



INNOVATIONS AND ADVANCED FOREIGN EXPERIENCES IN TEACHING CONSTRUCTION DRAWINGS IN THE EDUCATION SYSTEM

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Article history:	Abstract:
Received: 18 th January 2022 Accepted: 18 th February 2022 Published: 30 th March 2022	The article briefly examines the state of teaching drawing in secondary schools of the country on the example of construction drawing and the level of its compliance with modern requirements. The teaching of construction drawing in foreign countries was analyzed. It was also studied and analyzed the innovations in the teaching of construction drawing and important aspects of advanced foreign experience, innovative approaches to the educational process in them. The results of the analysis show that the science program includes the introduction of students to the professions of architects and builders through the study of construction drawings (vocational work) and teaching them to read simple construction drawings, the effective use of time in graphic exercises and assignments. Tasks designed to develop students' creative abilities using graphic tools are described.

Keywords: Scale, Facade, Plan, Shear, Master Plan, Scheme, Conditional Image, Graphics, Interior, Clear Image, Sketch, Layout, Isometry, Dimetry, Information, Innovative Technology.

INTRODUCTION

In the process of learning the science of drawing, students need to develop the skills and competencies required of them, as well as the professional qualities necessary for the future specialist in the profession of their choice. This is because advanced spatial imagination and logical thinking will be necessary in various areas of human professional and practical activity (architecture, construction, engineering, etc.). In addition, the importance of graphic sciences, especially drawing knowledge and skills in the field of technology in general secondary schools and in the study of specific subjects (labor education, mathematics, physics, chemistry, ..) has been proven many times.

Due to the fact that the procedures for performing and reading construction drawings differ greatly from machine drawings, it takes a relatively long time to study them. Due to the lack of emphasis on the practical importance of construction drawings in the curriculum and textbook, the teaching of construction drawings in schools has become seen as mainly to acquaint students with the types of construction drawings, as well as the common conventions used in them. Therefore, in studying this section, we consider it necessary to reconsider the current situation in the program and textbooks in terms of content. First of all, the subject of

construction drawing, by its nature, is primarily aimed at developing students' polytechnic knowledge and skills. The bulk of the theoretical information is usually given at the beginning of the practical training, which is reinforced by doing graphic work. This procedure is a well-known axiom through many years of pedagogical experience.

In this regard, it should be noted that in our country there is still a lack of modern textbooks and manuals for the education system of construction drawing, and the existing ones are not in demand. The published manuals do not reflect the changes made to construction drawing standards in recent years. No manuals have been prepared so far, especially for practical training.

In order to improve the quality of teaching construction drawing in general secondary schools, we believe that it is necessary to first enrich the content of the model subject program with practical directions of construction drawing and adapt the materials in the textbook. Despite the fact that this work has been done, it is difficult to achieve high educational efficiency without modern methodological support in science.



MATERIAL AND METHODS

In a brief practical drawing course, we will analyze the content of the construction drawing study covered in the syllabus, textbook, and teacher's book.

The program includes 3 hours of study of the section "Schematics and construction drawings", the content of which is as follows:

Information about schemes and their types. Simple kinematic, electrical and radio circuits. General information about construction drawings. Facade, plan and shear of the building. Peculiarities of sizing construction drawings.

We will briefly review the textbook drawings of construction drawings without dwelling on the study of schematics, based on the topic of our study.

The textbook "Construction drawings. Plan, section and facade of the building" provides brief information on the general plan, plan of the building, section of the building and facade of the building [1].

Since the information in the textbook is mainly in the form of information, it is difficult to engage students in construction drawings with these materials, their practical significance and how students can use these drawings in everyday life, as well as career guidance tasks.

We have briefly considered the coverage of materials in a drawing textbook on the example of the construction drawing department above. Today, as a result of the use of innovative and information technologies in education, many effective teaching methods are used. In this small research work, we set ourselves the goal of trying to form at least partially effective methods of teaching graphic science on the example of the Department of Construction Drawing.

Here we will briefly analyze the coverage of the department of construction drawing in school drawing in some CIS countries.

In the Russian Federation, the preparation of textbooks is an alternative form, in which the school administration independently selects the textbook, taking into account the interests of students, the direction of socio-economic development of the region. Therefore, some of the drawing textbooks are prepared with special emphasis on such areas as mechanical engineering, applied arts, humanities. We have reviewed about 10 types of similar textbooks in INTERNET materials. Textbooks prepared by such authors as A.D. Botvinnikov, A. Pavlova, Ya. Roitman, G. Preobrazhenskaya, V. Stepakova, G. Khakimov are designed to guide students in a particular field or profession.

Below we consider the coverage of construction drawings in the textbook for 9th grade students in the Republic of Belarus, published in 2008 by V.N.Vinogradov [2].

In this textbook, materials related to architectural and construction drawings are covered on pages 188-203 and are divided into the following topics:

- specific features of architectural construction drawings (types of construction drawings, plans, sections and facades of buildings, scales and dimensions in construction drawings);

- Conditional images and designations in architectural and construction drawings (descriptions of building elements, designations in architectural and construction drawings, drawings of communications (networks), reading drawings).

The information on the subject is explained using simple diagrams, the most commonly used and familiar to students the conditional designation and conditional descriptions of architectural and construction drawings. The topics are explained in a way that is understandable to students. In describing them, the author used the following forms.

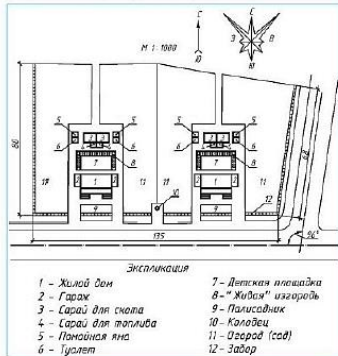


Figure 1.



Figure 2.

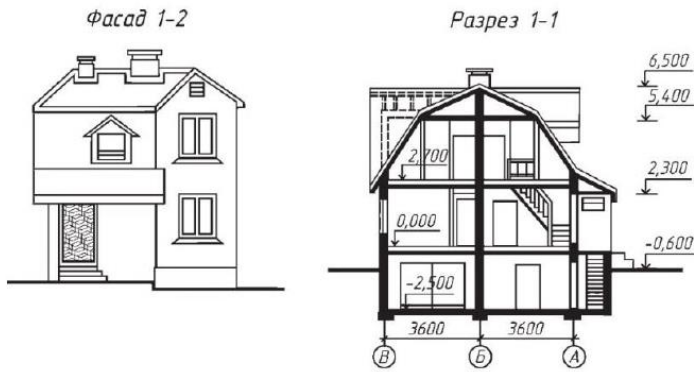


Figure 3.

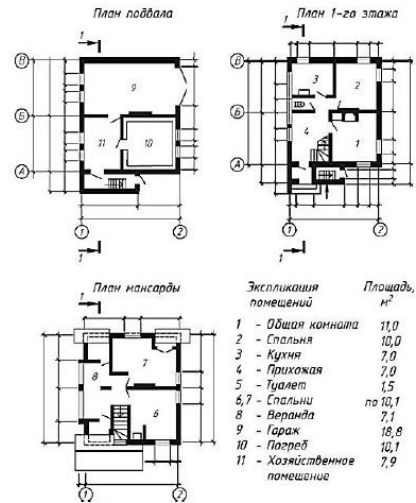


Figure 4.



Figure 5.

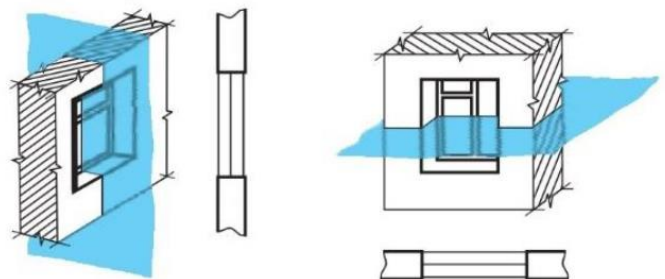


Figure 6.



After mastering the topics, students are asked to complete the following tasks:

1. Make a plan drawing of the classroom (study workshop, living room room, etc.) in kind on the teacher's assignment.

Determine the size of the room by measuring. Make a plan of the required dimensions and surfaces of the rooms, as well as drawings of windows, doors and furniture. Colors can be used to complete the task.

Use the conventional definitions adopted in the architectural-construction drawing to perform the task.

2. Read the architectural-construction drawing of the project of a one-storey one-apartment three-room residential building, given in the figure, using the previously considered sequence.

The reviewed textbook contains the age characteristics of students of the department of construction drawing, as well as the materials that they need to master and are of practical importance.

A similar approach is taken to the coverage of the section on construction drawing in the textbook "Drawing" [3] for secondary schools currently in force in the Republic of Ukraine.

In this manual, "Topographic drawings" are first covered on a separate topic, and then on topics related to construction drawings. In this textbook, we will briefly review the topics and their characteristics from the given forms:

- General information about construction drawings (images in construction drawings, sizing of construction drawings);

- Conditional images and designations in construction drawings (conditional images of building elements, conditional designations in construction drawings).

The content of the assignment for students is as follows:

Read the construction drawing shown in the figure.

Follow this sequence to read the drawing:

1) determine the name of the building depicted in the drawing;

2) determine what images (facades, plans, shears) are given;

3) review the notes and forms in the drawing together;

4) study the mutual arrangement and construction of all parts of the house;

5) determine the surface and height of the rooms and the overall dimensions of the building;

6) determine the location of windows and doors, plumbing and other equipment in the rooms.

In this guide, we will look at their characteristic appearances without quoting all the shapes related to construction drawing. As can be seen from the following figures, the author explained to the students the place of topographic drawing in construction drawings (in the master plan drawing). The conditional designations for this are explained in the examples of their use.

RESULTS

Now let's look at some of the textbooks "Drawing" used in schools of the Russian Federation. Despite the fact that many alternative textbooks on the course of drawing are currently used in Russia, the textbook "Drawing" by AD Botvinnikov is widely used [4]. This textbook is the basis for the subject of drawing in secondary schools in the CIS countries, it has become a "classic". It has been more than 30 years since the textbook was first used in schools. This textbook is in accordance with the current program approved by the Ministry of Education and Science of the Russian Federation and is the main textbook in the field of drawing. In addition to theoretical information, the textbook includes questions and assignments, graphics and practical work to reinforce and review the material studied. The illustrations in the book are aimed at making it easier for students to understand the topic and are done in a sufficiently high quality.

Created by GF Khakimov and others for 9th grade students "Drawing. The textbook "Practical course" [5] is unique. This textbook was created in collaboration with the Department of "Methods of teaching fine arts, drawing and labor" of Bashkortostan State Pedagogical University and the Department of "Descriptive Geometry and Drawing" of Ufa State Aviation Technical University.

The textbook is prepared in accordance with the curriculum of the subject of drawing and has regional components. The textbook also provides additional information on in-depth study of some sections of the science of drawing, as well as the placement of graphic parts of projects in technology and labor education classes. The textbook is based on an original methodology based on an active approach to education. It includes a variety of graphic tasks aimed at developing students' creative, spatial imagination and figurative thinking.

Chapter 5 of the textbook is devoted to the study of construction drawing, which is called "Architectural-construction graphics" and consists of the following topics:

- architectural originality of Bashkir settlements;
- images in construction drawings;
- conditional images in construction drawings;

- reading construction drawings.
- The following illustrations were used to illustrate the topics in the textbook (Figures 7-9):

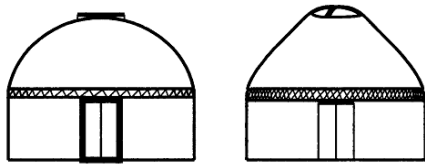


Рис. 292. Тирма: а) южная — со сферическим верхом; б) северная — с коническим верхом.

Figure 7.

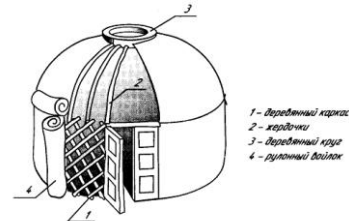


Рис. 293. Тирма

Figure 8.



Рис. 294. Аласык

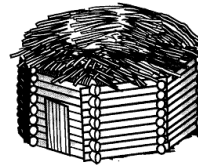


Рис. 295. Бурама

Figure 9.

DISCUSSION

There are advantages that can be studied by studying these textbooks and introducing them into textbooks published in our country.

In the example of construction drawing, this study briefly studied the state of teaching drawing in secondary schools of the country and its level of compliance with modern requirements. The teaching of construction drawing in the republics of Ukraine, Belarus and the Russian Federation, the study and analysis of innovative approaches to the educational process in them.

The results of the analysis show that it is impossible to acquaint students with the professions of architect and builder (vocational work) by studying construction drawing in the science program and to teach them to read simple construction drawings based on the materials provided in the textbook. It should also be noted that the materials in other sections of the school drawing course need to be enriched with materials that are understandable and interesting to school students.

But it is also possible to organize construction drawing classes in secondary schools in a completely different form in terms of content and size. Below we give methodological recommendations on this.

Everyone is more or less faced with the appearance of construction drawings in the process of building a house, shopping, remodeling a house or garden yard, placing furniture in a room or office. In addition, knowledge of the features of the "graphic language" of architecture is one of the components of general human culture and knowledge.

It should be noted that in the existing textbooks for secondary schools, these topics of construction drawing are very short and with some errors (in particular, the old standards were used in the conditional designations; It is therefore recommended that the teacher choose familiar, simple and interesting examples for students when explaining the topic. In this way, students become interested in architectural and construction drawings, and superficial knowledge about these drawings is not formed.

Once students are familiar with the types of architecture - construction graphics and general construction drawings, they can be offered assignments with the following content (they can choose at will):

1. Follow the plan of your room. On this scale (1:20;...) make a model of furniture and equipment in this room from thick colored paper and place it according to your taste and needs [7] (Figure 10).

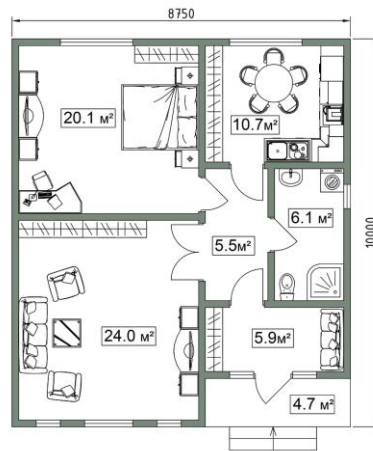


Figure 10.

2. Based on the isometric projection of the interior, make a sketch of the plan in which the furniture is placed [8] (Figure 11).



Figure 11.

3. Sample assignment to perform a room plan drawing on the isometric projection of the interior and show the placement of furniture in it [6] (Figure 12).



Figure 12.

4. Make a sketch of the facade and a sketch of the plan of the garden yard based on the given clear picture [9] (Figure 13).



Figure 13.

5. An example of a task to improve a clear image and plan of a building shown in Figure (Figure 14).



Figure 14.

CONCLUSIONS

In order to increase the effectiveness of teaching construction drawing in schools, it is necessary to train teachers of drawing in higher education, to teach them how to organize school drawing lessons based on advanced pedagogical and innovative technologies. To do this, it is necessary to teach teachers of construction drawing to find new materials from the content and use them appropriately, to organize drawing lessons based on modern technologies [10].

Exercises from construction drawing are performed in groups under the supervision of a teacher after each new topic material is described, making it much easier to assess students' knowledge.

ACKNOWLEDGEMENTS

The direct connection of the proposed exercises with practice, the availability of opportunities for students to learn new concepts in interesting forms, provides a significant increase in the effectiveness of lessons in the department of construction drawings. At the same time, the content of graphic works performed independently by students was revised and improved. In particular, students are offered a variety of options for the conditional designation of materials and symbols of building elements, through which students learn new concepts, develop skills in the correct execution of symbols, and develop graphic cultures.

But these do not solve the problem of teaching construction drawings. To do this, it is necessary to create modern methodological support



complexes for general secondary schools in construction drawing

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