

## Ways of evaluating the knowledge of descriptive geometry

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**Abstract:** The paper analyzes different ways of examining students, in evaluation the knowledge gained from the discipline of descriptive geometry. There are presented the results of evaluations using three ways: oral examination, grid test and mixed evaluation, grid test combined with oral examination and the conclusions drawn.

**Keywords:** evaluation strategy, evaluating tools, portfolio, grid test.

### 1. INTRODUCTION

Education, considered as a system, operates with the elements shown in Figure 1. Input stream represents human and material resources, and output stream, the graduates who have acquired skills and competences as a result of the system. The transformation of the first element is through the education process, which commits the resources to achieve the desired goal, that is obtaining the third element.

Evaluation is a major component of the educational process, along with teaching and learning.

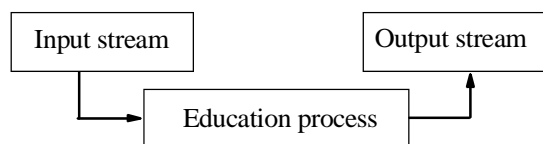


Fig. 1 Elements of the education system

When designing the evaluation process, it is envisaged, firstly, establishing the purpose for which it is made, thus delimited from other types of activities.

Success of the evaluation process depends on the consistency between goals, objectives, instruments and the degree of communication between those involved.

Evaluation may be related, generally, to certain purposes such as:

- substantiation of some decisions;
- awareness of certain issues;
- influencing the development of the educational system.

Establishing the evaluation strategy has a great importance, then influencing the student learning strategy as well as the teaching of the teacher.

Evaluation is a multidimensional process and according to the criteria to which it relates we distinguish several types of evaluation.

Among the most commonly used evaluation strategies are the normative and the criteria evaluation.

Normative evaluation compares a student's performance, with that of another student or a rule, a standard. Rules which may be referred to are:

- general and transversal professional skills established in qualification profile at the national level;
- learning outcomes (skill) described in the schedule of discipline and/or specialization.

Criteria evaluation measures student's individual performance in reference to a specific educational goal. It can manifest through detailed evaluation, exploratory evaluation and diagnostic evaluation.

Analyzing how the assessment integrates in the development of teaching process, we can identify:

- initial evaluation, conducted at the beginning of the first semester of the first year, to establish the level of knowledge that students have from the high school. This is very important, clarifying the teacher on the partition "Prerequisites" in the discipline sheet. Knowledge and skills with which are gifted students, are essential for the assimilation of new content and formation of other skills, necessary for the next activity and profession of engineer;

- formative evaluation, that accompanies all didactic stages. This can run on the application work and less on teaching/course;

- summative evaluation, which is usually done at the end of the semester through the session exam.

Optionally, for students who want, it is recommended the organization of partial exams, which, by their promoting, decongests the session of a part of matter.

For maximum efficiency formative and summative evaluation should be applied in tandem.

To current, formative evaluation it is followed the correlation that must exist between three aspects related to:

- the skills that are intended to be evaluated;
- the content elements that are subject specific to be evaluated;

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- criteria for scoring, materialized through the announced scales.

Formative evaluation is done throughout the semester, during learning, so that its success depends very much on the frequency of application.

Evaluation has a number of functions with multiple implications in the work of the teacher and student. Among these are followed ascertain, diagnostic, prognostic and motivational function.

## 2. METHODS AND EVALUATING TOOLS

Instruments by which we can achieve the assessment are divided into two categories (Fig. 2):

- traditional methods;
- complementary methods.

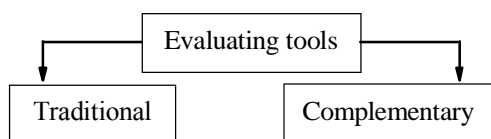


Fig. 2 Evaluating tools

Teacher must constantly improve the evaluation practice, combining traditional and complementary methods.

Traditional evaluation is done through written tests, oral tests and practical examinations.

Usually, at this type of evaluation the student is not directly involved. He perceives from the outside the evaluation process, by the fact that he is subject to intervention by the teacher, which is the one that comes with the proposal: when, how and what is assessed.

Oral tests are characteristic mainly to the subjects that involve demonstration of skills and abilities that are difficult to be captured by written tests. These have the advantage of offering the possibility to switch the type of questions and the difficulty level depending on the quality of students' responses. It also provides the opportunity to clarify and correct students' possible errors immediately and allow direct interaction between teacher and student.

The disadvantage of oral tests is that the number of students examined in unit of time is lower and there is a difficulty in maintaining the level of exigency throughout the examination.

Written tests have the advantage of allowing the evaluation of a large number of students per unit of time, reduce the subjectivity of grading, and the shy and introverted students prove easier the level of knowledge.

The disadvantage of written tests is that students can not receive support from the assessors and there is a delay in time of the moment of correcting some mistakes or supplementing the gaps. Also, from the point of view of the assessor, the test having 2-3 subjects, there is no possibility to know the degree of mastery of all subjects.

Traditional evaluation tends to be increasingly replaced by complementary alternative evaluating.

Complementary evaluation consists of systematic observation, essay, investigation, design, portfolio, self-evaluation or evaluation test.

Complementary methods of evaluation have a great formative potential. They aim to draw from the students what they know, as a set of knowledge, in relation to what they can do, with reference to skills, abilities, competences, in a variety of contexts and situations. They lead to a real teacher-student partnership. Thus, the student has the opportunity to evaluate oneself, to self-correct, to adjust the learning style, to express his creativity and critical thinking. All these take place in classes of applications, under the guidance of the teacher, who becomes a learning facilitator, in the student-centered learning.

Systematic observation of student involvement in practical applications is an action that takes place hour after hour and provides useful information for the teacher in the classification of students.

The essay is intended to stimulate student interest in deepening and broadening knowledge in general and is less applicable to graphic disciplines.

Portfolio is a complex instrument of evaluation, consisting of a presentation file of some themes. This is the student's card in a particular subject and highlights student progress from one application to another throughout the semester. Portfolio, as a complementary, evaluation method, allows activation of all students. It is a method that raises student interest and if the objectives of evaluation are clearly communicated at the beginning of the semester, provide constant concern from the students for their realization. The advantage of portfolio is that it facilitates the link between learning and implementation, individualizes and supports the learning approach. The disadvantage lies in favor of presenting issues to the detriment of content and relatively high duration of checking and valuating the portfolio.

The grid test is a tool and a method of evaluation, which has the item as a specific element requiring memory, logical thinking and imagination. The item is found to be a question or statement, with or without graphics, followed by several answers. The answer can be one, several or none correct.

Complementary methods of evaluation must be balanced integrated in the final evaluation, ensuring differentiated instruction.

## 3. EVALUATION OF GRAPHICS DISCIPLINES

Graphic disciplines by their nature present a special character in the evaluation. Thus, the design of assessment strategy was annually improved.

If many years only traditional evaluation through oral tests was applied, starting this year it was combined with the grid test and portfolio. They began to use this strategy because the students' graduation level decreased from year to year (Fig. 3 and Tab.1).

For completion of work during a semester, students receive at the beginning of activities, the evaluation criteria that will be pursued.

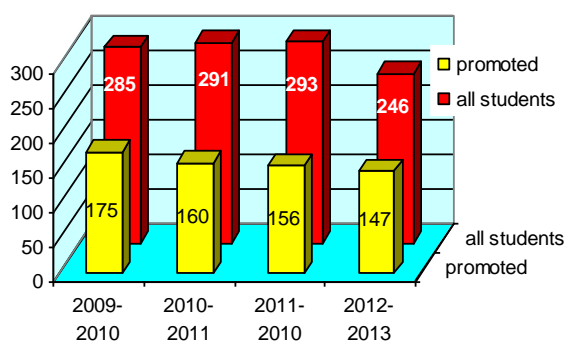


Fig. 3 Students' graduation level

Table 1 Graduation level %

academic year	%
2009-2010	61
2010-2011	55
2011-2010	53
2012-2013	60

Weekly applications work ends with a portfolio of papers, which have themes presented at the beginning of the semester and which are solved / corrected every week. Doing homework from portfolio aims to develop creativity and imagination, the ability to reformulate and generalize a problem and in the first place education of space view.

This leads to a great receptivity of students for teaching material and a more accurate understanding.

The first part of taught material is assessed through a grid test, that includes 20 simple questions or accompanied by some graphics, with three possible answers.

	a	b	c		a	b	c
1.				11.			
2.				12.			
3.				13.			
4.				14.			
5.				15.			
6.				16.			
7.				17.			
8.				18.			
9.				19.			
10.				20.			

Fig. 4 Grid for answers

The student choose the correct answer that can be one, two or none of the choice, and marks it in a table (Fig. 4). The correction is made using the grid for correction (Fig. 5)

	a	b	c		a	b	c
1.				11.			
2.				12.			
3.				13.			
4.				14.			
5.				15.			
6.				16.			
7.				17.			
8.				18.			
9.				19.			
10.				20.			

Fig. 5 Grid for correction

This part of the discipline of descriptive geometry, including projection systems, representation of the point, line and plane, relative positions and methods, was also the subject of a partial exam, organized mid-term of the semester, held similarly.

It was adopted the assessment through grid test of these terms, because they are also evaluated indirectly, being at the base of solving problems related to geometric solids.

The second part of taught material is evaluated orally, through problem solving. Several objectives are pursuing such as: understanding of data and requirements, selection of the information needed to solve, from the total of knowledge, choosing the method for solving, identifying obtained outcomes, generalizing learned solving techniques.

Oral evaluation, although it is labeled as a traditional method, was focused on dialogue, qualitative research rather than quantitative measurement of learning process developed by students in session.

In assesion from the first session, the student actively participate in the evaluation process. An important element is the teacher face to face discussion with students on the obtained results, being able to self - evaluating followed by recommendations for the future. Thus, the student can self-evaluate, single motivating a possible failure in the exam.

On the subjects related to the second part of the material can be found problems related to geometric solids (prism, pyramid, cylinder, cone, sphere) and to their intersection. A disadvantage is the difficulty of selecting, for all examined students, problems with the same level of difficulty and the same estimated time to resolve.

To eliminate this disadvantage are established certain rules on the difficulty of the subjects, their formulation being made clearly and precise,

unambiguously, similar to problems dealt in applications during the semester.

It is necessary to put emphasis on the presentation of the solving, as it is a graphic discipline. This involves a specific organization of the graphic solving, to highlight the adopted method and to enable the corrector to follow, easier, problem requirements.

Oral evaluation eliminates the possibility of fraud (copy). The teacher can ask student to motivate the solve to a specific problem and argue it, just as he also can help with additional questions when they are in trouble.

#### 4. CONCLUSIONS

There are many “for” and “against” arguments for exclusive use of one or another proven evaluation methods. In fact, over the time it appeared that their combination is the best solution.

Combined evaluation of grid and oral tests revealed better results, increasing the graduation level.

Oral test was preserved in the final evaluation, given the need to train at the students

qualities in terms of communication, creativity, autonomy and making decisions.

Student of the first year have to be learned to study efficiently, every day, even if the assessment is made at much larger intervals of time than in high school, goal achieved with the portfolio.

Exercise through portfolio provides students to exercise practical skills – application and integration of graphic notions into the knowledge acquired system, which then become operational.

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