

Use of Merlin System and Recorded Instructions in Engine Room Simulator Training

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Abstract: This paper presents the introduction of the e-learning in a form of use of the Merlin system and recorded materials as a response to COVID 19 lockdown into the teaching process of the course named Engine room simulator and onboard training in the final year of undergraduate study of a Marine Engineering. Merlin system was used for consultations and explanations in live sessions, while recorded materials were used by students for introduction and familiarization. Feedback of e-learning was arranged in a form of questionnaires, both for students and instructors to recheck both sides of the learning process. Over 60% of students claimed that regular classes are much easier to understand after preparation through e-learning and that introduction of the e-learning had a beneficial effect on their final course results.

Keywords: ER Simulator; simulations; training; Merlin; recorded materials

1. INTRODUCTION

Engine room simulator and onboard training is a course in the final year of undergraduate study of a Marine Engineering at the Faculty of Maritime Studies of the University of Split. The course consists of two parts, ER (Engine room) simulator training and training on board the ship. The course itself follows rules and regulations set up by the IMO (International Maritime Organization) and its STCW convention (International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978) [1].

The Faculty is equipped with several Engine Room Simulators where students are simulating real machinery problems and situations. One of the simulators is Kongsberg K-SIM ERS-L11 MAN B&W-5L90MC VLCC [2] (Figures 1 and 2). Simulators serve to train students in the environment similar to the real where they can try (and often fail) to operate various machinery and learn proper procedures and behavior in various situations. According to the [2] "the learning objective is to understand and operate the entire engine room system in a safe, timely and cost-effective manner".

In order to be able to perform any action on the Simulator a student must be familiar with its operation principle and the location and functioning of the associated equipment. It is the same in real life, any Marine Engineer must be familiar with layout of the ER and the machinery, and possess

good knowledge about the operation principles of various ER machinery.



Figure 1. Kongsberg Simulator Control Room

Our marine engineering students learn machinery operation principles during numerous courses in lower years of the study. ER Simulator commands and layout of the machinery is another required condition for successful start of simulations.



Figure 2. Kongsberg Simulator Classroom

ER Simulator layout and commands familiarization is intended to be first lesson of the course and should be finished during first week. In reality, this task often requires more time, which takes the time intended for training of students with various real scenarios. Often students learn to operate Simulators after their regular classes in order to better familiarize with the system and its operation. COVID 19 crisis prevented those activities and forced teaching personnel and students to try and accept new training practices. Those practices aimed to reduce familiarization time and enable students to learn about simulator layout and function using remote learning, therefore reducing significantly contact time and time on the Simulator needed for the familiarization.

2. E-LEARNING

In order to diminish time needed for familiarization with the Simulator and minimize contact time, a new approach has been introduced. Although due to IMO and STCW requirements [1], students have to attend at least 95% of the simulator training exercises in person, all additional contacts are transferred to online system, creating parallel e-learning system. E-learning can be described as technology-based learning where learning materials are delivered electronically to remote learners via a computer network [3]. Introducing this new approach to the course is "a complex phenomenon, entangled with multiple factors related to technology, the learning process, and administration" [4] and required significant amount of time from teaching personnel as well as from students.

2.1. Recorded materials

In order to minimize contact time (during consultations and during additional learning and familiarization lessons) and to promote faster learning process all exercises were recorded, using the Simulator and a recording program named Bandicam [5]. The program allows to record computer screen and instructor voice giving all explanations in form of the AVI file (Figure 3).

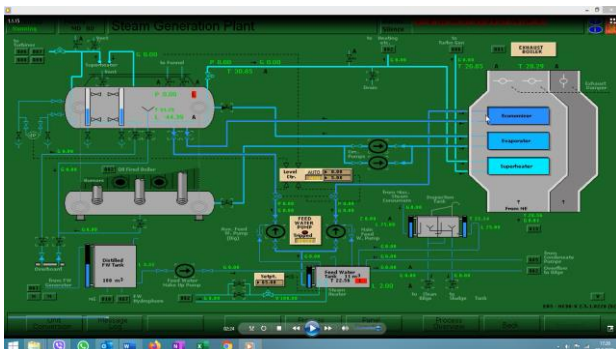


Figure 3. A screenshot of the recorded "AVI" file

Instructors recorded 74 exercises in the AVI (Audio Video Interleave) format. Those videos show all situations which should be analyzed during the course. Apart from videos additional help was created by introducing an instruction book with explanations on the simulator and simulations, giving the instructions to questions how, when and where (Figure 4). The Instruction book strictly follows AVI files and helps students in the replication of the exercises in the same way as various checklists help on board the ship.

1.1.74 Data Sheet #74 (NOx secondary reduction)	
Test Director Action	Expected Result
Load Condition: Sea Speed	Speed levers, instrument readings and lamp push buttons reflect the appropriate condition.
Go to MD 14, check NOx values.	As selected.
Start SCR (Data sheet #44).	As selected.
Go to MD 14, check new NOx values.	As selected.
Make a conclusion.	As selected.
Compare NOx reduction methods, advantages and shortcomings.	As selected.

Figure 4. Excerpt from PFST Simulator Instruction Book

2.1. Merlin

Merlin [6] is an e-learning system established, developed and maintained at the e-Learning Center of the University Computing Center of the University of Zagreb. That system is a common platform for e-learning projects in university teaching in Croatia. Its presentation tools allow placing all teaching materials in the system and making them available to students. System also facilitates communication with and among students using forum, chat or messages in the system.

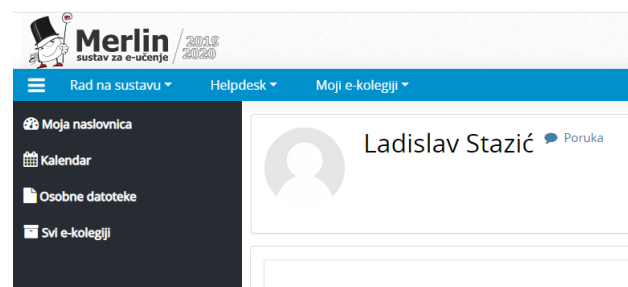


Figure 5. Part of the Merlin Screen

System beside presentation and communication allow supervision of the student activities, providing insight into activity of the participants during the course, what features of the system were monitored, how often, etc.

Introduction of the course, familiarization with the Simulator and consultations with the instructors were organized through this e-learning platform. Sessions were performed on regular, scheduled basis. Results of the e-learning were checked during normal (in person) classes where overall student behavior and knowledge was evaluated.

3. RESULTS

At the finish of the classes, all students and three course instructors had to fill questionnaires in regards Simulator and newly introduced additions to the learning process. Students had to fill a research questionnaire [7] (Table 1) with the intention to establish their "view on the topics" [8] i.e. if recorded materials and e-learning improved their understanding of the Simulator and its layout. Students had to answer the questionnaire with 0 or 1, depending whether the sentence is truth or false. On the right side of the Table there is a column with the number of students validating the sentence as truth followed with the number of all questioned students.

Table 1. Student questionnaire and results

Sentences	Results
I watched all Simulator AVI files.	36/38
I watched Simulator AVI files several times, repeatedly.	19/38
I attended Merlin consultations and e-lessons regularly.	26/38
I find Simulator AVI files useful tool in familiarization with the Simulator.	36/38
Watching Simulator AVI files helped me to replicate the exercises.	32/38
I was able to replicate every exercise only by watching Simulator AVI files.	4/38
E-learning and Simulator AVI files had a beneficial effect on my final course results.	23/38
Simulator AVI files must be incorporated with Merlin consultations and instructor explanation.	28/38
Regular classes are much easier to understand after preparation through Simulator AVI files and Merlin consultations.	26/38

From the Table 1 it is visible that 94.7% of students claimed that watched all recorded AVI files. All those students claimed that AVI files helped them in the familiarization with the Simulator. Answers on other questions are varying, but majority of answers were beneficial towards use of the recorded materials during e-learning process.

Smaller questionnaire was created for instructors, requiring their opinion on the use of the AVI files and results that e-learning produced. Intention of this was to determine instructors' opinion on e-learning effects, and to recheck students' results and to obtain another view on the same issue.

Table 2. Instructor questionnaire and results

Sentences	Results
This student watched Simulator AVI files and learned about the system before exercises on the simulator the system.	20/38
Student was capable to perform the exercise alone, without your help.	5/38

Instructors identified just 52.6% of students where they were certain that they used AVI files and only small fraction of students which were able to perform exercise without help from instructors.

4. DISCUSSION

Results of the questionnaires are bringing forward several results. One result is that although almost all students claimed active participation and watching of AVI files, instructors were able to detect only about half of students which showed decent knowledge about Simulator to verify students claim. Percentage of students where instructors detected knowledge about the simulator coincide closely with the number of students who claimed that they watched AVI files several times, repeatedly. Therefore, the impression is that significant number of students on this question exaggerated their activity with AVI files.

Another result which questionnaires showed is that 10% of students thought that, after watching recorded lessons, they were capable of performing the exercise without instructor assistance. That result was confirmed by instructors, according their opinion that percentage was slightly higher (13%). Overall findings are that the majority of over 70% of students claimed benefits of this addition to the regular teaching, at the same time more than 60% of them are thinking that this approach had beneficial effect on their final course results.

5. CONCLUSION

COVID 19 crisis brought new developments into ER Simulator teaching process where the course remote sessions are introduced for consultations together with possibility to download and play all lessons in advance. Recorded lessons, in form of AVI files, accelerated ER Simulator familiarization, thus improving and simplifying learning process. Feedback of students after finishing the course was wholly positive, majority of students found introduced changes as a big step in the right direction, with 10% of students finding that this new approach enabled them to finish the course without any additional lessons or help.

Another interesting issue brought forward is not connected to questionnaires. Students showed much higher interest in the on-line consultations, which were attended much more than normal consultations in instructors' office. This was caused because students had their instructors available "nearby, only one click away".

All listed results are just beginning of the monitoring of the effects of e-learning process and connected recorded lessons on overall knowledge and behavior of students and instructors. As all changes are fresh, prepared and introduced in last few months, there should be significant improvements in the quality and quantity in the future. Considering future improvements, it is expected that next monitoring results will show that more students marked as true the answer "E-learning and Simulator AVI files had a beneficial effect on my final course results"

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