

CONSTRUCTING THE SKETCH AND THE DRAWING AT A PROPER SCALE OF AN OBJECT

Abstract: *This paper presents a teaching activity having the topic „Constructing the sketch and the drawing at a proper scale of an object” and is addressed to the teachers who teach technical drawing in technical university education, but also to the students.*

The paper represents a help both for the professor in achieving learning objectives, but also for the students who need to understand easily the information and knowledge required by other fields.

Key words: *technical drawing, teaching, objectives, teaching method, knowledge, skills.*

1. INTRODUCTION

Teaching is the action of pedagogical communication, promoted and harnessed by the teacher, in an organized setting, especially at formal and non-formal level, according to the learning objectives. Teaching is conceived by the teacher in the form of a complex process consisting of several stages such as: initial elaboration of the pedagogical mix, completion of the pedagogical message, realization of the pedagogical message at the level of the common repertoire between the teacher and the student, the confirmation of the pedagogical message at the reception and its awareness at the level of pupils and the improvement of pedagogical skills [3], [4].

Teaching the subject Technical drawing determines the specificity of drawings both at lectures and seminars. This requires the use of special tools and paper. All drawings are executed according to state standards.

Several teaching methodologies will be used in teaching-learning-evaluation of the technical drawing discipline: lecture, explanation, case study, Front Page, PowerPoint presentation, video material. The study of this discipline allows students to familiarize themselves with the representation and determination of objects and surfaces, with the rules and conventions established by state standards [4].

2. CONSTRUCTING THE SKETCH

The sketch is a drawing executed with the free hand, in pencil, in a format corresponding to a clearer and complete representation, which is the basis of any technical drawing. The sketch can be made at an enlarged or reduced scale, by a visual approximation, and serves to construct drawings. If the sketch is completed with the required data regarding the dimensions, the surface condition and the shape and position deviations of the surfaces, it can also be used as a drawing [1].

The necessity of drawing the sketch, as the model, results also from the following situations:

- not always the parts, objects or objects to be redesigned can be dismantled, transported and drawn in the design workshops;
- drawing up the sketch firstly, and then the execution drawing, removes any mistakes of representation, saving time and materials.

Achieving the sketch of an object involves two main steps:

- the stage of observations and study of the part or object to be drawn;
- the graphic design stage of the sketch.

3. THE DRAWING AT A PROPER SCALE

Scale drawing contains the shape and real dimensional elements of the object required to execute it. Scale drawing is done on white paper, with tools or on a computer using a computer-assisted graphics software package, taking into account a certain scale [1].

- The drawing scale is chosen according to SR EN 5455: 1997, depending on the size and complexity of the part so that the representation is as clear as possible.

- Decrementing the size of the format is based on the selected replay scale of the number of projections in which the part is represented and the space required for the dimension, the free space between projections.

- The thickness of the drawing line is chosen according to the complexity of the drawing, according to SR ISO 128-20: 2002.

- Part representation and quoting requires the following steps: Layout on format of the minimum rectangles for stacking the projections, plotting the symmetry axes, drawing of outer and inner contours with thin line, enrollment of quotas and tolerances, hatching of sections, thickening of the edges, marking of roughness surfaces, deviations of form and position, notation of the sectioning paths.

- Enroll the notes, comments, fill in the indicator, etc. on the drawing.

- Check the drawing by comparing it with the sketch, checking compliance with the rules representation, rating and drawing on drawing [1].

4. DIDACTICAL DESIGN OF THE CHOSEN THEME

Didactical design is a continuous, permanent action that precedes the instructional and educational approaches, regardless of their size, complexity or duration [3], [4].

The didactic design starts from a content set by the curriculum, which includes the general competences of

the education, the specific competences and contents that are unique at national level. It completes the development of some useful tools for the teaching staff: the thematic plan and didactic / lesson projects, to the elementary training sequence.

Designing the lesson involves a forward-looking approach, based on an algorithm that correlates the following questions:

1. What will I do? - Identify the objectives of the lesson. The objective shows us "what is being followed in every sequence of the educational process and how to evaluate the achievements achieved".

2. What will I do? - Resource analysis:

- Human resources: student (personality traits, interests, learning needs); the teacher (scientific and psycho-pedagogical training, communicative competence);
- Teaching content resources: the set of educational values (knowledge, skills, abilities, attitudes) that are the subject of the teaching / learning process; the selection of the didactic content is made according to the identified objectives, based on the informative materials with didactic character;
- Material resources: teaching materials and technical means that can contribute to the efficiency of the activity;
- Place of activity (classroom, laboratory);
- Time available for a teaching activity.

3. How will I do? Elaboration of the optimal didactical strategies. The effectiveness of didactic activity depends to a great extent on the quality of the process of selecting and correlating the most appropriate methods, means and teaching materials.

The main factors contributing to selecting and combining methods, materials and means into a didactic strategy are:

- specific activity (communication / acquiring knowledge, evaluation);
- the operational objectives identified;
- psycho-pedagogical context of training (level of training);

- the material context of the training (available materials and teaching aids);
- the teacher's style and personality.

4. How will I know if I have achieved what I have proposed? Elaboration of evaluation tools.

This stage involves the choice of evaluation tools appropriate to the objectives proposed, their use at certain times of the activity, as well as the interpretation and use of the results in order to optimize the activity and the training of the students.

The success of a lesson is due to the fact that the activities carried out represent a unitary one, serving to achieve the goal pursued [3], [4].

4.1 Reference objectives:

- O1 - acquiring the notion of numerical scale;
- O2. -training skills to realise drawings on a scale;
- O3 - model analysis and representation;
- O4 - using technical terms;
- O5 - forming and developing three-dimensional vision.

The reference objectives specify the expected learning outcomes and follow the progress of skills and knowledge [4].

Reference objectives have activity targeting and orientation functions, and their clear formulation is an essential condition for achieving the expected performance.

4.2 Operational objectives

Operational objectives are objectives that represent a reflection of learning outcome and the progress of the student.

Formulating learning objectives must be made so that it can be found in the behaviour of students, respectively, in what they know and are able to do.

The operational objectives which are pursuing at constructing the sketch and the drawing at a proper scale of an object are shown in Table 1 [4].

Table 1

Operational objectives				
Code	The ability to form	The behavior certifying training	Terms of achievement	The level of acceptable performance
OO1	To acquire the notion of "numerical scale"	Getting the notion of "numerical scale"	- Drawing Office; - Computer; - Software.	Reproduce the definition of "numerical scale"
OO2	To know the types of numerical scales	Knowledge of numerical scale used in drawing	- Drawing Office; - Computer; - Software; - Documentation sheets.	List the numeric scales used
OO3	To know how to draw drawings on a scale	Drawing scale drawings	- Drawing Office; - Worksheets; - Parts.	Draw two of three scale drawings
OO4	To identify (differentiate) sketches / drawings on a scale	Identify sketches and scale drawings	- Drawing Office; - Worksheets; - Parts.	Identifies how to realize and differentiate sketches and scale drawings

4.3 Content:

Content is defined not only in terms of knowledge, but also in terms of principles, attitudes, skills, and value system.

The content of teaching / learning is carefully dimensioned because the information transmission can take place.

The content of learning is the means by which specific competencies are being developed. The correlation between specific content and skills allows the teacher to realize the connection between what is being learned and the purpose for which it is learned.

The content areas in constructing the sketch and the drawing at a proper scale of an object are presented in Table 2 [4].

Table 2

Content	
Code	Area of Contents
C1	The phases preceding the execution
C2	Stages of execution of sketch
C3	The phases of drawing

4.4 Appropriate knowledge and skills:

The formation of knowledge and skills requires appropriate strategies. This is associated with the trans disciplinary character of competence formation, translated into integrated training strategies.

Appropriate knowledge and skills are:

- Knowledge of the tools used in the drawing;
- Knowledge concerning the formats used in technical drawing;
- Knowledge about scales representation of the parts;
- Knowledge about conventional representations in industry.

4.5 Resources used at the lesson:

The quality of the material resource of the educational process is attributed to any material used in the educational process.

This category includes educational resources, technical equipment and training environments.

The resources of education through electronic presentations of information have enhanced the possibilities of organizing the training. They allow the development of an accessible and considerable amount of knowledge.

In Table 3 are presented resources used at the lesson about constructing the sketch and the drawing at a proper scale [4].

Table 3

Resources used at the lesson	
Code	Type
R1	Sketches
R2	Documentation sheets
R3	Worksheets
R4	Self-assessment sheets
R5	Parts
R6	Computer

4.6 Learning/teaching methods:

The didactic methodology sums up the system of pedagogical methods used in the training, plus the means of education, which leads to the achievement of the proposed objectives.

Education methods are constantly evolving, due to information and communication technology, as well as by their orientation towards the efficiency of the training process from the perspective of permanent education.

Table 4 presents learning/teaching methods used at the lesson about constructing the sketch and the drawing at a proper scale [2], [3], [4].

Table 4

Learning/teaching methods	
Code	Method
M1	Heuristic conversation
M2	The explanation
M3	The exposure
M4	Case study
M5	Practical application
M6	Exercise

4.7 Organizational form of the class:

In Table 5 it is presented the organizational form of the class used at the lesson about constructing the sketch and the drawing at a proper scale.

Improving the learning process involves creating an organizational framework of the proposed educational and training objectives.

In organizing the learning process is followed the optimal combination, according to the objectives pursued, of the main forms of activity: the front, the groups and the individual [4].

Table 5

Organizational form of the class	
Code	Form
F1	Frontal
F2	Individual

4.8 Training organization chart:

Instructional design is defined as a process of analysis of the skills, knowledge and learning goals and design, a transfer system to ensure the meeting of these needs.

The design of the training is conceived as a detailed anticipation activity of what the professor is going to accomplish within a framework of stability stereotyping.

Instructional design involves organizing and ordering the material to be taught, learned and assessed the correlation between teacher and student.

The design of the training includes four concrete operations: defining the pedagogical objectives, setting the content; applying the methodology and ensuring the evaluation of the didactic activity.

In Table 6 it is presented the training organization chart used at the lesson about constructing the sketch and the drawing at a proper scale [4].

The training organization chart contains areas related to each teaching objective [4].

Table 6

Training organization chart

Training sequence	Objectives	Content	Forms of organization	Teaching methods	Resources	Evaluation Criteria
1. Organizational sequence: ensuring the conditions necessary for the good development of the lesson.		verification of the class, attendance, classroom organization	F1	M1		
2. Checking and assessing the level of knowledge	O4 O5		F1	M1		
3. Creating the conditions for new knowledge	O1 O2 O3 O4 O5	C1 C2 C3	F1 F2	M1 M2	R1 R2 R3 R5 R6	Formative - Cognitive - Quantitative - Qualitative
4. Introducing new knowledge	O1 O2 O3 O4 O5	C1 C2 C3	F1 F2	M1 M2 M3 M4 M5 M6	R1 R2 R3 R5	Formative - Cognitive - Quantitative - Qualitative
5. Feedback	O1 O2 O3 O4 O5	C1 C2 C3	F1 F2	M1 M2 M3	R1 R2 R3 R5	Formative - Cognitive - Quantitative - Qualitative
6. Evaluation	O1 O2 O3 O4 O5	C1 C2 C3	F2	M5 M6	R4	Formative - Cognitive - Quantitative - Qualitative

4.9 Evaluation:

Performance evaluation represents the achievement of the established objectives. Based on evaluation activities, it is obtained the students motivation and receiving continuous feedback, which allows the operative correction of the learning process.

Table 7 presents the type of evaluation used at the lesson about constructing the sketch and the drawing at a proper scale [4].

Table 7

Evaluation		
Type of evaluation	The evaluated content	Scoring scale
Current	C1 C2 C3	According to the scale

5. CONCLUSION

The design of a teaching activity about constructing the sketch and the drawing at a proper scale presented in this paper shows a didactic scenario, how the didactic activity will be conducted, specifying the objectives, the resources, the teaching strategy, and the evaluation system.

This type of application helps students to develop specific abilities and skills.

The paper represents also a help for the professor for conducting the lectures in order to achieve the learning objectives.

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