*Research in Support*
*of Modern Maritime Education*

# ON EDUCATION AND TRAINING
# IN MARITIME COMMUNICATIONS
# AND THE GMDSS DURING THE COVID-19

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**Abstract.** This paper presents the experience of Nikola Vaptsarov Naval Academy (NVNA) teaching staff in providing education and training to students in Maritime communications and the GMDSS during the pandemic crisis. Within a one-year time period including a number of complete and partial lockdowns, many courses were organized in the Academy following all restrictions imposed by the situation. An attempt to find a solution for on-line/distance learning, practical face-to-face training with simulators and a combination thereof by using web-based information technologies is described. A methodology is presented where simulators have been used during complete lockdowns for on-line training, remaining in compliance with the requirements of IMO, international and national rules and regulations, such as SOLAS International Convention, the International Convention on standards of training, certification and watchkeeping for seafarers STCW78/95 and Ordinance No.6 on seafarers' competence in the republic of Bulgaria. Advantages and disadvantages of on-line education and training in Maritime communications and the GMDSS are analyzed in depth. Examination results are presented in comparison with results of traditional education and training provided before the pandemic crisis. Some ideas for development and improvement of teaching methodologies based on modern web-based information technologies are discussed in the conclusions.

*Keywords:* maritime education and training; online education; e-learning; simulators

### Introduction

The education and practical training of seafarers is carried out in accordance with the requirements of many international and national organizations, e.g. International maritime organization (IMO), International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), European Maritime Safety Agency (EMSA), National administrations, such as Bulgarian Maritime Administration (BMA or MARAD.BG), etc. Curricula are prepared in accordance with the so-called Model

courses, developed by IMO / IALA and with relevant national standards and approved by the national maritime administration (Alexandrov et al. 2014). The education and practical training in Maritime communications and the Global Maritime Distress and Safety System GMDSS, for instance, shall be carried out in accordance with IMO Model Course 1.25 and the training recommendations in Annex 3 to the IMO Assembly resolution A. 703 (17) – Recommendation on Training of Radio Operators related to the General Operator's Certificate (GOC) as well as with the national standard for education and training in "General Operator's Certificate for the GMDSS, according to ref. table A – IV/2 in the International convention on Standards of Training, Certification and Watchkeeping for Seafarers STCW'78, as amended". The newest standard, published in 2017, requires at least 108 academic hours of training with at least 61 hours for teaching theory, incl. a theoretical test and 47 hours for practical training, incl. 3 hours for practical examination. The use of simulators and real equipment in practical training is required by IMO, international and national rules and regulations, like SOLAS International Convention, STCW78/95 Convention, etc. to ensure the transfer of competences to maritime students.

There are strong requirements toward qualification of lecturers and instructors as well. According to the National standard, lecturers must have a university degree in the area of Maritime communications, Ship's radio electronics or similar and be holders of at least a "Second Class Radio Electronic for GMDSS" Certificate or to be watchkeeping officers with at least 5 years of experience at sea and to hold a GMDSS General Operator's Certificate. Additionally, all lecturers and instructors have to be trained and certified in IMO Model course 6.09 "Training course for Instructors", and those involved in practical exercises – in IMO Model course 6.10 "The Simulator Trainer and Assessor". All instructors included in examination procedures have to be trained and certified additionally in IMO Model course 3.12 "Assessment, examination and Certification of Seafarers".

### GMDSS education and training in NVNA

Education and training in GMDSS by using simulators in Nikola Vaptsarov Naval Academy began in 2003. At that time, it was done in the form of a qualification course after graduating and receiving a diploma from the Academy. Almost 200 courses were conducted in this form of training, through which more than 1000 trainees have passed.

In 2017, GMDSS training was included in the Navigation curriculum, during the fifth semester. Since then, all students go through this training and after its successful completion receive an appropriate certificate.

### Training courses and Learning materials

Over the years of training in maritime communications and GMDSS in the Academy, training courses were developed and updated according to the requirements

of international organizations and national institutions. Along with this, training materials were prepared to provide students with everything they need to successfully complete their studies. Printed learning materials (Tsanev et al. 2017 GOC; Tsanev et al. 2017 ROC; Alexandrov et al. 2019), as well as textbooks, workbooks and presentations on CD were published and provided to students in the library and online.

**Simulators**

In the beginning of the GMDSS education and training, there was only one simulator in the Academy, equipped with one instructor workplace and two trainee workplaces as well as with some samples of real equipment. During the following years, the simulator has been expanded to 5 trainee workplaces, and later on – up to 8. After 2017, when GMDSS training was included in the Navigation curriculum, 3 new simulators were built to provide 4 instructor workplaces and 25 workplaces for trainees in total. The real equipment was updated and expanded as well. The use of simulators in practical training has many advantages (Dehmel 2013; Alexandrov 2015; Todorov 2010). They provide options for simulating and practicing situations, which can be of extreme importance, but occur rarely in practice. Thus the experience collected for years can be shared in one semester (The time shortening effect). Simulators are computer-based and therefore they are closer to the students, who are mostly young people, accustomed to using such devices and applications. The interface is similar to a computer game which allows students to overcome easily the psychological barrier of transmitting on air. And last but not least, the maintenance and updating of simulators is cheaper and easier than maintaining real equipment.

Training using simulators has some limitations as well. The realism of simulations is still restricted more or less by the technologies and, as good the simulator is, it still has software bugs. On the basis of the good relations with the manufacturers, bugs found during the use of the simulator in the Academy are described in details and sent to them to be taken into consideration in the next versions.

**COVID-19 challenges**

The World Health Organization (WHO) declared the COVID-19 a global pandemic on 11 March 2020, suddenly disrupting economic and social activities, including education around the world (Ochavillo 2020). Most of the universities made a transition from face-to-face to on-line, distance or e-learning. For some universities and programs, however, this was very difficult to achieve. Most medical and technical universities, for example, were looking for ways to conduct at least practical classes in some courses face-to-face. For institutions providing maritime education and training, the situation was similar, moreover, as mentioned above this training is organized and conducted under the supervision of STCW, where the IMO by amending and upgrading the Convention periodically requires

seafarers to provide evidence of maintenance and upgrading through participation in courses or seminars. At the 27th Assembly of the IMO, held in December 2010 in Manila, changes and additions were made to the STCW Convention, where in Part B of the Code – recommended competencies, instructions for organizing and conducting distance and e-learning were recorded in section B-I / 6. Such training must be carried out under the supervision of the public authorities responsible for the process of training seafarers[1] (Belev et al. 2020; Suban et al. 2010).

### Legislation

According to the national legislation, Bulgarian maritime administration is required to monitor and control all aspects of maritime education and training, related to the requirements of STCW convention. According to these requirements, all classes have to be delivered face-to-face and at least 90% of them have to be attended by students. During the first lockdowns, a technology of how to use on-line platforms in teaching process was developed in the Academy and demonstrated to the BMA and was allowed for theoretical classes only. A permission was issued later on for delivering some seminars and other practical activities but without using simulators. Invitation of an inspector from the administration in virtual classrooms was mandatory for both theoretical classes and seminars. Practical exercises were only possible during partial lockdowns and under certain limitations, such as small number of students in simulator rooms wearing masks, distance of at least 1.5 m., ventilation and disinfection periodically, etc.

### Technical Prerequisites

In order to be successful, on-line teaching needs certain conditions, related to the technical support and skills of all participants[i] (Ochavillo 2020). Both teachers and students need to have computers or laptops with good internet connection and speed in universities and at home. Some students prefer to use their smart devices, such as smart phones or tablets but limited storage capacity, sizes of their screens and lack of hardware interfaces makes them unsuitable for on-line training purposes, especially when it comes to using them during practical exercises. Both teachers and students need skills to use the virtual educational environment, including cloud technologies and resources, but they were built relatively quickly after the transition to online learning. In addition, according to (Belev et al. 2020), lecturers need to apply effective methods to engage students during on-line lectures. The environment for discussions need to be improved, so as not to feel isolation of individual students when using on-line communications. Same research states that about 20% of all students are dissatisfied with teachers' ability to use new technologies, while for most of lecturers the relationship with the students is the most serious shortcoming, because it is important for a teacher to see living people in front of him instead on the computer screen.

**Organization of Online Training by using Simulators**

The effective use of simulators in the practical training requires careful planning, developing and delivering different kinds of exercises. According to (Alexandrov et al. 2014) simulator exercises could be divided into different types as follows:

– Familiarization exercises to enable students to learn more about the simulator's interface and capabilities;

– Basic exercises;

– Complex exercises;

– Exercises in emergency situations;

– Exercises for testing and evaluation of the trainees.

The first four exercises from the list require some demonstrations to be made by the instructor, while the last four include experimental work to be done by trainees as shown on fig. 1a).



a)
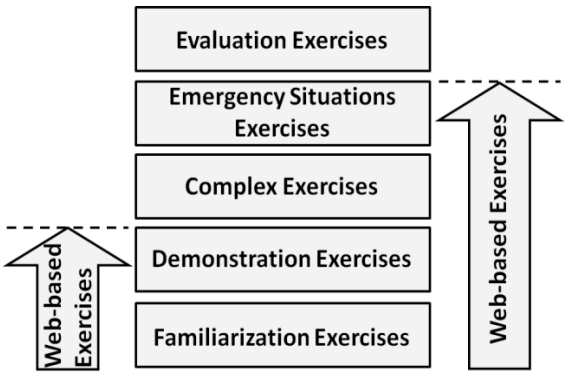


b)

**Figure 1.** Types of exercises

It is possible to reduce the number of face-to-face exercises into the simulator by using the on-line learning environment. According to (Alexandrov et al. 2014), familiarization exercises and some of basic exercises could be uploaded in the cloud as web-based resources for online training, as shown on fig. 2b) on the left.

During the discussions about how to deal with problems caused by the COVID-19 pandemic, the authors decided to develop a methodology for delivering online the first four types of exercises, as shown on the right. The methodology is illustrated on fig. 2.
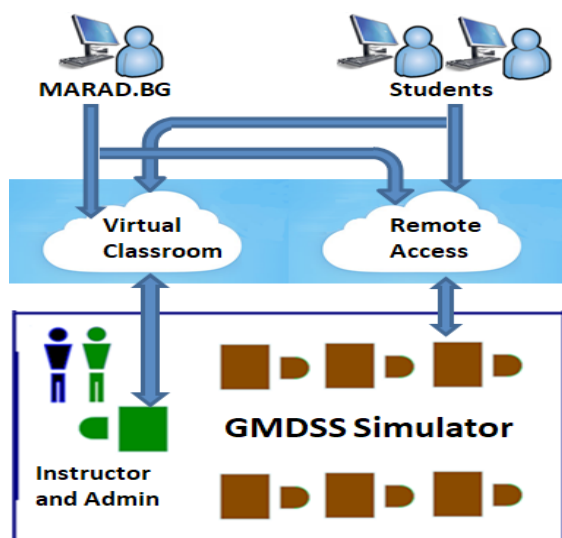


**Figure 2.** On-line learning architecture

After a number of experiments and improvements, the methodology was demonstrated to the Maritime administration and was approved by Varna directorate to be used as a backup option in case of a full lockdown. The methodology was applied during the second half of the summer semester in the conditions of full lockdown imposed by the Minister of Health of the Republic of Bulgaria in March 2021.

To reveal the effect of the COVID-19 pandemic on education and training in GMDSS, examination results are discussed. As was mentioned above in this paper, after successful completion of the training in the Academy, students have to pass an exam which includes both theoretical and practical tasks. Table 1 represents examination results expressed in terms of ECTS grades during the last three years – before the pandemic (2019), during the pandemic with partial lockdown (2020) and with full lockdown (2021). The number of trainees varies over the years, that is why the results are presented as a percentage.

**Table 1.** Examination Results

| Year \ Grade | 2019 | 2020 | 2021 |
|:---:|:---:|:---:|:---:|
| A | 18% | 16% | 11% |
| B | 10% | 13% | 6% |
| C | 10% | 9% | 6% |
| D | 5% | 4% | 0% |
| E | 4% | 5% | 0% |
| F | 30% | 34% | 0% |
| **Missed** | 21% | 19% | 80% |

**Results**

Results in the first column, year 2019 were achieved by students, which had attended all classes in face-to-face mode, while the results in second column, year 2020 were achieved by students, who had attended theory partially face-to-face and partially on-line. All simulator exercises had been delivered face-to-face. It is obvious that both results are very similar, perhaps due to the fact that both courses had been started face-to-face and all students were provided with printed learning materials. Results also show that theoretical on-line training is completely acceptable. High percentage of missing students in first and second column is because they did not cover the requirements of the administration or were not able to come back from their onboard practice. A small number of students were COVID-19 positive or in contact with positive people and missed the training due to medical restrictions. Comparing these results with results in column 2021 however shows some significant differences. Students from the last group started the training face-to-face but very soon theoretical lessons were transformed into on-line ones. In the middle of the semester, practical exercises were canceled due to the lockdown and later, after the permission of Maritime administration, continued on-line. The transition from face-to-face to on-line mode was easy because students already had become familiar with the simulator's interface. During on-line education and training most of these students left the Academy and went back home and only some of them, living in dormitories were able to attend final exams. Their results are much better and none of them has failed because they were very highly motivated to conclude the training successfully. These results also indicate that it is possible to deliver practical exercises on-line but under certain conditions, both technological and organizational.

**Conclusions**

In this paper, the authors described their experience in providing education and training to students in Maritime communications and the GMDSS during the COVID-19 pandemic. The methodology they had developed, permitted on-line education and training during complete lockdowns. The most significant advantages of this methodology were as follows:

– There was no need to postpone the start of the semester;

– The training in Maritime Communications and GMDSS ended on time, without delay;

– It was only necessary to make a few changes in the schedule without a significant impact on the work of students and lecturers;

– Results of the students were much worse than in the previous years but weaknesses are correctable.

The authors experience showed the significant role of the on-line teaching technologies in the implementation of the qualitative and effective education and training. It is obvious now that the role and importance of the newest information technologies in the field of maritime education and training increased during the pandemic crisis. Total on-line training in many areas of education will not be acceptable when everything returns to normal, but the tendency for expanding its implementation is obvious. This will require development and improvement of teaching methodologies for internet-based delivery of learning to increase the efficiency and to improve the results achieved by the students.

**Acknowledgments**

**NOTES**

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