

**INTERDISCIPLINARY INTEGRATION OF THE SCIENCE OF DESCRIPTIVE  
GEOMETRY**

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**ANNOTATION**

The descriptive geometry is a science was created to systematize and improve the design process in century XVIII. However, the teaching of descriptive geometry since then is not associated with design. The descriptive geometry is seen by professors as a pure science, like mathematics or physics, where a high abstraction level is demanded from students to understand representation techniques and geometric problems. Besides, the use of computational resources in the education of descriptive geometry has a great potential, but it is neglected yet.

***Key words: Descriptive geometry, Design based learning, Solid models, Perspective.***

The first book on graphic geometry appeared in 1798 in France. The author of the poem was a statesman, mathematician, engineer, scientist Gaspar Monge (1748-1818). In this book of Monge, only orthogonal projections are described in a total of 49 forms, and the coordinates and the plane of the third profile projections are not considered. The theory and perspective of shadows in the second part of the book G. Monj, M. It was written in collaboration with Brisson. Since the beginning of the XIX century, this science has been all the techniques in the world and began to be uttered in art schools. The science of descriptive geometry has been taught in Uzbekistan since the 1930s. Until 1953, there were no specialists in the field of descriptive geometry in the country. In 1953, the author of this book wrote a dissertation in this field and was awarded the title of candidate of science. X, the modern course of descriptive geometry is very different from Monj's descriptive geometry. The Tulitz course consists of four main sections: orthogonal projections, axonometry, perspective, numerical projections, and additional shadow theory. The first book of graphic geometry in Uzbek language Uzbekistan Published by the State Publishing House in 1959, author Yu. Kirgizboev. The book was recommended only as a masterpiece in the field of mechanical engineering. This book has 24 printed tabs, which mainly cover orthogonal projections, and axonometry has only one printed tab. In 1961, RakhimKhorunov's textbook on descriptive geometry was published in 16 printed sheets for all higher educational institutions. The second and third editions, which were later completed, were published. This fourth edition of the textbook is based on readers' feedback and the new program. Today, the computer graphics is present in every computer aided design system, but his users do few or none relation between the CAD's tools and descriptive geometry. Projections, views, parametric curves are common concepts in the two worlds, which are made, in CAD systems, through vector geometry. This work presents a new methodology applied to improve the learning of descriptive geometry which is based on a new approach of conceptual contents and the use of the design based learning. This new approach will be used on class and compared to traditional class. The goal is create a new paradigm to descriptive geometry education, becoming it effectively a design tool. The new conceptual approach aims at to reduce the degree of abstraction in the presentation of the basic concepts of descriptive geometry. The main alterations in relation to the traditional boarding can thus be enumerated: Presentation of the basic concepts of descriptive geometry through the faced solid study, using a symbology and an up to date nomenclature; Innovative techniques are proposals to get views perspective of solids and thus, to increase the agreement of the studied solid parts; The intersection concept between planes is used as modeling tool, used for the cut of solids and generation of more complex geometry; The true size concept is used to design the surfaces of solids. By these the development, real models can be produced.

2.1 Solid Objects The

approach change starts for the study objects that in the traditional approach were the abstract geometric beings like Point, Straight line and Plane, here they start to be solids, which is much more familiar for the students of whom the abstract entities. The knowledge and previous experiences of the students are taken in consideration. This is an important condition so that the learning occurs of efficient form, as the studies on significant learning of Silva [6]. In a first stage, are used facet solids (plain facets), which presents in its geometry the basic abstract entities (Point, Straight line and Plane). As well as the axon to get perspectives from the Monge's projections, using techniques of descriptive geometry and of the method of center projection. Thus it is possible to get perspective with 1, 2 or 3 vanishing points without great graphical constructions, as in the traditional perspective techniques. Using the proposed technique possible to define the exact position of viewpoint and the target. Therefore, the perspective is generated with accuracy and flexibility, according to viewpoint position. The proposal technique uses viewpoint and vector to define the observation direction. The board plane is considered perpendicular to the observation direction. The board plane is projected as an edge when the observation vector is projected in true length. The construction of physical models studied solids is a basic stage for the project based learning, therefore one of the phases of the design is the construction of models (Mockups) and prototypes, which has the objective to test form and function. In this stage, the students construct models of solids from the development of the surfaces in design stage. This is a very important stage for the teach-learning process, therefore it provides an effective contact between the apprentice and the study object through the manufacture experience and the concrete three-dimensional experience. The construction of models, depending on the scale, it can be made in a proper paper. As the objective is that all the students construct his models, it is intended to use low cost material and that it is easy handling, without specialized training. The educational systems come suffering transformations with intention to adapt the curriculums to develop capacities that are requisite of the professionals of Engineering nowadays, such as: knowledge in computational science, administration, costs, personal control, psychology, allies to the characteristics as creativity, leadership, initiative, negotiation capacity, general culture, and still, one expects that he is innovative, questionador and that it searches alternatives and solutions for the presented problems, thus encouraging the construction of new abilities. The act to design is considered [5] a basic intellectual activity to the engineer, that it must integrate in each new project his knowledge and experience, in the attempt to identify, to prioritize and to correct problems. This process happens through two stages: the synthesis and the analysis; and they occur alternated during the conscientious development of the design. The problems based learning is based on two basic points of the cognitive theory: the work in important or significant problems, and the search for more information when an unexpected situation is presented. The cognitive focus is satisfied [1] because the fact of that the solution of any problem assumes the reorganization of memories of last experiences suitable to the concrete requirements of the current situation. Therefore, the lessons that present practical cases, or real problems, bring a great profit in the learning process, therefore they allow to show to the student that the theoretical content is important and basic, facilitating the understanding of studied subject, stimulating the work in team and the interdisciplinary, as well, the development of a self style for problem solutions. A project is developed from a proposal that presents parameters and restrictions. The students must use the Monge system representation, as the convention presented, to represent a primitive solid from proposed data. So, cut and intersection operations are made to generate the shapes according the design requirements. Along the processes perspectives and axonometric views are made to improve the shape understanding, using techniques described in itens 2.5 and 2.6. With the shaped piece, the development of its surface from the determination of the true sizes of the facets is made. Finally, from the development, the real model must be constructed. The project presentation consists of the conclusive stage

of the work. It is made through the documentation and drawings of all the stages of development, including the modeling, views and perspectives, development and physical 3D model.

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