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Modern Digital Technologies Implementation in Marine Engineers Professional Training and It`s Influence on Their Image Formation

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Abstract. The study of the use of the Google-Education platform, namely Classroom in the information and educational environment of the Engineering Department of the Danube Institute NU "Odessa Maritime Academy" in future marine engineers` training and their impact not only on further professional activity but also on professional image development are presented in the article. The research was conducted in professional disciplines, namely "Technology of Materials and Repair of Ship Equipment", "Strength of Materials", "Marine Engineering Practice", "Descriptive Geometry and Computer Graphics". Concepts such as information and educational environment and professional image are considered, it is determined what skills future marine engineers should have. Google Classroom shows the process of manufacturing parts of ship's internal combustion engines on a lathe, the structure and principles of operation of ship's internal combustion engines, main engines, measuring instruments using photo and video resources from a dry cargo ship with a deadweight of 6093 tons. An express analysis of cadets and students on the introduction of remote form using G Suite for Education was concluded and it was considered that the proposed platform has a wide range of opportunities for use in the training of future maritime professionals due to its free and convenient. It was recognized that the structural component of the professional image of the future marine engineer is the presence of professional competence in inseparable connection with the possession of modern information technology.
Keywords: pedagogical conditions, digital technologies, professional image, marine higher institution, marine engineer

1. Introduction

The socio-economic development of Ukraine requires conditions that are related to human self-realization both in professional activities and in everyday life. With this approach, future professionals will be able to solve complex working issues that are aimed at solving modern problems of the relationship between vocational education and the labor market. All this depends not only on their vocational training, but also on their professional image: intellectual abilities, interacting abilities with society, find their place in the team, freely implement their professional and life plans and goals, be responsible for the results of their actions.

Due to adopted National Transport Strategy of Ukraine for the period till 2030, it`s necessary to say that the modern development of the transport complex should take into account not only the need to adapt to European standards, technical management principles, etc. and these innovations and high

technologies implementation are crucial in the formation of a new model of the future specialist and the further development of management of the transport and national transport system [7].

2. Analyses of the Literature Data and the Problem Statement

Researchers have paid much attention to the problems of development and introduction of information and communication technologies in the process of vocational training (V. Bykov, O. Burov, A. Gurzhii, T. Koval, O., Kolgatina, A. Kolomiets [3], V. Kremen, V. Kukharenko, N. Morse, O. Spivakovskii, O. Spirin, Y. Trius, S. Yashanov and others).

They confirm that in a relatively short period of time the use of the latest technologies in production will radically change production processes, and new technologies will lead to the expansion of the activities of the specialist and will require his production mobility. Various aspects of the introduction of digitalization in the educational process have been the subject of research by foreign scholars (K. Bassett, K. Gere, G. Griber, M. Deuze, G. Kriber and R. Martin, R. Bhandari [1], R. Clow [2], L. Manovich, J. Stommel, M. Hand and domestic (D. Galkin, M. Zhaldak, O. Kovnir [4], M. Leshchenko, P. Matyushko, O. Ovcharuk).

At the same time, it should be noted that the problem of the professional image formation of future specialists in maritime transport, especially marine engineers, has its own characteristics and is at the stage of scientific research and partial research. It should also be noted that there are a number of scientific studies (S. Glikman, M. Kulakova, O. Frolova, G. Popova, S. Smirnov, E. Bondarenko, V. Yagupov, etc.) that revealed some aspects of professional image formation of specialists in the maritime industry who are quite close to our problem.

In addition, the works of domestic scientists (L. Gerganov, U. Lyashenko, O. Denderenko, M. Babyshena, A. Yurzhenko) provide experience in solving problems of theoretical foundations of professional maritime education, and also with distance education. In particular, S. Voloshinov [8] conducted a study on mobile-oriented training of future marine specialists.

Various aspects of the problem of marine specialists vocational training, which are related to the use of ICT, were substantiated by domestic scientists (O. Diagelova, V. Chymshyr, V. Zakharchenko, S. Kozak, M., A. Pogodaeva, I. Sokol, V. Tityaev, K. Tkachenko and others).

3. Aims

New labor market conditions in the maritime industry, which are based on the competitiveness of seafarers, put forward fundamentally new requirements for their professional education

Despite this, among the most important professional qualities that future marine professionals must have to work on modern ships are perfect skilled in information and communication technologies (ICT - technologies) and digital competence, the ability to use cloud computing technologies, robotic systems, in particular 3D printers and 3D scanners, as well as the culture of solving production problems in extreme or emergency situations, strict implementation of occupational safety measures, professional mobility, tolerance.

Therefore, *the aim of the article* is to consider the results of research on the formation of professional - educational environment within the Engineering Department with digital media and professional image of future marine engineers in the educational activities of digitalization.

Kuprina K. claimed that digital transformation is the process of implementation of digitalization in educational activities, which greatly simplifies access to the necessary information. As for the concept of "digitalization", scientists interpret it as a way to bring any kind of information into digital form using digital technologies. [5].

Hence, in our study, it is important not only to provide future professionals with the ability to have their own general knowledge, but also to be ready to change and adapt to new needs of the maritime labor market, operate and manage information, treat it creatively and responsibly. solutions in dangerous situations and emergencies, to build career growth under the condition of lifelong learning [9].

Due to the significant development and implementation of ICT technologies in the practice of vocational education and in modern ships equipment, there is a need to reconsider the basic approaches of professional competence formation of future bachelors in specialization 271 "River and Maritime Transport" - "Management of ship technical systems and complexes".

During the Covid-19 epidemic, which forces Ukrainian higher education institutions to make innovative decisions in a limited time and introduce distance learning using different platforms, resources and social networks.

4. Key features of the Modern Digital Technologies Implementation in Marine Engineers Professional Training and It`s Influence on Their Image Formation

Due to the introduction of a mixed form of education in the educational process, distance learning has become widespread in the vocational maritime education. However, due to the fact that this form completely changes the technology of the educational process, there are many problems related to the requirements of the International Convention on Training, Certification and Watchkeeping for Seafarers, 1978 (STCW) [6] for the practical training of seafarers that significantly affects the quality of training and their further employment on ships of foreign shipowners.

Accoding to what distance learning for educational institutions of Ukraine is not sufficiently tested, there is a need for further research and systematization of experience in implementing distance learning in educational institutions of Ukraine and EU countries, where this form of education is quite developed in terms of vocational education and the labor market. The educational process for the formation of a qualified specialist in the maritime industry in Ukraine is not very different from foreign, because the requirements for their professional competence are clearly set out in the STCW. In the future, national requirements will also approach the requirements of these countries in the context of economic and social globalization. Ukraine has signed an agreement on joining the European Competence Scheme (EQF), which, unlike the European Qualifications Framework, focuses on specific professional activities. However, it should be noted that the distribution of professional competences may differ, mainly due to the national qualifications framework.

Today, the digitalization of education is a major trend in the development of educational systems in almost all countries of the world and covers all levels - from primary education to masters and doctors of science. The rapid spread of "digital" technologies makes digital competencies of citizens, according to scientists and IT experts are key among other skills. Thus, "digitalization" and multiplatform are the main trends in the general labor market today, especially under pandemic.

The training of a competitive naval officer for the maritime industry requires the educational institution to continue research on modern approaches to the formation of its digital competencies. At the same time, the teaching staff should not only possess, but also promote the introduction of digital technologies in the practical activities of the cadets future profession. Unfortunately, it is often the case that the skills of teachers digital competences are not enough for implementation in the educational process. In our opinion, in order to overcome this problem, it is expedient to create an educational-professional environment in the educational institution, which provides opportunities to unite efforts to form digital competence of both teachers and cadets.

The development of such an environment must comply with both general didactic and specific principles, namely: determining the purpose of education of the subject of knowledge; systematic acquisition of professional knowledge, scientific knowledge in this field of knowledge; accessibility in the assimilation of educational material and its focus on self-education, self-development and most importantly - on personal orientation. According to specific principles: self-determination of the subject of knowledge in the professional field; socialization of the individual in the future professional activity, self-recognition of their competitiveness, individualization of professional career building and educational trajectory.

Thus, it has been agreed to develop within the Engineering Department - educational - professional environment in professional disciplines using elements of digital technologies such as "Marine

Engineering Practice", "Technology of Materials and Repair of Ship Equipment", "Strength of Materials" and "Descriptive geometry and computer graphics " (Fig.1).

An important element in our study is the interdisciplinary connection in the educational information environment. Appropriate for the image-building potential of future marine engineers is the connection of professional disciplines and their impact on the quality of acquisition in special disciplines and the formation of practical skills in the process.

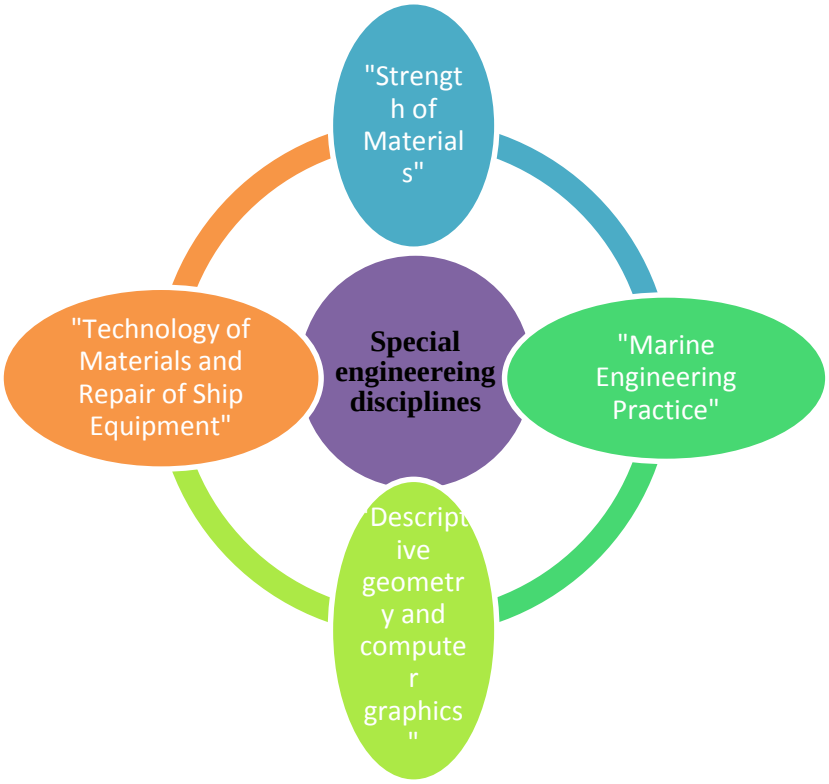

Figure.1 Interdisciplinary connection of professional disciplines at the departmental level

In the general structure of the educational - professional environment is considered step - by - step process of digital competences formation in professional activity of the future marine engineers. The condition for the effective functioning of such an environment is a clear sequence of professional knowledge from basic engineering to their implementation in the labor market, as well as feedback between the requirements of the employer and the educational institution to the specialist (Fig. 2).

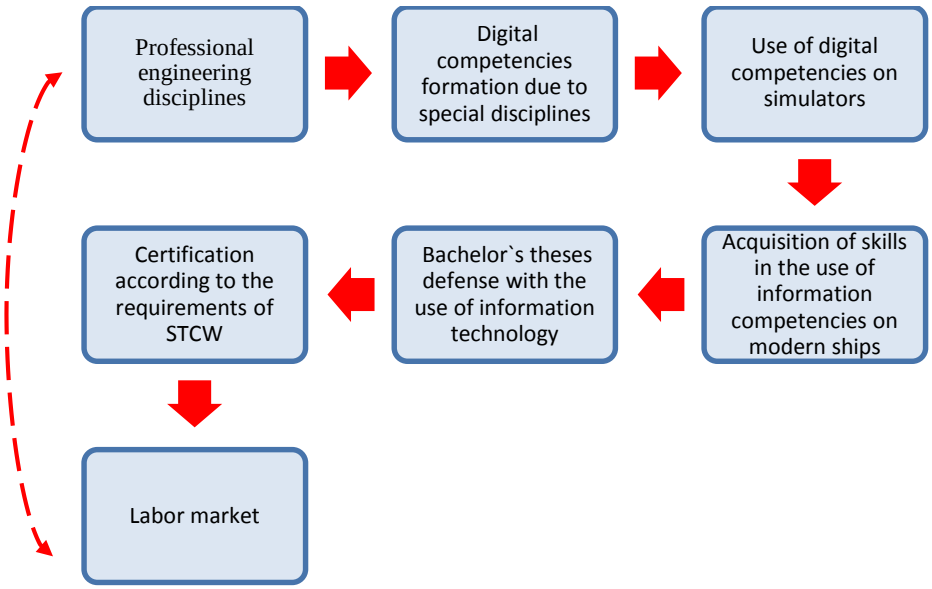

Figure.2 The sequence of acquiring professional knowledge from basic engineering to their implementation in the labor market

In other words, the ability to work with "digital" technologies is gradually becoming permanent and necessary for most marine specializations. In general, the number of professions, specialties and jobs in Ukraine that require at least a basic understanding of information and communication technologies is growing rapidly.

To solve this problem, a sociological and pedagogical study, which involved 100 respondents, including 60 first-year cadets, and 40 second-year cadets, future marine engineers of the Danube Institute of the National University "Odessa Maritime Academy" was conducted by auhors,. During the study, control sections (questionnaires, tests, interviews and rapid analysis) were performed, which allowed to diagnose the level of development of cadets digital competence.

The results of the control sections showed that out of 40 second-year cadets - 20 persons are well-versed in smartphone applications, but the results of owning a desktop computer are low - only 15 cadets; and only 5 cadets can work with an interactive whiteboard. But the results of the first-year cadets were quite worse (out of 60 respondents, only 40 have knowledge of using educational applications of smartphones, 15 - of computer, and 5 cadets have sufficient knowledge to work with an interactive whiteboard).

Based on these results, was made a proposal to the administration of the institute on a comprehensive approach to the further development of digital competencies of both academic staff and cadets, namely:

- to organize a special laboratory to provide advisory assistance to cadets and teachers;
- to develop an educational - methodical complex on digitization of educational material;
- to develop a program and conduct consulting classes for groups of teachers and cadets to work with digital media;
- to introduce developments in special disciplines of the engineering department.

The first results of such training showed that academic staff and students responded positively to the possibility of further learning to work with digital media, which confirmed the fact that the Danube Institute NU "OMA" has prospects for further development in the trend of information area.

This study was conducted to determine the level of digital competencies of future marine engineers using the Google Education platform in the learning process in distance learning.

A screenshot from Classroom, which showed the task and photo/video material from a real dry cargo vessel during the training process (discipline "Technology of Materials and Repair of ship Equipment") on the theme "Device, adjustment and maintenance of the drilling machine" was shown below. Technological process of manufacturing parts of ship internal combustion engines on a lathe. Development of operational maps".

The following tasks were introduced by the authors:

1.Provide a description of the processing of the stepped-shaped shaft on a lathe (according to the drawing).

2. Provide a description of the processing of the inner surfaces on the sleeve (by operations) on the drilling machine (according to the drawing).

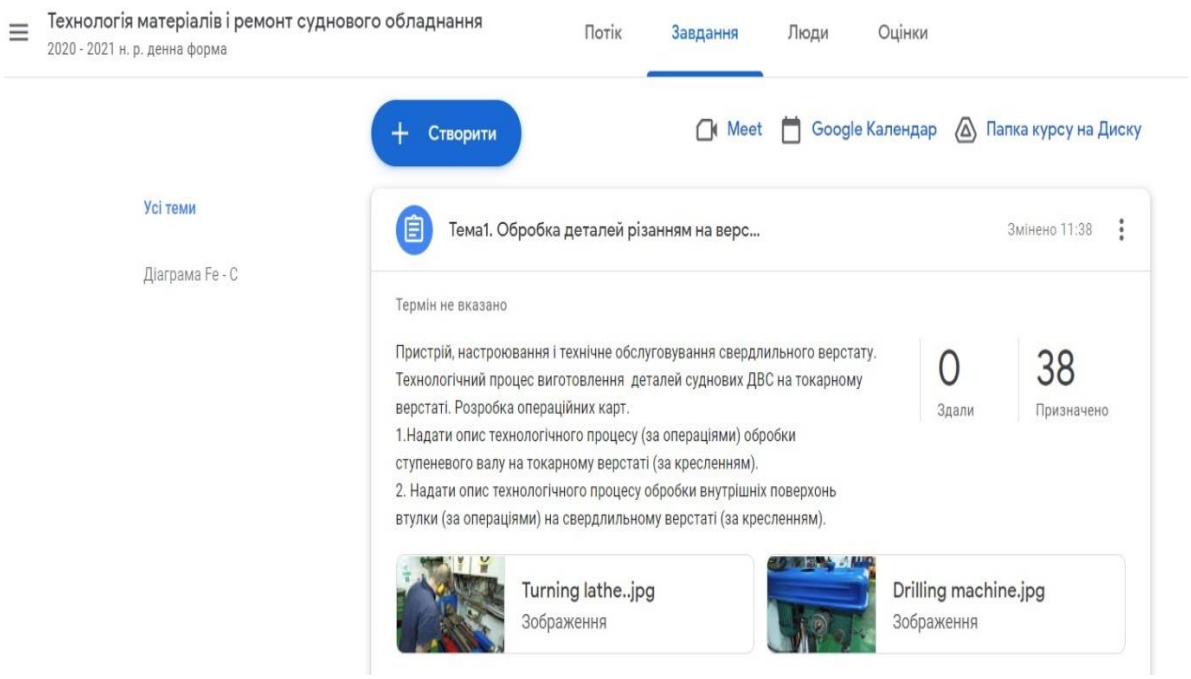

Figure.3 Description of the technological process of internal combustion engine parts on drilling and lathe machines by means of distance learning

The formed professional image contributes to the socio-cultural and professional identification of the individual, career building in a competitive environment, finding their purpose in the ever-changing conditions of society. It is the social order of society that requires a competitive, mobile specialist, open to continuous self-development in the context of a meaningful choice of goals of life, ways to achieve success in various fields of practice.

We believe that for a successfully formed professional image of the future marine engineers it is fundamentally important to combine the educational trajectory with information technology training. Therefore, according to the above descriptions of practical and laboratory classes, there is a need to show how these information technologies influence on the formation of the professional image of the future specialist (Table 1).

Table 1. Key features of professional competences and learning results and their influence on image formation

Professional competencies	1) The ability to provide management of a safe and efficient maintenance and repair of ship mechanisms and systems 2) Ability to use hand tools, machine tools and measuring tools for the manufacture and repair of parts on the vessel	→ Professional image of future marine engineers
Learning results	2) Ability to check, adjust ship equipment and perform metrological verification of basic measuring instruments. 3) Knowledge of characteristics, properties and limitations of materials and processes used in the construction and repair of ships, equipment and ship systems and components. 4) Knowledge of features structures and materials used in the manufacture of ship equipment.	The presence of sufficient professional competence of the future marine engineers, in accordance with the requirements of the Convention on the use of modern information technology, at the level of operation.

5. Conclusions

The study of scientific sources made it possible to identify the lack of research on distance learning, and its connection with traditional forms in the educational process of training specialists in the operation of ship engines. Thus, the results of the study allowed us to conclude that the introduction of the professional environment in basic disciplines of the Engineering Department using elements of digital technology, should be considered as a gradual process of formation of digital competencies in the professional activities of future marine engineers. It is noted that such environment should comply with both general didactic and specific principles, namely:

- *according to general didactic principles*: determining the purposefulness of the subject's education knowledge; systematic acquisition of professional knowledge, scientific knowledge in this field; accessibility in the assimilation of educational material and its focus on self-education, self-development and most importantly on personal orientation.
- *according to specific principles*: self-determination of the subject of knowledge in the professional field; socialization of the individual in the future professional activity, self-recognition of the competitiveness, individualization of construction of a professional career and an educational trajectory.

The results of the study made it possible to state that the professional training of future marine engineers will be significantly effective with a comprehensive approach to the development of digital competencies not only for cadets but also for the academic staff of the educational institution. For this purpose, a special laboratory was organized, which includes IT specialists and methodologists to provide advisory assistance to cadets and teachers; develop a program and conduct consulting classes for groups of teachers and cadets to work with digital media; to introduce developments in special disciplines of the engineering.

It is essential, given the specifics of the work of future specialists on modern automated vessels in multinational crews, marine engineers should have knowledge of full structure, principle of operation and rules of operation of all ship auxiliary mechanisms and systems. To achieve this goal in the educational process, the teacher must use not only demonstration posters, but also educational videos from the theoretical part of the thermodynamics course and a computer simulator of this installation, but the most important in this regard is their own practical experience of this installation. This experience can also influence on cadet`s professional image. At present, some shipbuilding manufacturers are creating computer simulators to use on board along with ship documentation, which is very important for the adaptation of young professionals to work on modern equipment, as well as for a better understanding of the crew.

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