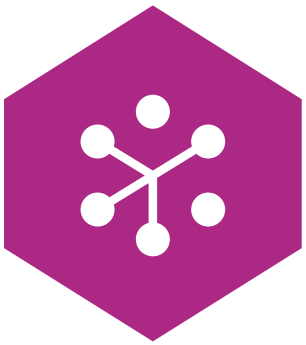

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ULIANA FEDOROVNA EGOROVA, LYUDMILA IVANOVNA AMANBAEVA, VARVARA SEMENOVNA DMITRIEVA, MARINA ALEKSEEVNA FEDOTOVA, AND LILIA YEGOROVNA SIDOROVA

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Ethno-Technical Creativity of Students Studying Jewelry Design in Russia

Uliana Fedorovna Egorova,[1] North-Eastern Federal University, Russia
Lyudmila Ivanovna Amanbaeva, North-Eastern Federal University, Russia
Varvara Semenovna Dmitrieva, North-Eastern Federal University, Russia
Marina Alekseevna Fedotova, North-Eastern Federal University, Russia
Lilia Yegorovna Sidorova, North-Eastern Federal University, Russia

Abstract: The article is intended to solve the problem of developing the creative abilities of students who study jewelry design in Russia. To this end, the authors used a little-studied material; namely, the traditional technology of processing precious metals. The traditional technology of processing precious metals is a folk art created by the centuries-old experience of the Yakuts, one of the Northern peoples of Russia. Based on the traditional technology of processing precious metals, the authors designed a model for the development of students' creative abilities. The model includes pedagogical conditions, the means of the Yakuts' traditional technology of processing precious metals, and blocks of creative tasks, and reveals the criteria for creative abilities, in particular, creative thinking, imagination, craftsmanship, creativity, and ingenuity. The implementation of this pedagogical model enhanced the quality of education and the criteria for the creative abilities of jewelry design students in six classes at North-Eastern Federal University in Yakutsk.

Keywords: Ethno-Technical Creativity, Precious Metal Processing Traditional Technology, Jewelry Design, Pedagogical Model For Developing Students' Creative Abilities

Introduction

Modern living conditions require people to be ready for active creative work, create products, and get creative results from their activities. In this regard, the problem of developing creative abilities and fostering an active personality remains relevant and requires increased scholarly attention in many national contexts.

Currently, pedagogical scientists are actively seeking ways to modernize and improve the quality of professional education. Although the problem of creativity and the development of students' creative abilities is hard to study, it is extremely important to consider possible approaches to it. The complexity of this problem is due to a large number of early-plan factors that determine the nature and manifestation of creativity. Nevertheless, the authors of this article believe that knowledge and preservation of historical and cultural traditions of arts and crafts—in particular, jewelry design—are the most important factors in optimizing the educational process and forming students' creative abilities. The genesis, i.e. the further historical development, of the Yakut ethnos' jewelry art and its ideas and traditions preserved to this day are referred to as the "traditional technology of processing precious metals" by jewelry craftsmen of Yakutia. It preserves the unique national culture and foundations of peoples' creative worldview accumulated for centuries by many generations.

The historical development of the Yakuts' traditional technology of processing precious metals testifies to the high skill and brilliant talent of the Yakut people. Masters of jewelry art have always enjoyed special reverence in society for their artistic and spiritual creativity. Over the course of historical development, there has been improvement in the graphics and design of jewelry and expansion of materials used. Yakut jewelry is distinguished by nobility and delicacy

[1] Corresponding Author: Uliana Fedorovna Egorova, 58 Belinsky St., Department of Precious Stone and Metal Processing Technologies, North-Eastern Federal University, Yakutsk, Sakha Republic, 67700, Russia.
email: egorova.nefu@bk.ru

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in ornamentation and form. Yakut jewels have their own specific identity as well as philosophical and psychological peculiarity. The authors of the article pay particular attention to the technological processes used in jewelry manufacture. Some ancient methods of processing precious metals no longer exist. However, some effective methods have been preserved and can still be used in modern conditions. These methods fully justify themselves and, in some cases, are even more effective in the process of developing a performer's skills as well as in the creative approach towards their application. Thus, the traditional technology of processing precious metals is the art of the past, which makes it possible to create the art of the future.

Literature Review

The analysis of Russian and foreign literature has revealed a stable scientific interest in creation and the manifestation of an individual's creative abilities. The scientific works of Russian and foreign researchers such as Vygotsky (2000), Altshuller (1979), Taylor (1988), and Barron (1998) play a major role in the study of the phenomenon of creativity and the creative process. The majority of researchers perceive creativity as a practical and theoretical activity, which generates something that is qualitatively new and has a social value (Barron 1998; Mooney 1963). In the continuous creative process, a person gets fully involved and immersed in what one does. Meanwhile, a person acquires knowledge, proficiency, and skills, thus creating one's own understanding and vision of the world (Kozlov 2014). Peoples' creative activity is referred to as the main component of a society's culture (Sharipov 2016).

Many researchers believe that the abilities of an individual—for example, a person's intellectual activity (Altshuller 1979; Taylor 1988), imagination (Rubinstein 1976; Altshuller 1979), and creative thinking (Beskova 1993; de Bono 2005)—play an important role in a person's creativity. Modern researchers use the term "creative abilities" as a synonym for "creativity" and "ingenuity." Guilford (1967) who introduced the main ideology of creativity. He regards creativity as a universal ability to create, which can manifest itself in psychological processes (thinking, perception, curiosity, etc.) in various activities. Creativity is the ability to create and an intellectual susceptibility that is understood as origination of unique ideas and deviation from traditional thinking patterns (Torrance 1962). The concept of creativity is closely related to the concept of "an individual's creative potential," i.e. an individual's internal freedom to realize his own individuality (Guilford 1967).

In modern didactics, various methods of scientific and pedagogical research are used, the leading one being the modeling of the pedagogical process. Modeling is a method of investigating objects of cognition and is closely related to experiment (Gordienka 2017). The works of Novikov (2009) play an important role in the modeling and construction of pedagogical phenomena. For the achievement of didactic goals, one of the most important requirements implies a properly organized pedagogical process, which is referred to as "pedagogical conditions" by Andreev (1996).

There exist a wide range of directions and views on the diagnosis of the process of developing creative abilities in view of research complexity and the multifaceted manifestation of creativity. Therefore, there is no unified opinion due to the complexity of its study and the multifaceted nature of manifesting creativity. It is necessary to point out that Russian researchers—namely, Rubinstein (1976), Beskova (1993), and others—assert that abilities are inextricably linked with activity. At the same time, each type of activity has its own structure. The development of creative abilities requires mastering and familiarization with the specifics of an activity by forming individual skills and abilities.

The development of creative abilities, as well as the organization of the educational process of higher educational institutions—in particular, engineers of jewelry art students—have not been sufficiently studied. This is due to the fact that existing methods are mainly aimed at the development of an individual's artistic and creative abilities (Ermolaeva-Tomina 2005; Ovcharova 2013), artistic perception (Amirzhanova 2013), and spirituality (Makarova 2016). Although these literary sources do play an important role in the problem of developing creative abilities, they focus on specific specialties; for example, ceramics, painting, and design. There are also authors, like Kozlov (1988) and Sokolov (1993), who researched folk art, i.e. the traditional technology of metal processing for the development of student's creativity.

Methods

The methodological basis of the study included:

- The phenomenon of creativity and its manifestation as an individual's individual psychological characteristics (Vygotsky 2000; Rubinstein 1976; Torrance 1962);
- Creativity as an ability to create and as a person's inner potential (Guilford 1967; Torrance 1962), imagination (Rubinstein 1976; Altshuller 1979), and creative thinking (Beskova 1993; de Bono 2005);
- Construction and modeling of pedagogical phenomena (Babansky 1977; Novikov 2009); creation of pedagogical conditions aimed at educational, creative, and productive activity (Andreev 1996; Vygotsky 2000);
- Means of the Yakuts' traditional technology of processing precious metals in the development of students' creative abilities and independent work (Kozlov 1988; Sokolov 1993; Zykov 1976; Neustroev 2007);
- ideas for the development of creative tasks for students studying jewelry design (Kallenberg 2000; Brepohl 1980);
- Conduct of pedagogical experiment at the Department of Precious Stone and Metal Processing Technologies, North-Eastern Federal University named after M. K. Ammosov (the Sakha Republic (Yakutia), Russia);
- Diagnostics of the development level of an individual's creative abilities (Rubinstein 1976; Mironova 2006).

Results

Based on the analysis of scientific works by Russian and foreign researchers on creativity and an individual's creative abilities as well as available recommendations on the construction and modeling of pedagogical phenomena, the authors created a model for the development of students' creative abilities by means of the traditional technology of processing precious metals (Figure 1).

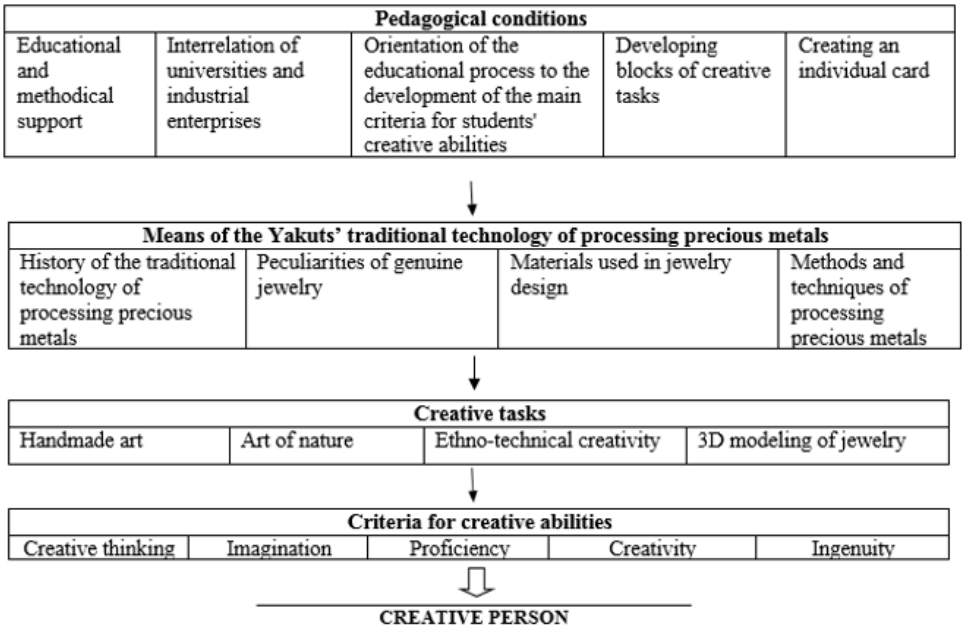

Figure 1: Model for Development of Creative Abilities via Traditional Technology of Processing Precious Metals
Authors

Discussion

The pedagogical model constitutes the initial basis for the development of students' creative abilities in accordance with the state educational policy and university program, as well as their priorities and goals. This model is a mechanism that makes it possible to create a special creative world and freedom of choice in students' activities. When developing this model, the authors sought to create a model that is simple, convenient, and adaptive to changing conditions.

Block of Pedagogical Conditions

Educational and methodical support for students in the process of developing students' creative abilities was provided through the traditional technology of processing precious metals. The structure of the educational program included a national-regional component that allows reflecting regional specifics. In addition, educational disciplines were modernized. Furthermore, teaching aids and methodical recommendations were developed for students. This process also highlighted the interrelation of universities and industrial enterprises in teaching and developing students' creative abilities. Teaching requires a close relationship between theory and practice, which is achieved through the mutual activity of universities and advanced industrial enterprises. The atmosphere of enterprises, communication with experienced jewelers, as well as acquaintance with technological operations provide the opportunity to develop students' creative interests, curiosity, desire for professional growth, and achievement of mastery.

Taking into account the needs of specialists working in jewelry manufacturing enterprises of the Sakha Republic (Yakutia), new special disciplines, such as "Computer Modeling of Jewelry," "Laser Processing of Precious Stones and Metals," painting, composition, design, and sculpture, have been introduced into the educational process. This is aimed at orienting the educational process towards the development of the main criteria for students' creative abilities; namely, creative thinking, imagination, craftsmanship, creativity, and ingenuity. The analysis of psychological and educational literature revealed a wide range of criteria for developing an individual's creative abilities. The criteria are understood as standards that serve as main

"vectors" for the development of students' creative abilities. They require integrity since they are interrelated. It also creates an individual card. The main goal of a student's individual card was to fix the process of performing creative tasks and to evaluate students' products, the results of the observations of the development level of creative abilities, as well as the forecasting of possible consequences. Thus, an individual card serves as a "creative portrait" of each student.

Means of the Yakuts' Traditional Technology of Processing Precious Metals

History of the Traditional Technology of Processing Precious Metals

Given the importance of knowing the development history of the Yakuts' traditional technology of processing precious metals, the authors created a methodical manual called "Turkic Peoples' Traditional Technology of Processing Precious Metals" designed to guide students' independent work and containing different types of creative tasks and projects (Egorova and Amanbaeva 2012). For example, if a student presents a creative project on "Jewelry Art in Yakut Folklore," the finished product should include the following criteria: novelty, relevance, sapidity of the product, originality, creativity, quality and the level of technique (product manufacturability), and the degree of demand (feasibility for consumers).

Peculiarities of Genuine Jewelry

In the production of creative products, students try to follow the national traditions, canons of ornamentation, as well as the design and decoration. Therefore, students endeavor to apply their special individual creative approach and action.

Materials Used in Jewelry Design

There are numerous materials that are used, with one of the basic one being silver 925. In addition to the numerous advantages of silver, among them low cost and high reflectivity, silver is well processed. Other materials used by students include precious and semi-precious stones mined in Yakutia, for example, charoite.

Methods and Techniques of Processing Precious Metals

To identify the disappearing methods of processing precious metals, we used the works of well-known ethnographers like Zykov (1976). Some methods that were not recorded in literature were obtained from well-known and highly respected masters of the Republic like Neustroev (2007). The effective ancient methods include:

- The method of casting in earthen molds. This casting method has a number of advantages, for example, the possibility of an integral casting. This implies that there is no need to solder and acquire the most identical casting. In addition, it is possible to cast products of any complexity, and molds can be used multiple times.
- The use of charcoal for metal soldering and melting. The uniqueness of this material consists of heat resistance, thermal insulation, as well as the quality of being reusable, highly processable, and accessible. Besides, charcoal ensures quick soldering and melting of metals and guarantees the high quality of metal processing by reducing the oxidation time during soldering and melting. Multiple applications of this method helps students acquire professional skills, proficiency, and curiosity.

- The use of open fire soot in soldering products. This method of processing precious metals is not found in literary sources. Masters following the traditional technology of metal processing used open fire soot. During thermal processing of metals, fire soot forms an excellent protective layer from oxidation. When heating a metal, for example, silver, the black-colored soot is deposited on the metal in a thin layer. For this purpose, burners (gas, gasoline) are used. Their external light cone of the torch serves as a source for getting soot. This method is very convenient as it ensures quick high-quality performance. Unfortunately, this simple and unique traditional way of using open fire soot is not used in modern conditions.

As a result of analyzing the Yakuts' traditional technology of processing precious metals, the authors derived the term "ethno-technical creativity" as one of the main components in developing students' professional creative abilities. Ethno-technical creativity is neither a phenomenon nor a structure of consciousness. It is a vital, i.e. ontological, relation that connects humans to the world of creativity. Ethno-technical creativity is a continuous movement in the creative process. The culmination of this movement is inspiration, which is characterized by a special emotional uplift, ethno-mentality, as well as ethno-tolerance of thought, consciousness, and ideas. The concept of "ethno-technical creativity" is broad and multifaceted. In addition to being determined by the creative capacity of a student's personality, it also depends on a student's temperament, character, will, and other personal abilities.

Block of Creative Tasks

The formation of creative tasks is based on the ideas of famous foreign authors, namely Brepohl (1980), Kallenberg (2000), and Taylor (1988). They include:

- "Handmade Art"—(third year)—ancient and modern handmade jewelry of masters who used the traditional technology of processing precious metals served as a sample for the fulfilment of tasks;
- "Art of Nature"—(fourth year)—for the fulfilment of creative tasks, any objects created by nature, as well as their shapes, colors, textures, etc. (for example, leaves, shells, butterflies) were used;
- "Ethno-Technical Creativity"—(fifth year)—the Yakuts' national jewelry served as an example for performing creative tasks;
- 3D modeling of jewelry—(starting between third and fifth year)—designing one's own idea (sketch) and the finished creative product on a computer.

Criteria for Creative Abilities: Case Experiment

We singled out the criteria for an individual's creative abilities, as well as the indicators of the identified criteria. The identification of the latter was based on the specifics and peculiarities of students, as well as the process of making creative products. Thus, the criteria for students' creative abilities include: creative thinking as acquisition of new solutions to problems and views, improvement of new ideas, curiosity; imagination as the ability of spatial perception, imaginative thinking, fantasy, and artistic form; and craftsmanship as an ability to design, quality of performance, economic feasibility, an ability to form their own style, handwriting, and ingenuity as a manifestation of one's own individuality, aspiration for professional growth, the degree of identity manifestation.

To identify the effectiveness of the developed model, the authors conducted a pedagogical experiment at the Department of Precious Stone and Metal Processing Technologies of the Physico-Technical Institute of the North-Eastern Federal University named after M. K. Ammosov of the Sakha Republic (Yakutia). In addition to being the only one in Russia, this new

educational unit is unique in the world. It is a place where engineers of jewelry design and lapidary production study. Its exclusiveness is related to the fact that future specialists study for a profession that allows them to master the entire technology of industrial and manual processing of precious stones and metals. During the educational process at the university, students are given an exceptional opportunity to process real precious raw materials such as diamond, gold, and silver.

The experiment included third-, fourth- and fifth-year students. The number of participants in the experimental sample was seventy-five, and the number of students involved in the control sample was seventy-five. The experiment included a total of 150 students. By the end of each semester, the authors of the research conducted final work and comparative analyzes based on the results of performing creative tasks by students in their third, fourth, and fifth year of studying. The students presented their best creative work for assessment of the development level of their creative abilities. The results were recorded in individual cards.

The authors assessed the final creative product in points:

- Low level (1 point) development of creative abilities is manifested by necessity under the guidance of external influence—and not by one's own desire. The lack of positive creative activity, curiosity, and interest, as well as low imagination, creativeness, and craftsmanship in a student. When solving creative tasks, a student uses ready-made objects without much change and performs tasks at random, without any pronounced independence. Due to the fact that the search for ideas is poorly organized, there is need for a teacher's help.
- Middle level (2 points) was characterized by the fulfilment of creative tasks using a ready-made object with their own modification. At this level, a student does have new ideas but the implementation of these ideas is impossible without external influence. This level was characterized by weakly expressed positive creative activity in students.
- High level (3 points) was manifested after a student overcame the first two levels. This level is characterized by pronounced and constant creative thinking, interest, as well as a desire to find new original goals to achieve. At this development level of creative abilities, students' highly developed imagination allows them to quickly plan and choose the optimal solution among all possible options. They gradually develop their own methods and "instruments" for fulfilling creative tasks. In addition, high self-organization, professional creative activity, and personal attitude was observed in students.

To diagnose the development level of students' creative abilities, the authors used an adapted methodology of Vishnyakova (Mironova 2006). The significance of the differences in the mean values was estimated by the sudent's t-test.

As a result, the authors came to the following conclusion. As compared to the control group, the difference in the development of the creative abilities of third-year students of the experimental group was as follows: ingenuity—38.46 percent; craftsmanship—28.57 percent; creative thinking—22.47 percent; imagination—17.20 percent; and creativity—7.84 percent. Fourth-year students of the experimental group showed a high level of difference in the development of craftsmanship (23.08%), creative thinking (18.75%), ingenuity (14.04%), and imagination (13.76%). In terms of percentage, there is a significant increase in the creative abilities of fifth-year students in the experimental group, in particular: creativity—28.71 percent; ingenuity—15.70 percent; creative thinking—14.81 percent; imagination—12.96 percent; and craftsmanship—2.46 percent.

In order to assess the pedagogical experiment, the authors conducted a comparative analysis of the mean values of all the criteria for the development of students' creative abilities of the experimental and control groups of the third-, fourth- and fifth-year students. The difference in the mean values in the experimental and control groups was as follows. The third-year, fourth-year, and fifth-year experimental groups (EG) demonstrated higher values (by 2.14, 1.58, and 1.62 points respectively) (Figure 2).

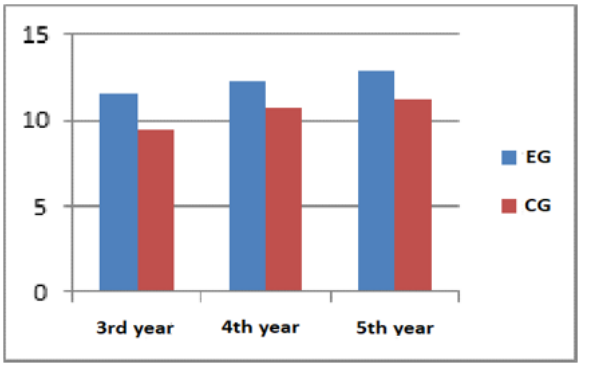

Figure 2: Comparative Analysis of the Mean Values of All Criteria for the Development of Creative Abilities of Students in Experimental and Control Groups at the End of the School Year
Egorova et al. 2017

Conclusion

Based on the results of the research, the authors offer the following conclusions. First, creativity is a process that results in a new product via activity. Like a person's individual psychological characteristics, creative abilities are manifested in the creative process. Thus, there is a need for a purposeful pedagogical process that orients students into educational and creative activity, as well as the development of their creative abilities and internal capabilities.

Second, the proposed pedagogical model of developing students' creative abilities is a mechanism of methodological and conceptual support for their development in higher education. The model is based on a systematic approach, which implies emphasis on the following basic blocks based on well-known scientific theoretical provisions:

- Pedagogical conditions (educational and methodical support, a relationship between universities and industrial enterprises, the orientation of the educational process towards the development of students' creative abilities, the development of blocks of creative tasks, as well as formation of an individual card);
- Means of the Yakuts' traditional technology of processing precious metals (the history of the traditional technology of processing precious metals, peculiarities of genuine jewelry, materials used in jewelry design, as well as methods and techniques of processing precious metals);
- Blocks of creative tasks (handmade art, art of nature, ethno-technical creativity, and 3D modeling of jewelry);
- Criteria for creative abilities and their indicators (creative thinking, imagination, craftsmanship, creativity, and ingenuity).

This model can be used in teaching and developing the creative abilities of students studying jewelry design. A modified form of the model can be used abroad as well.

Finally, the analysis of the final data of the pedagogical experiment shows that there were positive changes in all the criteria for the creative abilities of the students in all the experimental groups. Over the course of the research, it was established that the students in their first years of study first of all try to improve their abilities and skills in technological processes (craftsmanship, ingenuity). By the end of the fourth year of study, the students greatly increased their creativity, creative thinking, and imagination, as compared to their first years of study. This positive tendency is related to the modernization of curriculum content, the assimilation of theoretical and practical materials, the acquisition of abilities and skills of the traditional technology of processing metals, and the manifestation of interest in one's own profession, among other factors.

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ABOUT THE AUTHORS

Uliana Fedorovna Egorova: Lead Engineer, Department of Precious Stone and Metal Processing Technologies, North-Eastern Federal University, Yakutsk, Sakha Republic, Russia

Dr. Lyudmila Ivanovna Amanbaeva: Professor, Department of Social Pedagogy, North-Eastern Federal University, Yakutsk, Sakha Republic, Russia

Dr. Varvara Semenovna Dmitrieva: Associate Professor, Department of Precious Stone and Metal Processing Technologies, North-Eastern Federal University, Yakutsk, Sakha Republic, Russia

Dr. Marina Alekseevna Fedotova: Associate Professor, Department of Precious Stone and Metal Processing Technologies, North-Eastern Federal University, Yakutsk, Sakha Republic, Russia

Dr. Lilia Yegorovna Sidorova: Associate Professor, Department of Precious Stone and Metal Processing Technologies, North-Eastern Federal University, Yakutsk, Sakha Republic, Russia

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