

*Valentyna Bilyk, Lyudmyla Sushchenko**

National Pedagogical Dragomanov University Kyiv, Ukraine

Psychoogical and pedagogical diagnostics of the level of future psychologists' natural science competence formation a Higher Educational Institutions in Ukraine

Introduction

Fundamental changes that are currently taking place in Ukraine necessitate the improvement of Ukrainian higher education in accordance with the world standards. One of the ways of its improvement lies in the modernization of future psychologists' science preparation.

Analysis of relevant research

Based on national and foreign research findings (Baloha, 2017; Belousova, 2010; Biletska and Basista, 2013; Kosyarum, 2010; Lutsenko, 2011; Bybee, 2011; Musikhina, 2010; Khomenko, 2015; Borisenko and Semashkina, 2014; Wenham, 1995 and others) and personal scientific and teaching experience, we can conclude that at present the science preparation provided by Ukrainian higher education institutions does not fully cover the range of issues essential for the effective formation of future psychologists' science competence. First of all, it is obvious that such situation arises from the inadequacy of the Standard of Higher Education of Ukraine for specialty 053 «Psychology». In particular, due to the low awareness of the importance of science competence, science preparation in Ukrainian higher education institutions is not well-regulated. The latter negatively affects curricula and syllabi of science disciplines. Thus, the problem of psychological and pedagogical diagnostics of future psychologists' science competence is currently essential and timely; the results of this research will help determine the ways to develop and implement the appropriate measures to improve its quality and bring it in line with the world standards. The existing scientific works present the attempts to determine the nature and structure of science competence. Thus, in the research paper by Biletska and Basista (2013) this notion is defined as an integrated characteristic of specialists' qualities reflecting the level of their fundamental knowledge of sciences, scientific mindset, ecologically sound value orientations, cognitive and practical activities sufficient for professional

* Valentyna Bilyk – ORCID 0000-0002-6860-7728; Lyudmyla Sushchenko – ORCID 0000-0002-2461-3739

activities. In Musikhina's terms (2010), the essence of science competence consists in pupils' or students' ability to use the acquired science knowledge to identify problems under real-life conditions that can be explored and solved with the help of scientific methods together with obtaining conclusions based on observations and experiments.

The same opinion on the meaning of this concept but with an emphasis on the need for taking into account the dynamics of science development is also expressed by Belousova (2010).

The publication by Wenham (1995) presents a modification of the notion «science competence» considering the term «science competence of a primary school teacher». The latter is treated as the highest level of understanding of the natural environment, the ability to effectively and competently transfer knowledge of science subjects to elementary school pupils.

Considering the science competence of a specialist as the basis of their productive relations, as a means of achieving the goals and objectives of professional activities and as a way of self-improvement, self-realization and overcoming personal profession-related crisis situations, Lutsenko (2011) claims that «one of the reasons for the question of this competence formation remaining in abeyance is the lack of a common understanding of science competence as a complex phenomenon requiring specific measures for its cultivation and having considerable potential to solve the problem of professional competence improvement» (p. 94).

Khomenko (2015) understanding science competence as an integrative feature of a specialist who has a complex systemic organization of knowledge, skills, experience, personal qualities and professional values, sees in its structure the unity of the axiological, epistemological and operational components (p. 127).

According to Borisenko and Semashkina (2014) in the structure of science competence it is reasonable to distinguish the target, content and procedural components (p. 127). The researcher stresses that the target component will «contribute to the formation of science knowledge on the basis of acquiring the leading ideology and worldview attitudes that determine the way an individual treats the nature, society and themselves through awareness of the fundamental unity of the man and nature system» (p. 127).

As for the content component, Borisenko and Semashkina (2014) considers it to be «knowledge of the main objects and phenomena of the wildlife and inanimate nature, natural and scientific picture of the world; system-forming laws of ecology; evolution of the relationship between the man and nature ...» (p. 127). According to the scientist, the procedural component implies «the use of reproductive, illustrative, heuristic, partly research and research training methods» (p. 127).

In the paper by Kosyarum (2010), it is emphasized that future engineering specialists' science competence structurally covers a set of interrelated components: motivational and axiological, cognitive and pragmatic as well as reflexive (p. 6).

Baloha (2017) offers a little bit more complex, stepped structure of science competence. Examining the science competence as a component of future elementary school teachers' professional training, Baloha initially distinguishes the following components in its structure: philosophical, value-based, research, intellectual,

informational, communicative and organizational and only then in relation to the distinguished elements such structural units of the science competence as axiological, cognitive, reflexive and pragmatic are singled out (p. 138).

Bybee (2011) argues that a similar approach to distinguishing the natural science competence structural components can be found in the International PISA Study. Bybee (2011) mentions that in terms of the PISA study (Program for International Student Assessment) the following four interconnected structural components are singled out: «recognition of life situations appealing to science and technology; acquisition of competences implying the ability to ask scientific questions and apply scientific knowledge, draw conclusions based on proven facts; understanding the material world (including technology) on the basis of scientific knowledge about the surrounding world and its laws as well as of sciences; an interest to science, the fact of science curiosity being included to the individual's system of values, the motivation to act responsibly in relation, for example, to natural resources and the environment» (p. 16).

All the above mentioned allows us to conclude that there is no general consensus among scholars on the science competence structuring. However, the conducted detailed analysis of the scientific developments on the problem being investigated and the identified common characteristics of the science competence structural components distinguished by the scientists give us grounds for their systematization and the competence structure being treated as the complex of motivational, cognitive, pragmatic, profession-oriented and personal groups.

Aim and tasks

The aim and tasks of the article is to analyze the definitions of future psychologists' science competence, to present the results of the psychological and pedagogical diagnostics of the initial level of future psychologists' science competence formation and to outline the requirements for improving the quality of future psychologists' science preparation in the higher education institutions of Ukraine that will serve as a basis for bringing it in line with the world standards.

Research methods

To accomplish the objectives it has been used the set of methods: methods of analysis; pedagogical experiment (ascertaining); methods of interpretation, synthesis and representation of results; diagnostic methods: the method of personality diagnostics motivation to success by Elers (9), method of communicative and organizational abilities assessment by Syniavskiy and Fedoryshyn (15), «Diagnostics of empathic abilities levels» by Bojko (7), method of reflexivity diagnostics by Karpov (10); questionnaires and computer testing; mathematical statistics (statistical processing of data); prognosis method.

Research Results and Their Discussion

In view of the fact that there is currently no universally accepted definition of the concept o «future psychologists' science competence», it seems to be reasonable to specify the meaning of this term. Thus, future psychologists' science competence is considered by us as an integrative quality of the individual resulting from the

natural science training of future psychologists in higher education institutions. It is characterized by the formation of a holistic system of knowledge and skills in natural sciences together with the scientific outlook. Taken together these factors boost the level of a general cultural and professional competence and the capacity for a qualitative performance of professional duties.

From the author’s perspective, and in accordance with the distinguished structural components (Bilyk, 2019, p. 25), future psychologists’ natural science competence is analyzed based on the motivational and axiological, cognitive and sense bearing, pragmatic, emotional-volitional and reflexive criteria with corresponding indicators.

These criteria underlie the development of the methodical framework within which it has been carried out the psychological and pedagogical diagnostics of future psychologists’ natural science competence and analyzed the differentiation of its formation levels in psychology students studying in the higher education institutions of Ukraine.

The sample size was 480 psychology students.

The ascertaining experiment that was conducted based on the unity of the diagnostic techniques was aimed at discovering the initial level of future psychologists’ science competence according to the specified criteria. The investigation into the formation level of its components has made it possible to conclude that most respondents have a low level of such a competence formation. The component-based analysis of the results obtained in the ascertaining experiment shows that the highest values were given to emotional-volitional and reflective indicators (table 1).

Table 1. The results for formation indicators of future psychologists’ science competence (ascertaining experiment)

| No. Sl. No. | Formation indicators of future psychologists’ natural science competence | High | Average | Satisfactory | Low |
|-------------|--|---------|---------|--------------|---------|
| 1 | Motivational and axiological | 105/22% | 77/16% | 98/20% | 200/42% |
| 2 | Cognitive and sense bearing | 52/11% | 220/46% | 50/10% | 158/33% |
| 3 | Pragmatic | 72/15% | 197/41% | 43/9% | 168/35% |
| 4 | Emotional-volitional | 153/32% | 145/30% | 91/19% | 91/19% |
| 5 | Reflexive | 163/34% | 134/28% | 125/26% | 58/12% |

Thus, according to the emotional-volitional indicators the majority of the respondents (153 students, representing 32% out of the whole group of respondents) showed a high level of the science competence formation; an average level was discovered in 145 respondents which is 30% out of the whole group; emotional-volitional indicators were formed at acceptable and low levels in 19% of the tested – by 91 experiment participants respectively. According to the reflexive group of indicators, 34% of the respondents (163 persons) demonstrated high level of science competence formation, 26% of the participants (125 students) had an acceptable level. At the same time, a considerable part of future psychologists had average

(28% – 134 students) and low (12% – 58 respondents) levels of the reflexive component formation.

The experiment also revealed that the science competence formation in terms of the motivational and axiological, cognitive and sense bearing, pragmatic indicators was at a lower level. According to the cognitive and sense bearing indicator the majority of the examined psychology students (220 persons, representing 46%) demonstrated an average level of science competence formation. A low level of the indicator formation was recorded in 158 students (33% of the whole group). And only 11% (52 students) showed a high level of science competence formation according to the cognitive and sense bearing indicator.

The motivational and axiological indicators were formed at acceptable and high levels in 98 (20%) and 105 (22%) students respectively, the rest of the examined participants had a low level of its formation. The pragmatic indicators of future psychologists' science competence were at low and average levels. A low level was identified in 168 students accounting for 35% of the respondents in the whole group while an average level was recorded in 197 (41%) of the participants. A high level was discovered in 72 respondents – 15% of the total contingent, an average level was peculiar to 43 future psychologists (9%).

The detailed analysis of the experiment results reveals the inadequate level of future psychologists' science competence formation which characterizes it as not satisfying the present-day requirements.

Taking into account the ascertaining experiment findings, we expect a significant improvement of future psychologists' science competence and bringing it in line with the world standards on condition that the science preparation in which the examined competence is formed is conducted based on the following proposed requirements:

- the syllabus of future psychologists' science preparation has to correspond to modern science and scientific advancements, be professionally orientated and contain universal cultural courses that will form the understanding of the unity of science, culture and professional activities and boost the significance of science preparation serving as a motivating factor to study sciences;
- the syllabus of future psychologists' science training has to be comprised of the professionally oriented integrative scientific courses the modules and themes of which will have such a logical sequence that will ensure the harmonization of all the knowledge, skills and abilities acquired during the learning process, contributing to a high level of future psychologists' science competence formation;
- the organization of future psychologists' science preparation has to be carried out in accordance with the cognitive strategy of a higher level «the instructor does not give knowledge, but sets tasks and solves them together with the student» (Bilyk and Sheremet, 2019, p. 97) using innovative methods and modern training technologies that will provide such interaction between a teacher and a student that will facilitate the effective implementation of science preparation;
- diagnostics of the quality of future psychologists' science competence should be carried out in such a way that, first of all, it would be useful for students. It has to be realized with the help of new innovative methods, in particular, computer tests of various complexity levels and imply solutions of situational problems.

Conclusions

Consequently, as a result of the ascertaining experiment it has been figured out that future psychologists' science competence considered by us an integrative quality of the individual resulting from the science preparation in the higher education institutions and which is characterized by a holistic system of knowledge and skills in sciences together with the scientific outlook contributing to boosting the level of a general cultural and professional competence and the capacity for qualitative performance of professional duties has only a low level of its formation.

In order to bring it in line with the world standards, it is reasonable to modernize the syllabus, structure, methods and means of assessment of future psychologists' science competence in Ukrainian higher education institutions taking into account national and foreign experience

Prospects of further research are seen in checking the efficiency of the proposed requirements for improving the quality of future psychologists' science competence formation.

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Abstract

The future psychologists' science competence is considered by the authors as an integrative quality of the individual resulting from the science preparation of future psychologists in higher education institutions. It is characterized by the formation of a holistic system of knowledge and skills in sciences together with the scientific mindset. Taken together these factors boost the level of a general cultural and professional competence and the capacity for a qualitative performance of professional duties. It has been determined the initial formation level of the motivational and axiological, cognitive and sense bearing, pragmatic, emotional-volitional and reflexive components comprising future psychologists' science competence. The requirements for improvement of the quality of future psychologists' science preparation in Ukrainian higher education institutions and their harmonization with the world standards are outlined.

Keywords: future psychologists' science preparation, future psychologists, higher education institutions

Streszczenie

Kompetencje naukowe przyszłych psychologów są uważane przez autorki za integracyjną jakość, wynikającą z naukowego przygotowania przyszłych psychologów w szkołach wyższych. Cechą charakterystyczną jest tworzenie holistycznego systemu wiedzy i umiejętności w naukach ścisłych oraz naukowego nastawienia. Czynniki te podnoszą poziom ogólnych kompetencji kulturowych i zawodowych oraz zdolność do jakościowego wykonywania obowiązków zawodowych. Określono początkowy poziom formacji elementów motywacyjnych i aksjologicznych, kognitywnych i zmysłowych, pragmatycznych, emocjonalno-wolicjonalnych i refleksyjnych składających się na przyszłe kompetencje naukowe psychologów. Przedstawiono wymagania dotyczące poprawy jakości naukowego przygotowania przyszłych psychologów do ukraińskich instytucji szkolnictwa wyższego oraz ich harmonizacji ze światowymi standardami.

Słowa kluczowe: przygotowanie naukowe przyszłych psychologów, przyszli psychologowie, instytucje szkolnictwa wyższego