Adaptation of teaching methods to the requirements of the postgraduate labor market in the field of oceanography and bathymetry

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Introduction

Smart technologies are advancing at a rapid pace as scientific processes develop through IT technology. The economic and industrial competition requires the implementation of these technologies at the level of companies, as well as the preparation of human capital for their use. Therefore, education systems need to constantly adapt to the demands of the labor market, in terms of delivering skills to pupils/students, skills that are anchored in the real world. This is done by:

- the relation of the educational institutions with the labor market, by making a permanent contact with the business environment;

- developing the teaching base with equipment to simulate the processes of new technologies;

- adapting the curriculum to new technologies and labor market training requirements;

- implementation of new teaching/learning/assessment methods that will rise to the level of expectations of pupils and students and the labor market in terms of knowledge delivery;

- adapting the teaching process to modern teaching tools, which will stimulate the student in understanding the processes and functions of new technologies.

The maritime industry is no exception to these technological realities by requiring universities to deliver skills to students through new technologies, as well as to support their implementation in companies, by funding research and development projects.

In this regard, to the requirements of the maritime industry, ANMB and NTNU, as partners in the Marintech project, adapt their curricula and teaching methods to deliver specific skills to master students in areas such as industrial robotics, machine learning, and oceanography. and bathymetry.

2 modern teaching methods can be adapted within these universities for the delivery of specific skills to students in these areas of interest, namely:

- the computer simulation method;
- the scientific research method.

Also for stimulating students' interest during lectures and seminars there are 2 modern teaching tools, such as *PowerPoint presentation and Prezi*.

A. The method of learning by computer simulation

The simulation is based on the imitation of real activities, aiming mainly at the formation of professional behaviors, in this case - the training of students in technical skills and abilities in the simulated field. This activity relates the exercises/situations, proposed to be stimulated, to the past or potential-future experiences of the participants. The case simulation method is student-centered and used as a classic learning method: the game method, the experiential method.

Purpose of the simulation: By imitating a real system, students will learn to explore it, perform experiments/exercises in it, and be able to understand it before implementing it in the real world. Computer simulation is a particular case of the simulation method that is based on the use of hardware and software components to simulate real situations of the functional processes of the technique, as well as their use.

Computer simulators have two functions in the teaching/learning process:

- to simulate the functional processes of the technique, to acquire theoretical technical skills;

- to simulate the activities of exploitation of the technique, to acquire practical technical skills. Simulators can also simulate a certain technology (eg engine operation) or a set of technologies (eg integrated navigation system), or simulate activities (eg military tactical actions).

Applicability of the computer simulation method:

The method can be successfully applied both in initial training courses (university studies) and in master's and doctoral courses in technical disciplines because students enrolled in these courses have the necessary IT skills and are motivated to deepen their knowledge. in that area.

Case-based learning strategies

The specifics of the case simulation:

- provides didactic contents in a coherent, non-formalized form, recognizable by the student;
- uses real situations and data or specially designed for this purpose, but which simulate situations that can be encountered in reality;
- can be used in all fields through computer games, role-playing games, or building models;

True simulation has a specific purpose: by imitating a real system, we can explore it, perform experiments on it, and understand it before implementing it in the real world.

Simulation elements:

1. a scenario based on real data, even if it is sometimes simplified;
2. concrete data, which provide the basis for the decision or solution of the problem/situation;
3. an open-ended question, which allows the formulation of multiple answers, from different perspectives.

Stages for implementing the computer simulation method

Stage I
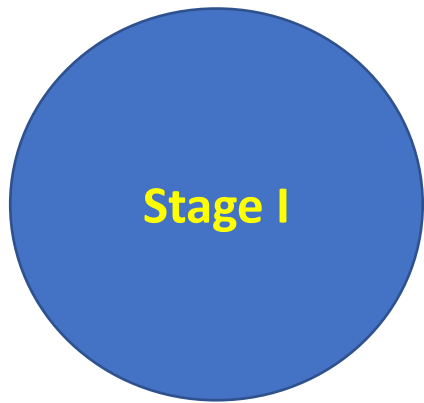
Identifying the real situation that lends itself to computer simulation;
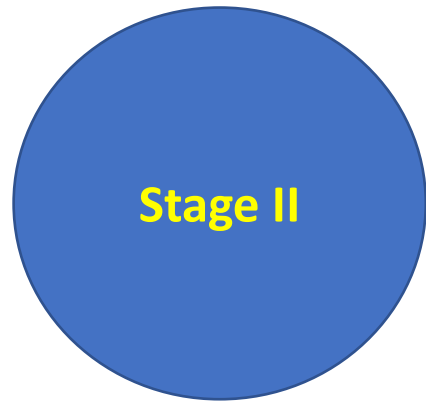
The role of the teacher:
- proposes real cases compatible with computer simulation;
- defining the purpose of the case, what are the purposes of the case? What do you want to achieve after simulating the case?

The role of students.
- can propose real cases based on practical experience to be simulated.

Stages for implementing the computer simulation method

Stage II

Situation modeling and scenario design

The role of the teacher:
✓ model each case identified in the simulator.

The role of the students:
✓ participates in modeling cases on the simulator.

Stages for implementing the computer simulation method

Stage III

Training students in accordance with the specifics and requirements of the simulation;

The role of the teacher:
- ✓ Presents the student simulator and simulation algorithms for each simulated case;

The role of the students:
- ✓ participate in training.

Stages for implementing the computer simulation method

Stage V

Individual learning of the role by each participant by studying the worksheet;
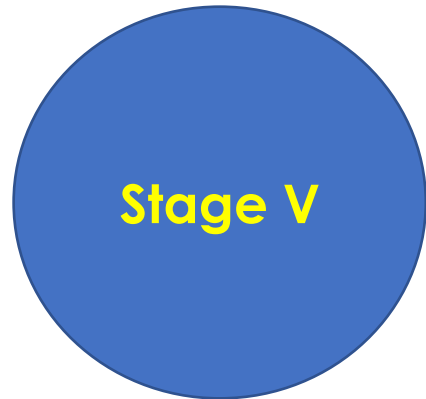
The role of the teacher:
- ✓ coordinates the learning of roles by students;
- ✓ assesses students' knowledge

The role of the studenților.
- ✓ each student learns the role they have to play in the simulation.

Stages for implementing the computer simulation method

Stage V

Interpretation of the roles of each student in the computer simulation
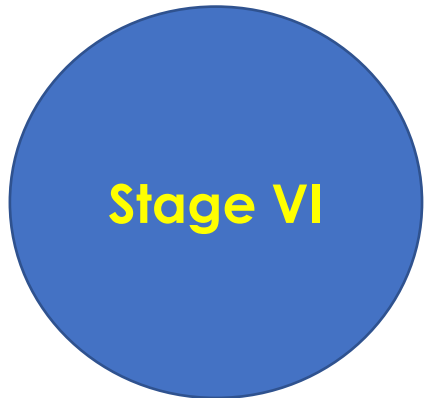
The role of the teacher:
- ✓ coordinates and supervises the fulfillment of the role of each student;
- ✓ assesses the performance of tasks by each student.

The role of students:
- ✓ each student performs the simulation tasks set by roles.

Stages for implementing the computer simulation method

Debate with all participants on how to interpret and resume the sequences in which the expected behaviors were not obtained

Stage VI

The role of the teacher:
- ✓ organizes the meeting after the end of the simulation;
- ✓ presents the conclusions of the simulation for each participating student;
- ✓ establishes and organizes new simulation sessions with the resumption of the sequences for which the expected behaviors were not obtained.

The role of students:
- ✓ attend the final meeting;
- ✓ master the problems presented by the teacher;
- ✓ participates in new simulation sessions to remedy the problems found.

B. The didactic method through scientific research (Inquiry-based Learning – IBL)

It is a modern method of active learning, by involves students in applied research. This method is based on uninterrupted initiatives and searches by the student.

The purpose of the method: is to train students to make systematic and independent observations on technical phenomena on a given topic in scientific research projects, the results of which can be presented in original papers, which will be presented in conferences scientific or published.

Applicability:

The method can be successfully applied in master's and doctoral courses in technical disciplines because students enrolled in these courses:

➢ have a knowledge base in the field;
➢ have experience in the individual study;
➢ have experience in organizing activities and teamwork;
➢ they are motivated to deepen their knowledge in that field.

Teaching strategies:

- ✓ Student-centered learning;
- ✓ Experiential learning;
- ✓ Discovery learning.
- ✓ Expository learning;
- ✓ Project-based learning.

General objectives of the method:

- ➢ competences in the field of scientific research;
- ➢ skills in the use of specific techniques and equipment;
- ➢ skills in the field of project management;
- ➢ competences in the field of data processing with statistical methods;
- ➢ teamwork skills.

The stages of the didactic method through scientific research

Stage I

Choosing the research topic

The role of the teacher:

It proposes project themes based on the research and development requirements of maritime industry stakeholders or that may be requested by companies. In this sense, experts in the field of the maritime industry will also participate in the elaboration of research topics.
- ✓ organises research teams on research topics according to the initial competencies of the students.
- ✓ assists in substantiating the need to address proposed research topics;

The role of the students:
- ✓ may propose design topics based on practical experience in the field.
- ✓ participates in defining the name of research topics;
- ✓ substantiates the need to address the research topic established for each team.

Documentation-observation of facts, data collection, and classification, and complex theoretical training of the researcher.

Stage II

The role of the teacher:
- ✓ defines the documentation directions for each team;
- ✓ provides courses, bibliography, technical documentation, STAS, etc. provide access to databases;
- ✓ coordinates the documentation activity.
- ✓ provides access for documentation to companies in the researched field.
- ✓ gives lectures on the research method and project management.

The role of the students:
- ✓ collecting and processing up-to-date information on the project topic,
- ✓ Identifying new ideas that will be brought through the research topic;
- ✓ identifying the methods and means of solving the problems imposed by the project.
- ✓ participation in teacher's courses.

Establishing the methodology of the research activity

Stage III

The role of the teacher:
- ✓ coordination and provision of technical assistance in developing the methodology of the research activity.

The role of the students:
- ✓ formulating working hypotheses for the research topic;
- ✓ choosing the most appropriate hypothesis based on the problems formulated and the analysis of the initial information collected;
- ✓ choice of working methods and techniques for collecting and analysis of the data that the researcher will use in the explanation of phenomena related to the object to be researched;
- ✓ establishing the list of means necessary for research, they being related to research techniques;
- ✓ designing the organization and deployment logistics of some field research on scientific "dialogue" with samples of representative persons/subjects.
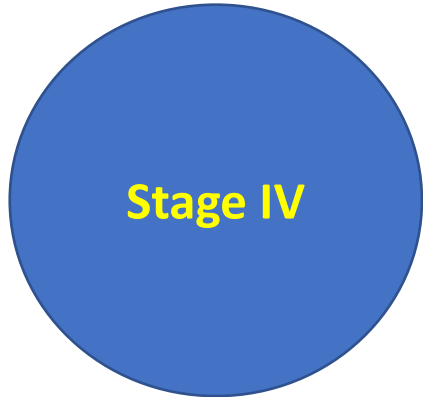
Theoretical research

The role of the teacher:
- ✓ coordination and provision of technical assistance for the conduct of theoretical research by students.

The role of the students:
- ✓ synthesizing and analyzing the basic laws given by the basic sciences about the studied object, by:
  - ▪ mathematical, imaginary, and computer-aided modeling of possible solutions to the problem;
  - ▪ trying to solve key questions related to problems at the abstract level, including philosophical;
  - ▪ the search for systematizing ideas in the history of analogous problems;
  - ▪ breaking down the problem into subproblems;
  - ▪ the transition from general to private knowledge;
  - ▪ pre-selection of investigation methods.
- ✓ synthesis of data obtained from theoretical research.

Stage IV

The stages of the didactic method through scientific research

Stage V

## Applied (experimental) research

The role of the teacher:
- ✓ providing logistical needs for research;
- ✓ experimental: specific research technique, measurement, and control equipment, research laboratories, etc .;
- ✓ coordinating and providing technical assistance for experimental research activities.

The role of the students:
- ✓ performing experimental works based on the established methodology;
- ✓ collecting data obtained from experimental works;
- ✓ setting results.

The stages of the didactic method through scientific research

Stage VI
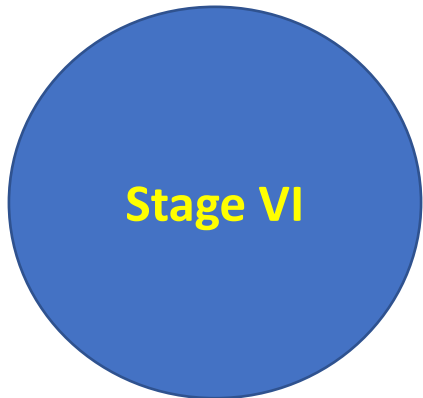
## Processing and interpretation of empirical data

The role of the teacher:
- ✓ providing logistics for the equipment needed to process empirical data: computers, software, etc.
- ✓ coordinating activities and providing technical assistance.

The role of the students:
- ✓ checking the experimental results by comparing them with the existing ones;
- ✓ interpretation of empirical results in the light of general theories;
- ✓ substantiation and theorizing of the obtained data;
- ✓ interpretation of data obtained in light of the essence of the problem and the working hypothesis.

The stages of the didactic method through scientific research

Stage VII
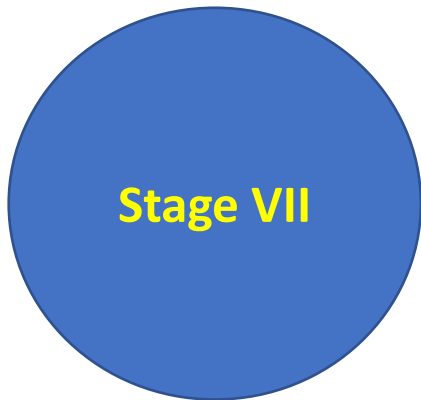
Elaboration of final data

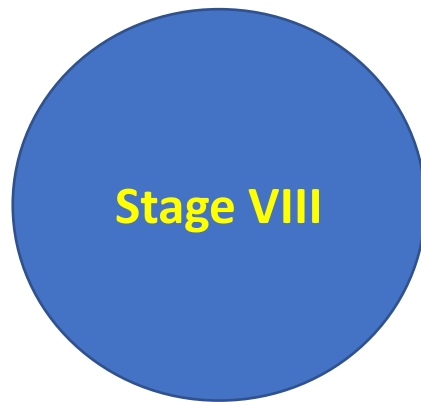**The role of the teacher:**
- ✓ coordinating activities and providing technical assistance

The role of the students:
- ✓ presentation of data obtained by: elaboration of graphs, diagrams, tables, videos, and models to explain the data obtained;
- ✓ formulating scientific conclusions and recommendations based on the results obtained.
- ✓ preparation of technical-scientific documentation of the project.

The stages of the didactic method through scientific research

Stage VIII

Presentation of research results

The role of the teacher:
- ✓ coordination in the elaboration of the technical-scientific documentation of the project;
- ✓ coordination in the elaboration of scientific articles to be presented at conferences in the field.

The role of the students:
- ✓ elaboration of the technical-scientific documentation of the project;
- ✓ elaboration of scientific articles to be presented at conferences in the field.

MODERN TOOLS USED FOR LECTURES

The main modern tools that can be adapted for the presentation of courses and seminars in the disciplines of oceanography and bathymetry are Powerpoint, Prezi, and video presentations.

The PowerPoint presentation is a series of slides, connected by different animations. The application is oriented towards the processing of specific documents, respectively presentations use specific entities and concepts, other than those used by the applications studied in the Microsoft Office program set.

PREZI Presentation is an application that allows you to build presentations, both through the dedicated application and through an online interface.

PREZI is an alternative to the eternal PowerPoint and differs from it in that it has a non-linear approach to creating a presentation.

It is presented as a board, theoretically infinite, where you can spread the ideas you want to present.

Similarities between Prezi and Power Point

• Both programs are used in making presentations;

• Shapes and wallpapers are limited;

• Images, Gifs, audio, and video files can be inserted.

Differences PREZI vs POWER POINT

PowerPoint presentation is most often used and is done directly from your PC or laptop. this presentation consists of accessing several individual pages called slides. Slides can be created separately, as well as using a template or Slide Master. the presentation can be printed and displayed live on the computer or the projector screen with the video projector. PowerPoint Viewer is currently only available on computers running Microsoft Windows.

Prezi is a web application that makes it possible to design an attractive presentation. Provides a large space for entering information.

Organizing the content is easy, without having to set the presentation thread from the beginning. There are various ways to organize the content, as well as facilities to change the look of the presentation. Each material created is different from others that may have the same theme.

In Prezi, the information is not filled in different slides. The new content adds to the grid. Subsequent viewing is based on the successive zooming in or out of each content area.

The presentation is automatically saved on the site. When the computer cannot be connected to the Internet, a Prezi presentation cannot be performed.

The presentation can be downloaded from the Internet on the computer, but no changes can be made in the downloaded version, but by accessing the account created on http://prezi.com.

How to access Prezi?

Online and surprisingly fast.
- ✓ All you have to do is log on to https://prezi.com and sign up.

- ✓ The online interface saves your project on the Prezi server.

- ✓ The frequency of rescues is high, you will not lose anything even if the internet network fails.

- ✓ Another quality of the online interface is the ability to invite someone to see your presentation or, even more useful, to work with you to build it.

Steps to follow ... PRICES

Access the site: https://prezi.com

- Get started
- Continue with public presentations
- Create an account /sign up with Facebook or with LinkedIn
- Log in
- New Prezi
- Template
- And now we can start playing!

https://youtu.be/Hqw0PzOTqOY

Choice of theme ...

Prezi allows us to choose our favorite theme for the chosen template to create a background as attractive as possible to our presentation.

Insert option ...like comment share

✓ Insert a video clip from youtube. This is done very easily and quickly by obtaining

   Insert-Youtube video-inserare link.

✓ Inserting an image from your personal computer or here comes the novelty from the images recommended by Prezi or directly from the internet by obtaining:

   search images on the web.

✓ Possibility to insert a sound background for presentation by obtaining

   added background music.

✓ A new aspect is the possibility of inserting a PDF document in the presentation.

How is it saved?

Save mode:

✓ automatically in your Online Pricing account as you work and tells you this, showing the time of the last save at the top of the badge
✓ have the opportunity to come back later to edit the presentation.

How to share?

Prezi offers us the possibility that from the **Share** option we can share our price online by generating a link to the presentation or the possibility to invite someone to see our presentation or as an editor.

How can we download the presentation?

Shared a Link

•From the Share option we can download our Prezi presentation on our computer through the download as portable Prezi option or we can download the presentation as a Pdf document.

Video presentations

Video presentations are used to present certain phenomena, functionalities of the technique, simulations in operation, methods of using the technique, etc. to deepen their learning by students.

There are several sources of video presentations, such as youtube, real videos, etc.

These movies can be edited by editing, adding subtitles, collating multiple movies, and more. There are several editing programs that we can access in this regard.

There is also the possibility to turn a presentation into a video in which all its elements (narration, animation, indicator movements, timings, etc.) are saved in the actual presentation. In essence, the presentation becomes a video that students can watch at any time PowerPoint, through e-learning platforms provided to students by the university.

To do this, you have two options for turning your presentation into a ready-to-watch video: Save/export the presentation in a video file format (.mp4 or .wmv). Save the presentation as a PowerPoint Exposure file (.ppsx). (A PowerPoint slide show appears on full screen in Slide Show, ready to be viewed immediately.).

More details on:
https://support.microsoft.com/ro-ro/office/transformarea-prezent%C4%83rii-%C3%AEntr-un-videoclip-c140551f-cb37-4818-b5d4-3e30815c3e83

Conclusions:

The daily reality determined by the pace of development of intelligent technologies requires educational systems to change the strategy of preparing human capital. One direction of change is to rethink all aspects of the teaching process, by replacing traditional teaching methods in which the teacher is a transmitter of information and the student a passive receiver, finally equipped with abilities, skills, and abilities valid more in school than in its evolution. with modern methods in which the student learns to think critically and strategically to solve various everyday problems, to have the ability to learn in a constantly changing environment, to be able to build their knowledge on sources numerous, from several perspectives, and be able to collaborate locally and regionally. The two teaching methods addressed in the presentation are student-centered and meet the current teaching/learning/assessment requirements imposed by both the labor market and human capital training expectations for current social contexts.

These methods can be successfully implemented in the technical university environment, as students have a system of knowledge acquisition, which facilitates their understanding of technological phenomena and processes in certain specific fields. They stimulate students to carry out activities based on interests and stimulate their motivation to know and adapt new knowledge to previous knowledge to integrate them into the realities of the labor market. By using these methods, the student evaluation process consists both of the evaluation of the process and the involvement of the students in the didactic activities, as well as the theoretical contents that they have accumulated.

No teaching method is perfect, but by implementing the labor market feedback method, by making permanent contact with market players and supporting them in the implementation and development of new technologies, these methods will be permanently improved. Modern teaching methods are supported by tools for the transfer of theoretical knowledge based on ICT technology. These tools, through their interactive design, arouse students' interest in accumulating theoretical knowledge during lectures. In this presentation, two of the main modern teaching tools were addressed, namely: the Powerpoint presentation and Prezi.

ANMB and NTNU, through the Marintech project, support the current labor market requirements of the maritime industry for the preparation of human capital in the fields of robotics, machine learning and oceanography, and bathymetry, by modernizing the curriculum and adapting new teaching/learning/assessment methods for training of master's graduates in these fields.

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