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# Design of flipped classroom lesson in educational electronic environment of maritime higher education institutions

**Abstract.** Online classes (due to COVID, and then because of the war in Ukraine) require the teacher to make constant changes and to use new forms and methods of learning so that students feel free and more independent. Such a learning model as the flipped class is a type of mixed learning, the peculiarity of which is that students work on new educational material at home and consolidate what they have learned in class by performing practical tasks on the topic. The research aims to describe the process of creation and implementation of flipped classroom lessons for ship engineering cadets of a modern maritime higher education institution. The following methods were used in the research: observation, study of practical experience, verification of creative works and application of tests. The example of a flipped classroom lesson on the Learning Management System platform MOODLE is presented in the article. The priority of such lessons is to redesign the learning model so that the cadets are familiar with new material before class. The set of examples of activities that motivate cadets to get ready before class are given. Fourth-year cadets of the ship engineering department of Kherson State Maritime Academy, Ukraine are the main participants of the experiment. The formation of competence regarding Maritime English using a flipped classroom was analysed. The article presents and substantiates the results of the experiment, confirming the positive influence of flipped classrooms on the communicative competence of future ship engineers. It is shown that, using the flipped classroom the teacher gets the opportunity to work with each student individually and immediately focus on the performance of practical tasks; each student can independently, at the necessary pace, review the material, which is available at any time (for those who attended the class, and for those who were absent for some reason). The practical significance of the article is that it demonstrates how the new pedagogical model allows for increased active learning opportunities for cadets of the ship engineering department

**Keywords:** maritime establishments; personalized space; digital surroundings; LMS MOODLE; maritime English; flipped study

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## INTRODUCTION

Language communication skills play an important role in the work of the modern seafarer. International Maritime Organization (IMO) demands a broad understanding of English to meet specific professional objectives from each specialist in the marine industry (Official website of the International…, n.d.). Though the created IMO courses don't intend the instructors to follow blindly the teaching packages there. The updating or supplementing of the materials is highly welcomed to improve the quality and effectiveness of the training courses.

In the age of progress and computer technology, people face something new every day. Gadgets improve every day and force us to develop as well. Many are confused by innovations and rapid modernization, but there is no doubt that progress makes our lives easier and more comfortable. English language teaching methodology is also modernizing and becoming more productive and diversified. In other words, language learning becomes easier and more fun. Each language school or course has a methodologist, and sometimes even a methodological department. The need for the methodologists is obvious – to control the quality of teaching and the work of teachers. It is common practice for teachers to conduct the lectures in the classroom, while a small portion of time is left for individual tasks. To apply all this in practice, usually, the student must find it out at home on his own. In such a way, it is difficult for many students to fully comprehend the material. A Flipped Lesson (classroom) is an approach in which the teacher provides material for self-study at home, and in the face-to-face class, practical consolidation of the material takes place. Flip learning is characterized by the use of vodcasts, podcasts, and pre-vodcasting. Flipped Classroom is also an approach in which doing homework includes, among other things, applying podcast or vodcast technologies: watching a video (the lecture can be pre-recorded by the teacher); reading the texts, considering explanatory pictures; and passing quizzes. The transition to this model opens the way to increase the teacher's role in learning. The flipped class is often confused with distance education. The difference lies on the surface – the time of face-to-face class work remains unchanged, only its content changes fundamentally.

There are many types of flipped classrooms:

• Typical Flipped Classroom, where students support homework, which involves watching a video lecture, and familiarization with materials related to the topic of the next lesson, during which the acquired theoretical knowledge is applied in practice, and teachers have additional time for individual work (Yi, 2022).

• The Discussion-Oriented Flipped Classroom, where students support the task of viewing certain videos or materials from Internet resources. The teacher organizes a discussion of the received information in the lessons (Pillai, 2019).

• The Demonstration-Focused Flipped Classroom. This form will be effective for those subjects that require the demonstration of materials and conducting visual studies. The teacher demonstrates the necessary activity, and the students perceive and analyse it, and then provide certain actions at their own pace - as they are comfortable.

• The Group-Based Flipped Classroom. This model encourages students to learn from each other, explain answers to groupmates, effective ways of obtaining information, conduct scientific research, etc. How to use it? Before the lesson students should form groups and familiarize themselves with the relevant materials and then work together on a certain scientific problem (Kaur *et al.*, 2022).

• Flipping The Teacher. The teacher does not need to do all the work – prepare or search for video materials, form practical tasks, advise, or check works. Certain types of work can be performed by students, and the teacher will monitor how the learning process will be organized, and how information will be presented and will provide assistance if necessary.

No more than 25-30% of the time can be done during class work to analyse the difficult theoretical part. This time can also be devoted to answering the questions which arise while doing home tasks. Practical problems and research tasks can also be done in the class with the teacher. After this period of while-class time, the teacher gives students quizzes to check their knowledge (Kondratenko *et al.*, 2021).

Two teachers in Colorado Jonathan Bergman and Aaron Sams (2023) invented an inverted classroom in 2007. They were the first who started providing lectures for sportsmen who used to miss face-to-face classes. In addition to saving their time, teachers have received a lot of advantages from the introduction of the concept of "flipped lessons".

The flipped class is considered an innovative, quite successful model of differentiated education in conditions of higher education. Students demonstrated better individualization than in a traditional classroom and showed an increased interest in joint learning with children of different cultures and educational levels (Striuk & Semerikov, 2022). However, the flipped model is still understudied, especially in the context of higher education, and only a limited number of studies exist.

The research aims to describe the current situation, theory, and practical experience in the field of the learning process, which uses the "flipped classroom model" as the main trajectory, particularly while Maritime English is studied by future ship engineers.

## MATERIALS AND METHODS

The pedagogical experiment was conducted to prove or refute the hypothesis that English training of future ship engineers will be productive if flipped classroom technology is used in the educational process. Research participants included 79 ship engineering cadets of structural subdivision of Kherson State Maritime Academy (KSMA) – Maritime Applied College (male, 17-19 years old, pre-intermediate – intermediate level of English, same training conditions and curriculum).

The cadets were divided into two groups: control (40) and experimental (39). The two groups are mostly

the same. The experimental group includes cadets from K231 and K232, control group includes K233 and K234 cadets. Participants of the experimental group were studying English for special purposes using the LMS MOODLE e-course of two teachers. The materials of the e-course are from "Welcome Aboard: Course Book" (Kudryavtseva *et al.*, 2018). This course book consists of five modules: Maritime Education, Types of Ships, Types of Cargo, Crew, and its Tasks, and Personal Safety Aboard. Every module begins with objectives and essential competence (e.g., By the end of the module you should be able to explain the importance of maritime education and its components for a successful seafaring career). Each module also ends with a Sea story, which is an original text from maritime reports, news etc. The end of each module also includes a speaking activity assignment, which cadets need to pass.

LMS MOODLE course has the same number of modules as "Welcome Aboard: Course book", although it has additional gamified activities, forums, assignments, chats, quizzes etc. Every day students have two hours of Maritime English (10 hours per week).

The following methods were used during research: observation, studying the practical experience, examination of creative work and applying tests. Firstly, the terms "flipped classroom", "flipped class" and "flip learning" were defined (comprehensive literature review). The generalization of these concepts from the standpoint of different scientific approaches was then done. The model that used the flipped class for future ship engineers to study English for a special purpose was created (theoretical modelling). The observation of the state of MET of future seafarers for professional work was then done to identify the levels of the specified training. Experimental verification of the effectiveness of the results and statistical analysis were conducted.

All procedures performed in the study followed the ethical norms and did not violate the honour and dignity of the respondents; age characteristics were also considered. During the experiment, personal rights were not violated, and anonymity was preserved following the developed recommendations regarding the ethical aspect of conducting pedagogical research by authoritative organizations, including the American Educational Research Association (2011) and the British Educational Research Association (2018).

## RESULTS AND DISCUSSION

The model or methodology of the educational process "inverted classroom" is blended learning – a combination of the traditional form of acquiring knowledge with elements of electronic distance learning (Learning Management System): modern information technologies. Research participants found an inverted classroom more engaging in the sense that it allowed for more differentiation in learning. They've also been more satisfied with Maritime English learning, the attendance of face-to-face classes has been improved, and students' learning efforts raised. Cadets demonstrated better individualization than in a traditional classroom and showed an increased interest in joint learning with children of different cultures and educational levels (Striuk & Semerikov, 2022). They participate in assimilating lectures' material more easily and also develop self-determining skills through the proposed approach.

To create a Flipped classroom, it was decided to divide the lesson into four parts: preparation, presentation, practice, and production. The materials of the first two stages were given on LMS MOODLE. The preparation consists of a starter. Starter (Figure 1) is a type of activity in which the teacher tries to direct the student`s attention to the subject. The starter can be used both on the topic of the lesson and on a free topic (Semerikov *et al.*, 2020).
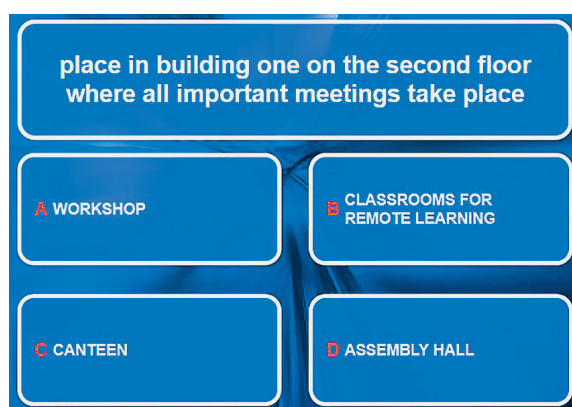


**Figure 1.** An example of a starter
**Source:** compiled by the authors based on LMS MOODLE of KSMA

The educator starts with an introduction to the context of a new language study, particularly English. It should focus the cadet's attention on how and when to use it. The presentation is created to engage the learners by showing them situational context first (e.g. figures, videos, tables etc.). Example texts can also be used. The educator presents the new lexical units in context at the beginning. It is done to show how this lexical unit would be used naturally.

Then, the teacher suggests cadets hear a word at least three times and repeat after either after an educator, a cadet, or the whole group. Lastly, the teacher checks the comprehension of different meanings of a word (Fig. 2) to ensure that cadets understand the proper meaning of a new lexical unit (Valko *et al.*, 2021).
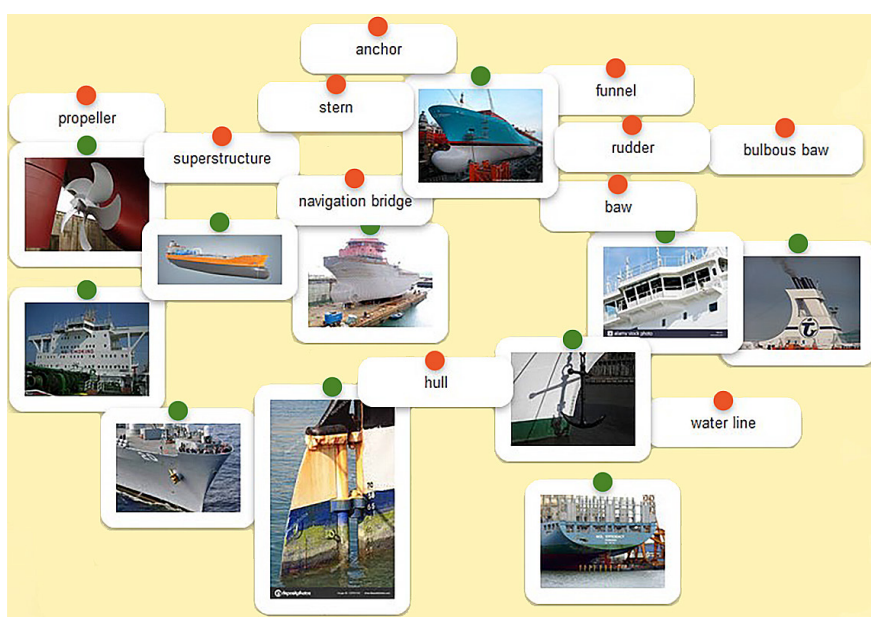


**Figure 2.** The task is to label the pictures
**Source:** Learningapps.org SCORM package added based on LMS MOODLE of KSMA (developed by the authors)

There are many exercises teachers can use to check the meaning: match the words with their definitions, match the synonyms/antonyms, complete the statements, fill in the gaps, etc. (Zaitseva *et al.*, 2022), it should be mentioned that while performing the exercises, the student should explain why this lexical unit or grammatical form was chosen, which helps form the communicative competence of future specialists (Fig. 3).

**2. Fill in the words from the box.**



**protuberances, ports, completed, bits, require**

1. Please indicate how many spare parts you _____.
2. He read _____ of his work to me
3. He _____ his PhD (Doctor of Philosophy) in 1993.
4. Some dinosaurs evolved _____ on top of their heads.
5. 2- stroke engine has _____ which makes it's design simpler.

*Model:* *What word did you use in the first sentence?*
*I used _____*

**Figure 3.** Checking the meaning
**Source:** PowerPoint Presentation added on LMS MOODLE of KSMA (compiled by the authors)

It is also possible to do pre-reading or pre-viewing tasks at this stage. Students complete different exercises. For example, the task may ask the student to look at the picture and get the gist of what it (text or video) is about, answer the questions, tick the true statements, study the pictures and write the title, find, and highlight the title of the text (word snake), scan the text (watch the video) and title the paragraphs, etc.

The next stage is practice. It is subdivided into two sub-stages: controlled and semi-controlled practice. Firstly, cadets need to focus on saying out loud (speaking skills) and writing the new lexical unit without any distracting difficulties (writing skills). The correct structure manipulation is the main goal at this stage. The teacher monitors the student`s achievements. The next stage is semi-controlled practice. The tasks here are more complicated. The cadets will be

asked to use new language within a wider context. The educator should ensure that the cadets are using the new lexical units accurately while controlled and semi-controlled activities. Sometimes it is needed to come back to the presentation stage to repeat once again if any mistakes are made (especially if students are not too confident or only begin to learn).

After completing both the presentation and practice stages, students proceed to the production stage where they will demonstrate new skills in speaking or writing. This stage is crucial. Educators should not correct any mistakes in this stage, as students develop their fluency. Examples of such activities can be "make a poster, complete pie-chart, make an advert, role plays the dialogue, make group discussions according to the topic, debates" etc. (Hatmanti & Septianingrum, 2020).

The analysis of pedagogical practice shows the following disadvantages of the "flipped class". Firstly, not all students are required. Some may not even watch the lectures at all. There is no guarantee that they will enjoy this form of education and that they will agree to learn this way. Teachers have to spend time learning new skills. For example, learning how to make videos or prepare for lessons that will consist entirely of discussions or dialogues. As a result, all this will be able to be integrated into the "inverted model", but additional efforts will be required first (Mohan, 2018). Although teacher tries to provide students with additional materials, they still learn within a textbook. The textbooks are adapted to the minimum that the cadet needs to know. There are cases when the textbook was fully neglected in the "flipped class" model. Sometimes some of the textbook parts are done while doing homework. The materials of the textbook can be used as the basis of video lectures in an online educational environment. There are different advantages and disadvantages of flipped classrooms. One of the disadvantages is that some topics can't be "turned over". Teachers should decide by themselves whether a flipped classroom is suitable for every situation, student's knowledge, difficultness of new topics etc. should be considered. The usual classroom system cannot be fully removed. It all depends on what the teacher considers useful in the "flipped" teaching. If lessons are not substantively supplemented by this, then there is simply no great benefit from the "flipped class" (Schaffzin, 2021; Kurban, 2018).

By the end of each module, cadets have a quiz with 30 questions of three levels of complicity (easy, intermediate, and hard). Easy questions are 60% of a quiz and enough to get a positive mark, intermediate questions are the next 30% and help to get good and very good achievement levels. Hard questions are only 10% of a quiz and are needed to get excellent grades (Mezentseva, 2020). Quizzes are needed to test the effectiveness of the proposed teaching method. The grades of both control and experimental groups were analysed since all the groups had quizzes by the end of each module, regardless of which teaching method was used. Table 1 given below represents the quizzes' results.

The graphical representation of the results of the last total communicative competency assessment is described in Figure 4 below.

**Table 1.** Quizzes' results

| Activity name | Group | Levels of communicative competence | | |
| | | high | intermediate | low |
|---|---|---|---|---|
| Quiz 1 | Experimental group | 13-33% | 16-41% | 10-26% |
| | Control group | 10-25% | 20-50% | 10-25% |
| Quiz 2 | Experimental group | 9-23% | 18-46% | 12-31% |
| | Control group | 7-17.5% | 19-47.5% | 14-35% |
| Quiz 3 | Experimental group | 12-31% | 17-44% | 10-25% |
| | Control group | 9-22.5% | 21-52.5% | 10-25% |
| Quiz 4 | Experimental group | 15-38% | 19-49% | 5-13% |
| | Control group | 10-25% | 20-50% | 10-25% |

**Source:** compiled by the authors based on LMS MOODLE of KSMA
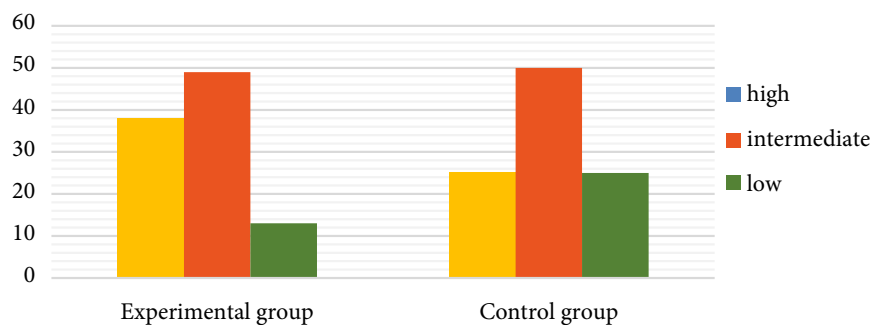


**Figure 4.** Comparison of results of the final quiz on LMS MOODLE
**Source:** compiled by the authors based on LMS MOODLE of KSMA

The figure shows a considerable increase in the high level of communicative competence while the number of cadets with intermediate levels both in experimental and control groups is nearly the same (Rasool & Dawood, 2021). However, the number of cadets with low levels of communicative competence is smaller in the experimental group (Sherman *et al.*, 2020).

To get feedback from cadets of the experimental group, the activity Survey was created based on the LMS MOO-DLE e-course (Kaur *et al.*, 2022). This provides many tools needed to verify the survey. They can be used while assessing and stimulating learning on learning modular systems (Pillai, 2019). Each couple of the 24 questions in the survey asked cadets to compare their preferred and actual experience in the course. After the completion of a survey cadets of the experimental group proved the high level of interactivity of e-course based on Flipped classroom lessons. A graphical representation of the results is seen in the Figure 5 below.



**Figure 5.** Survey on the interactivity of Flipped classroom e-course "English for a special purpose"
**Source:** A. Yurzhenko (2018)

Flipped Classroom allows students to spend as much time studying the new topic as needed. The cadets should be ready for flipped learning: teachers can't just upload a new topic into the same video lectures, as this can cause a situation when most of the group simply does not do their home tasks and does not understand what is required. Recorded video lectures are less interesting than when cadets study new material on their own (Yi, 2022). The Flipped Network (FLN) online community, provides educators with a wide range of videos that can be used to flip, (links to FLM-related meetings, videos for the less experienced, archived webinars, and book descriptions associated with the "flipped" approach), the teacher's time freed up and can be spent on more complex professional tasks – consolidating and deepening the understanding gained by students on their own, to monitor student`s activity during the lesson, and help those, who are not learning as fast.

It is of high importance for teachers and students to communicate, flipped learning needs motivation before, after and during MET. Flipped classrooms can be positively used in many courses (e.g., Maritime English, General English, and English for specific purposes). Educational activities can be different, but all aim to activate and optimize the educational process, introduce new methods and techniques, participate in debates or discussions about current events, and project-based learning (Lytvynova, 2015).

The experiment on the implementation of flipped learning, conducted at the College of KSMA, continues similar initiatives of other educational institutions and is fully in the context of the results obtained. Clinton Dale High School in Detroit City in the United States of America is the first "flipped" school which was fully transited to this teaching principle in 2010. MEF University from Istanbul city at Turkey was the first higher education establishment which adopt such a model of a flipped class throughout the university (How one school turned…, 2013). In 2016, The Reverse Approach to Higher Education (Shahin & Kurban, 2016) was published.

However, this model is still understudied in the context of high school and technical subjects the use of the flipped classroom has received less attention. The flipped model is still underexplored in the higher education context (Chen *et al.*, 2014), and only a limited number of studies exist (Kerr, 2015).

This study, based on the results of existing publications, as well as on a training experiment conducted at the Maritime College, confirmed, and enriched the theoretical and practical basis of the researched area of an innovative educational approach – flipped learning. Analysis of experiments of mixed and "flipped" learning allows us to draw the following conclusions about the advantages and disadvantages of the model.

Advantages of the "flipped classroom":

1. Working on projects in a group allows students to foster a tolerant attitude towards each other, change their perception of other cultures for the better, and reveal social stereotypes.

2. Individual approach and feedback - the teacher can communicate separately with each student, helping adapt and select individual tasks that correspond to the level of education of the student. The model allows the student to view the same material as many times as needed.

3. There is an opportunity to break down a new topic in all its subtleties and nuances.

4. In the lesson, all complex issues can be sorted out.

5. The teacher can organize educational activities in such a way as to teach class students with different levels and abilities. It is also possible to organize the educational process for children and adults with disabilities.

6. Study hours can be used for joint practical work (laboratory work, seminars, etc.).

7. The flipped learning model can be applied in elementary, middle, and high levels.

8. Students who skip class have the opportunity to work through the material.

Disadvantages of the "Inverted" class model:

1. Converting a course to an inverted format entails high launch costs.

2. More attention needs to be paid to teacher training.

3. It takes time to change the attitude of students towards their role and move to more active participation in the learning process. In addition, teacher training itself should be more focused. It will take a lot of time to get the students accustomed to the new learning model.

There was also found to the lack of the following:

• Qualitative research to understand "flipped MET" in specific contexts, particularly while Maritime English learning by future ship engineers;

• Scientifically based research to examine different aspects of the implementation of the "flipped MET";

• Working programs to implement "flipped MET", and also various training materials for that;

• Methodological recommendations for teachers and other educators who implement "flipped MET" to create action plans.

As the problem of flipped classrooms was investigated by many modern scientists, most researchers have noted the undoubted advantages of inverted learning. This provides students with statistically significant benefits in the complex, application areas defined in the classroom. In addition, it was determined that the students who studied using a flipped classroom announced that they were more engaged than in a traditional classroom educational model. Gained experience in communicating with children from different cultures, which can be saved after the end of the course (Zinchenko *et al.*, 2022). While learning in a flipped classroom, students become actively evaluative and use received data, while the teacher goes from a non-personal educator to an engaged teacher. The study also shows that the students need to stop being passive listeners to gain new knowledge, they need to learn independently. Students become more motivated, and a sense of responsibility is formed. The flipped lesson becomes not a place for students to copy the teacher's words, but a space for individual and group work for possible debates and creative tasks as each student begins to be an interlocutor while working in pairs. For the "flipped" class, there is a rule to be ready and work in the classroom, each student must first work at home on the new material, and the teacher, using this time, can pay attention to weak students, implementing the requirements of an individual approach.

## CONCLUSIONS

The "flipped" teaching approach has become more popular not only at schools but also in maritime higher education establishments. Flipped learning helps solve different pedagogical problems in MET.

The study concluded that interactive methods of teaching English are a precedence today. Using them in combination with traditional approaches is the key to the development of high-quality communicative competence of students of maritime institutions. The research revealed the meaning of the concept and described the process of creating and implementing a flipped classroom as a mixed form of education, which was used to determine its characteristics and distinctive features from other teaching methods. The study showed that the new model allows the expansion of the communicative opportunities (discussion, role play, interview) of students of the ship engineering faculty. Using this model of activity stimulates students to develop their English language skills in different professional situations and express themselves freely.

Investigation showed that the issues of "flipped" education are not sufficiently researched in the scientific and methodological literature. Nowadays, it is necessary to conduct further scientific research, studying various aspects of the practical implementation of long-term programs and educational materials for teaching students. The study proved the usefulness of such teaching. The results of a pedagogical experiment conducted at Kherson State Maritime Academy and Maritime College proved the positive impact of flipped classroom lessons on the communicative competence of future ship engineers.

Further investigation of the effective use of the flipped classroom and virtual communication in its pedagogical aspect study of student-centred methods can be done for MET using challenge-based activities, storytelling, and role-play.

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## CONFLICT OF INTEREST

None.

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# Створення перевернутого класу в освітньому електронному середовищі морських вищих навчальних закладів

**Анотація.** Онлайн-заняття (через Covid, а потім воєнний стан в Україні) потребує від викладача постійних змін, застосування нових форм і методів навчання, щоб студенти почувалися більш вільними й самостійними. Модель навчання «перевернутий клас» – різновид змішаного навчання, особливість якого полягає в тому, що студенти опрацьовують новий навчальний матеріал удома, а закріплюють вивчене на занятті, виконуючи практичні завдання. Дослідження спрямоване на опис процесу створення та впровадження перевернутого класу для студентів судномеханіків сучасного морського вищого навчального закладу. Під час дослідження використано такі методи: спостереження, вивчення практичного досвіду, перевірка творчих робіт та застосування тестів. У статті наведено приклад перевернутого класу на LMS MOODLE. Пріоритет такого заняття – перебудова навчальної моделі так, щоб студенти ознайомилися з новим матеріалом до заняття. Наведено набір прикладів діяльності, яка спонукає студентів готуватися до занять. Основні учасники експерименту – студенти четвертого курсу судномеханічного факультету Херсонської державної морської академії, Україна. Він був присвячений формуванню компетентності щодо морської англійської мови з використанням перевернутого класу. У статті представлено та обґрунтовано результати експерименту, підтверджено позитивний вплив перевернутих аудиторних занять на комунікативну компетентність майбутніх судномеханіків. Показано, що, використовуючи перевернутий клас, викладач отримує можливість працювати з кожним студентом окремо та одразу зосередитися на виконанні практичних завдань; кожний студент може самостійно, у необхідному темпі передивлятися матеріал, який доступний у будь-який час (для тих, хто був на занятті, і для тих, хто з якоїсь причини був відсутній). Практичне значення статті полягає в тому, що вона демонструє, як нова педагогічна модель сприяє підвищенню навчальних можливостей студентів судномеханічного факультету

**Ключові слова:** морська освіта; персоналізований простір; електронне середовище; LMS MOODLE; морська англійська; перевернуте навчання