

THE MOTIVATION FOR STUDYING DESCRIPTIVE GEOMETRY

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Different reasons for motivating the engineering students for studying Descriptive geometry are being examined. A poll is made and analyzed. Conclusions are made for two possible ways of making the subject more appealing to students.

1. Introduction. In the recent years the one who teaches Descriptive Geometry faces two major problems. The first one is the insufficiency of lecture hours as the subject is currently studied for one semester two hours weekly. In comparison, in the past it was studied by the students for two semesters three hours weekly. The second problem is the poor stereometry knowledge of the students obtained at school and consequently the difficulty in mastering it. In this context the Motivation of the students for studying Descriptive Geometry must be boosted continuously. One should convince the engineering students weekly of the importance of the stereometric understanding of three dimensional objects and that Descriptive geometry helps in improving this understanding. Many handbooks on Descriptive geometry can be mentioned in which the authors have different ways of explaining the steps of drawing certain geometrical problems (see [1, 2, 3]).

Every technical idea must undergo its graphical interpretation before it can be realized. For an effective graphical modeling the specialist must have technical knowledge, must be able to think in spacial (stereometrical) form and have to know how to display his/hers ideas descriptively. Descriptive geometry teaches the ways of drawing up graphical two dimensional models of three dimensional objects in a manner as close as possible to the real. Moreover, one must be able to determine the real look of the depicted object. The descriptive drawing must be clear and simple and determine the real form, measurements and position of the depicted object.

The focal point is finding different sources of motivation for studying this subject and keeping the student's interest.

2. Seeking the motivation. One possible way is pointing out the connection of the subject to other subjects taught at the engineering majors.

Other possible way is explaining how the subject is connected to their future work as engineers and architects. For example, pointing out that the first projection of the object is the plan and that the second projection is the facade that makes Monge projection more perceptible.

The usage of models of the solids that are depicted proves to be a very helpful idea, too. The usage of a descriptive triangle for showing the ideas of steep, horizontal lines of an inclined plane or for orthogonal projection of a line and many others seems helpful,

too. Showing by visual aids how a plane orthogonal to the projection plane is projected as a line or how a line orthogonal to the projection plane is projected as a point and every other concept possible improves the stereometric understanding of the students.

The teacher should be “contagious” with all these ideas, be energetic and slice the rotational cones and the other objects that are depicted to fragments so there is no time for the students to turn to their smartphones for something more interesting. Apparently, the mood, the humour of the teacher and the proper attitude towards the students are highly important during the classes.

In Descriptive Geometry the succession of the material is still highly controversial. Should we start with Monge projection or better with Axonometric projection. As the Axonometric one is closer to the human perception most of the students reply that it is better to start with it. Starting with Monge projection could be very demotivational and even students with well-developed stereometrical thinking might meet difficulties.

A big challenge is to explain some of the algorithms in such a manner that they are understood stereometrically and not learnt by heart. For example depicting a plane sections of rotational cones is one of the easiest problems at the exams but more than 50 percent of the students tend to learn it by heart. It proved an useful experiment to ask the students to make a paper models with the needed size and place them on the drawing board while solving the problem. Again by all kinds of visual aids like using a paper for the intersection plane and vertical papers for the second and third projection planes during the whole process helps understanding step by step the stereometrical ideas of the solution.

Apparently the “vividness” of the language used during the lectures is very important. Some of the more old fashioned and more scientific terms might be replaced by more lively and appealing for the students terms. For example when drawing an object in Monge projection, instead of “first projection plane” one might use the “floor” and “second projection plane” might be called the “blackboard”. Such “replacements” keep the attention of the students during the class.

Evidently, consultation (given as complementary hours during the week) are very beneficial, too. Many “shy” students use them to ask their questions and to clarify the ideas explained at the lectures. One method that seems to give promising result at the exam is to have an additional lecture two or three days before the exam in which problems from previous exams are being solved. This clarifies the material and calms the students. Even so, about 30 percent of the students fail the first exam. But after attending few more consulting hours most of them pass and some of them with a higher mark.

It is important to mention that students from major Architecture are highly motivated in studying Descriptive geometry. They have less problems with understanding the stereometric ideas and only about 10 percent fail the exam.

All of the above lead to the making of the following poll given to 21 students first year studying Civil-engineering and Transportation engineering:

Assess your motivation level to study Descriptive Geometry, based on the following reasons using the numbers between 1 and 5 (here 1 means – it does not motivate me; 2 means – it motivates me a little; 3 means – it motivates me partially; 4 means – it motivates me; 5 means – it motivates me, definitely):

- 1. Helps in improving my 3D imagination – assessed 4.05;**
- 2. Will be useful in my future engineering work – assessed 3.67;**

3. It is connected to other subjects that I study – assessed 3.24;
4. I need to pass the exam – assessed 3.38;
5. The method of stereometrical explanations during the lecture – assessed 4.48;
6. The experience, attitude and the way of teaching of the professor – assessed 4.67;
7. The understanding of the subject and the knowledge will improve my image in class – assessed 2.95;
8. I fear failing on the exam – assessed 2.48;
9. My classmates made the subject interesting and clearer – assessed 1.76;
10. Other (give any other reasons for motivation if you have any – assessed 2).

The poll shows that the first three reasons for motivation for studying Descriptive geometry are the experience and the attitude of the professor and that the subject improves the stereometrical imagination.

Two of the students gave as an additional tenth reason that the subject is interesting.

3. Conclusions. Ways must be found to convince the students in the usefulness of descriptive geometry in their future engineering. This will increase their motivation to study. Numerous examples must be given during the semester how Descriptive geometry is connected to other subjects that engineering students have.

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МОТИВАЦИЯТА ЗА ИЗУЧАВАНЕ НА ДЕСКРИПТИВНА ГЕОМЕТРИЯ

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Потърсени са различни причини за мотивация за изучаване на Дескриптивна геометрия от студентите от инженерните специалности. Направена е анкета и е анализирана. Заключение са направени за два възможни начина предметът да стане по-привлекателен за студентите.