the world in many different ways. In its many manifestations, life (or living Nature) not only produces waste products, but also transforms Nature and the face of our planet in general.

When humans appeared, they not only produced qualitative changes in the biosphere, but also amplified its effect on the planet. Gradually happened the transition from simple biological adaptation of living organisms to their environment to purposeful activity of changing the environment by intelligent living beings.

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In the process of interaction between the society and Nature many problems emerge. First of all, it is the problem of the ecological crisis resulting from pollution of our habitat, of water, soil, and the air, depletion of natural resources and the related energy crisis, food crises etc.

If the early stages of human society were characterized by mostly harmonious co-existence and unity of humans and Nature, later on the fast-paced technological advances created and widened the gap in the natural link between the society and its natural habitat. Human activity gradually became in its destructive effect commensurate to the force of natural catastrophes, and in places even superseded them. The objectives of this activity were merely utilitarian, pragmatic, and did not pursue to restore harmonious co-existence with Nature. On the contrary, there was a steady growth of destructive consequences of uncontrolled consumption of Nature which was perceived as an endless stock of natural resources. That produced the following consumerism attitude towards Nature: humans are masters of Nature, and they can do with Nature whatever they want in order to satisfy their current needs and wants.

This attitude to Nature seriously impaired Nature's ability to recover from the damage. If these ecological problems become irreversible then the humanity will be driven to the brink of survival. Therefore, it is a primary task of the education to comprehend the objective laws of Nature and the laws of interaction between Nature and the society. By understanding these laws and using them as the foundation for human activity a new mentality can be born which embraces the need to live in harmony with Nature, to put this activity on a rational footing (Karpinskaya, et al., 1995).

And the logical concluding section of this course is "A human: the body and the personality". Traditionally various sciences have focused their attention on humans: the natural sciences, on the one hand, and the social sciences, on the other hand. That created a certain gap in the accumulated knowledge about the human nature, led to rise of certain teachings, such as vulgar-social and biologization. At present there is a pressing need for creation of an integral concept of human activities which would unify its social and biological aspects. That would contribute to solution of a number of global challenges connected to self-development and self-formation of humans (Andreeva et al., 2018; Kozlova et al., 2017).

The modern natural sciences have been getting closer and closer to studying the most complex Nature's creation. The object of study of these sciences is everything belonging to human nature which has not been conditioned by education, culture, social environment. However, because humans are subject to social laws, then the natural sciences study the underlying biological principles of social actions. Socio-biology has been making a particular progress in this regard. This science studies humans by combining the approaches of natural and social sciences. There are also many processes about which it is impossible to say definitely whether they are social or biological. They are on the borderline between biology and sociology, and the natural sciences contributes to their integral understanding.

Therefore, this section of the course should cover specific features of human physiology, biological mechanisms of human behavior, emotions, cognition, biologically-driven human needs, health factors and ecological risk factors, genetics and inherited features, the place and role of humans in the general process of the universal evolutionism.

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7. Conclusion

Current intensification of the global challenges has its specific, deeply rooted causes. They reflect the deep cultural crisis related to the gap between cognitive and value-based guidelines of human activity. These global challenges are complex, difficult to tackle (Andreeva et al., 2018) but they are not fatal for the humanity if we do not waste our time.

The task of solving these problems requires fundamental changes in the system of education, a paradigm shift towards education based on the concept of fundamentalization.

The fundamental education should be integral, because fragmented education and narrowly specialized training led to the current crisis of the educational system and the society in general.

New educational model should prepare broadly educated erudites who posses truly scientific and humanistic outlook. Contribute to finding a solution to these important tasks should the new integrated course in natural sciences which should not only help students to form a scientific outlook on the world and give integrated knowledge about Nature and humans' place in it, but also should set for the students the value-based guidelines which would help them realize their participation in humans affairs and of their own role in the fate of the humanity.

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