

## The Technology of Developing Pupils' Decorative-Applied Creativity at School: on the Example of Embroidery

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### ABSTRACT

The relevance of the study is determined by a decrease in moral criteria among the youth, the loss of the sense of belonging to the homeland history, the collapse of the "connection of times". To refocus students' spiritual values is possible by increasing their interest in national traditions and art. The goal of the article is to reveal possibilities of the school subject of "Technology" in developing pupils' decorative-applied creativity. The leading approach of the study of this problem is an activity approach allowing to consider peculiarities of the teacher and students' decorative-applied activities on the example of embroidery. The article explores the importance of arts and crafts as a means of students' personality development. It is proved that the subject area of "Technology" provide wide opportunities for developing decorative-applied creativity conditioned by the specificity of the subject content. The content of the worked out technology for developing pupils' decorative-applied creativity in the basic school on the example of embroidery is revealed. The article explains the impact of the technology of developing pupils' decorative-applied creativity within the subject area of "Technology" on the development of pupils' creative abilities, preservation of national traditions. In this regard, the article will be useful to educators dealing with issues of spiritual and moral upbringing of the younger generation.

### KEYWORDS

Decorative-applied creativity, subject "Technology", interschool training facilities.

### ARTICLE HISTORY

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## Introduction

### *The Relevance of the Problem*

Russian folk arts and crafts embody the centuries of aesthetic perception of the world, store deep artistic traditions. However, now the insufficient level of young people's competence in the sphere of national arts and crafts, their features and history is evident. In this regard, optimization of developing children's artistic abilities, creative imagination and creative potential is

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relevant which is caused by the requirements of educational standards to the contents of basic general education.

Today, the problem of preserving national traditions in fabric art processing becomes topical. Our ancestors left many fine examples of embroidery to us. All this was handed down from generation to generation in decorating clothes, household and interior products. But, unfortunately, spiritual and business continuity of generations has interrupted. The family lost crafts, which once had been mastered by almost all of our grandparents, and now only a few do.

Knowledge given by traditional education is not enough to develop pupils' decorative-applied creativity. Moral impulses cannot be grasped rationally through purely scientific education, no amount of sciences themselves is able to replace love, faith, compassion.

Therefore, the important issue is the development of the technology for developing decorative and applied arts based not only on the transmission of theoretical and practical knowledge, but also on the organization of pedagogical support, aimed at creating a creative environment for the children association.

### ***Explore Importance of the Problem***

Developing pupils' decorative-applied creativity is favored by the subject area of "Technology", which is a practice-oriented subject where students have the opportunity to get acquainted with several kinds of arts and crafts, to complete practical tasks and projects.

School provides students with quality educational services for mastering the basic general education courses, but delegates authority to teach the subject "Technology" to the so-called resource center, which has sufficient human and logistical capacities. This resource centre is an interschool training facility (ITF). One of such institution is Russia's largest interschool training facility №3 in Kirov (hereinafter – ITF No. 3).

Training in IFT No. 3 is conducted in conditions as close to the professional activity as possible. In addition, IFT's training and material base is basically intended for shared use by students of several schools, which allows to equalize their opportunities to some extent, to take into full account students' needs and interests.

Our research of developing of pupils' decorative-applied creativity in basic schools was implemented on the example of studying technologies of embroidery: simple stitches, counting stitches, stitch-embroidery sewing, satin stitch and the manufacturing products in the course of working out and executing models of clothes and interior details.

### ***Embroidery as a Form of Decorative-Applied Arts***

Embroidery is one of the kinds of decorative-applied arts in which patterns and images are performed manually or by using the embroidery machine on various fabrics, skin, felt and other materials with linen, cotton, woolen, silk (more often color) threads. Embroidery is used for decorating clothes, objects of everyday life, for creating separate decorative panels.

Embroidery is an ancient type of decorative-applied arts. For example, the Red Indians decorated blankets with various embroideries; the Lapps embroidered different patterns on their deer skin clothing.

Each Russian region has its own traditional type of embroidery. For example, stitch-embroidery sewing on a cloth with white thread is typical for the Kirov region.

### ***Status of a Problem***

The value and the place of arts and crafts in the process of the personality development are revealed in the works of D.B. Bogoyavlenskaya (2002), T.Y. Shpikalova (2001). The authors emphasize that the lessons of decorative-applied arts develop artistic and creative potential of the individual, contribute to the restoration of ties between generations.

The works of V.M. Vasilenko (1977), G.S. Maslova (1978), M.A. Nekrasova (2003) are dedicated to moral, aesthetic, and social aspects of folk arts, and in particular, embroidery. The authors analyze the issues of modernity and the continuity of folk arts.

According to I.B. Levitskaya and K.S. Turchak (2007), renovation of the modern system of education associated with humanization of the educational process determines pedagogical conditions necessary to provide the development of creative abilities of each child.

Thus, the analysis of these works identified the need for working out the technology of developing pupils' decorative-applied creativity taking into account, on the one hand, historical peculiarities of folk arts and, on the other hand, modern educational standards of the subject "Technology".

### ***The Hypothesis of the Study***

The analysis of theoretical works and practical activity in the area of the developed problem revealed that the issue of the possibilities of the subject "Technology" in developing pupils' decorative-applied creativity remains insufficiently studied and worked out. That has allowed to formulate the hypothesis of the study: application of the technology of developing pupils' decorative-applied creativity within the subject area of "Technology" will promote the development of pupils' creative abilities, preservation of national traditions.

### ***Methodological Framework***

#### ***Decorative-Applied Arts as a Means of Students' Personality Development***

Decorative-applied activities as a means of personality formation in the modern educational system have wide opportunities for developing personality, creativity and potential abilities of children, as it is based on centuries-old experience, concentrating the knowledge and skills of many generations. Traditional art introduces students into the rich heritage of handicrafts, brings up artistic taste, develops imagination, creativity, and contributes to the restoration of ties between generations, the development of creative personality in general.

The applied works raise a strong-willed personality, build children's skills, intelligence, and this is an excellent school of aesthetic education based on promoting the artistic view of the world, the search for beautiful details in the reality.

### *Content and Methodological Aspects of the Subject "Technology"*

The subject area of "Technology" was introduced in the basic curriculum of general educational institutions of the Russian Federation in 1993. It replaced labour training.

Technology is a basic practice-oriented subject area in the school curriculum, which can be described as design and manufacture.

The second generation of basic general education standards defines the concept and goals of the subject "Technology".

Technology is the knowledge of transformative human activity, transformation of materials, energy and information in the interests of the man, society, nature.

Mastering the academic subject "Technology" is intended to ensure:

- 1) acquiring general labour and vital skills, including the field of labour culture and behaviour;
- 2) studying the world of professions, gaining practical work experience and on this basis forming informed professional identity;
- 3) forming a creative approach and aesthetic attitude to the reality in the learning process and executing projects;
- 4) upbringing diligence, honesty, responsibility, decency, spirit of enterprise and patriotism.

Teaching children technology is based on mastering certain processes of transformation and use of materials, energy, information, natural and social environment. Taking into account the current national system of students preparation for subsequent professional education and labour and to meet the students' educational inclinations and cognitive interests, possibilities of educational institutions, local socio-economic conditions the obligatory minimal content of basic educational programs on technology is studied in the framework of one of three areas: "Technology. Technical labour", "Technology. Service labour", "Technology. Agricultural labour (agricultural technology)".

Each area includes basic sections. The basic section for the program "Technology. Technical labour" is the section "Making products of structural and ornamental materials". Basic sections for the program "Technology. Service labour" are "Cooking", "Making products of textile and ornamental materials". Basic sections for the program "Technology. Agricultural labor" are sections "Plant growing" and "Livestock raising". This program is studied in rural schools.

Embroidery classes are included in the section "Making products from the textile and ornamental materials".

The main form of training on the subject "Technology" is students' educational and practical activity. Priority methods are exercises, laboratory training and practical works, creative or design works. All kinds of practical activities in the basic school programs are aimed at mastering different technologies of processing materials, transformation of energy, information, natural objects and social environment.

The peculiarity of the subject "Technology" is in its uniqueness: at present this educational area connects history and modernity. It's a kind of

interdisciplinary bridge, which integrates other areas of knowledge in school. We are surrounded by cultural objects, which were created for generations. Students learn about national traditions and peculiarities of culture and life of the peoples of Russia.

At present technology lessons are the only ones where children create their own educational products which are personally significant to them. Many of these products are important for society. What students make with their own hands at the lessons is in demand by preschools or sold at fairs.

The subject "Technology" has a very important educational value. It teaches what our children will pass on to their children and grandchildren. Technology classes can be conducted in classrooms and workshops as well as in interschool training facilities.

### ***The Specificity of Teaching the Subject "Technology" in ITF No. 3***

Technological training of pupils of basic school in ITF No. 3 comprises three stages. The first stage is an introduction to labour, where students become aware of the process as an appropriate and necessary activity, and is designed for pupils of grades 5-6. The second stage is the basis of labour, enabling the student to enter the world of production of consumer values. This stage is implemented in grades 7-8. The third stage of technological training is implemented in grade 9 and involves organizing and carrying out professional tests in which the student is "trying on" various professional costumes and chooses the one that fits him best.

These stages formed the basis of the technology of developing pupils' decorative-applied creativity in basic school, which is presented as a program on arts and crafts "Creative workshop of embroiderers".

### ***The First and Second Stages of the Technology of Developing Pupils' Decorative-Applied Creativity***

The first stage of the program "Creative workshop of embroiderers" involves motivating children in creative activities, organizing cognitive activity on the basis of personality-oriented, individual approaches in the process of studying arts and crafts. The function of the first stage is to help the child to self-actualize in the course of mastering the educational program.

The peculiarity of this stage is the first meeting of students with the teacher-craftsman. The craftsman creates a new creative atmosphere in class that interests, fascinates and motivates children. Meeting with any interesting and enthusiastic craftsman always attracts attention. The craftsman himself is always in the sense of getting things done, he is given a perpetual childhood by nature. The identity of the craftsmen is culturally-valuable, he is distinguished not only by high professionalism, but also by a poetic manner of thinking, so no wonder he's often called a storyteller.

On the first stage the craftsman performs the following tasks:

- to study traditions of the peoples of our country and native land;
- to introduce embroidery as a form of decorative-applied arts;
- to master basic techniques of embroidery;
- to learn creating designs in decorations with embroidery;

- to introduce elements of materials science.

To solve problems, students are offered the following topics to study:

- Elements of materials science. (Classification of textile materials. Materials used in decorative-applied arts).

- Traditional arts and crafts. (The concept of arts and crafts, folk art, decorative-applied art. The value of arts and crafts. Folk arts and crafts of the country and of the native land. The history of embroidery, types of embroidery. The use of embroidery in folk and modern outfits. Types of embroidery).

- The basics of composition. (Basic concepts and definitions: composition, rhythm, ornament, pattern in embroidery).

- Basics of color. (Study of the color wheel. Cold and warm colors, chromatic and achromatic colors).

- Transferring the pattern on the fabric. (Practical work: "Transferring the pattern on the fabric, pattern increase and decrease. Filling products in palce).

Students complete samples in the techniques of "simple stitches" and "counting stitches" and embroider napkins in these techniques.

The aims of the second stage of the program "Creative workshop of embroiderers" are:

- introducing production technology of synthetic fibers and complex weaves;
- students ' mastering the technology of making counting stitches, satin stitch,

- introducing the possibilities of using embroidery in interior design.

On this stage student master, the techniques of decorating products with embroidery. It should be noted that students decorate such products as panels, needle-holders, pot holders, separate parts of clothing (cuff, "foreparts").

### ***Elective Differentiation as a Means of Developing Pupils' Decorative-Applied Creativity***

The third stage of the technology of developing pupils' decorative-applied creativity is implemented in the 9th grade. The curriculum subject "Technology" in the 9th grade is made a component of the educational institution to organize a pre-profile training of pupils. One of the areas of the pre-profile training, which we implemented to develop pupils' decorative-applied creativity, is elective differentiation.

Elective differentiation is a form of differentiation according to students' interests, which is characterized by providing students with the right to choose elective courses. Elective courses are a subsidiary form of learning and their aim is to expand students' horizons, to satisfy their diverse interests. Previous option courses can be considered the analogue of elective courses. The only difference is that option courses were not studied by all students and after school and elective courses are for all students and they are a part of the individual student' curriculum. The set of courses they offer is of a variable nature, their number is redundant, which provides a real choice for students.

Among elective courses students are offered elective courses on embroidery, which are the logical extension of the previous stages of the technology of developing decorative-applied creativity.

The purpose of elective courses on embroidery is that they, first, let the students try their hand at decorative-applied creativity, and, second, they introduce students into the diversity of professions and different socio-professional roles. As an example we give the educational-thematic plan of the elective training course "Simple and elegant" (Table 1).

**Table 1.** Educational-thematic plan of the elective training course "Simple and elegant".

| No  | Topic   | Hours |        |          | Professional orientation   |
|---|---|-------|--------|----------|--|
|   |   | total | theory | practice |  |
| History of embroidery origins: our traditions           |   |       |        |          |  |
| 1   | History of embroidery origins. Our traditions: Handicraft and health.   | 3     | 1      | 2        | Archeologist, teacher of History and World Culture, librarian, scientific worker, museum employee. |
| Equipment   |   |       |        |          |  |
| 2   | Instrument, materials and appliances for embroidery. The use of each instrument, appliance. Use and storage regulations.  | 3     | 1      | 2        | Sales manager, consumer services officer, raw materials specialist, advertising agent.             |
| Basic rules of embroidery. Care of embroidered products |   |       |        |          |  |
| 3   | Thinning thread. Fixing the working yarn (with even and odd number of threads). Transferring the pattern on fabric (via carbon paper, in the light, using darting, rolling pins).                 | 3     | 1      | 2        | Sales manager, consumer services officer, raw materials specialist, advertising agent.             |
| Materials science.                                      |   |       |        |          |  |
| 4   | Fibre classification. Comparative qualities of natural and chemical fibres. Plain weave of warp and weft. The value of plain woven fabrics for embroidery. Environmental assessment of materials. | 2     | 1      | 1        | Sales manager, consumer services officer, raw materials specialist.                                |

**Table 1.** Continued.-

| No  | Topic  | Hours |        |          | Professional orientation   |
|---|--|-------|--------|----------|--|
|   |  | total | theory | practice |  |
| <b>The technology of making simple stitches</b> |  |       |        |          |  |
| 5   | Methods of making stitches: "needle forward ", "needle behind", "chain", "loopy", "stalked", "cross".<br>Requirements for quality control of embroidery. The main types of embroidery defects, their causes. | 6     | 1      | 5        | Embroiderer, master of arts and crafts.  |
| <b>Principles of design.</b>                    |  |       |        |          |  |
| 6   | Composing technological sequence of execution of the project. Manufacturing the product.   | 15    | 3      | 12       | Designer, modeler, production technician, teacher of Technology, teacher of drawing. |
| 7   | Project defense. Exhibition of products.   | 2     | -      | 2        |  |
|   | Total:   | 34    | 8      | 26       |  |

While studying the section "Principles of design", the students made a pin cushion in the technique of "cross" and the picture "Blooming meadow" in accordance with three levels of difficulty:

- basic level – copying the sample,
- increased level – with changes in color, size, shape,
- advanced level – with changes in composition and original artwork.

Thus, the elective course "Simple and elegant" allows to solve the following tasks:

- to master the necessary set of knowledge, skills and abilities for artistic processing of fabrics, which contributes to the preservation of cultural and national traditions;
- to develop cognitive interest, aesthetic feeling and artistic initiative, ability to solve creative tasks in project activities;
- to be aware of their preferences for future activities, planning options for further education, occupation.

#### 2.6. Professional tests in developing pupils' decorative-applied creativity.

The program of the academic year includes 4 elective courses. Each elective course is a complete module and is an object for students' individual. Upon

completion of the elective course the student has an opportunity to choose an elective course in another kind of arts and crafts (e.g. lace, woodcarving).

Elective courses provide professional tests. A professional test is a professional examination with elements of the specific process of the professional activity. While professional tests the student has an opportunity to determine how the content and nature of this work corresponds to his/her health, abilities, interests and skills.

The professional embroidery tests include a set of theoretical and practical tasks simulating the main features of the subject, aims, conditions and tools that allows students in the process of preparing to "try them on" and assess their own capabilities (table. 2).

**Table 2.** Elective courses in embroidery.

| No | Elective courses                      | Theoretical tasks   | Practical work  |
|----|---------------------------------------|---|---|
| 1  | «Simple and elegant»                  | Written test "Basics of ornament composition "<br>Reports in groups: "Traditional embroidery of various countries of the world"<br>Preparation of the technological sequence of the produced products                     | Picture "Blooming meadow"   |
| 2  | «Magic thread»                        | Oral questioning on the topic "Color".<br>Crossword puzzle "Types of stitch-embroidery sewing<br>The essay "Traditional and new materials for the openwork sewing<br>Written test "Methods of making "drawn thread"       | Making interior details:<br>- cushions<br>- table cloths<br>- panels                                    |
| 3  | «Bead embroidery»                     | Written test "The Sequence of stringing beads"<br>Quiz "My idea"<br>Development of technological documentation  | Making accessories:<br>- glasses case<br>- phone case<br>- cosmetic bag<br>- bag                        |
| 4  | «Embroidery in modern youth clothing» | Oral questioning "Stages of the project activities"<br>The report "Modern trends in fashion"<br>Development of technical documentation to the project<br>Grounding economic and environmental parts of a produced project | Making clothing details and accessories in one style: embroidery elements on the women's dress, costume |

The content and ways of work in the classroom on elective courses in arts are similar to the work in the creative group. The program of these courses is more flexible because the teacher can change the program in response to the interests of this group of students and each individual.

Each course is designed so that it allows to use fully active forms of training, informative and project work.

Students attend classes for different motives: to make some useful thing for their homes, to make a gift, to work together with friends, to show their abilities, etc. In all cases, their interest is supported and developed through their success in work, appropriate input of time and effort. Enthusiastic work at the lessons, freedom in action and choice of objects are powerful incentives for activities that meet their personal interests and giving the possibility to exercise their self-dependence more fully.

Individual approach in work with students allows us to compensate significantly the shortcomings of the school educational activities. Students with a low level of training are successfully engaged in elective courses, demonstrate creative initiative and exceed their friends in results. The classroom creates an atmosphere of creativity and understanding with adults, peers, which promotes the formation of pupils' creative abilities, spiritual and moral values, respect for his and others' work, forming patriotism and civic solidarity.

Thus, the development of pupils' folk-applied creativity while taking elective courses occurs without dictate and imposition, through students' independent choice of arts and crafts interesting for them. Moreover, taking professional tests contributes to actualizing the process of students' personal and professional self-determination, to identifying students' possibilities in mastering creative professions (embroiderer, master of folk arts and crafts, designer, couturier, painter), students' most important professional qualities.

## Results

### *The Level of Student Achievement in the Field of Decorative-Applied Art*

As a result of implementing the technology of developing decorative-applied creativity from 2012 to 2016 we have analyzed the level of students' achievements in the field of decorative-applied creativity according to the following criteria (Table 3). The study involved 32 graduates of the basic education level in Interschool Training Facility No. 3.

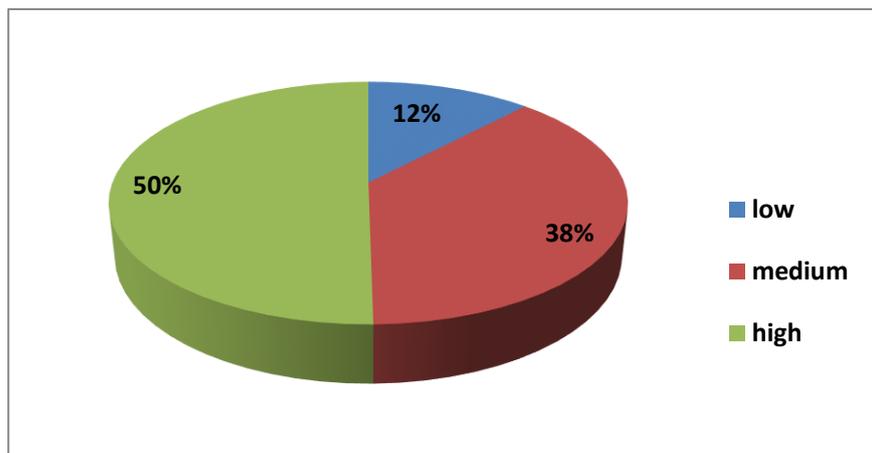
**Table 3.** Criteria for assessing the level of students' achievement in the field of arts and crafts.

| <i>Criteria</i>                             | <i>Level of students' achievements</i>       |  |   |
|---|--|--|---|
|   | <i>Low</i>                                   | <i>Medium</i>  | <i>High</i>                                   |
| Activity in the choice of the labour object | Works according to the teacher's advice      | Consults the teacher choosing the labour object        | Independent choice of the labour object       |
| Interest to completing the work             | Works only under control, can quit the work. | Works unsteadily but completes the work independently. | Works with interest. Steadily, systematically |
| Difficulty of the work                      | Copies of products                           | Original products but on the basic sample.             | Original products.                            |
| The level of learning                       | Lower basic level.                           | Basic level.   | Advanced level.                               |

Based on the above criteria, we assigned students into groups according to their level of achievements in the field of arts and crafts (low, medium, high). The basis for placing students in one group or another was a comprehensive analysis of the results obtained for each student. The results are shown in Table 4 and are reflected in Figure 1.

**Table 4.** Levels of students' achievement in the field of arts and crafts.

| Level of achievements | Number of students |
|-----------------------|--------------------|
| Low level             | 4                  |
| Medium level          | 12                 |
| High level            | 16                 |



**Figure 1.** Levels of students' achievement in the field of arts and crafts (in per cent).

Half of the graduates demonstrated a high level of achievements in the field of decorative-applied creativity. 38% of students showed a medium achievement level. 4% of students had a low level of achievements. It should be noted that these students did not participate in the events dedicated to the arts and crafts.

### 3.2. The students' participation in events dedicated to arts and crafts

Pupils of the 5-9 grades, undergoing training on the program "Creative workshop of embroiderers", took an active part in various activities (Fig. 2).

Half of the students enrolled in the program "Creative workshop of embroiderers" presented their works at the art exhibitions of regional, municipal and school levels. 25% of students took part in festivals of folk crafts. At festivals the students not only got acquainted with products of local craftsmen and craftsmen from other parts of Russia, but also participated in master classes. 12% of students successfully participated in the academic competition in technology.

Technology competitions is one of the most effective forms of extra-curricular work which increase students' interest to arts and crafts, develop their creative abilities. This is a unique event with no analogues among school subject competitions. Participation in the competition in technology includes three stages:

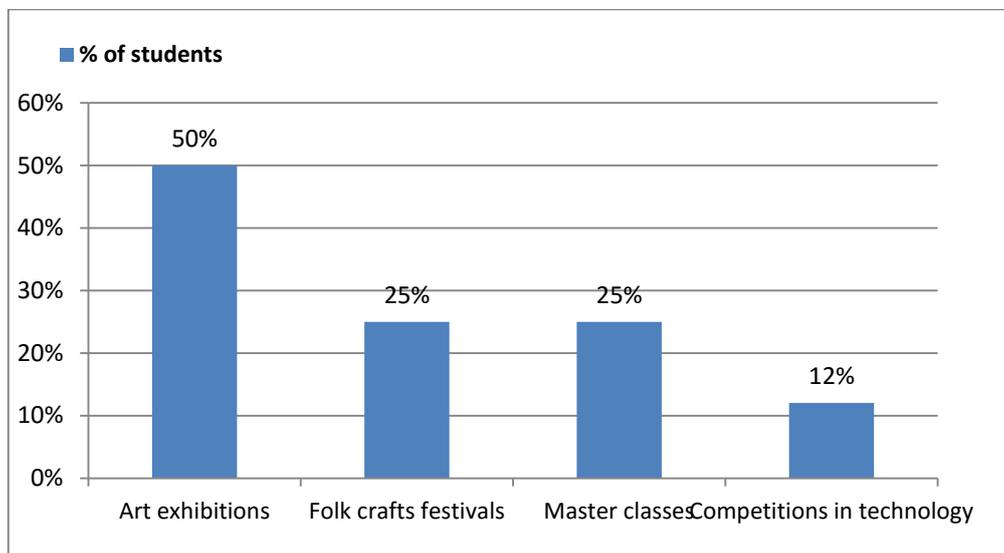
1. testing,
2. completing practical work,

preparing and defend in the project.

The third stage is the most difficult for the student and the teacher, but at the same time it is the most effective from the point of view of competence development in the field of arts and crafts. The student makes an interesting product in the selected technique, prepares a full description with all the grounding and calculations and defends it before a competent jury.

Students of Kirov ITF No. 3 successfully participated in the competition on the subject "Technology" with projects of a set of clothes with embroidery in different techniques.

Active students' participation in the events devoted to arts and crafts shows the development of pupils' creative abilities and the preservation of tendencies in developing the national art – embroidery.



**Figure 2.** Levels of students' achievement in the field of arts and crafts (in per cent).

## Discussions

The analysis of the conditions most effective for learning the art of embroidery is presented in the work of O.V. Yemelyanova (2009), Pesman (2015), and Demir & Kutlu, (2016). The authors considers possibilities of additional education for developing children's creative potential. In her work the author offers a methodological system aimed at the development of pupils' creative abilities in children's art schools in the process of learning the art of embroidery.

Y.N. Alexandrova (2003) in her paper "Developing creative abilities of younger schoolchildren in the process of mastering the basics of Russian embroidery: in the system of additional education" analyzes the pedagogical conditions under which the study of traditional artistic features of Russian embroidery develops younger students' creative abilities. According to the author classes in embroidery, with proper organization, are natural activities for elementary school students corresponding to the needs and characteristics of

this age. In her work the author offers a system of exercises and tasks for embroidery classes that can be used in the system of additional education.

The thesis of N.F. Babina (2001) is devoted to the development of pupils' creative abilities at technology lessons. In her work the author analyzes the mechanism of realizing pedagogical conditions that create possibilities for the development of creative abilities of the pupils of the 5-9 grades on the material of service labour. With regard to the determined set of pedagogical conditions the author developed a structural model of organizing the educational process and the scientifically-grounded program of the development of pupils' creative abilities.

The issue of developing pupils' decorative-applied creativity within the subject area of 'Technology' remains insufficiently studied. Moreover, with the adoption of new standards the possibilities of "Technology" from the point of view of developing decorative-applied creativity are expanding requiring new research in this area, which were conducted by the author of the article.

### Conclusion

Thus, this study allows to conclude that the subject area "Technology" has many possibilities to implement the technology of developing pupils' decorative-applied creativity. These possibilities are determined by the specific content of the subject, which is as follows:

- there are sections and topics aimed at developing pupils' decorative-applied creativity in the educational standards of the subject;
- active design and research activities of students completing practical work in the field of arts and crafts;
- the opportunity to express themselves in professional activities and to create a product with their own hands;
- providing students the right of independent choice of the decorative-applied creativity;
- greater freedom of action and choice of the labour objects by students;
- teacher's ability to adjust the curriculum in response to the interest of the group of students and each individual.

The proposed content of the subject "Technology" is the result of best practices of technology teachers of Kirov ITF No. 3. The analysis of obtained results makes it possible to conclude that the use of the technology of developing pupils' decorative-applied creativity within the educational field "Technology" contributes to students' high achievements in the field of arts and crafts, students' active participation in events dedicated to preserving national traditions

### Recommendations

The content of the article have practical value for university teachers working with students - future teachers of chemistry, for young chemistry teachers, for students of extension courses.

In view of the results of this study can identify a number of scientific problems and promising areas for further consideration: the deepening and widening of certain provisions contained in the article related to the formation

and accumulation of psychological-pedagogical potential of scientific explanation in teaching chemistry; development of scientific and methodological provision of electronic scientific explanation in teaching chemistry with the aim of developing the unified educational space.

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