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Graphic culture development in specialists in the field of technical sciences

Desarrollo de la cultura gráfica en especialistas en el campo de las ciencias técnicas

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ABSTRACT:

This article is devoted to graphic culture in professional development of a future specialist in the field of technical sciences and features of its formation. Timely and properly developed graphical culture increases the level of professional competence and competitiveness on the labor market due to modern increasing requirements for young graduated specialist. Therefore, we understand the principle of graphic culture development as fundamental in terms of teachers' competence formation. Graphic culture development in a future specialist is interpreted as a creative process on the part of the teacher and students motivated for independent work in this direction. Graphic culture development is studied by historiographic analysis based on a wide variety of sources and considered as ab interaction of personal parameters with the functional structure, content and object of graphic activity in the learning process.
Keywords: cognition, creativity, professional development, graphic activity, graphic culture, cognitive activity, learning, learning process, creative abilities.

RESUMEN:

Este artículo se dedica a la cultura gráfica en el desarrollo profesional de un futuro especialista en el campo de las ciencias técnicas y características de su formación. La cultura gráfica oportuna y adecuadamente desarrollada aumenta el nivel de competencia profesional y la competitividad en el mercado de trabajo debido a las crecientes exigencias de los jóvenes graduados especializados. Por lo tanto, entendemos el principio de desarrollo de la cultura gráfica como fundamental en términos de la formación de la competencia de los profesores. El desarrollo de la cultura gráfica en un futuro especialista se interpreta como un proceso creativo por parte del profesor y de los estudiantes motivados por el trabajo independiente en esta dirección. El desarrollo de la cultura gráfica se estudia mediante un análisis historiográfico basado en una amplia variedad de fuentes y considerado como interacción ab de los parámetros personales con la estructura funcional, el contenido y el objeto de la actividad gráfica en el proceso de aprendizaje.
Palabras clave: cognición, creatividad, desarrollo profesional, actividad gráfica, cultura gráfica, actividad

1. Introduction

In today post-industrial era, university undergraduates have to be prepared, according to new standards. The Bachelor's Proficiency Level relevant to the current time depends not only on his or her professional skill, but also on the level of preparation in technical drawing. In modern labor market, especially in technical drawing masters, good graphical preparation is a guarantee of demand and competitiveness. That is what determines the priorities of higher education and updates pedagogical theory on professional culture of the future specialist (Musalimov, 2013).

We consider the features of cognitive activity in professional development as one of the necessary conditions for academic training of teachers that are able to work creatively and independently, to solve complicated theoretical and practical challenges of education and upbringing.

The Proficiency Level of the future teacher of drawing and his or her ability to organize graphic activity in the learning process effectively are determined by his or her graphic culture development. The latter depends on student's cognitive activity and abilities, his or her psychological readiness to perceive knowledge, his or her successful socialization.

Teacher's vocational qualification in technical sciences is directly related to his or her understanding of the nature of pedagogical process. Therefore, the content of teacher's vocational education is the unity of specialist disciplines and features of pedagogical process.

We believe that training is a process of teacher-student interaction in learning specific educational material with a view to learn and master the cognitive methods, creating environment for the active acquisition of knowledge in the future.

Achieving such a learning goal in relation to the specialist in the field of technical sciences is more or less lengthy process that contains teaching graphic objectives. Each creative teaching objective requires a certain amount of creativity, cognition and communication abilities and skills, the successful use of which depends on a number of objective and subjective factors. Thus, actualized graphic culture is possible only in specific graphic activities related to students' creative abilities.

Achieving main objectives of modern vocational education is not possible without a proper understanding of the nature of training, which effective identifying requires scientifically based approach. In this case, the purpose is to characterize the features of graphic culture development in teachers of drawing, highlighting the pedagogical, psychological and professional aspects of the process. The objectives of the study are the following:

- Determining the main features and components of the complex concept of graphic culture of a specialist in the field of technical sciences;
- Determining main stages of graphic culture development in the learning process and its realization in activity (in pedagogical, psychological and professional aspects);
- Characterizing each stage of graphic culture development in relation to professional competences of the teacher of drawing.

2. Methods

In the present study, we have used historiographic analysis of classic and modern sources on the subject, as well as methods of qualitative content analysis and abstraction.

2.1 Literature Review

According to the analysis of various studies in psychology and pedagogy, we can conclude that at present there is no consensus about the meaning of the concept of "graphic culture".

Especially this is the case of researchers of the Soviet era and the post-Soviet states, where there is no scientific development of this issue. At the same time, we have studied the opinions of the educators, not psychologists. Accordingly, the context of the problem had mainly pedagogical connotations. Thus, A. A. Pavlov considered graphic culture in connection with the concept of general graphic literacy". (Pavlova, 1992).

Definition of the concept is much broader in the dissertation of V. A. Kurina, who poses problems of graphic culture development in a future teacher in the field of technical sciences. She considers graphic culture in relation with such terms as "general culture", "professional culture", "educational culture" and "creative work" (Kurina, 1997).

In studying theoretical fundamentals and practices of technical university students' graphic culture development, A. V. Kostryukov provided a system interpretation of this concept, including "professionally significant personality traits of a teacher in engineering, necessary in profession knowledge and skills, creative approach to engineering challenges" (Kostryukov, 2004).

Apart from previous specific pedagogical variations of the concept of "graphic culture", modern research is devoted to information aspects of its content and formation features. In this regard, V. P. Molochkov has placed the premium on teacher's ability to use graphic devices in the learning process in secondary schools (Molochkov, 2003). In recognizing the importance and applicability of information technologies, the actual graphic culture should not be interrelated with mediated skills of using graphic devices in mass media.

In considering the issue of graphic culture development in a traditional way, other modern scholars determine the following important components of graphic culture:

- wide graphic outlook and thesaurus;
- graphic skills;
- effective graphic activity carried out on the basis of previously acquired skills;
- high spatial thinking, which allows perceiving, understanding, learning and applying graphic information;
- values, involving personal awareness and professional development.

We consider it is necessary to draw particular attention to the work of V. L. Stepakova. She has made a conceptual distinction between broad and narrow meaning of the term "graphic culture". In a broad sense, the researcher interprets graphic culture as a "complex of human achievements in developing graphical methods and methods of display, storage and transmission of geometrical, technical and other information about the material world, as well as in creative professional activity on graphic language development" (Stepakova, 2001). The narrow meaning of the concept –individually-personal learning skills of graphic interpretation, learning and transmission of graphic information as the ability to interpret a drawing. Accordingly, the quality of this work is the only one criterion for assessing the level graphic culture in the narrow sense of the word.

We consider the rigid distinction of "broad" and "narrow" meanings is not theoretically correct. The right way to consider a complex concept of "graphic culture" has many sides: socio-theoretical and personal-practical. However, the vision of the meaning as a compound concept is epistemologically and methodologically attractive.

All the necessary professional competences in the field of technical sciences, including graphical culture, involve learning process.

The main aspects of training have been the subject of many studies.

K. N. Travinin, B. P. Esipov, L. V. Zankov, M. T. Smirnov etc. indicate that "learning is a kind of organizational cognition" (Travinin, 1965).

In referring to V. G. Ananiev, B. F. Lomov stresses that the verbal and cogitative processes and the second signal system play an important role in shaping our vision of representation (Lomov, 1984). He notes that a common way of learning to interpret a drawing is gradual

transfer from practical activity to mental efforts: initially there are methods, which provide practical actions with the objects depicted in the drawing, and then there is a gradual transfer to methods requiring verbal description.

The accumulated research analysis on methodological preparation of future teachers shows that studies focused on personality traits in creativity are still important. They noted that creativity is a mandatory personality trait, although it is inherent in each person in varying degrees.

V. I. Zagvyazinsky states that creativity is an activity that results in new material and spiritual values.

According to the cultural-historical theory of L. S. Vygotsky (1997), creativity has psychological aspect, personal aspect and the procedure one. His ideas were developed in his scholarly traditions (Galperin, A. N. Leontiev, A. R. Luria, Zaporozhets, L. I. Bozovic, etc.).

Such scholars as B. F. Lomov, V. D. Shadrikov, E. A. Klimov, Z. A. Reshetova, E. M. Ivanov etc. show that personal professional activity has a complex system structure because the action starts in the functional mental system, having multiple mental reflection of the same objective activity.

Finally, the skill issue was studied by L. S. Vygotsky, S. L. Rubinstein, B. N. Teplov, A. N. Leontiev, V. A. Krutetskaya etc. as a problem of individual pedagogical skills that are relevant to successful activity or activities. Accordingly, it should be noted that skills develop in activities and are possible in development; there are not human natural traits. These statements form the basis of the research on skills in Psychology.

N. D. Levitov considers pedagogical skills as a number of traits that are relevant to various aspects of teacher's personality. They are transferability of knowledge in a short and interesting form; ability to insight into student's character, independent and creative mindset; organizational skills necessary to ensure teacher's activity and to form a fine teaching staff (Levitov, 1960).

3. Results and Discussions

Graphic culture development in future specialists in the field of technical sciences involves three main aspects – pedagogical, psychological and professional. Accordingly, it is possible to characterize training and personality development of a teacher as the implementation of his or her professional competences in practice.

The pedagogical aspect of graphic culture includes the following components: axiological, activity-related, personality-creative, socialization.

The axiological component is the value orientation of educational activities and involves a formed complex of professional, national and universal value orientations of a future teacher. Such orientations create moral foundation for teacher's personality, his or her readiness to self-improvement and capacity for creative dialogue with the pupils. Most scientists consider such values as education, teacher's knowledge, student personalities and learning activity as primary values while following the main characteristics of teacher value orientations. There are also universal (Ravkin Z. I., Karakovsky V. A.), entertainment (B. T. Likhachev, Schurkova N. E.) and moral values (Nikandrov N. D.).

The cultural orientation of graphic preparation is based on its role in preservation, generation and transmission of spiritual and cultural values, in particular, visions of graphic language as a synthetic with a variety of systems (graphical, sign) displaying information on three-dimensional objects, its origin, development and place among other world languages. Received graphic knowledge and skills are valuable and significant for each student, which provides individualization and personality-based education, promoting lifelong learning and self-development of a man. Thus, this analysis allows concluding that graphic culture is a value in terms of axiological side.

Graphic activity of a person is derived from labor and has its main feature – the creative

transformation of the world, in which a man transforms himself, as the subject of self-development.

The main theoretical problem we face in Psychology and Pedagogy due to activity-related aspects of graphic culture development in a future teacher of drawing is the exact delimitation of the concepts of cognition and learning. We have studied the classical scientific heritage. Thus, we assume that most researchers understand cognition and learning as various aspects of cultural creativity.

In this regard, we find it necessary to provide methodologically full definition of the concepts of "learning" and "activity" by S. L. Rubinstein. He understands "learning" as "a joint study conducted by the teacher and the student" and "activity" – as "cognition, discovery, expression and identification of the subject". He determines the following features of learning activity: subjective nature; necessity of being objective, informative, creative and independent (Rubinstein, 2000). In our view, the same is relevant to the conceptual distinction of cognition and learning. Learning can be considered as a form of cognition in activity. Thus, I.T. Ogorodnikov believes that learning is a kind of cognition, which has the objective (content) and subjective sides (cognitive activity).

Practical activity of teachers and students is not in their mind, but in reality – in the university, auditorium or classroom.

The educational process is based on general laws of cognition, including the stages of sensation, perception, memory, imagination and thinking.

Academic knowledge begins from the object of cognition in the external world that can be perceived by senses. The object and the subject of academic knowledge involves the training material.

Academic knowledge always includes attribute listing – object analysis in terms of its nature and phenomenon.

The nature is the basis of the object existence that defines all its changes in the interaction with other objects. The phenomenon is a form of external manifestation of nature, combination of surface features, links, etc. The main purpose of cognition is to discover stable, deep, relatively unchanged sides of the object, its nature. Students perceive directly by senses only those phenomena that are the starting point for nature cognition.

In studying technical sciences, especially with a variety of teaching aids, the student is not able to devote the typical phenomena and analyze the sensory information. Therefore, the teacher must control the cognitive activity of students gradually to help them find the important facts to explain the nature, to compare them with previously known facts and knowledge.

In learning technical drawing, information is transmitted in three ways – via text, natural objects (presentation) and visual means (visualization). Therefore, there must be overall consideration and continuity of all the possibilities of academic knowledge in the learning process. Consequently, the verbal and imaginative aspects of graphical activities are complementing each other, thus guaranteeing proper acquisition of knowledge in learning technical sciences.

Based on the above, we believe that student's graphic culture is important to consider as a dynamic process, in which the person develops cultural values that indicate his or her relationship with culture and brings his or her knowledge of material and spiritual reality into drawing.

In terms of personality-creative approach, graphic activity contains a high creative potential. In this sense, its basic features can be compared with creativity definitions provided by L. S. Vygotsky. Its specificity is in underscored relations with axiological vision of culture, personality aspect of creative activity (Vygotsky, 1997).

He describes creativity as "any human activity that provides something new, whether it will be a thing of the external world created in activity or something in mind, or feelings that can be

found only in a man"(Vygotsky, 1997).

According to A. V. Khutorsky (1999), "creativity is always beyond bounds and standards, it is a change of current knowledge, beliefs, norms, creation of new content that is not the part of curricula". Many scholars hold a similar view – I. P. Kaloshina (1983), M. I. Makhmutov (1997), M. G. Yaroshevskii (1985), etc.

S. L. Rubinstein, A. N. Leontiev A. M. Matyushkina, J. A. Ponomareva, D. C. Tikhomirov have developed the fundamental statements of psychology of creative thinking and allowed providing a conception of creativity development in terms of culture and history. This is important for our research on personality-creative aspect of graphic culture and creativity development. In developing the creative aspect of activity, I. A. Sharshov suggests that creativity development of a person must be based on personality self-development since creativity combines personality and activity elements, while the first one is dominant. I.A. Sharshov considers the concept of "creative self-development" as the "conscious personality formation for effective personal fulfillment by significant internal aspirations and external influences" determining its four functional units: self-knowledge, self-organization, self-education, self-fulfillment (Sharshov, 2000).

N. B. Krylova considers the main role of fulfillment as targeting on high creative abilities, as proper and flexible behavior, as performing actions according to significant challenges, as fulfilling personality potential (Krylova, 1995).

Thus, graphic creative environment is required for personal fulfillment, regardless of development and abilities, and thus, is always a favorable environment for creative growth.

However, in addition to people's self-identity and his or her readiness to learn the basic values and act in accordance with them, in addition to creative self-development in forming graphic culture environment, we cannot brush off the social aspect of the issue. Consciously formed teacher's professional traits on a personal level must be performed in the society.

R. R. Kondrashov notes that "educational culture of a person" should not be developed in the course of "unsocial intellectual development", it should become a way of practical action and attitude towards other people. This statement can be attributed to graphical culture. Interaction in the learning process allows the person to enter social life successfully. Therefore, the graphic activity is also helpful in socialization.

Now, we can conclude that the prerequisites for student's graphic culture development are divided in three essential stages – creative self-identity, creative self-development and socialization of a person. These three stages are comparable with teacher's practical values, namely – with their formation, development and implementation in the field of technical science.

Psychological aspect is the unity of training and mental development of a person, while learning is a guide in this process. L. S. Vygotsky, B. G. Ananiev (1945), V. V. Davydov (1994) have pointed out the same in their studies.

We highlight the necessary personal factors of a teacher, who is ready for professional activity. In terms of Psychology, we are more interested in developing such important features of thinking, as spatial representation and spatial imagination. At the same time, we describe spatial representation only as the first stage of cognitive activity that is related to improved spatial orientation. The latter is a part of technical background, required for technician's professional development. Spatial imagination is a universal technical value, a specific main factor determining the level of creativity in drawing. Developed spatial imagination allows free use of object's representations kept in mind.

In terms of cognition, imagination is related to other two mental processes – memory and thinking.

Imagination is a mental construction of objects not existing in real life. These images must serve as prefigures of practical results or as a means for resolving certain mental challenges.

Transformation of visual material for extra information about it is the main element of creative imagination.

In consciousness, there can be performed new ideal objects without their specific pre-image in material world. The creative thinking would be impossible without the ability to create such images.

Informative images can be divided into: 1) sensory-visual and 2) rational (conceptual), reflecting most common and essential aspects, linkages and relations of the material world in abstract form that cannot be sensed. Sensual images include complex judgments and conclusions, out of which they would lost their meaning. Therefore, the concepts of "perceptual knowledge" and "sensory image" are scientific-theoretical abstractions with only one side of the complex information processing (Ibid 15-18).

It is stated that the physiological ground for imagination is the nervous network – nervous redistribute themselves out and come together in a system. Thus, there are images that do not coincide with previous experience, but do not cut off from it.

The imagination, as well as memory, may vary in terms of arbitrariness or premeditation.

Arbitrary imagination is much more important for a man. This kind of imagination is helpful when the person has to create certain objects. The various types and forms of arbitrary imagination involve reproductive imagination, creative imagination and a dream (Arnheim, 1974).

Reproductive imagination is helpful when a person needs to recreate the representation corresponding to its description as fully as possible.

We believe that we face the reproductive imagination in the graphic activity, when it is necessary to reconstruct any representation by verbal description. However, there are times when we represent any object not in words, but in plans and designs. In this case, successful reconstructed image is largely determined by spatial imagination, man's ability to recreate the image in three dimensions. Consequently, reproductive imagination is related to human thinking and memory.

Imagination development is the most important condition for learning to interpret a drawing. However, learning to conduct technical drawing is one of the most important instruments of imagination development (Botvinnikov & Lomov, 1979).

Dealing with spatial images also promotes logical thinking due to certain challenges related to transformation and combination of original images. Eye-mindedness, in turn, contributes to technical thinking, because it is one of its components.

Professional aspect of graphic culture connects it with the concept of professional culture. In terms of Pedagogy, there are the following fundamental components of professional culture:

- Professional knowledge;
- Professional techniques and skills;
- Professional values.

E. S. Romanova had conducted a wide psychological analysis of 99 most popular vocational professions, including teaching, and developed a job profile diagram. The researcher considers the abilities and personality traits as the most important qualities in terms of successful professional activities and decisions (Romanova, 2004).

We agree with this statement and believe that the scope of personal traits is hardly homogeneous – it can be structured according to three the most important characteristics. Firstly, creativity is associated with the ability to create new ideas. Secondly, the cognitive part is based on rational logical thinking and forms a system vision of all ideas. Finally, social personality traits (for example, entrepreneurship) involve practical planning and communicative performance.

Thus, we can formulate the essence of the professional culture based on the following

characteristics:

- Professional knowledge (specific professional knowledge in drawing and all necessary knowledge in pedagogy);
- Skills developed due to the ability to carry out professional activities successfully (ability to work with drawings and the capacity of effective pedagogical communication);
- Spatial thinking (spatial representation and spatial imagination);
- Combination of personality traits (creativity, cognition and organizing) and values (responsibility for the work, positive attitude to professional activities, preservation and transferability of professional experience, etc.)

Currently, modern higher educational institutions are focused on training in the broader sense, promoting further strengthening of academic education and taking research and practice as the basis for learning. Wherein, the support is aimed at combining the beliefs, knowledge and creative abilities of students, allowing them to develop after graduation, as well as to find innovative solutions of problems in science and practice, to understand new scientific, computer, graphic and public information.

4. Conclusions

We can conclude that the modern specialist needs graphic culture to improve his or her competitiveness in the labor market. Graphic Culture is a complex concept, reflecting socio-theoretical and personal-practical aspects.

In terms of personal-practical aspect, we have allocated the pedagogical, psychological and professional aspects of graphic culture development in the specialist in the field of technical sciences.

- In terms of pedagogical aspect, we have determined three stages of graphic culture development in the future specialist, based on different approaches:

  axiological stage, involving basic value formation .

  activity-related stage, involving learning process as cognition in activity.

  personality-creative stage – developing abilities to graphic activity, creating a graphical environment for personal fulfilment.

  socialization stage, involving the ability of using acquired skills in practice.

- In terms of psychological stage, graphic culture development is based on spatial thinking and involves two stages:

  spatial representation development, related to successful intellectual space orientation.

  spatial imagination development to use representations kept in mind freely.

- In terms of professional aspect, graphic culture is related with professional culture and contains the following components:

  professional knowledge;

  skills, useful in developing abilities to carry out successful professional activities;

  spatial thinking;

  combination of personal traits (creativity, cognition and organizing) and values (responsibility for the work, positive attitude to professional activities, preservation and transfer of professional experience, etc.).

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