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EQUIPMENT DESIGN FOR STORAGE AND DISPLAY OF EDUCATIONAL PROJECTS

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Introduction

The object of the design is the equipment for the storage and display of educational projects for the classroom №305 building 10, Tomsk Polytechnic University. Since the existing standardized furniture sets in the classroom do not meet the requirements, there is a need in the design of modern equipment for specialized classrooms which provides comfortable accommodation and storage of large format graphics and tridimensional works of students in small spaces.

The aim of the project is to create a set of furniture which should combine the study of works storage and display functions. It is necessary to take into account the additional features: demonstration of graphic works and models, possibility of transformation or movement.

The work involves the following tasks:

- identify the wishes of the target audience;
- perform evaluation of the existing solutions on the market, describe their advantages and disadvantages;
- analyze of the learning process in the classroom;
- conduct ergonomic studies;
- choose the most suitable design solution;
- select color and texture decision;
- select the most suitable materials and manufacturing techniques;

As a result of the work it is necessary to achieve novel and creative solutions, consider ergonomic, economic and aesthetic components of the designed object.

Survey results

Using the editor “Google Forms”, profiles were created for students and teachers to identify the user wishes and the problems they face in the course of application of the equipment. In general, the survey results show the relevance of the development and identify some of the important requirements for the appearance and functional features of designed furniture. For example, comfortable environment in the classroom, careful storage of the works and the opportunity to see and evaluate the work of other learners is important for the students. For teachers who regularly use one classroom it is important to have an opportunity to change the furnishings, the exhibition and the color scenario.

Analogues analysis

Existing storage systems can be divided into basic application areas for equipment:

- office;
- library;
- museum.

After analyzing the existing analogues, we can conclude that at the moment there is no solution that meets all the requirements and functional features for the problem. However, we can highlight some of the features that will help to solve it:

- modularity, the possibility to combine the elements of the furniture set, depending on the requirements for the content of the equipment;
- mobility, the ability to change the layout and structure of the equipment for space of various configurations;
- variety of possible designs, the use of furniture to store various formats of work.

The analysis of space

This classroom is used to give workshops and lectures and can accommodate 20 students. During work in the classroom periodically access is needed to the sink, because a lot of the practical work is performed by using a variety of graphical tools (gouache, watercolor, ink, etc.). The main part of the graphic and text information is displayed on the TV monitor. Chalkboard is not involved in the learning process, therefore it is possible to abandon it, that will free space for storage system and wardrobe.

After the analysis of space, we found the most convenient location for the furniture set in the classroom. The first plan (Fig. 1) shows the original location of the equipment, and the second plan shows the new location with the most efficient use of space (1 - chalkboard 2 - wardrobe; 3 - the storage system).

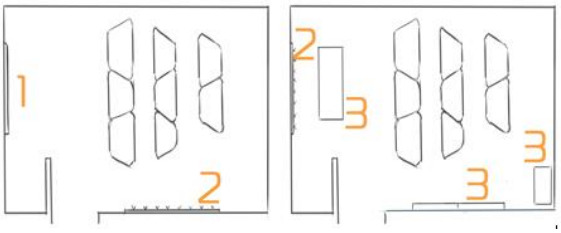

Figure 1. Location of equipment in the classroom

Form making

Modularity [1] sets will allow to combine elements, change the composition of the equipment, depending on the room configuration. The rectangular shape and paper formats dictate the shape and size of modules. Smooth forms create an interesting artistic image thanks to its rhythm. It should be taken into account as well as the ability to store and display layouts, which is necessary to provide space, 300 × 450 × 200 mm according to their maximum size. The final sketch of a modular kit (Fig. 2) is made on this basis.

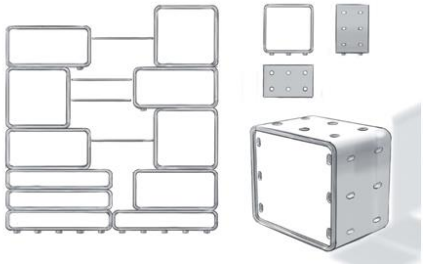

Figure 2. Sketch

150 mm is a minimum size for the modular grid. This size allows to create modules of such magnitude that they can contain paper formats from A1 to A4. Thus, 4 modules size - №1, №2, №3, №4 are developed, respectively. The gaps between the modules are also taken into account.

Cylindrical legs on the bottom of each element are used as the attaching modules. Thanks to multiple positioning of the fixing modules, they may overlap with each other, and turn sideways.

Additional elements are the doors, which can act as shelves, located between the adjacent modules. Doors are put forward through the slots in the sidewalls of the modules. Shelves are fixed on special hooks, included in the package, and tailored to the required size. Hooks can also be used to secure special poster profiles [2] which will create the exposition of works of graphic art.

A0 map-cases in a certain amount are stored in the classroom, therefore it is decided to make one additional module (Fig. 3). Its height will be 900 mm, depth - 150 mm, width - 1250 mm.

Figure 3. Sketch of additional module

Ergonomic analysis

Let us consider the basic ergonomic design parameters:

1. Three №1 modules are placed on each other have the height of 470 mm, which corresponds to an optimum seat height range (420-480 mm).

2. For easy access to the upper boxes the construction height should not exceed 1900 mm [3] - 12 modules №1 and №2.

3. Owing to the space formed in the corners between adjacent modules, one can easily take them into hands.

4. The size of the openings in the door suggests that doors move out conveniently by fingers.

5. In addition to the attaching opening in the module walls the hooks allow convenient grasp of the module.

6. The holes in the doors are located at such a distance that the door can be conveniently extracted from the module.

7. The depth of the groove for the door is 5mm, which is sufficient for secure hold of the door and eliminates the susceptibility to foreign objects, dust and litter.

Choosing a color palette

When making the classroom it is recommended to use bright color accents on a neutral background, which encourages activity, and at the same time does not lead to irritation, lowering of attention, as is the case with a large number of vibrant colors.

The main colors in the palette of the project are not mixed spectral cool colors - gray with the addition of blue, green, light blue, white. Deep yellow, dark red and turquoise are available to choose as accents. These accent colors in small amounts promote the increase of working capacity, physical activity and mental stimulation [4].

Constructive features

Since the side wall module must be made of a single sheet of veneer, it is important to choose the connection. The most favorable place for connection is the center line on the bottom of the module as a place of the lowest strain. The height of the modules depends on the dimensions of the veneer. For the rational use of material a certain pattern is offered.

Conclusion

This equipment increases user productivity. The wishes of users are identified in the survey and taken into account in the project. A new set of furniture (Fig. 4) creates a comfortable atmosphere in the classroom, provides careful storage of works, as well as the opportunity to see and evaluate the work of other students. Another important characteristic is the ability to change the furnishings, the exhibition and the color scenario.

Figure 4. Final project

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