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Proceedings of the International Maritime Lecturers' Association.Seas of transition: setting a course for the future

International Maritime Lecturers' Association (IMLA) 2021

WORLD MARITIME UNIVERSITY

#WMUIMLA2021

International Maritime Lecturers Association

INTERNATIONAL MARITIME LECTURERS' ASSOCIATION (IMLA) 2021

SEAS OF TRANSITION: SETTING A COURSE FOR THE FUTURE

8 - 10 SEPTEMBER 2021
MALMÖ, SWEDEN

CONFERENCE PROCEEDINGS

SUSTAINABLE DEVELOPMENT GOALS

4 QUALITY EDUCATION

Recognizing that all the goals are interrelated and indivisible, the conference is a call for action in support of achieving, in particular, Goal 4 focused on quality education.

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Editors
Anne Pazaver
Michael E. Manuel
Johan Bolmsten
Momoko Kitada
Inga Bartuseviciene

WELCOME REMARKS

Dr. Cleopatra Doumbia-Henry
President, World Maritime University

As the President of World Maritime University, it is my immense pleasure to welcome you to the 40th anniversary Conference of the International Maritime Lecturers' Association at the World Maritime University. I sincerely congratulate IMLA on its 40 year history and recognize the leadership of IMLA's Chairman Professor Jin Yongxing for making this important network reputable and unique. IMLA has had a close relationship with WMU since its establishment.

The theme of the 40th anniversary conference, "Seas of Transition: Setting a course for the future" is a very timely one as we are living in an era of uncertainty about our future.

The world has changed dramatically within the last 2 years. Indeed, what would have been considered routine travel for work, study or leisure has turned into an impossibility or at least a challenging endeavour for many in the COVID-19 era. The COVID-19 pandemic has had direct impacts on educational programmes in all educational institutions. Social distancing, the wearing of masks or visors, the constant use of hand sanitisers, quarantining and lockdown have redefined our relationship with mobility and transport. Luckily, modern means of communication have enabled us to transfer our activities online. We appreciate the great opportunity to hold this conference and celebrate together 40 years of the existence of the International Maritime Lecturers Association.

Since WMU was established in 1983 within the framework of the International Maritime Organization (IMO), the University has been committed to the advancement of quality maritime education and capacity building. To date 5392 students from 170 countries have graduated from WMU. As you know, the maritime community is facing unprecedented change under the impact of rapid technological innovation, new legislative requirements and sustainability issues. Maritime education and training (MET) must acknowledge and respond to these changes to meet the needs of the industry and the oceans community now and in the future.

The current trends and changes in shipping related to the introduction of new technologies are difficult to predict due to a high level of uncertainty. With a high degree of uncertainty, there is one certainty: new technologies will dramatically change the nature of work across all industries and occupations. Modern technology is fundamentally changing our style of life and work by creating new opportunities and challenges for all of us. The main challenges are related to our capacity and ability:

- to use technology to empower people rather than replace them;
- to enable the progress to serve society rather than disrupt it;
- to foster the innovators to respect moral and ethical boundaries rather than cross them.

The challenges may affect safety at sea and changes in the labour market and necessitate retraining and reskilling, which is not yet well defined. MET can provide assistance to the maritime community and the labour market in the areas of adaptation to technological changes over the transition period and in the ensuring of safety at sea through proper identification of the new functions of personnel, the establishment of standards of competence, and optimal organisation of training and reskilling of needed specialists.

There is no doubt that future maritime professionals have to be suited to adapt to the continually changing environment. That means that to prepare students for an unknown future is to help them to learn to deal with uncertainties, take risks, confront dilemmas, embrace complexity, recognize the limitations of their own knowledge, and maintain health and wellness. Although educators cannot reduce uncertainty about the future, they can help students develop the tools required to learn how to adapt and live in uncertain times. Learning for an unknown future means making decisions in situ, without all of the information at hand. Although, it is difficult to foresee what kinds of skills and competences will be needed in the future, MET institutions have to be ready to face changes and to present effective solutions for the development of students' knowledge and practical skills to be able to meet volatile labor market needs, with an emphasis placed on their quick adaptation to rapid technological, societal, environmental, and digital changes.

The role of maritime educators is crucial in the process of making MET a reliable tool to provide high quality maritime and ocean education and training. Special attention should be paid to the reskilling and continuous upgrade of competence of instructors. This may involve additional training and qualification upgrading courses. But discussions with colleagues to exchange ideas, share best practices, coach and mentor one another and learn about latest developments are equally essential. This conference provides a forum and opportunity to do just that.

The selection of the IMLA Joint Conference theme provides an opportunity for MET professionals, administrators and decision makers worldwide to come together to discuss challenges and future directions for MET, in response to current disruptions and in line with the United Nations Sustainable Development Goals (UNSDGs), in particular, Goal 4 on Quality Education. The Conference brings together, for the first time, IMLA members and interested parties with IMLA's three special interest groups, the International Maritime English Conference (IMEC), the International Conference on Engine Room Simulators (ICERS) and the International Navigation Simulator Lecturers' Conference (INSLC) in an interdisciplinary forum, covering all facets of MET.

OPENING REMARKS

Prof. Dr. Jin Yongxing
Chair of IMLA

It is my great honor and pleasure to join you here online at the 27th IMLA Conference, the first joint conference ever with all three of its Special Interest Groups. Although we cannot meet face to face, I am delighted to see our respected IMLA members, delegates and friends virtually. First of all, on behalf of the IMLA, I would like to take this opportunity to extend my sincere appreciation to all of you. And special thanks to Ms. Mayte Medina, Chair of IMO MSC for taking your valuable time to participate in today's conference and deliver a keynote speech.

As some of you may know, IMLA was rooted in and has been keeping close connections with the World Maritime University in the past decades. We can also say, the glorious city of Malmo is the birthplace of IMLA. Today, IMLA with its three Special Interest Groups: International Conference on Engine Room Simulators (ICERS), International Maritime English Conference (IMEC), and International Navigation Simulator Lecturers' Conference (INSLC), have returned to the place where they developed themselves. In this sense, the 27th Conference could be remembered as a unique and milestone event in the history of IMLA.

Forty years ago, our predecessors, with their visionary minds, established IMLA as an independent and professional association, providing a no-border global forum for exchanging information and discussing issues related to MET. As a big family for maritime lecturers, and an IMO NGO (Non-governmental organization) with consultative status, IMLA has effectively created a world-wide network for the dissemination, sharing and transfer of knowledge and experience among maritime professionals. During the last four decades, IMLA has steered the wheel of MET full ahead with proper course by its active role in the MET community, and has so far made an enormous contribution to the international shipping industry.

Mr. Kitack LIM, the Secretary General of IMO mentioned in his special message for IMLA's 40th Anniversary in December 2020: A critical factor to shape the future of shipping is the education and training of people engaged in maritime activities. IMLA, over the four decades of its existence, has stood at the forefront of this field, exploring coordinated and comprehensive approaches to challenges we have faced locally and internationally. It has brought together maritime academics from over the world to promote education, research and capacity building

as a means to enhance the overall standards of the industry. IMLA has held conferences with contemporary and relevant themes in different continents including Europe, Asia, Africa, North America, as well as areas in Latin America and the South Pacific. These conferences have provided opportunities for interdisciplinary discussion and exchange of ideas on issues facing MET in the present era of rapid change and great challenges in the global maritime community, with a view to harnessing the past to navigate the future.

History and reality tell us, ships and seafarers take mankind to discover and change the world, carry and disseminate civilization, and facilitate global trade and economy. Especially during the difficult times of a global pandemic, the ability for shipping services and seafarers to deliver vital goods, including medical supplies and foodstuffs, will be central to responding to, and eventually overcoming, this pandemic. Seafarers have inscribed their monumental feats on the history of human civilization. This has been true in the past, and is even more so in the future.

With the 2021 World Maritime Theme "Seafarers: at the core of shipping's future", the world maritime community has been drawing greater attention to seafarers as key workers in the world economic and social development. The world's seafarers have gone above and beyond during the pandemic to ensure that supply chains continue to be active in order to deliver personal protective equipment, food, medicines and other vital supplies.

Meanwhile, we must also embrace diversity in the maritime workforce. We need the best and brightest individuals to safeguard our sector and it is up to us to create an attractive work environment. In the longer term, we must ensure that seafarers are provided the right tools to support them in adapting to evolving work requirements. Our goal should be to properly prepare them for life on board, with quality education and training, mental and physical health resources, appropriate shoreside care and a supportive work culture.

It has been fully and clearly understood that advanced technologies and operations have been promoted more rapidly than ever before, which greatly impacts human life accordingly. The huge transition to digitalization, decarbonisation and intelligent ships is placing ever higher expectations on seafarers whose responsibilities are this becoming heavier than before. Surely enough, as the most important origin for providing human resources to the industry, maritime education and training is now confronted with ever greater challenges.

With the Conference theme: "SEAS OF TRANSITION: SETTING A COURSE FOR THE FUTURE", I am confident that the Conference will provide us with opportunities for strengthening the academic exchange and cooperation in the international maritime education and training community and sharing the latest scientific and technical innovations in an effective MET way. It also provides a good platform for enhancing our friendship among the participants.

Dear colleagues and friends, I would like to express our sincere gratitude to all concerned for their time and efforts in making this virtual major conference possible. Much thanks to the World Maritime University, for providing us the opportunity to share new ideas and experiences. And of course, special thanks to the whole team of the Local Organizing Committee in Malmo. Before ending my speech, hereby I want to quote the lyrics from the song IMLA attributed to IMO for its 70 year anniversary.

We berth and re-sail full ahead,
Shipping towards our glorious missions.
We'd ship across every ocean,
And navigate every ambition,
Just to be with the heritage,
And forward to a better future.

Finally, I wish the Conference a great success. Thank you.

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Plenary Session 1

Mayte Medina

Chief, Office of Merchant Mariner Credential, U.S. Coast Guard/Chair, Maritime Safety Committee, International Maritime Organization

Keynote speech

Keywords: STCW convention, seafarer training and assessment, technology, pandemic, MET models

I would like to extend special thanks to the organizers of the conference, in particular, Dr. Cleopatra Doumbia-Henry, the WMU President as well as Mr. Jin Yongxing, the IMLA Chair. This IMLA conference is a timely and appropriate one to address what we have been facing during the pandemic over the past year. Because of the IMO theme for this year: "Seafarers at the core of shipping's future", it is a turbulent time for seafarers, competence, training and education. I am going to speak about the future of training from an international perspective, since a review of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978 as Amended, is looming in the horizon. It has been 10 years since the last amendments to the STCW Convention. Everyone is wondering if the international regulatory framework for the training of seafarers can keep pace. Everywhere I speak on this topic, I always get a lot of questions or three key questions come to mind.

- How do we ensure that our seafarers continue to be safe, safely and competently trained?
- What do we need to do to ensure that crew meet the minimum regulatory requirements and at the same time are competent in the role?
- How do we ensure that rapidly changing requirements in competencies are caught by training requirements?

During this speech, I will also address the impact on the international education and training infrastructure during the pandemic. I am a firm believer that the pandemic pushed forward the

need for changes. In order to address the previous questions, we need to have a common understanding of the training infrastructure, including the STCW Convention, the training requirements and how these requirements are developed. First, it is important to ensure that we have a common understanding of the main goals for the training of seafarers, and those are that it's personnel are qualified to carry out the duties and responsibilities to ensure the safe and secure operation and environmentally responsible ships. That is a very important goal. It is important also to understand that the STCW Convention first fits minimum qualification standards in support of the other IMO conventions, that is, equipment carriage and operational requirements. In fact, STCW uses tables of competence in order to accomplish this. The second point on the STCW Convention is that the minimum standard is applicable to all seafarers worldwide. Therefore, we cannot incorporate new training or remove training based on technological advances on one ship or a small group of ships.

New technology and the IMO regulatory framework

Introducing technology into the IMO regulatory framework supporting maritime operation is not a new topic. The new twist is that technological advances are developing at a faster rate. Traditionally, as new technologies emerge within the maritime industry, the IMO has been in the leadership role for the development of the necessary standards. These standards often times include the training of personnel. The difficulty in the development of training standards is that they must be developed after the equipment performance standards are agreed to in order to develop the supporting training. Often times, we're frantic to rush to develop the training standards to be completed in time for the entry into force date of the equipment standards, and this has happened many times.

I have spoken at different conferences about this topic and I keep repeating myself that I am always losing the battle of the training trying to keep up with the changes of technology. The basic example is the ECDIS training. The training was behind the implementation of the equipment requirements by over two years. The IMO must accommodate these new technologies in order to ensure the seafarers are qualified to carry out their duties and responsibilities, when operating these equipment or these advances. We must make a number of changes to the STCW convention and a number of changes to the training model. What is the current model? Mariners are generalists. If you look at the STCW convention, you have very small training on very specific things. The training model is formal education, "brick and mortar" as they say in the United States; the maritime schools with physical facilities performing basic training, position specific training, cadetship in conjunction with formal education and simulator training. On the job training - only a few countries still have this type of training, experience in lieu of formal education and performance assessment. We have the familiarization training, which is provided normally on board the ship. This is what the ship owners and the Masters provide. That is STCW and based on the ISM Code.

What are the challenges with this model? It is heavy reliance on classroom training. I can honestly say based on my previous position as Chair of HTW Sub-Committee that this model failed during the pandemic. Due to national COVID restrictions, schools around the world were almost closed, the majority of them. If not closed, they were limited in how many students they could bring in for training. Now what I consider the future model - mariners must be specialists, especially with the new technology coming on board. In my view, general training needs to include, for example:

(1) Basic training on navigation principles, basic understanding of maritime laws, and basic safety of life at sea.
(2) Specialized training needs to support each industry segment, safety concerns, specialized use of technology, mariners' personal training, and personal safety within an industry segment. For example, we are talking about, at IMO right now, industrial personnel. You are carrying a lot of people; specialized mariners skills needed by an industry segment.
(3) Increased need for technology competent mariners.

Navigating Seas of Transition

Now, one of the important part in my view of this new model will be the transition from one sector of the industry to another. We need to figure out what training is necessary for one sector, specialized training, and develop that so they can get those if they are moving from one sector of the industry to the other. One thing that I heard Dr. Cleopatra Doumbia-Henry mention is the issue of welfare of seafarers. This is something that we need to make sure our mariners are prepared to deal with, even though the STCW Convention has particular provisions on how to deal with this, it is very minimal. We need to increase that, and not only for those in management positions, but for all seafarers.

Now let me spend some time on the STCW convention. The STCW convention is not obsolete. However, it is time to make some changes to remove obsolete requirements and to include new ones in support of introductions of new technology. First, I need to spend time on the functions, those that came before us, before me, were very smart in how they developed those functions and how they developed the chapters. We have the two chapters; chapter two and three, which is deck and engine. It is the structure following the traditional shipping model of the two departments. However, the tables of competence are divided into the seven functions. These functions were derived from the requirements in other conventions, and provide a systematic way to look at how technology and automation can be incorporated on board ship. It is possible to automate certain functions and activities, while fully manning others without entering into discussions of seafarers' responsibilities on board the ship. These functions are very much alive and well and will continue even with autonomous vessels or vessels that heavily rely on technology.

The STCW convention includes a very important chapter that have not really been used by an administration. It is what I call the famous Chapter Seven, alternative certification. This is the most important change that will need to happen if we review the convention, in order to provide the middle step for the use of future technology. As currently drafted, Chapter Seven provides for the issuance of alternative certificates by combining the functions between the two departments, deck and engine. The concept of Chapter Seven in the convention needs to be completely overhauled since as currently drafted, it establishes that a person most qualified for a deck or engine Certificate of Competence, before being allowed to add functions from the other department. Taking into account the new technologies are developing faster, it is clear that the future is a multi-purpose person that has a combination of both Chapter Two and Three functions based on ships' needs.

Let me spend some time on STCW flexibilities because the convention has flexibilities; however, the way that they are being applied, we can make some small changes that would allow us to use them in the future. The first STCW Convention has a number of flexibilities that could potentially assist in addressing innovation and technological advances. Among them

is, one, the companies are responsible to ensure that mariners are familiarized with their specific duties, or ship arrangements and equipment that are relevant with their duties; and, two, submissions of equivalencies to adopt arrangements, adapted to technical developments and to special types of ships. I previously mentioned that the STCW is applicable to all ships, to all seafarers worldwide. Therefore, I want to repeat myself, we cannot incorporate new training or remove training based on technological advances on one ship or a small group of ships. Therefore, it is of utmost importance as we go into a review that ship owners are going to have to step up to the plate to provide training specific to the ship, if you want seafarers to operate specific technology. This is a very important point because the STCW convention, even when it's reviewed, needs to be able to apply to existing and new seafarers, all of them together, not for one ship, not for a group of ships. A consistent and sustainable approach on how we use these flexibilities can provide the interim step in advance of the mandated training. This is important because you always have a step. We are always in a grey area between when amendments are developed, and when they enter into force. Well, shipowners can provide that middle step while we wait.

I mentioned the removal of obsolete requirements, and the STCW contains a number of requirements that are obsolete. In some cases they have become obsolete due to the introduction of technological advances on board a ship. An example is the three separate training requirements for radar, ECDIS, and ARPA without providing any links between them and the potential integration of other navigational technologies. The introduction of more complex digital technologies on board require that seafarers are more technologically savvy to perform troubleshooting operations. The STCW Convention already includes training requirements in support of digital technology. These are the electrotechnical rating and officer endorsements, but these may need to be increased. We also need to increase the competence for engineer personnel performing engineering functions to ensure they can address on board problems with these technologies.

Time for Change

The one that is my favourite change, and I think it is very much appropriate to this conference is a review of sea service requirements. The basis for the STCW certificate of competencies are a combination of experience, sea service and training requirements, tables of competence. To date, most of the experience in the Convention comes in the forms of sea service; serving on the actual ship. However, in some instances, it allows for the use of simulators, labs, workshop skills, experience, etc. In every instance, the requirements specify that the sea service must be met. However, it does not provide for the quality of the sea service. Several studies and anecdotal information have shown that there are technologies such as simulators that provide better experience than obtaining sea service. As currently drafted, the only way to use simulators is to take advantage of equivalency arrangements in the articles of the Convention. To date, only three countries in the world have submitted equivalent arrangements, the Netherlands, the United Kingdom and the United States. Their submissions for equivalences were not based on studies with specific data. The submissions for these three countries were based on anecdotal information, relying on each other's studies to make these submissions. The point I am trying to make is that there are no specific studies on the use of simulators for training assessment and sea service credit. This is very much something that is needed on an urgent basis.

Now, my second point, which is very much appropriate to this conference, in the changes in learning technologies, and instructional techniques. Before I make those points, I would like to say that we failed during the pandemic when it comes to these instructional techniques. I would be surprised if any country can actually say that they were prepared during the pandemic to use virtual training as much as it was needed during this pandemic. It is envisioned that some of the training can be done using modern learning technology. Therefore, there is the need to amend the convention to allow for their use. I said before that currently the model is that seafarers would normally go to a classroom to get their training. This is the current model. Probably about 75 or 80% of training is done in this manner. Use of modern learning technologies was pushed forward by the pandemic. As I said, the norm is classroom training. Not anymore. There are three parts to this change:

- The training platform, which I think is something that we need to review. There is no requirement for that in the convention, specifically, the identification of the platform, and our domain.
- Knowing who the person is that is taking that training.
- The assessment exam platform. I am talking about assessment of skills via virtual.

You will be surprised how much skill assessment can be done virtually. I can tell you that I asked my staff, when this was happening through the pandemic, to go through every single competence, every single assessment and, individually, tell me whether or not it could be done virtually. We found some. We found a lot of them. You will be surprised, but we just have to take the time to identify them and be very careful that we are not losing the fact that they need to be trained, and they need to be assessed. There is a need to look at this carefully since not all training is appropriate for virtual training. My favorite example here is always firefighting. However, some parts of firefighting training can be done virtually. We just need to provide for that use in the Convention. The tested technology is there. The tested technologies are already there. We just need to make sure that it is correctly applied to the industry to ensure competent seafarers.

Setting a Course for the Future

Now, you are probably wondering, I gave you all this information, but how do we make the transition to tomorrow? We need to change to a new model to ensure that seafarers are qualified to carry out their duties and responsibilities while addressing the new technological challenges, particularly the increase of technology. We need to make sure that we adapt to a mobile population. We adapt changes to learning technologies and instructional techniques. We will require changes to international regulations and their implementation, but this will require a deliberate approach. Training needs to be cutting edge to grow with needs, and the most important part is that all stakeholders need to participate.

There are three points that I want you to take with you from what I just said. Today’s mariners are generalists; tomorrow’s mariners need to be specialists. Today's training process and delivery system needs to change to meet tomorrow's needs. An international focus on training requires that all stakeholders must participate. Thank you very much for giving me the time on the platform to speak on this very important topic.

Plenary Session 2

Murray Goldberg

President and CEO, Marine Learning Systems

Keynote speech

Keywords: educational technologies, blended education, data analytics, assessment

I'm the CEO of green learning systems, and if you thought that the keynote today might be, or at least my touch on educational technology, it is a bet you would not be far from the truth. In fact, what I want to talk about is a particular shift, a huge shift, that is happening right now in educational technologies. I want us all to be aware of what's going on. I want us to be prepared for it if we choose to be prepared for it, and to be able to take advantage of it if indeed, we choose to want to take advantage of it. So let's begin with what we know, right now, where we are right now, in educational technologies.

The rise of elearning and blended education

About 20 years ago, elearning absolutely exploded in terms of its use. Why did it explode? Why was it increasing so drastically in its use starting about 20 years ago? It's because it is efficient and effective and, if done well, it works. Practically every bit of research that we have tells us that it works very very well.

I began researching the question back in 1995, with a series of studies, but there have been hundreds and even thousands or more much better studies since then that unequivocally tell us that elearning works. Probably the most definitive of those studies is a 2010 US Department

of Education meta-analysis that looked at all of the existing work asking the same question - does elearning work? Is it effective? And what did they find? Well, they found that students learning in online conditions performed at least as well, if not modestly better, than those learning face to face. So you can teach online and expect roughly equal outcomes. Now that right there was kind of a game changer because now we had a tool that allowed us to teach anywhere, anytime. It had huge implications for travel and, probably most importantly, it had huge implications for access to education, which was really wonderful.

The second thing the study found was that if you blended education, if you combined online learning with face-to-face learning, you actually got better outcomes than you could possibly get either just face to face, or just online. This was even a bigger game changer because now after arguably thousands of years of very little change in the way we taught, by adding an online component to what we were already doing and intelligently blending it, we could actually achieve better outcomes than we ever could have in the past.

Blended learning and MET

The third thing that study found was that this effect that blended is better and online is just as good, was discipline agnostic. It did not matter what you were teaching. Now, we all know, maritime is a little bit different, right? Does this apply to maritime? Well, it turns out maritime isn't that different in this regard, and we've got implementations and we've got case studies that show that blended learning produces better outcomes in maritime and in fact, blended learning is particularly suited for maritime education and training because of the focus on skills. And in fact, when BC Ferries moved from traditional training methods to a blended approach, their outcomes improved substantially with respect to accidents and insurance claims costs and those kinds of things.

Looking back the focus for the entire edtech community was on the process of learning, on proof in outcomes by improving that process. We examined how we talked and how we assessed, and whether we should teach in the classroom or teach online, or in blended format. We asked if learning should be self-paced and if it should be asynchronous or synchronous, individual or group. All of these questions were about the process of creating more effective education by improving the process. And as I say, it works. So within 10 years, elearning was just everywhere and that's where we were up until very recently. What happened since then was that big data happened. The world is entering the age of data and, in particular, data science and analytics and machine learning. Analytics are changing the world in so many ways for us right now. And for learning, everybody who's been tracking this agrees it's going to be absolutely revolutionary as it takes off and continues to accelerate. This is going to propel learning outcomes forward in a way that I don't think was ever previously possible.

Introduction to data analytics in everyday life

So let's talk about what analytics are. In general, analytics are the process of analyzing data to find patterns and answer questions based on the patterns that we find in that data. Now, I think that definition really undersells its abilities and its potential. With data, we can answer some questions shockingly well. Have you ever thought about why sites like Amazon are so compelling to so many millions of people? It's data analytics. Amazon knows shoppers better in some ways than they know themselves. Amazon employs something like 2000 data scientists,

many of them are PhDs; Google employs about 1000. There's a reason for that; data science actually works really, really well. It has been pivotal as a tool in the pandemic. It has helped identify treatment candidates from tens of thousands of possibilities. It has helped us predict COVID hotspots and who is most likely to suffer. There are other great examples that impact our lives all the time. Credit card fraud detection is now really really effective, very few false positives and very good at detecting fraud. That's all data science. Spam and email filtering, again very good data science and machine learning. This is all done by having software, reviewing millions of examples, finding patterns in them and then using that knowledge, using those patterns, to predict the future. Patterns in data abound in a way that humans could never detect because the data is just too big, but software can detect them. And once we detect them, we can use them to our advantage because they repeat their patterns. Most of the examples I just gave you are done far better by software than they could ever be done by humans.

Breaking analytics down just a little bit more, according to Gartner, there are four kinds of analytics:

1. Descriptive analytics: They tell us what happened by looking at data. If you think about learning, who passed? Who failed? Are we compliant?
2. Diagnostic analytics: Why did something happen? Why did this person pass? Why did this person fail?
3. Predictive analytics: Predict what will happen. Who is likely to pass? Who is likely to fail?
4. Prescriptive analytics: Tell us how to make something we want to happen happen. How can we ensure that this at risk student passes?

Data analytics and education

So how does this all apply to learning? There's a whole field of analytics called Learning Analytics. It's basically analytics applied to learning for the purpose of understanding and optimizing learning. What are the data sources that inform analytics? The EdTech revolution has mostly set us up pretty well because software is very good at generating data. And now we have a reason to use that data. The existing data sources for learning analytics are things like our learning management system. It produces a tremendous amount of tracking data, such as the content viewed by students, where they dwell, how long they dwell, what they review and what they skip over, their grades, grades on exams, and even within a question on an exam, what did they get right? What did they get wrong? All these kinds of things can come from the LMS and tell us a lot about students.

Our student information systems as well are very good sources for analytics, things like transcripts, past experiences, the school somebody has gone to in the past, their interests, the courses they're registered in, and the path they take through those courses can be very revealing. In fact, skill performance is another good source for analytics. And then of course, if we can get data from on the job performance, that too can feed back and kind of complete the loop and tell us what worked and what didn't work with respect to creating good performance.

So with this data, you can pretty quickly think of some potential analytics. There are some simple ones that we can think of right away. For example, we could develop analytics that identified difficult content in learning or identify students who are falling behind, or identify students who are risk well before we, as as faculty members, or instructors could identify them, and then maybe tell us based on how they're falling behind and how they're at risk, effective

course corrections to bring them back in line to success. We could understand what is the most or least impactful content, or experiences or assessments that we're giving them that tell us most directly whether or not they're going to succeed, or even tell us which students or which situations are most likely to cause accidents in the future. These things can affect admissions, they can affect recruiting, what we teach and how we teach. They can help us stop over teaching, or they can stop us from under teaching, how and what we assess, job placement, all these things can be influenced. These also give us, however, a kind of a meta advantage in that they give us metrics that allow us to continually improve the education we're giving them, and the process for the education, based on the trends that we see.

Looking at a few examples is illustrative. This first one is from a tool called Visit. It's a descriptive analytic showing what students are talking about in discussion forums. It's simple but useful because it can help the instructor understand the issues and the topics that are top of mind for students. Another one is video analytics. For courses with video content, it shows what learners are looking at, what they're skipping over what they're returning to, and looking at two and three times. It helps us understand, number one, what students find difficult, what they find relevant, and what they find irrelevant. If you don't have this, it's kind of a black box. You put the video out there and you assess and you hope for the best. A third one is about enrollment pathway analytics. For every program at the institution or possibly at multiple institutions, what do students enroll in? What's the outcome of that enrollment? Do they complete? Happily? Do they fail out? Do they stop part way through possibly enroll in something else? And for those who enroll in something else? What's that outcome? And what does that path look like? The idea is, of course, that we can understand what paths lead to success and which ones are more likely to lead to failure, and for which kind of students, so we can advise them later. So again, it is very useful for advising.

We can also look at performance differences according to any variable. For instance, we can track how males are doing versus females, and identify whether there's a problem possibly in the way we teach or in the way we prepare different classes of students, and whether some mitigating actions that we might apply are useful. Once we see this problem, hopefully, what we're going to try to do is correct the problem. And we can use the same analytic to see if those corrections are helpful. And finally, predictive analytics can help students choose courses or programs based on data about students who have come in the past, and looking at the trends and the patterns in those students and then understanding what they've been successful at and applying those patterns to the student who's looking at the tool right now and giving them suggestions that they're likely to be successful at.

Data analytics: Maritime case study

So now that we've introduced data analytics,I want to shift to a maritime case study involving the Royal Canadian Navy and an organization called CSMART. It's interesting because it's a lesson in the need to gather objective and accessible data. If you don't have good data, you really can't run analytics you can't learn without having data to learn from. CSMART is a massive maritime simulation training facility outside of Amsterdam owned by Carnival Corporation. They do a tremendous amount of skill assessment - they are expert assessors. Their original assessment practices are very much like most assessment practices for simulation assessment. Expert assessors observe the simulation that's in the performance of the candidates in the simulation, and they complete paper based forms. Now CSMART wanted to use analytics but really couldn't because, number one, based on their existing assessment practices,

there was a large lack of standardization and objectivity. They couldn't compare an assessment I did, for example, against one that another assessor did because there's a lot of human input to this and a lot of subjectivity. They really couldn't even compare two assessments done by the same person because people vary over time, which is not very good for analytics. Secondly, they needed deeper, more granular data than was available in a database that they could mine for insights. Everything here was just locked in paper. So they thought technology could help, which isn't terribly surprising, because if you think of the educational technology landscape, there really is very little that addresses skill assessment, which is, again, largely done on paper. For knowledge teaching and knowledge assessment, we have the LMS; it's pretty well established. So we have data on those sides. And for skill training, we have simulation; we have augmented reality and virtual reality, but really nothing for skill assessment. So this was the challenge that CSMART had to be able to capture accurate and objective data for analytics. CSMART worked with us in a Swedish human performance factors group to build a tool that actually measured skills and produced data for analytics.

The tool is called Skill Grader. It's a tablet based app that just replaces the paper based form. And it's used to assess either teams or individuals performing observable skills. The assessor selects the scenario they're testing, maybe it's a fire drill, or navigation exercise, selects the participants, and then observes. And for each thing they observe, they simply tick the little box that says they've observed that thing. So every row in the assessment form is what's called a performance indicator. And it will be checked by the assessor if somebody actually performed that performance indicator. So at the end of this, it simply creates a debrief report, gives insights on team performance and individual performance and how the individual contributed to the team performance. So the advantages here are simply that these forms that are in the Skills Grader are created by the organization's assessor. So they effectively build the expertise into their form and into the algorithm and the Skill Grader enforces rigor and consistency and, therefore, it meets the needs of an analytics program. You get consistent and objective assessments and data; you get a more sophisticated analysis, more granular data. And of course, that data is in a database for mining. So we built this prototype to do this for CSMART and they quickly started using it across CSMART and started gathering a tremendous amount of data.

I'm going to tell you a little bit about the Navy, and how they're using it. But first, let me just mention why the skills data is so important. It's really important because it kind of closes the loop and now we have data on actual performance. With this data, we can look at correlations between the performance and all the other aspects of that trainee. We can look at their education; we can look at the competencies, their knowledge of the assessments; we can look at how they were trained, and find out what leads to good performance and poor performance. It can help us recruit; it can teach us how to train and when to retrain. All of these things now are possible if we have minable skill data. So very early it's being used at a number of organizations, CSMART, BC Ferries, the Canadian Navy, soon at Warsash and Carnival. It's used in training assessment, but also operational assessment as well.

So what is the Canadian Navy doing with this? The Canadian Navy cared deeply about understanding and optimizing training, so their initial target for this and for analytics is their navigation and bridge simulation program. It's a simulation training school. Their current practice, like most, is paper based forms and, of course, filling out the form is informed by a rubric. But even though there is a rubric, there really is a lack of objectivity. There's a tremendous amount of subjectivity, and then assessors at the Navy really saw this problem. The Navy did a survey and the assessors were pretty strong in their agreement, but less than

50% said they could identify trends and gaps over many assessments in their current practices. Fewer than 30% could say whether their training practices were more or less effective than in the past and why; less than 40% said they could easily rank trainees past and present for a given role, and only about 40% said their current assessment practices were fully impartial and data driven. These were all problems that the Navy saw that analytics and clear data could really help with, so they had an incentive to make assessment much more objective and create data for analytics.

So we're running a pilot at the Navy to move assessment from paper to this technological assessment. The first phase is to use their existing rubrics, but use them electronically, and then to build some simple analytics. It's very early in the project, but it's already creating some fascinating discussions in the Navy about rethinking assessment. They're really actually looking at what they're measuring in assessment because they're realizing that there's so much more they could capture. Ultimately, the Navy may include operations assessments, not just training assessments, and other learning and profile data to inform these analytics. If things go well, it may even expand to other branches of the military. So it really is a very exciting time and data is driving all of this.

The message I'll leave you with is this - analytics has arrived. We're just at the beginning of it, so you're not seeing it much yet in education and training, but it's absolutely arrived. Without data, we can't manage; we can't improve outcomes. But with data we can. So we need to start thinking about data. And even if we're not thinking about using it, we have to start thinking about our sources of data and how we're collecting it, so we're prepared to be able to do this. The more data we have, the deeper the history of data, the more objective it is, the more granular it is and more accurate it is, the better we can train and optimize performance. Thank you very much.

SESSION 1:
LIFELONG LEARNING IN MET

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A key component of continuing professional development in the maritime context

Olga Zavalniuk MNI
Associate Professor, *Kherson State Maritime Academy, Kherson, Ukraine,* e-mail address *olgazavalnjuk82@gmail.com*

Volodymyr Nesterenko MNI
Captain, *Kherson State Maritime Academy, Kherson, Ukraine*, e-mail address *nesterenko_mast@mail.ru*

Inna Zavalniuk
Associate Professor, *Kherson State Maritime Academy, Kherson, Ukraine*, e-mail address *zavalnyukinna@gmail.com*

Halyna Doshchenko
Associate Professor, *Kherson State Maritime Academy, Kherson, Ukraine*, e-mail address *hersongala@gmail.com*

Abstract: The maritime industry, one of the world's most influential industries, is developing with a rapid speed. There is, therefore, a special need to find new approaches to prepare students to be ready for the changing realities of modern life. Taking into account generational peculiarities of information perception, new approaches were developed with the aim of building a number of competencies for future marine specialists in order to manage ships safely and efficiently. Ukrainian sailors are said to reflect a high level of training and professional skills, which is considered to be a distinguishing feature. Nevertheless, nowadays Ukrainian seafarers are facing new realities trying to be competitive in the world labour market. Using the approaches created by the authors for the delivery of special courses during navigator training, the key component of continuous professional development was implemented effectively. The authors have evaluated the effectiveness of the approaches by processing the learning outcomes of a focus group. It was found that the tested approaches developed the ability of the students to analyse, evaluate and create, which are crucial in the lifelong learning process to continuously improve professional knowledge, skills and competencies.

Keywords: competency based education, creative thinking, critical thinking, lifelong learning, specialized laboratory.

Introduction

The rapid and dramatic development of the maritime industry, technical modernisation of ships as well as constant increased demands for shipowners in terms of environmental protection and cybersecurity tend to put the lecturers of maritime higher educational institutions under

constant pressure to find new approaches to the training of future maritime specialists to make them competitive in the labour market. Annually, in Ukraine, about
12 000 maritime professionals graduate from maritime educational institutions. At the same time, more than 120 000 Ukrainian sailors are already working on internationally owned ships. It should be noted that the Ukrainian sailors are greatly appreciated due to their high level of training and technical skills, which is considered to be one of their distinctive features attributed to the well-established long standing traditions of maritime education in the country. Despite all the efforts and striving to do the best, in the contemporary world, the Ukrainian seafarers are seen to be facing real challenges to remain competitive in the world labour market.

It goes without saying that the maritime industry, as one of the foremost industries in the global economy, has to keep pace by having highly qualified specialists – including deck officers – with a certain set of abilities. They are highly likely to embrace the following much-needed characteristics: mental or cognitive flexibility and fast learning, along with adaptation to ongoing qualitative progress in the technical enhancement of ships and success in facing incoming changes and innovations in maritime legislation and related requirements of the International Maritime Organization, classification societies, etc.
According to research data from Gilbert Maturan, Global Training Manager at Teekay (Casey & Sturgis, 2018), "60% of learning occurs onboard, through practical, hands-on experience; 30% takes place through interaction with peers (coaching and mentoring); 10% comes from formal, short courses taken while ashore". Thus, the very issue of providing specialised base education on a high-level of competence is sure to beneficially contribute to the preparation of future maritime professionals.

The competence-based approach in the primary training of specialists in the maritime industry, in particular navigators, in the Kherson State Maritime Academy (KSMA, Ukraine), has encompassed a wide range of training for decades. Being in the abovementioned environment, the authors of the study have aimed at introducing and mapping innovative approaches to future navigator training to instill the necessity for self-improvement and "never ending learning".

Taking into account the specifics of the goal, empirical research methods, including interviews, questionnaires, rating, self-assessment, observation, experiment, expert assessment and analysis of results have been used. The present scientific research embraces the following directions: analysis and evaluation of the data collected during the educational process for a certain time period and the authors' verified and consolidated experience in conducting professional disciplines for future navigators. In addition, the study method comprises survey and analysis of student term papers, theses and the rating of students.

A Bachelor of Navigation is a specialist according to the requirements of the International STCW Convention, and is able to perform a number of important functions and complex tasks. These functions and tasks require diverse knowledge, skills and abilities, including studying on a constant basis for continuous improvement during the whole course of their professional career. The curriculum of the KSMA is noted to provide a complex combination of special disciplines correlated with the professional competencies' development of a navigator. More specifically, it seems to represent about 80% of the entire educational program. The main purpose of the research is, based on an example of a professional training course for the bachelor of navigation, "Ship's theory and design", along with the authors' teaching experience, to uncover potential ways to shape the students' lifelong learning in the professional abilities.

Discussion, theoretical or practical implications

The classic training course, "Ship's theory and design", is considered to be the basic one in the educational program for navigator training. This course is designed to provide the navigator with opportunities to obtain knowledge, skills and abilities relating to the control of stability and strength of the vessel during its functioning. As a result, it tends to lead to the safety enhancement of the vessel in various sailing conditions. Furthermore, it should be noted that the areas of competence of the navigator in accordance with STCW must embrace the following items: "plan and ensure safe loading, stowage, securing, care during voyage and unloading of cargoes" as well as "control trim, stability and stress" (Maturan, 2016). Taking into account a 10 year survey of the educational research laboratory "Ship's theory, design and maritime safety" of the KSMA, 95% of students enrolled in working practice on a ship were not capable of implementing the theoretical knowledge gained on the shore concerning practical tasks of the ship's cargo plan development. Moreover, it goes without saying that this procedure, while being a routine one, nevertheless reveals, at the same time, the creativity of the navigator in the course of professional activity. Thus, there was an attempt to bridge this gap with the well-documented curriculum for the discipline "Ship's theory and design" in such a way to enhance the practical over the theoretical aspects. Therewith, it had to be regarded as not being in mismatch with the global trends of continuous professional development of a marine specialist, i.e. "Continuing Professional Development (CPD)" (IMO, 2014) as well as revealing its practical and applied properties in the form of a ship's cargo plan development.

A graduate of the maritime educational institution taking their career path is involved in five distinct states of skill acquisition, according to the Dreyfus & Dreyfus model (IMO, 2014): novice, competence, proficiency, expertise, and mastery. This issue makes us believe the evidence, further highlighting the necessity to form and develop lifelong learning abilities in future navigators.

Thus, a series of innovative approaches to navigator training has been created and carried out by the authors of the research. It is to be emphasised that mastering the competences means that the future maritime officer is passing through several efficient and quite contradictory directions. The essence of these issues is schematically presented in Figure 1,

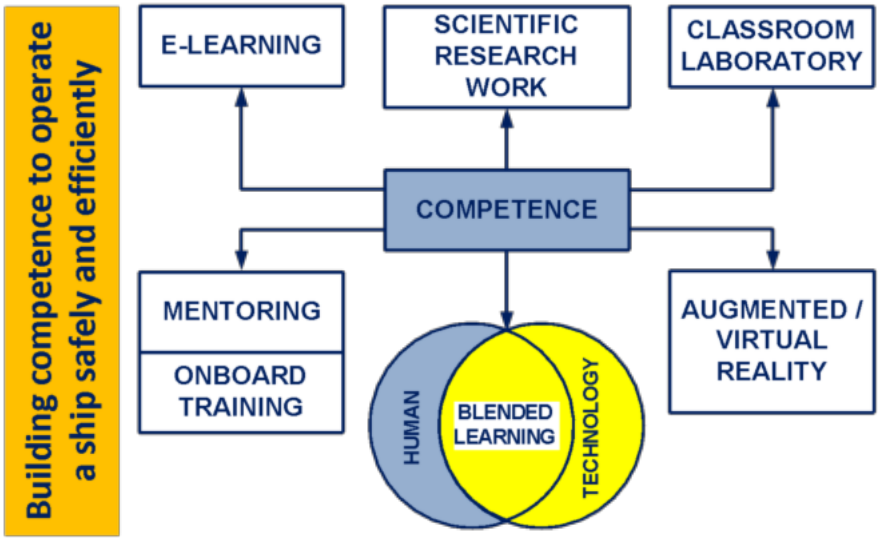


Figure 1. Building competence to operate a ship safely and efficiently.

Note: reproduced from Chawla, P. (2019). Crewing needs in 2020 and beyond. *Seaways, 4,* 10-11.

Undoubtedly, such components as e-learning, scientific research work, classroom-laboratory, onboard training, blended learning, and augmented/virtual reality have become extremely important to the formation of a seafarer's sphere of competence.

1. E-learning, blended learning. For the last two years, future maritime specialists' training in a pandemic environment has put increasing pressure on lecturers to find and apply effective innovative approaches to e-learning and blended learning.

In order to study different methods of applying the latest technologies operating in the unique information and educational space, the Academy encouraged the laboratory of innovative technologies to be created. Besides, keeping abreast of these developments empowers pedagogical staff to create electronic, educational and scientific content. 2020 has been spoken about as a year of mixed learning coexisting with remote mode functioning during the quarantine period. In order to facilitate delivery of technical support, methodological guidelines and counselling, lab assistants have been enrolled. Regarding the remote learning process itself, it is worth mentioning that it is provided by the LMS Moodle platform. The LMS Moodle e-learning site is noticed to be constantly increasing its performance. For example, in June 2020 the platform was updated to version 3.9.1+. To deal with the a growing need to encourage students and lecturers of KSMA to use modern electronic training technologies (i.e video conferencing, instant messages, chats, exchange of electronic documents) in a much more diverse way, a new electronic system, "Corporate Messenger KSMA - Chat KSMA", was favourably introduced in 2020 during the quarantine period. This process was implemented through the collaboration of the educational and methodological laboratory of innovative technologies and partners. It should be emphasised that the introduction of the abovementioned system was sure to promote widespread use of these training technologies on a corporate scale. Therewith, the system is operating under centralized management with the integrated submission of organizational structures, services, ideology and symbols of KSMA, being successfully integrated into the existing system of information services of the Academy. The system has empowered pedagogical staff to make the most of the learning process organization and its further improvement during the quarantine period caused by the COVID-19 pandemic (remote and mixed forms of training were made to be effectively co-existing) delivering optimization of all facets of its effectivity.

2. Scientific research work. It is vividly seen that the very heart of navigator training seems to comprise the slogan: "It is better to investigate another personnel accident than to have my own". Therefore, students are actively involved in constant message tracking of mass media information concerning severe marine accidents. All these issues might seem to be easily solved due to the availability of the appropriate materials in open press and networks. Therefore, data is being collected and cases are being analyzed; as a result, conclusions are possible to be made nurturing the development of critical thinking among students. In addition, they appear to occupy an active position as researchers of current scientific problems and paradoxes related to the safety of navigation. In this regard, students of senior courses get used to taking part enthusiastically and actively in scientific measurements and experiments on the vessels, making reports in specialized conferences and seminars, along with publishing articles based on the results of their own studies. In this way, creative thinking is encouraged to be beneficially developed.

3. Classroom-laboratory. During theoretical training, students are used to being located in the auditorium or the specialized learning laboratory, "Ship's theory, design and maritime safety", where the task of forming the scope of the competence of the navigator seems possible. The authors of the study, being involved in conducting the discipline "Ship's theory and design", as a rule, have students face a challenging task with several possible solutions to be applied. Assignments of the following type are highly likely to be targeted to train the imagination and abstract thinking of the future officer at the same time shaping the skill of finding the optimal solution in correspondence to current operating maritime legislation, cargo transportation regulations, recommendations of competent marine practice, and peculiarities of ship building. It goes without saying that the process of competence development is considered to be time-consuming, including getting gradual benefit from ship building, its operational features and restrictions, learning about the legislative base of shipping and navigation in general as well as particular regulatory documents to be used when planning maritime cargo transportation.

Such conditions for the building of competence have been created during lessons with students, paying special attention to individual work encompassing laboratory and practical class organisation for dealing with cargo plans. Special emphasis is given to the idea that the best form of motivation, according to researchers, is developing students' interest in the proposed material and working with the original publications, and the knowledge required for routine professional life on the fleet. In the above mentioned research laboratory, "Ship's theory, design and maritime safety", original editions of IMO, The NI, P&I Club (SOLAS, MARPOL, BLU Code, International Grain Code, The Code of Safe Practice for Ships carrying Timber Deck Cargoes, CSC, IS Code, IMDG Code) are used on a regular basis. In addition, the laboratory is equipped with the original Stability Booklets of several real sea vessels, having been purchased by the Academy as "simulators" for the building of navigator competences on the cargo planning of the vessel, in accordance with the requirements of Table A-II/2, STCW. Stability Booklets occupy an essential place in acquiring required knowledge for students in their professional sphere skills.

Accordingly, before the work with Stability Booklets has started, students are to be acquainted with the Intact Stability Code (Chapter 3, paragraph 3.6) as covered in the Stability Booklet, and in particular, the format and the amount of information that is included in the booklet. By comparing the list of information provided in the Code with the content of Stability Booklets, students become clearly aware of the obvious identity of the above mentioned documents under consideration. As a result, a significant conclusion can be reached by them obtaining solid ground about valuable experience of active learning and working with Stability Booklets processes taking place in the laboratory. These issues are believed to contribute to shaping skills highly likely to be useful on the vessel. Exactly this air is gained which allows young people to turn into more business approach-oriented ones towards cargo plan development, escaping from scholasticism and gradual shaping and expansion of their competence sphere i.e. professionalism.

Thus, during the ongoing course of the discipline "Ship's theory and design" (four educational semesters being equal to 2 academic years), availability of aforementioned regulatory documents lets the students consult regulatory acts, codes, and laws, making them use current maritime law and correct documents which ought to be applicable on a regular basis on the vessel.

It is worth mentioning that the curricula of the analyzed discipline has been shaped to be completely in tune with the recommendations of IMO Model Courses 7.01, 7.03. In such

circumstances Stability Booklets are taken to be used as "simulators" according to the sections of the program. For example, for the "Fresh water allowance" course almost all data is provided for a particular vessel and the students are required to solve a set of tasks focused on the appropriate subject. Likewise, such wholesale "binding" of the curriculum issues to the vessel options has stimulated much student interest. Besides, the multiple uses of Stability Booklets to solve various practical tasks leads to being able to handle the material capacity conjointly with memorizing techniques for using the documents. Subsequently, these items tend to be heading for the development of competence in general.

Spotlighting the targets of finding sustainable approaches to the training of navigators, the newcomers from the initial stages are being challenged to face disorientating tasks including having unsuccessful, dead-end, and indefinite types of solution. For instance, the school's habit of using all data to solve the task gets used to driving them to an undefined answer, dragging out the process of solution achievement and, as a result, causing wasting time etc. Hence, the development of the ability to analyze data allocating the necessary information may seem to point the way towards maturation of useful information retrieval. These are targeted to solving optimization problems coupled with building a foundation for finding a sustainable and favourable approach to any professional challenge.

4. Mentoring. Onboard training. As mentioned above, most of the theoretical knowledge as well as practical skills are targeted to be obtained and updated by the navigators on board of the vessel. 25% of the total curriculum occurs to be spent in relevant Induction, Shipboard and Industrial practice. Besides, the first sea-going practice experience of students is encouraged to be preceded by educational training on the basis of the KSMA laboratory and simulatory complex. To add, each student is sure to get through the necessary preparation training regarding life safety on board, the use of rescue tools and the vessel safety which are further confirmed by the international certificate, preparing the trainees to be global ready. Moreover, specialised courses involving simulation training, such as "Ship Crane Management", "Fasteners of sea containers", "Security when performing mooring operations", "Rigging" etc. are available to be delivered the same way.

It is to be highlighted that for the sake of meeting the requirements of compliance of the Academy's educational process with the demands of the global maritime industry and employer companies, a training laboratory based on a contemporary vessel of the Marlow Navigation company has been fostered. To be more precise, the laboratory-based model of learning has become possible to be implemented on the vessel "Warnow Jupiter" with an aim to carry out training of the group of students under the guidance of an experienced company coach. At the same time, this very laboratory happens to undertake the tasks of multidimensional targeting such as analysis of highly likely to be reached compliance of theoretical base of KSMA program to the real sea-going experience of students on modern maritime vessels, participation in updating and optimisation of this educational programs and curricula, curricula of special disciplines in particular, as well as training ones.

It is worth mentioning that mentoring is a priority occupying an important position on board the vessel in the process of training. Barely is it possible to name the most consummative way of dealing with striving desire not only to help your classmates, colleagues or future subordinates but simultaneously expand their knowledge and master skills according to the principle: "While teaching I become increasingly aware of the material myself." Thus, it is emphasized by the authors that mentoring is a vital tool for all participants in the educational process, regardless of position, education or age. Being able to share their knowledge and

experience is by all means to be treated as leverage. In addition to the aforementioned, mentoring creates a friendly and trustworthy environment on board the vessel relieving social isolation in a multinational and multi-religious crew. According to Le Goubin (2017), "Navigating a ship is complex and takes years of experience to master; mentoring on the job is one of the best ways to achieve success".

5. Augmented/Virtual reality. The digital world of virtual reality, referring to computer-generated simulation of reality, seems to be capable of providing a full range of feelings (visual, sound, tactile etc.) Likewise, modern technologies alluding to the mission of enriching our reality without actually existing but with the possibility to be seen and partially even interacted with in real time are considered to be augmented reality. Both technologies are gradually and consistently being introduced into the system of marine officers' preparation. For example, highly responsive virtual reality glasses have been set for research and practical training for special discipline purposes to be attained in the laboratory of innovative technologies. The manufacturer has introduced a series of simulators based on highly engaging virtual reality covering actions that may pose a threat and be problematic if trained in the real world. The unique courses regarding the maturation of rescue boats operation skills, carrying out cargo operations on tankers, steering maintenance, launch of emergency signal rockets and operation of ballast tanks appear to be taken for granted. Virtual reality glasses are certified by Bureau Veritas. There is a multidimensional range of training courses of a specialist/crew available to be worked out concerning life saving appliances, craneker, performing a cargo watch on the tanker, actions on the inspection and availability of the life saving appliances of the vessel (LSA), actions on the inspection and availability of fire fighting equipment of the vessel (FFE), actions to test and prepare the elements of the vessel regulated by the International Convention on Load Lines, action on launch and verification of the emergency diesel generator; actions on maintaining and checking the steering machine, actions for the operation of a foam fire system, actions for the operation of the emergency fire pump, bulker crawlers, mayday signals, the inspection of the hull and its spaces.

Special emphasis is to be given to the eye-catching and brilliant way of material representation. Bright background, 3D bulk parts of a modern vessel, natural light and moving figures of the crew members tend to convey the impression of presence on the ship. Thus, virtual reality is perceived by a person through all sensory organs. Consequently, there is evidence to suggest that an immersion impression makes the students earn professional experience and absorb real emotions. As a rule, the process of mastering the skills of interaction with the three-dimensional environment may be characterised as fervently aspiring to become familiar with it, at the same time figuring out that it is not a game but has endless training capabilities.

The results of the training of navigators on the discipline "Ship's theory and design" in accordance with Bloom's Taxonomy.

In order to gain a deeper understanding of issues, the authors consider it useful to make the best classification of training goals, acknowledging it as a tool that assists in determining and structuring learning outcomes. On this point, a well-known classification system has been coined by Benjamin Bloom for the cognitive sphere (Ugur et al., 2015; Chandio et al., 2016) is deemed to be the most constructive and favourable one to be applied. The classification represents a hierarchy of learning outcomes defined by the means of verbs. It is a wide-spread and widely-accepted system in an international educational environment. In the cognitive sphere, its essence can be described in the following way.

1. Remembering is described as the ability to memorize or reproduce facts (terms, specific facts, methods and procedures, basic concepts, rules and principles). 2. Understanding is perceived as the ability to understand and interpret the absorbed material. This means the ability to explain the facts, rules, and principles, for example turn the verbal material into mathematical expression, anticipate or predict the following consequences based on the knowledge gained. 3. Applying is defined as the ability to use the studied material in new situations, for example, to apply ideas and concepts to solve specific tasks. 4. Analysing is illustrated as the ability to split information into components, understand their interconnections and framework structure, detect errors and flaws in the logic of reasoning, understand the difference between facts and consequences and assess the importance of data. 5. Evaluation is explained as the ability to evaluate the importance of material for a particular purpose. 6. Synthesis or Creating is identified as the ability to combine parts together to get the whole air with a new set of properties.

For the sake of getting proper analysis and evaluation of the learning outcomes according to Bloom's taxonomy, the authors agreed upon introducing 50 options of tasks containing 6 questions in each of them. It must be assumed that every question is edited in such a way as not to be in mismatch with one of the six components of the classification. An example of a task is presented in Table 1.

Table 1.

Contents of Assignment according to Bloom-Anderson Taxonomy Action

Bloom-Anderson Taxonomy Action	**Contents of the assignment**
I. Remembering	What is «DWT»?
II. Understanding	What kind of condition is to be met for the vessel to be floating?
III. Applying	Calculate the block coefficient for the vessel having length Lpρ = 180 m, breadth 32 m, draft 12 m, displacement 62000 t. The vessel is located in salt water.
IV. Analyzing	M/v «Sunray», Δ = 38 495.1 t, LCG = 99.12 m. Calculate the movement of G (GG_1) from mass w = 250 t is added in № 1 hold.
V. Evaluating	Construct the curves of statical stability for the m/v «Sunray» for KG=10.00 m; with the draft d = 8.00 m and evaluate of ship stability.
VI. Creating	The principle and order of cargo plan development.

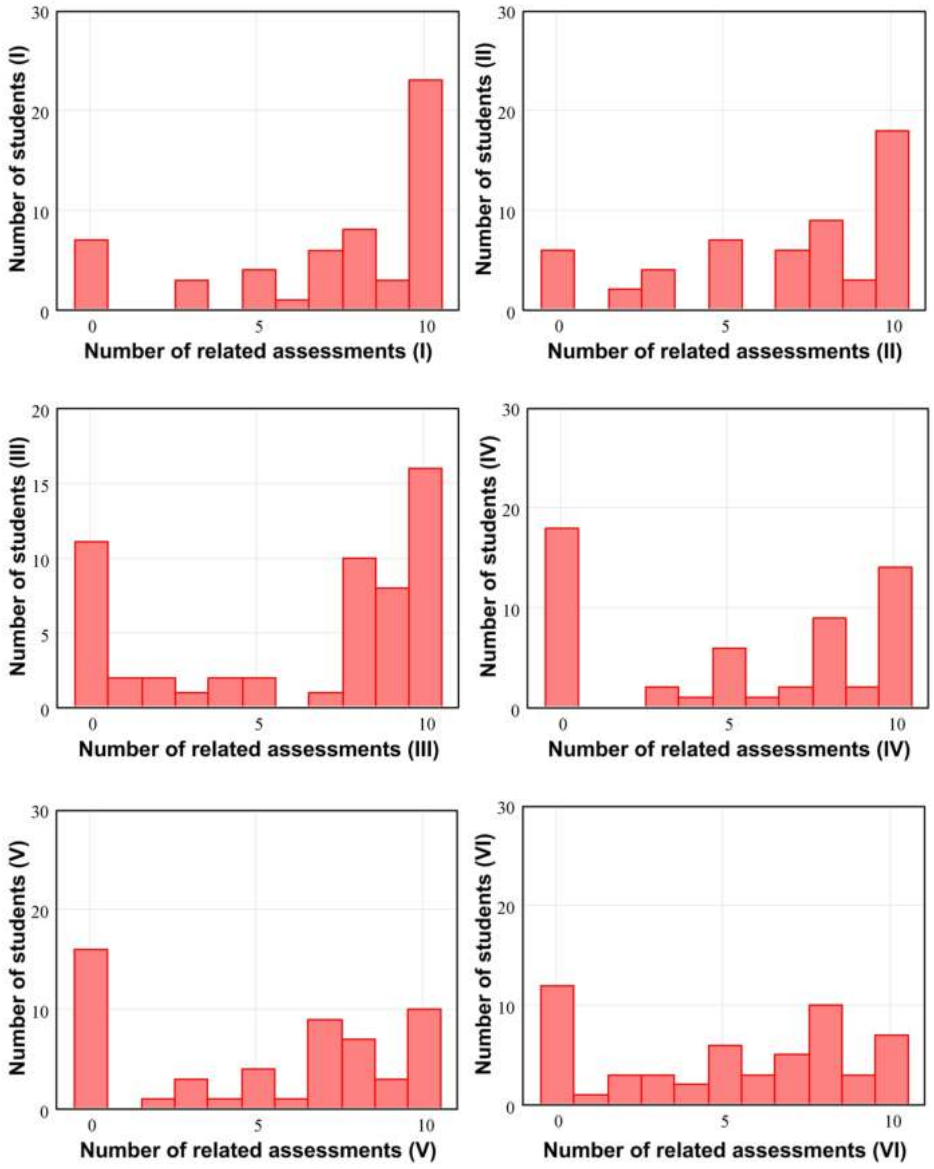
The results of the analysis of the collected data performing the studying process by the navigators of the discipline "Ship's theory and design" in accordance with Bloom's Taxonomy are displayed in Figure 2. It should be added that 55 students from three groups of second year study were chosen to participate in carrying out the experiment granting runtime permission to be tested. The initial findings show that the number of students having coped with the tasks of the first group (I. Remembering) can be named as maximum. Whereas the number of students having managed to fulfil the tasks of the sixth group (VI. Creating) is minimal. These issues notwithstanding, participants were able to thrive in the interpretation of the theoretically studied material and in finding new technical task solutions by means of applying this

theoretical material in practice. failing at analysis and evaluation being noticed to comprise the least possible to overcome task .

According to the Educational Research Laboratory "Ship's theory, design and maritime safety" more than 50% of students who are enrolled in certified programs have been taking part in working practice, implementing their practical tasks within the framework of the above mentioned competencies with complete confidence.

Conclusions

Thus, approaches to teaching one of the professional bachelor's training courses "Ship's theory and design" allows an unprecedented step towards the opportunity of building and shaping a sustainable scope of competence, escaping from surface understanding by the navigator routine basic procedures (loading / unloading of ships, control the landing and stability of the vessel, safety in various weather conditions etc.).



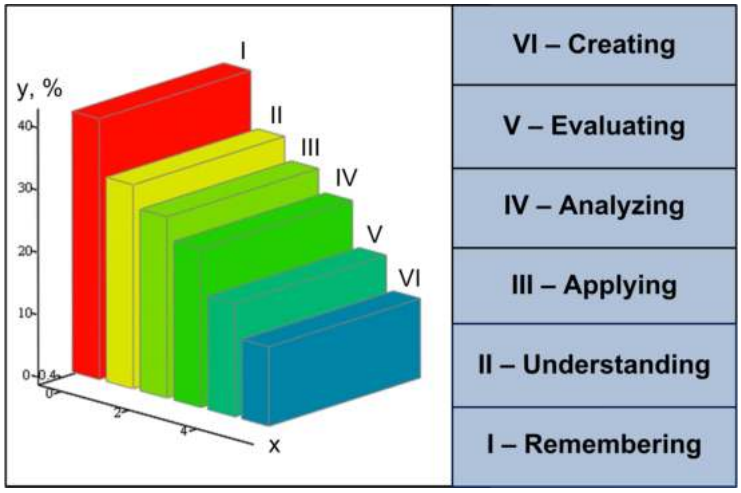


Figure 2. The results of the successful training of navigators on the discipline "Ship's theory and design" in accordance with Bloom's Taxonomy.

As follows, providing the professional reliability foundation of the maritime officer can be considered applicable enough to be embodied. It goes without saying that this very item is being formed gradually, on the long road of consistently replacing each other stages of professionalism. The framework for its functioning is being established in the process of basic special training of a navigator bearing in mind professional adaptation. The aforementioned approaches tend to let young professionals feel self-assured in whatever stressful situations acting professionally and explicitly avoiding minimal mistakes. In addition, it is true to say that having introduced algorithms are highly likely to lay the groundwork for shaping basic students' necessity "Training throughout life", the striving for Continuous Professional Development.

Analysis of the collected data alongside with summing up of positive experience and obtained high incidence of the above research is able to contribute significant benefit into mapping of the educational navigator training program as well as the curricula of other special disciplines. Notwithstanding this fact, the abovementioned area is considered to be a patchy one. So, further suggestions can be made upon conducting the research targeting to assess the quality of students' training delivered on distance mode as well as the effectiveness of the use of Modern Blended Learning Techniques that appeal to generation Z (Cloud Simulation) in the educational process of the Academy.
The development of a student's ability to be studying throughout their whole life, capability to be ready, to be aware of and to use modern technologies, flexibility in professional and social spheres are the only productive ways to shape, empower and facilitate a health conscious individual.

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Lifelong Learning: The 21st Century Skill to Guide Maritime Training and Development

Angelica Sogor
Senior Yacht Manager, *Hill Robinson Yacht Management, Fort Lauderdale, USA*,
ang.sogor@gmail.com

Abstract: Each educational institution, each industry, and each business sector within an industry is likely to have their own unique requirements for what 21st century skills are needed to develop a successful, innovative, and sustainable future. When looking at a few areas (including educational and professional contexts) where research and strategy development have been conducted on this matter, there are some common trends. One of these common trends is the ability to understand, appreciate, and act on the concept that learning, personal growth, and professional aptitude are not "one and done" achievements. In order to develop a core set of professional skills, a transferable set of general skills, and a dynamic set of 21st century skills, it is imperative that one first develops the most critical skill of being a lifelong learner.

This paper focuses on: what it means to practice lifelong learning; how a practice of lifelong learning can bridge generational gaps within the maritime industry; and how a practice of lifelong learning can develop shipboard mariners and shoreside maritime educators who adapt to and lead technological and innovative industry growth.

Keywords: lifelong learning; 21st century skills; maritime education and training; professional development

Introduction

Searching for a list of critical "21st century skills" produces a laundry list of online results. Often, the lists are categorized by target audience – the 21st century skills needed for students, teachers, and other working professionals. The National Education Association (n.d.) posits that 21st century learning for American schools is comprised of the following focal points: "emphasize core subjects; emphasize learning skills; use 21st century tools to develop learning skills; teach and learn in a 21st century context; teach and learn new 21st century content; [and] use 21st century assessments that measure core subjects and 21st century skills."

A contributor to The Rand Blog recognized that the acquisition of 21st century skills often requires a more tailored approach than a "one size fits all" approach, which is often dictated by one-way lectures and use of textbooks. In this familiar approach, one lecture and one textbook are expected to equally reach many students, backgrounds, learning levels, and learning styles. This strategy has evolved, but is still common in both teaching children and adults. In order to more appropriately impart 21st century skills, however, nine methodologies are suggested to offer a more dynamic approach. Included in the list of nine methodologies are: "make it relevant; encourage transfer of learning; teach students to learn to learn (metacognition);

exploit technology to support learning; [and] foster students' creativity" (Saavedra & Opfer, 2012).

With some understanding of what 21st century skills students need to learn and how teachers can more effectively facilitate this learning process, one can begin to paint the picture of how educational systems have evolved, and should continue to evolve, to meet the demands of a modern and ever-changing society. Moving beyond the traditional and formal educational system: what does the skill set look like for that society, for those who are not enrolled in school and for those whose profession is not directly involved with educational systems? What are the 21st century skills for a typical working professional?

A Forbes contributor identified four generalized skills that have relevance, vast applicability, and can be transferred across various professional industries and roles. The skills are "critical thinking, collaboration, creativity, and communication" (Quast, 2014). It likely does not take long to consider how those four generalized, core skills can be applied across different professional functions and industries. Critical thinking and creativity contribute to both day-to-day problem solving and development of long-term strategies for business development. Meanwhile, collaboration and communication foster even the most rudimentary internal professional processes, while also being integral aspects to more complex external marketing, partnerships, and customer service.

Looking more closely to the specific 21st century skills and qualities required for the maritime industry, the Maritime College at the State University of New York highlighted strategies as an educational institution for preparing students and faculty for the future. Their strategies to achieve this included focusing on "…a strong technical foundation, applied learning opportunities, and leadership development… [and] … lifelong learning that enables [students] to meet the future in leadership roles that positively impact society" (SUNY Maritime College, n.d.).

One can begin to picture, with more clarity and detail, how skills such as critical thinking, creativity, collaboration, and communication (Quast, 2014) are crucial to onboard operations in the maritime domain – as well as in the myriad of shoreside functions (operations, resource management, regulatory compliance, training, and emergency preparedness – to name a few) that govern and support onboard operations. For example: communication and collaboration are needed to support both routine operations in familiar ports and emergency response efforts, where unfamiliar port agents and authorities may become new and necessary resources.

Outside of the United States, the European Marine Board is an organization focused more predominantly on marine science and research. In recognition of their role in supporting the European Commission's Blue Growth Strategy, the European Marine Board reviewed training and education in both the marine and maritime industries in their Future Science Brief titled "Training the 21st Century Marine Professional." In this brief, they identified nine "key targets for marine graduate training in the 21st century," which included "encourage international networking and collaboration; incorporate innovative training methods; [and] facilitate continuous professional development" (Vincx et al., 2018, p. 5).

From students to teachers to non-academic industry professionals to the specific operations of the maritime industry, there exist many choices when trying to narrow down and identify key skills required for evolution within society in the 21st century. Each of these important skills are not commodities that can be acquired overnight, nor are they skills without a need to be

reviewed and refined. One must dig deeper to determine not only how these skills are acquired, but also how they are maintained and how they are able to evolve across industries, functions, and technological changes. In this pursuit to dig deeper, it is hypothesized that the skill of lifelong learning is the skill that must be acquired before choosing to develop a core set of professional skills, a transferable set of general skills, and a dynamic set of 21st century skills.

What is Lifelong Learning?

Lifelong learning can be defined most simply as learning that: "take[s] place at all stages of life cycle (from the cradle to the grave) and, in more recent versions that it should be life-wide; that is embedded in all life contexts from the school to the workplace, the home and the community… [it] is the continuous building of skills and knowledge during one's life" (Laal, 2011, p. 471).

Beyond the continuous acquisition of increased knowledge and skills, lifelong learning can be distinguished from other pursuits that are finite, pre-determined, or infrequent by examining one's attitude or motivation. Lifelong learning is not merely an education or defined activity to earn a certificate, enhance one's application for promotion, or (literally or metaphorically) complete a required or expected checklist. Lifelong learning is observed through constructive and questioning attitudes, self-derived or intrinsic motivations, and a personal willingness that is present in a variety of social, educational, cultural, and professional environments. The process of lifelong learning is dependent on active, planned, and intentional engagement from an individual (Smith & Spurling 1999: 9). As Vincx et al. explain, effective lifelong learning must be facilitated both by an individual's environment and their own engagement: "Whereas most employers recognize the importance of the need to have a workforce that is continually developing its skills, knowledge and competencies, individuals share the responsibility, and as such need to pro-actively engage in their own personal and career development and lifelong learning" (2018, p. 35).

The definition of lifelong learning (as described in the two previous paragraphs) is simple, but vast and diverse – the pursuit of learning is often compulsory or compliance-driven, but to truly exemplify the principles of lifelong learning, the lifelong learner reaches far beyond required education. The lifelong learner pursues formal learning, recognizes opportunities to learn from others even in day-to-day activities, and seeks out learning opportunities throughout their lifetime, without prescribed oversight and "beyond the formal structure of an educational institution" (teAchnology, n.d.).

The lifelong learner is often the person asking the "why" behind decision-making processes, the person asking "what more" can they do beyond a task or role they have completed or become complacent in, and the person challenging the status quo to consider "what if" operations were conducted differently.

Why is lifelong learning important? Why is it not enough to know and be satisfied with the skills needed for today's society, for today's economy? What is the value in continuing to learn when one has already completed educational or professional milestones?

One of the easy-to-understand reasons that demonstrate the importance of lifelong learning is considering the reality that today's society and today's economy are not the society and economy from 10 – 20 years ago, and they will not be the society and economy 10 – 20 years from today. Simply: today's skills are not enough if one wants to remain an essential and

relevant member of society's workforce. The most visible, the most undisputable way to understand and appreciate how relevance can be temporary is considering the impacts of machinery, automation, and technology across industries and countries. As highlighted by one contributor to Forbes: "With rapidly changing technology, the speed at which businesses must operate to be competitive in a global economy and with human life expectancy rising steadily, it's clear that lifelong learning will become essential for humans to remain relevant in the workplace." More specifically, the impacts of evolving technology remain even if human functions are not outright replaced by technology because "…the shelf-life of technical skills, such as software development, are getting shorter and shorter." Predictions suggest "…more than 120 million people will need up-skilling or re-skilling in the next three years and that the average length of training needed to close skills gaps has increased from 3 days to 36 days in just five years' time" (Busteed, 2020).

The benefits of lifelong learning, of continued engagement, of active pursuits to master something new extend outside of professional realms and business operations as well. Specifically when considering generational gaps in professions, it may be easier to think older or more experienced persons will not see similar benefits from lifelong learning, especially for those who are actively planning career transitions or retirement. Lifelong learning, however, is not merely about marketing oneself for a future promotion or about achieving job security in a dynamic and evolving future.

In an article highlighting various benefits of lifelong learning, a contributor to the Harvard Business Review recognized that learning pursuits and goals are not static over a lifetime. Coleman (2017) stated: "As we age, though, learning isn't simply about earning degrees or attending storied institutions. Books, online courses, [massive open online courses], professional development programs, podcasts, and other resources have never been more abundant or accessible, making it easier than ever to make a habit of lifelong learning. Every day, each of us is offered the opportunity to pursue intellectual development in ways that are tailored to our learning style." Coleman (2017) listed several key benefits or outcomes that occur when such learning opportunities are pursued, including: increased economic earnings, reduction in stress, cognitive benefits, enhanced social and interpersonal interactions, and the "electrifying" and "worthwhile…expression of what makes every person so special and unique."

When considering the personal and professional benefits of lifelong learning and understanding what distinguishes lifelong learners from other learners, one can begin to understand why lifelong learning is the underpinning needed to develop and sustain other 21st century skills. Collaboration and communication (Quast, 2014) are not only important in the contexts of human-to-human interactions, but they must be adaptable for how technology (e.g., smart phones, video conference calls, webinars, and shared software tools) has changed human-to-human interactions. It is hardly enough to have comprehension of today's collaborative tool; one must embrace and adapt to tomorrow's tools to maintain personal and professional connections and communications.

Furthermore, there are many human-to-data interactions that proliferate across industries. People need to process, respond to, and even manipulate the data they receive from various technologies and systems that are integral to their job or their industry – whether thinking of the advanced coder who applies computer programming language to design a vessel's planned maintenance system or thinking of the end user who received routine data and non-routine error messages from that software. Learning *requires* the coder to design the software one time or requires the end-user to learn how to use the software as initially installed. Lifelong learning

enables the coder to respond to user feedback to fix bugs and provide more explanatory error messages and enables the end-user to adapt their understanding of the software with each version released.

The maritime industry is rife with educational and certification requirements, as well as shipboard and shoreside technological advancements. These aspects create ample opportunities not just for required learning and promotional growth, but also for lifelong learning. How can this lifelong learning help reduce generational differences, develop adaptable mariners, and encourage advancements in maritime training and education?

Applications of Lifelong Learning in the Maritime Domain

In the maritime domain, mariners (or aspiring mariners) can be taught navigational skills, how to perform effective Bridge Resource Management (BRM), how to apply leadership and managerial skills, and how to use shipboard technologies, such as Radar and Electronic Chart Display and Information System (ECDIS). Individual ship owners or managers can: further train their shipboard employees in unique company policies and procedures, focus voyage planning in the specific routes and regions of the ship's expected operations, tailor ship-handling classes to anticipated ports of call, and collaborate with manufacturers to ensure that mariners know and understand the specific types of safety systems and environmental technologies equipped on their vessels. Training may seem endless at times; even after attaining the rank of Captain, various trainings and certifications require periodic renewal and shipboard systems may be frequently replaced with newer versions or completely new systems. Whether driven by industry regulations, company requirements, or an individual's desire to be promoted, there are regular opportunities for on-going training and development for mariners.

With all these training schemes already in place, it may seem that there is hardly a need for one to be a lifelong learner; surely, they must become one by default when they pursue such a highly-regulated industry or have goals of professional growth. These factors alone, however, do not create a lifelong learner. One can receive training in *how* to lead and manage a team, but one cannot necessarily receive training in *wanting* to lead and manage others effectively. One can receive an updated instructional manual and guidance from a manufacturer regarding the latest ECDIS software update, but one is not necessarily provided with the optimism, engagement, patience, and persistence that are often required to "re-wire" the technical knowledge of the previous version, onto which they are consciously or unconsciously holding.

The qualities and characteristics of lifelong learning are then what separate those who simply find themselves in regular training courses, versus those who may receive regular training but also appreciate and seek out the opportunity to make that training an active and engaging learning experience beyond acquisition of a particular skill and beyond only the present moment of receiving training. In other words: while most technical skills can be taught and a license or certification may document such skills, it is often difficult to teach or instill the qualities of wanting those skills, wanting more than those skills documented on paper, and wanting more than what is required for that paper or ultimate professional position. This is where lifelong learning not only separates obligatory trainees from engaged learners, but also where lifelong learning can reach out and expand its roots to improve mariners and maritime educators far beyond standard industry and technical requirements. Lifelong learning is not only the underpinning for various other 21st century skills, it is an underpinning that can transform the way the maritime industry sustains current and future generations, across varying professional functions.

Bridging Generational Gaps

While learning is hardly ever "one size fits all," younger generations or those newer to the industry may require more formal training, with typical instructor-led courses and hands-on classroom or shipboard activities. At the same time, younger generations may also be more apt to learn and engage with learning technologies or even through platforms initially designed for social media and personal communications. For example: Generation Z (those born between 1995 and 2000) prefer digital and contemporary experiences, often foregoing personal contact by primarily choosing to engage in communication through technology (Jurenka et al., 2018).

Because these types of technological mediums are pervasive in the day-to-day life of younger generations, opportunities for learning may not even appear as such when they occur informally or with tools typically used for social or entertainment purposes. Alternatively, older generations who may have grown up with very structured "lecture and learn" strategies, facilitated exclusively through instructor-led classroom training, may find traditional, structured trainings something that they have "grown out of" or have surpassed the need for, as their professional rank and credentials expanded. They may have some engagement with social and other technologies, but may not see these as educational or informative tools.

Lifelong learning can aid in bridging some generational gaps if multiple generations are open to engaging with one another across technology platforms. Examples of learning and engagement with modern technology include: "how to" videos hosted on YouTube; interactive polls or quizzes shared through Instagram's "Story" feature; and a discussion of industry events shared in a LinkedIn group. Finding a technological platform that is compatible and user-friendly across different types of devices (traditional desktop computer, tablet, and mobile phone) can bring different generations together on the same platform – even when they work in different professional areas, are on different ships within the same company, or are working within the same company but some are actively sailing and some are on vacation.

Perhaps now more than ever, such technological spaces also offer a connectedness, that expands beyond formal and informal learning, through a professional community that support the well-being of seafaring professionals. As Buchmann (2021) explained the role of technology in aiding seafarer's mental health, particularly in response to the COVID-19 pandemic, he stated: "Providing personal internet access as a way to keep in touch with people can be a lifeline for seafarers at sea for months. Being able to send emails or do video calls is something that more shipping companies are recognizing is a way to tackle mental health issues." Sharing photos, hearing stories, discussing articles, and taking interactive quizzes with colleagues through social media and learning technologies does not substitute for video calls with friends or family. However, these actions can offer another pathway for staying socially connected and contributing to mental wellbeing for seafarers, all while also offering an opportunity to engage in lifelong learning.

Creating this space to share, discuss, and receive information in different formats (e.g.. text, photo, audio, video) and interact (e.g., like, comment, vote) can foster some of the collaboration, creativity, and communication that were highlighted by Quast (2014) as key professional skills, which are valuable across industries and professions. In order for such a platform to be truly informative, interactive, and purposeful, those engaging with the platform have to *want* to actively provide and receive those qualities; it is not enough to train someone how to use any company-specific tool or company-specific application of a publically available technology.

When learning, collaboration, and communication technologies are effectively employed and users are actively engaged in these tools, these platforms "have the capacity and capability to bring expertise to a large audience of professionals at all career stages within an international context (subject to availability of high-quality internet connection)" (Vincx et al., 2018, p. 35).

Sometimes these platforms, such as e-learning systems, provide evidence of completed training through a course completion certificate. In other, more informal platforms: there is no certificate of completion provided after one joins the platform or after a specific number of days they are active in the platform; there is only the resulting joys of practicing lifelong learning, such as increased engagement in their professional endeavors, enhanced social experience and connection with colleagues, and increased adaptability to share and gain new knowledge in new environments.

Bridging generational gaps is also accomplished through knowledge sharing. This objective can be achieved through technology, but it is not required to occur over a specific mode or platform. While different generations are actively employed together, it may be assumed that those with greater experience levels are teaching, leading, and coaching their younger or greener colleagues. Sometimes, however, it is not until an experienced professional leaves their employment (either by transitioning to a new career or by retiring) that a company recognizes the gap in knowledge and process that occurs without that experienced professional. Further, in some instances, this may be the only time it is realized that the prior assumption (of experienced professionals teaching, leading, and coaching others) was more of an unspoken aspiration and less of a planned reality.

It is possible, however, to transform such an aspiration into reality. A company can develop written procedures and processes to ensure implicit knowledge of experienced employees becomes explicit knowledge for others. A company can also offer internal professional development, mentoring programs, and even casual networking or socializing events. Through these and other methods, a company can create a culture where learning and knowledge sharing is not exclusive to a single training course or specific company procedure; learning is part of a company's daily operations and interactions. In this culture where active engagement is encouraged across different strategies, a company can promote the development of its employees not only as professionals, but as lifelong learners who routinely strive to connect with, collaborate with, learn from, and share something new with their professional peers. This professional culture and its lifelong learners then actively bridge generational and knowledge gaps as routinely as they reply to emails. Over time, this culture can significantly minimize the potential loss of knowledge and leadership when employees depart the company.

Developing Mariners

Many mariners sailing in the deck and engine departments aspire to achieve the required licensing, certification, and professional experience to sail as Captain or Chief Engineer, respectively. As previously highlighted, there is no shortage of training for mariners with these professional goals. Sailing in these ranks, however, should be about more than having the responsibility and authority to make strategic or tactical decisions, oversee maintenance and equipment, and ensure compliance with all required health, safety, environmental, and security regulations. Commanding a ship's department (or the ship in its entirety) should also entail leading and motivating others through displays of lifelong learning, such as encouraging questions and transparent discussions regarding operations and decision making.

When lifelong learners attain these leadership positions, they have often already exemplified strong critical thinking, collaboration, and communication skills, in addition to technical knowledge and skills. They may continue to seek opportunities to ensure their skill set is up-to-date with the latest technologies and equipment outfitted on a ship, and thus continue their function as a lifelong learner. Ideally, however, those in command are not only engaging in their own lifelong learning, but they are also supporting their onboard teams and shoreside colleagues in engaging in lifelong learning. When lifelong learners flourish and grow into leadership positions, they often want to share their passions and motivations with others. Whether they formally act as a mentor to a cadet or informally impart some local knowledge of the next port of call in a casual conversation over coffee on the Bridge, these leaders can use their collaboration and creativity to encourage the development end engagement of the mariners they lead and manage.

While mariners will often have the opportunity to gain new technical skills in a classroom or simulation, there is also opportunity for them to learn through: listening to their colleague's sea stories in the crew mess, achieving understanding through practicing closed-loop communications between the Bridge team and Pilot, and actively participating in a drill debrief to identify what team actions could have been better or executed differently. Encouraging mariners to apply technical skills in real-life applications, maintaining training and certifications that are up-to-date with technology advancements, and asking questions are important for professional development at all career levels – and these actions are not, and should not be, limited to formal classroom training. Those charged with formal command, as well as those who may have informal leadership roles, should be tasked with exercising their own lifelong learning goals while also actively shaping the current and future generations of mariners to develop similar lifelong learning goals. Practicing lifelong learning enables mariners to support their individual value in a dynamic society; and encouraging lifelong learning in others enables the maritime industry as a whole to adapt to global, economic, and technological demands that are larger than any single ship or company.

Developing Maritime Educators

When discussing the development of mariners, the component of their formal shoreside education and training must also be considered. And surely, these students and trainees cannot be expected to develop or sustain 21st century skills if their educators and trainers are absent of such skills. Many educators find themselves teaching others because it is a passion for them to share knowledge and it is fulfilling to inspire future generations. Others find themselves in such roles because of circumstances outside of their control that no longer allow them to actively sail on ships. The transition to an instruction-based role allows them to maintain a connection with the seafaring community, to which they have strong professional and personal ties. All educators, regardless of their initial reason for entering an instructional role, must strive to support and inspire the development of lifelong learners. Instructors can achieve this, in part, by: encouraging students to find real-world applications of course material; motivating students to make connections and draw relevance for course material beyond today and beyond their present role; encouraging students to ask questions and share their experiences; and adapting course material to include current events, recent case studies, and advancements in technology.

In order for maritime instructors and educators to truly and organically create lifelong learners who are readily able to absorb and apply various 21st century skills, these instructors and educators must be lifelong learners themselves. They can practice lifelong learning by: seeking out new instructional strategies and tools to present content in more effective or engaging ways;

respecting and appreciating the experience and knowledge students bring to a course regardless of background and experience level; collaborating with peers when opportunities for interdisciplinary projects arise; and retaining a recognition that, despite their subject matter expertise, their individual development (as a person, as a leader, as an instructor) is a continuously evolving process.

When reviewing the European Marine Board's vision for education and training programs, and picturing young and new professionals who are "…applying multi-disciplinary knowledge to address complex marine and maritime issues which cut across scientific, environmental, economic and social systems," one can wonder how graduates and professionals will be able to achieve such knowledge and appreciation for the dynamic and inter-connected maritime domain if their training and education does not expose them to such a domain (Vincx et al., 2018, p. 29). When picturing instructors who stick too rigidly to a pre-defined curriculum, do not engage in back-and-forth discussions, and provide reference material or examples that are limited to only specific scenarios and specific geographic regions, it is almost impossible to imagine being able to contribute to the development of students or professionals who "…develop innovative approaches that emphasize not only multi-disciplinarity, networking, and collaboration across sectors, but also create links between different areas of expertise and skills" (Vincx et al., 2018, p. 29).

When considering the unique skills required for the international maritime industry, one would not anticipate to receive training in shiphandling, meteorology, crisis management, or engine room resource management from one who possesses no discernable skills or qualifications in the respective subject matter. Similar to those industry-specific skills: when considering more general and transferable skills that enable critical-thinking and problem-solving, facilitate strong interpersonal relationships, and demonstrate openness to new technology, one would anticipate that training or practice in applying these skills would also be led by one with relevant skills or qualifications. Therefore, if seeking to employ lifelong learning in professional settings and shipboard environments to bridge generational gaps and develop multiple generations of mariners, it is required to also look for maritime educators and instructors (whether they are based in a traditional classroom or have adapted to technological platforms) to exhibit the same lifelong learning qualities sought after in maritime students and professionals.

Conclusion

When looking beyond technical skills required for a singular role or function in the maritime industry, it is important to consider that the industry is comprised of: many roles and functions across ship and shore, professionals who may have begun their first career in another field, and many different cultures, nationalities, and geographies. Company procedures, recruitment specialists, and hiring managers can sometimes narrow down how to define an ideal professional, regardless of their individual characteristics and experience, by identifying industry-specific skill sets believed to be required to for success and achievement. But the consideration, the evaluation, the qualifying factor for success and achievement cannot be limited to only the skill set needed today. The engagement, motivation, and attitude of a professional must also be taken into consideration because these professionals will not all stay in that singular role or function for the entirety of their career and because the technologies, regulations, and environment that guides the industry will not be static in the entirety of any one person's career or one company's business plans. To fill the gaps that exist between today's measure of success and the future's needs, companies and industries can continue providing

training, providing leadership and promotional opportunities, providing collaborative networking events, and implementing new systems and equipment that out-pace outdated ones.

Providing training, opportunities, events, and equipment sounds like a robust plan, but it may not be enough to create or sustain professionals who require 21st century skills to achieve success today while also having the adaptability to achieve success tomorrow. In order to be sure that 21st century skills are absorbed, applied, and adapted, the industry must first encourage and identify those who *want* 21st century skills, those who *want to learn and teach* others, those who *want to actively* navigate their own professional course and not merely bob to stay afloat in the wake of another's. The industry, its companies, and its leaders must encourage, identify, and sustain those who are lifelong learners. International Maritime Organization (IMO) regulations and codes and shipboard technologies will always evolve. Lifelong learners will not have perfected tomorrow's skill set today, but they will be in a more advantageous position to be adaptable and successful in the face of these and other changes. It is not always easy, or even possible, to predict the equipment that will drive tomorrow's communications, the safety and environmental regulations that will necessitate tomorrow's compliance, or the platform that will host tomorrow's training. It is reasonable, however, to assert that coupling the continuous acquisition of 21st century skills with the engagement and motivation present in lifelong learners will yield benefits for professional sustainability and adaptability, for both individual and industry gain.

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An engineer on board a marine research vessel: Proposal for education and extra-curricular activity toward the creation of value

Hironori Funatsu
Chief Engineer, *Member of Seafarer Group Hatokai, Tokyo, hikaku272@kub.biglobe.ne.jp*

Abstract: Seafarers do not come in the foreground in society and support their country from locations away from many nations. Under such a special circumstance, **the Happiness Of Life At Sea (HOLAS)** as seafaring is a life, both on board and ashore, where seafarers acquire and achieve their own value in themselves internally. Here I consider and propose, through my personal experiences, value-creating activities which we must address as part of maritime education and extra-curricular from now on.

Keywords : value-creating education, unseen virtue and visible reward

1 Introduction

Is there no equipment lacking?

Are there sufficient materials available to respond to potential problems?

I examine against a checklist, time and time again, the items contained in suitcases which have already been packed. After the departure of the members, there is no way other than locally procuring necessary materials. The task to reduce such risks as far as possible is one of the duties of a person in charge of equipment. It is a continuation of a dull, mindless job no one wants to do and, at times, I myself want to throw it away. However, on hearing that the photograph exhibition was a success, I am filled with delight to have learned that the solitary effort made up to the point in time has borne fruit. I have found it is a supreme joy which only those who have made a painful effort can feel and I have tasted the pleasant feeling. I recently understood that this is the meaning in terms of the value of preparatory work. When you truly realize that your assigned role is your own mission, you can greatly feel a sense of fulfillment and accomplishment.

1-1 Marine Research Vessel

Working as an engineer on board the ocean research vessel for 30 years, I have been engaged mainly in general operations of the engine department (maintenance of engines and their related equipment) and the upkeep of a hydraulic type winch system used for sampling by researchers.

Researchers do not want to be deprived of their research time by a problem with an observation instrument, so we devote ourselves to the maintenance of such instruments at other times. Even

so, trouble occurs without any warning and, in such a case, we are forced to conduct restoration operations in a hurry. Jobs with time restrictions demand extreme care, and fray our nerves.

The main duty of vessels engaged in drilling or ocean research is observation work and, unlike cargo ships and other kinds of vessels, these vessels have a feature that operation departments (i.e., deck and engine departments) exist in the background to provide supporting work. It is not confined to research vessels but, on board such vessels, especially required is an attitude to perform his duties proactively while increasing his motivation for work. For this reason, it is important for crew to find and create value for their duties, they may often accumulate stress from personal relationships.

1-2 The way seafarers use their vacation

Seafarers pass their days on board by using various methods to refresh themselves but how do they spend their vacations they have waited for?

When it comes to seafarers' vacations, it is common for them to use them to recover both mentally and physically from their work or to devote themselves to family duties. However, in my case, as I am a member of a group of seafarers co-hosting this photograph exhibition, activities to hold a photograph exhibition are the main pillar of my vacation. I hope that activities for this photograph exhibition may contribute to the spread, in the world of the shipping industry and seafarers, of education which places importance on peace and culture.

2 Photo Exhibition at IMO, IMLA and other world maritime educational fields

The photo exhibit "Beyond the Horizon" has been held since 1987 by Japanese seafarers. The permanent photo exhibition, displayed since 2008 in the headquarters of IMO, was established in the hope that those people involved in preparing conventions and laws know the actual world of seafarers. For the 70th anniversary of the conclusion of the IMO Convention, the theme of the exhibition is "HOLAS for SOLAS", in collaboration with the IMLA, which was transferred to World Maritime University next year. Although such exhibits are permanently displayed in nineteen maritime academies in the world, we would like to continue them by replacing photographs every year, with the theme of "HOLAS (Happiness of Life at Sea) for SOLAS".

3 For bringing a photograph exhibition to a success

3-1 Support in the background—importance of general affairs—

Before the date of an exhibition and lectures, various tasks are required to be done, such as negotiation, communication, dispatch of personnel, study of the contents of lectures, preparation of photographs, preparation for setting up the exhibition venue, and bringing in photographs. If we liken negotiation for lectures or the provision of guidance and explanations through the exposition, to the 'centre stage', general affairs, such as the preparation of photographs and the setting up of such a display, may be low-profile 'back stage work'. Although the latter operations are inconspicuous, they are vital ones without which the display of photographs cannot be held successfully.

Even among us, the members of 'Hato Kai', such members who can carry out these tasks are limited. With the absence of such members to carry out such low-profile jobs, I, myself, have been forced to do so for many years. Thanks to this situation, I have become an expert.

3-2 Unseen Virtue and Visible Reward

In Japan, there is a training of *'Hanto'*. In the Japanese art of tea ceremony, *Hanto* is a person who assists the host in going through a tea ceremony. To become a master of the tea ceremony, this training of *Hanto* is considered most important.

I am not good at negotiation or speaking before many people. For this reason, I found my life meaningful when I made up my mind to devote myself to background battles instead of work in the foreground. This is the principle of cherry, plum, peach and damson blossoms. It suffices if a person shines in their position or in their field. It is most important to find value in their position. At the same time, the joy of a person who has obtained their own mission is immeasurable. It is more fortunate to encounter a leader who can cast light on each person's personality, strong points, and give a suitable mission.

Dr. Daisaku Ikeda, The founder of Soka University Japan, quotes words from Huainanzi (ancient Chinese collection of essays) and intends as followings

Quote "***What is done by night, appears by day.***"

Unseen Virtue: ***To do good by stealth***

Visible Rewards: ***Tangible Outcomes***

Who pursues open rewards without doing good by stealth, is not walking the right track of life. Because they cannot understand the law of cause and effect, they slack off in their efforts and have weakness to avoid troubles. ***Doing good by stealth*** means a person who spends all of one's energy to act sincerely whether it is recognized by someone or not. Though we can't know when rewards will come back to us, Unseen Virtue certainly will appear as an Opened Reward.

This is the philosophy of ***Winter Always Turns to Spring***. Leaders and Educators must enlighten human resource who spends all of one's energy ***to what is done by night***.

I do intend that this basic policy is the most important guideline for seafarers and must be infiltrated into the young generation who aspire to work for maritime society.

3-3 Actual record of photograph exhibitions in IMO

In June 2008, I was involved in a photograph exhibition held at IMO in London. As you are aware, IMO, because of its importance, imposes various restrictions, such as the screening of visitors from outside, instruction in relation to the contents of operations.

Concerning the method of display, we underwent various simulations thoroughly over several months on the basis of a prior survey. We also paid attention to minimize the items to stuff

suitcases with, such as photograph panels and other equipment for the exhibition. The time allowed to set up the display in the IMO headquarters was restricted to six hours and we managed to complete it at the last minute by using the entire time, while discussing, among all of us, the arrangement of partitions so that visitors might enjoy the exhibition fully. The ceremony to celebrate the 100th session of IMO was held in the lobby on the first floor of its headquarters. It was honoured by the attendance of Mr. Ban Ki-moon, the ex Secretary General of the United Nations.

During the work for the exhibition, when I directed my eyes to the outside through the windows, Westminster Abbey and Big Ben over and along the river Thames, came into view.

While thinking 'Oh, this is London,' I was engrossed in the operation, with my eyes lowered. Suddenly a thought occurred to me: "Heavens! What am I doing now?" What I am doing now has no difference from what I do in the Tokyo office. I was taken by a strange illusion like an instant shift from Tokyo to London and was wondering "Where am I now?"

That is, this was the moment I understood for the first time that this monotonous preparatory work has connected me with the world. I came to believe, strongly, that what I had been continuing for decades, believing in myself, led me to London while creating my own value.

4 Conclusion

4-1 Recommendation of value-creating activities

Crewmembers who work on board vessels are burdened with various duties in respective departments. What is most painful for those seafarers is when they cannot find value in what they do or when they are not given a mission.

In short, the purpose of life is to acquire happiness for each person and for the society as a whole, and a part of such happiness depends on the creation of value, I think. **Happiness of life at sea (HOLAS)** as a seafarer means, after all, the state of life where one has acquired and realized value on board and during vacations.

The study of value is not only necessary as a concept of the purpose of life but also inevitable in order to break through shipboard daily life which has never been considered happy, thereby to establish life filled with happiness.

4-2 Function of maritime education

Young students who are going to work on board ships are filled with various worries as well as hopes. When faced with various difficult realities, how do they overcome them on their own? For seafarers who work on board vessels, a special environment where assistance from the shore is difficult to reach, it is important to improve their ability to accomplish a breakthrough and, while continuing their work, acquire a sense of happiness in their own job and life. While this is a personal aspect, on the other hand, in view of the principle of cherry, plum, peach and damson blossoms, an environment where team members respect the roles and qualities of respective individuals is also important.

Therefore, even in maritime education, I would like to conclude that the importance and necessity of an educational system of creating value through:

• Fieldwork to participate in various cultural activities outside each individual's own field

• Activities to shed light on strong points of, and give a mission to, each individual; and

• Activities to award those who work in the background,

will increase more and more.

SESSION 2: MARITIME TRAINING IN SAFETY AND RISK

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An example of risk management on board a cruise ship - COVID-19

Katsuya Matsui
Captain of Cruise Ship, *Member of Seafarer Group Hatokai, Nara , Japan ,*
ran_lab@m5.kcn.ne.jp

Nobuaki Nakamura
Third Officer, *Member of Seafarer Group Hatokai, Fukuoka , Japan*
n.t.l1014@gmail.com

Abstract: The COVID-19 outbreak in 2020 is still giving impacts to world economy and crisis management system. My cruise ship sailed from Yokohama in Jan 17 2020 to round Asian Cruise with 300 aged passengers and 200 crews under beginning of emergency situation.
As a reference of crisis management and human behaviour, designated in STCW convention STCW section V/2 par. 3-4 and is based on the guidelines of IMO Model Course 1.29, I introduce my experience featuring leadership of crisis management of anti-infectious disease of COVID 19 as a captain of cruise ship.
The objective of this paper is to suggest that methodology based on leader's humanism leads better or best results of risk management.

Keywords: Risk Management, Crisis Management and Human Behaviour, STCW, COVID-19

Introduction

On New Year's day, I came to know about the outbreak of COVID-19 through breaking News on TV while I was enjoying my vacation at home. Because I had got a black eye on board due to SARS (Severe Acute Respiratory Syndrome) in 2002, I was very worried about this news. I felt like another serious crisis in the next couple of days was already right in front of my eyes. In this paper, I will introduce my experience of crisis management for 30 days on an Around ASIA Cruise 2020 from January to the end of February and discuss necessary leadership for crisis management on board.

Sailing Away to Asia

I was on board a Cruise Ship as a Captain and sailed away from the Port of Yokohama bound for Asian countries on 16th January. The total number of people infected by the virus was not so serious. The World Health Organization and Japanese Government leaders also did not consider it a large threat to security at that time. However, I remember a case of Severe Acute Respiratory Syndrome in 2002 that saw most countries ban the arrival of cruise ships to prevent importing the virus and it was very hard for us just to send our 'normal' patients on board, they were all refused. In addition to that, I also had a mission to make elderly passengers, average age 70 years old, travel and go back home to Japan safely and in good health.

Table 1. *Summary of schedule of ASIA Cruise 2020*

Date	**Port**	**Country**
16th Jan	Yokohama	Japan
17th Jan	Kobe	Japan
20th-21st Jan	Keelung	Taiwan
24th-25th Jan	Manila	Philippine
29th-30th Jan	Laem Chabang	Thailand
1st Feb	Duong Don, Phu Quoc Is	Vietnam
5th-6th Feb	Bai Chai, Halong Bay	Vietnam
7th-8th Feb	Da Nang	Vietnam
9th Feb	Sanya	PRO.China
11th-12th Feb	Xiamen	PRO.China
16th Feb	Kobe	Japan
17th Feb	Yokohama	Japan

Eruption of Taal Volcano in the Philippines

While we were so busy with primary preparations for the voyage on 12th January, I received further breaking news of the eruption of Taal Volcano in the Philippines. Some cities in the vicinity of the volcano were locked down and the local residents were warned to evacuate the area including our crew living there.

'Beginning of outbreak of virus in China' and 'Eruption of Volcano in Philippines" My sense of crisis reacted sensitively to these two Keywords and I started investigating the situation and collecting information about the crises immediately.

First at this point, I established a defined goal of 'Bring back all passengers to Japan in good health' and went into action.

Leadership for Risk Management Factor-1

Gathering specific information with rapidity
Directions of swift, specific and sufficient investigation made subordinates analyse the situation by themselves. The action can also make them recognize that this challenge is not resourceless and not thoughtless.

Setting clear goals immediately
'Bring back all passenger to Japan in good health'

Expression of firm belief based on the clear goal
Each behaviour of a leader influences the feelings of people around the leader under emergency situations. A Captain is not a medical professional; however. It's most important for a leader, not to discuss whether the goal may be right or wrong, but to set clear goals quickly in this first phase. It is also important to make judgements and decisions based on the goal. When a leader should direct concrete action, I intend that the leader must maintain fairness, not be machinelike,

rooted with humanism because the parties who are directed to implement action also feel vigorous anxiety under crisis.

Implementation of concrete measures - First Action
As a result of the investigation, I implemented the following concrete measures on my own responsibility.

- Additional pre-purchasing of medical surgical masks to get ready for an outbreak (we were able to obtain enough stock of masks in advance because COVID-19 was not a big problem all over the world - except China - in this first phase).

In face, the purchasing manager had already ordered enough surgical masks and other necessary sanitary items before being instructed to do so, based on the experience of SARS. A leader's serious stance of fulfilling their responsibility could bring detailed plans with general cooperation. If we had started the action to secure masks and sanitary items after a week, we would only be able to get a few items.

- Going into force of measures according to the H1N1 novel influenza manual. (Company still had not established a manual of novel coronavirus.)
- Under the ship doctor's supervision, I edited a video of countermeasures and knowledge of novel coronavirus immediately and broadcasted on crew TV channels repeatedly.

Leadership for Risk Management Factor-2

What does it mean to 'take responsibility'?
A leader must always have a good reason for every move they make. This policy does not mean that a leader must resign for responsibility due to failure but that the leader expresses responsibility by implementation of concrete measures of 'I did this'; for example, to proclaim waiting and standing with an air of composure for a good chance if the general situation is bad.

Implementation of concrete measures – Adaptation to changeable situation
While the total number of patients in the city of Wuhan, People's Republic Of China, was increasing day by day, the ship arrived at Keelung, Taiwan on 20th January. Many citizens seemed to be using medical masks in the city. Passengers' anxiety on board was growing bigger and bigger as well, because we were scheduled to visit some ports of PROC. The government of Taiwan had already started limiting entrance into Taiwan from PROC.

Considering the details of the situation and information, I called all the managers on board for a meeting to summarize their opinions. I started the following concrete measures.

- Giving up visiting ports of PROC and changing to Port of Taiwan
- Booking berths in 3 ports of Taiwan instead of in PROC
- Stopping and changing the flight schedules of further crew and passengers who have scheduled flights from PROC or via PROC
- Starting examination of other Asian ports where we will visit during the period of the Lunar New Year Festival.
- Investigating the damage situation in Manila and other provinces affected by volcanic ash, including effects on the respiratory system.
- Monitoring crew's anxiety about the virus outbreak

Healthy exchanges of ideas were generated in all departments on board and the following suggestions were proposed and carried out:

A) Preparing charge free masks at the gangway and encouraging use of masks (we had a stock of more than 20000 masks in the store)
B) Manning an exclusive crew to enforce disinfection of all passengers' hands with alcohol disinfectant solution at all entrance of gangway, dining rooms and event spaces
C) Raising onboard level of overall sanitation and disinfection from level 1 to 2 as defined by the in-house novel influenza manual
D) Posting on bulletin board in the crew mess room regarding the world situation of COVID-19 and giving notice to crew to prevent infection. Preparing alcohol disinfection solution as well.
E) Issuing announcement of directions about COVID-19 from the ship doctor to crew and passengers through several orientation and onboard TV programs
F) Enforcing all cabin crew and gangway security staff to use surgical masks
G) Setting one isolated crew section of the cabin and passage as a Quarantine Section. The ship doctor could isolate patients showing symptoms of contagious disease in the section for a certain period even if the result of influenza examination was negative.
H) Purchasing additional hypochlorous acid air cleaners for quarantine cabins (This item was also sold-out after one week)
I) Arranging a shuttle bus to the nearest shopping mall, where only local people go shopping, at Laem Chabang, Thailand on 29th Jan, peak period during Lunar New Year Festival, and otherwise prohibited going ashore.

Leadership for Risk Management Factor-3

It is necessary for a leader to generate one-team solidarity by making time for attentive dialogue in order to make the team clearly understand the goal and idea. The leader needs to listen to team members while showing mutual respect and equality under clear goals and ideas. Additionally, the leader also tries to discover each member's individual talent by understanding their circumstances and position, and to assign roles to fields in which each member can demonstrate their ability with assurance.

Implementation of concrete measurements – Relieving stress

Almost no passenger and crew complained about the announcement of an alternative itinerary to Taiwan. The days had been long and threatening with further limitations to going ashore. Everybody could understand the situation but many managers reported the crew's demoralization. The ship was intended to visit the World Natural Heritage Halong Bay, Vietnam on 5th Feb; however, the crew was still worried about safe shore leave for taking a breather. I discussed with the company and arranged an exclusive recommended boat cruise tour for the crew. I had already negotiated with the company to cover 50% of the cost, so most of the crew were able to gladly join this tour by adjusting their working shifts with each other. This solution enabled reducing the crew's contact with an unspecified number of people and ease their stress.

Leadership for Risk Management Factor-4

A leader needs to prepare cheerful choices, relaxation and humour full of humanity and benevolence for those who are brooding and for those who cannot break the deadlock. The humour should not overbear them but be conscientiousness. In this case, the humour could give them a mission to protect the safety of passengers.

Implementation of concrete measurements – decision at turning point

The ship arrived at Da Nang,Vietnam on 9th Feb. It was past the peak period of the Lunar New Year Festival and it was reported to us that there were not so many tourists downtown. Vietnamese quarantine officers understood well regarding our solution of preventing infection and our sense of caution also eased a little.

However, the Taiwanese Government banned entrance of international cruise vessels into Taiwanese Ports at this time and 'Virus outbreaks of infection on board of a large cruise vessel' was big news in Japan. We are closely losing our destination.

- Most of the passengers were watching daily news about COVID-19 and kept feeling anxiety about further shore excursions themselves.
- Passengers thought that staying on board was most safe.
- We still did not have any suspected case of fever or other symptoms of infection.

For the above reasons, I made the decision to go back to Japan directly while maintaining the present stable and controlled on-board situation, in order to show the Japanese quarantine office and media a positive fact of being free from virus infection. We fixed the first Japanese port to Nagasaki, the only port where the local quarantine office could accept us generously.

No passenger complained about this decision with the removal of 3 destinations (continuous for more than a week with no landing) but the general mood on board was going slow and not lively in the following couple of days.

Therefore, I made another decision to change the planned route to Kobe passing the Japanese Inland Sea national park, a famous narrow passage of scenic beauty, after inward clearance at Nagasaki completely. And I agreed to make a large banner with the cooperation of the crew and passengers to encourage the CM/V Diamond Princess in Yokohama. This idea was suggested by many of our crew members because many of the crew on board the Diamond Princess were ex-crew and friends, and passengers also felt deep sympathy for those who were suffering from the same threat.

The creation of the banner was very vibrant and lively. Many crews and passengers joined to write messages of encouragement and support on two large banners together.
The total number of crew and passengers who had ill health and symptoms was 30% less than that of past experiences of a long cruise itinerary when we arrived at Nagasaki and the medical record was also very orderly. We succeeded in getting good reliance from the Nagasaki quarantine office and free pratique was granted smoothly.
Most of the media crews waiting outside of the gangway could not catch any bad information through interviews with passengers because they were all very normal and seemed to be very calm.

Leadership for Risk Management Factor-5

A leader must focus on an idea and humour fostered from humanism and sympathy, which can ignite to remove deadlock of measurement. The full of motivation of leaders is the most important prime mover. Though analysis of the situation is important, the leader must sometimes trust subordinates and have broad-mindedness and courage to adopt their opinions thoroughly.

1-1 Epilogue

The ship entered the passage of the port of Yokohama and we could see the large hull of M/V Diamond Princess. There were few people on deck of the Diamond Princess.

Many crew and passengers prepared the banners on deck and they held their breath. Just before passing right abeam of Diamond Princess, I blew a long whistle to attract attention. Many of the guests and crew on board the Diamond Princess came out on deck. Instantly I blew three long blasts again and people on both decks were waving at each other, with some of them shedding tears. Diamond Princess blew one long whistle as a reply.

1-2 Conclusion

7 important points of risk management in this case

1) Leader's faith, determination and defined clear goal
2) Human resource management to assign people to the right positions
3) Fairness based on humanism
4) Taking responsibility through actual behaviour; a leader must always have a good reason for every move they make.
5) Dialogue to generate solidarity to achieve the designated goal
6) Produce good ideas and humour removing deadlock fostered from humanism and sympathy
7) Full of motivation of front men and relationship of mutual trust between leader and subordinates to accept flexible ideas and suggestions.

All must be one team and create a chain reaction from the abovementioned factors. Then together they could derive positive human behaviour and hope in the future. I conclude these mixed tactics were an important substance of crisis management in this case.

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Cyber security training strategy: Dealing with maritime SCADA risks

Dimitrios Dalaklis
Associate Professor, *World Maritime University, Malmo, Sweden,* dd@wmu.se

Nikitas Nikitakos
Professor, *University of the Aegean, Chios, Greece*, nnik@aegean.gr

Razali Yaacob
Captain, *Netherland Maritime Institute of Technology, Johor Darul Takzim, Malaysia*, razaliy@nmit.edu.my

Abstract: Control systems on board ships collect sensor measurements and data from various operational activities and display all the relevant information; they also facilitate relaying of control commands to local or remote equipment. Distributed control systems (DCS) are typically used within a single process or generating plant; supervisory control and data acquisition (SCADA) systems are used for larger-scale environments. The SCADA system communications infrastructure tends to be slower and less reliable, and so the remote terminal unit in a SCADA system has local control schemes to handle that eventuality. Security in general and cyber security specifically were not the major concerns of early standalone maritime SCADA systems. Security was primarily achieved by controlling physical access to system components, which were unique and used proprietary communication protocols. For years, security in SCADA systems was viewed as just an implication of safety. Over the last decade, however, the situation has changed, and numerous standards/directives dealing with the cyber security of SCADA systems have emerged. Characteristics of maritime SCADA cyber security are discussed; related training needs are identified next. The pedagogical approaches are also presented in order to train seafarers in risk assessment, prevention and mitigation strategies related with maritime SCADA cyber security risks.

Keywords: Cyber Security; Training Needs; Maritime Supervisory Control and Data Acquisition (SCADA) Systems.

Introduction

Ships today are quite complex systems to design, build and maintain throughout their life-cycle. Contemporary sea-going vessels are equipped with a wide variety of technologically advanced systems and are associated with an extremely high level of automation. It is a rather self-explanatory fact that the continuous improvement and integration/interconnection of electronic systems (most commonly termed as the "network-centric" approach), have created a rather different operating environment for the shipping industry, when compared with the prevailing model of just two decades ago. At that time, the exploitation of data exchange between interconnected equipment and systems on vessels engaged with maritime transport tasks, was relying mainly on stove-piped architectures and applications. However nowadays, the issues of connectivity and interconnection are clearly standing out when examining the prevailing trends in ships' design and equipment. Furthermore, easy access to various computer systems, and quite often in the so-called "remote mode", is holding a pivotal role during the conduct of operations -both on board a modern ship, as well as in relation to an extended number of related

activities ashore, with indicative examples in this domain being provided by various remote sensing and maintenance tasks (Dalaklis et all, 2020).

The seas and oceans of our planet are now well integrated into the Internet (most often via satellite support); this global coverage has provided the opportunity for shipping companies to reduce costs across supply/demand chains, improve customer services, and even redefine their way of conducting operations. Modern ships are being transformed into "remote offices at sea"; applications like voice over IP (Internet Protocol), email and instant messaging are now used on-board contemporary sea-going vessels on a daily basis. However, this new and "interconnected world" that is also strongly associated with an on-going digitalisation trend within the maritime industry itself is simultaneously associated with very significant risks, which in case they are not effectively and timely addressed, can result into really devastative outcomes. On the positive side and with a quite forward looking approach, during July 2017, the International Maritime Organization (IMO) already approved Guidelines on maritime cyber risk management (MSC-FAL.1/Circ.3) in order to provide high-level recommendations on maritime cyber risk management, to safeguard shipping from current and emerging cyber threats and vulnerabilities. The adoption of Resolution MSC.428(98), which brought the importance of Cyber Security to the forward of attention, is also clearly standing out.

The European Union's Agency for Cybersecurity has already pointed out that the contemporary heavily industrialised world is constantly changing, including the introduction and/or further modification of technologies and associated business models that are needed to adapt towards "new" and evolving market requirements (ENISA, 2014). One of the most transcendental adaptations that the maritime transport industry is currently experiencing is the convergence between Operations Technology (OT), the operations needed to carry out the industrial processes, and Information Technology (IT), the use of computers to manage data needed by the organisation's enterprise processes. This convergence has many advantages (optimisation of operations, better use of resources, cost savings, etc.), but on the other hand it increases the need for cyber security of industrial control systems (ICS) and Supervisory Control and Data Acquisition (SCADA) systems. Initially, SCADA systems were used mainly in power transmission, gas pipeline and water distribution control systems. However, in recent year their use has expanded significantly and nowadays they are found extensively on-board ships. SCADA systems stand out among other ICSs, as systems that (1) monitor and control assets distributed over large geographical areas, and (2) use specific control equipment such as a Master Terminal Unit (MTU) and (various) Remote Terminal Units (RTUs) and are therefore exposed to cyber security risks (Cherdantseva et all, 2015). The Control Systems framework and the technical components of the basic SCADA structure are presented in Figure 1.

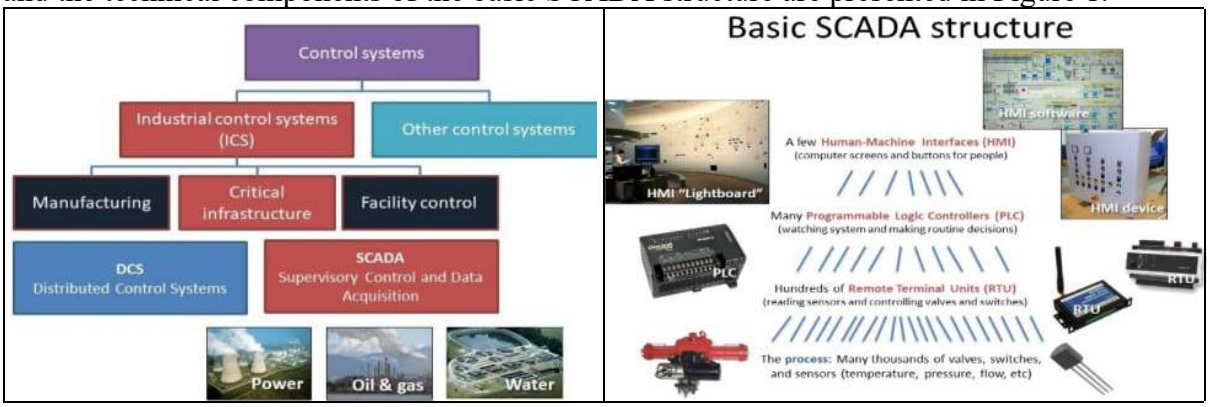

Figure 1. Use and technical components of a SCADA system.

Created by the authors, via adaption of certain slides from the presentation: Woudenberg, B. (2012). SCADA Right Now, Retrieved from https://slideplayer.com/slide/5703843/ June 2021

Control systems on board ships collect sensor measurements and data from various operational activities and display all the relevant information; they also facilitate relaying of control commands to local or remote equipment. Distributed control systems (DCS) are typically used within a single process or generating plant; SCADA systems are most often used for larger-scale environments. Security in general and cyber security specifically were not the major concerns of early standalone maritime SCADA systems. Security was primarily achieved by controlling physical access to system components, which were unique and used proprietary communication protocols (Cherdantseva et all, 2015). For many years, security in SCADA systems was viewed as just an implication of safety. Over the last decade, however, the situation has changed, and that paradigm is not valid in the contemporary "well interconnected world". It is indicative of the fact that numerous standards/directives dealing with the cyber security of SCADA systems have emerged, as an initial response to the specific need. In any case, this aforementioned convergence between OT and IT, which affects hundreds of thousands of industrial systems worldwide, implies that professionals with knowledge of cyber security for ICS/SCADA will be needed. However, currently, there are very few professionals with the proven skills available to do this work. Following a rather simplistic qualitative approach, characteristics of maritime SCADA cyber security are discussed first and related training needs are identified next. The main aim is to identify the "right" pedagogical approaches which can be deployed in order to train seafarers in risk assessment, prevention and mitigation strategies related with maritime SCADA cyber security risks.

Importance of Cyber Security

The contemporary era is very frequently referred to as "the information age"; cyber-attacks on the wider maritime industry (and especially on the relevant port IT systems) should no longer be considered hypothetical or simply the stuff of over-exaggerating analysts, resembling a fictional narrative. Probably a very strong "wake up" message was sent in June 2017, when the Maersk shipping company was hit by a cyber-attack from the purely destructive NotPetya virus (Boyes et all, 2020). The virus entered Maersk's systems through a widely used piece of tax accounting software in Ukraine. Maersk was not the intended target for the attack, but the consequences for the company were very real. The virus spread through the company globally and made all their applications and data unavailable for several days. Real world operations, including its extremely important Rotterdam terminal, were seriously affected, or even completely crippled, with relevant financial losses being estimated at the level of $200-300 million. The Maersk story testifies how a system that fails in key ways becomes unusable, even if certain parts of it remain unaffected: Maersk's shipboard systems were fine, but there was no way to distribute their loads or take on new cargo (Dalaklis and Schröder-Hinrichs, 2019).

It is a self-explanatory fact that the NotPetya virus could attack the Maersk global network because it was loaded onto one unpatched computer operating in a single local office, which in turn was connected to the company's global network. This incident shows the vulnerability of everyone to cyber-attacks: you do not even have to be the intended victim. On a positive note, Maersk could recover relatively quickly because it had already recognised that resilience and recovery processes are as important in terms of the wider Cyber Security framework as trying to prevent an attack. Being able to recover all your systems and data from secure backups within a very short timeframe of a successful cyber-attack will protect your business from potentially serious financial and the more important reputational damage. Spreading of viruses

through the computer systems that are serving the wider needs of the maritime industry is just a small part of the complex equation. In other cyber security incidents, IT assets have been quite often infected with malware and in numerous occasions it has been recorded unintentional jamming or interference with wireless networks (Boyes et all, 2020).

In order to bring forward a widely accepted definition, "Cyber Security" can be described as "*the collection of tools, policies, security concepts, security safeguards, guidelines, risk management approaches, actions, training, best practices, assurance and technologies that can be used to protect the cyber environment and organisation and user's assets*" (International Telecommunications Union (ITU), 2008). Within this definition, the "cyber environment" comprises the standalone computers and interconnected networks of both information and operational technology that use electronic, computer-based and wireless systems, including information, services, social and business functions that exist only in cyberspace. At the same time, the "organisation and user's assets" includes connected and standalone computing devices, personnel, infrastructure, applications, services, telecommunication systems, and the totality of transmitted, processed or stored data in the cyber environment. Cyber security is not just about preventing hackers gaining access to systems and information. It also addresses the maintenance, integrity, confidentiality and availability of information and systems, ensuring business continuity and the continuing utility of cyber assets. Before moving to a different direction, it is worth clearly highlighting the fact that on board a modern ship there are numerous SCADA systems. With the help of Figure 2, an attempt to summarize all ICS that can be found on a modern vessel is taking place; a few indicative examples of interest are also listed next: Alarm and Monitoring System; Auxiliary Control System; Power Management System; Cargo Control System; Propulsion Control System; Ballast Automation System; Air Conditioning System; Anti–Heeling; Reefer Monitoring; Fire System; Main Engine Monitoring System. Furthermore, a representation of the IT environment supporting the conduct of a shipping company's business and other activities, as well as how the use of these computers relates to maritime SCADA is provided.

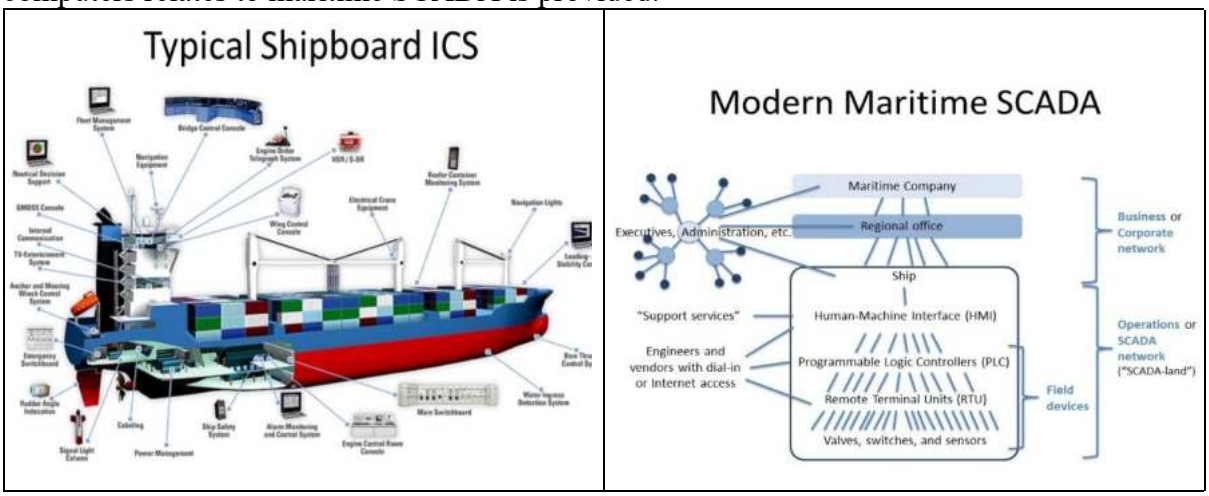

Figure 2 ICS on-board a vessel and the wider framework of maritime SCADA.
Created by the authors, via adaption of certain slides from the presentation: Woudenberg, B. (2012). SCADA Right Now, Retrieved from https://slideplayer.com/slide/5703843/ June 2021

The main vulnerabilities that are related to SCADA systems are (Woudenberg, 2012; Nikitakos 2017): The adoption of standardized technologies with known vulnerabilities; The connectivity of many control systems via, through, within, or exposed to unsecured networks, networked portals, or mechanisms connected to unsecured networks (which includes the Internet); Implementation constraints of existing security technologies and practices within the existing

control systems infrastructure (and its architectures); The connectivity of insecure remote devices in their connections to control systems; The widespread availability of technical information about control systems, most notably via publicly available and/or shared networked resources such as the Internet; Disrupt the operations of control systems by delaying or blocking the flow of information through the networks supporting the control systems, thereby denying availability of the networks to control systems' operators and production control managers; Attempt, or succeed, at making unauthorized changes to programmed instructions within PLC, RTU, or DCS controllers, change alarm thresholds, or issue unauthorized commands to control station equipment; Send falsified information to control system operators either to disguise unauthorized changes or to initiate inappropriate actions; Modify or alter control system software or firmware such that the net effect produces unpredictable results (such as introducing a computer "time bomb"); Interfere with the operation and processing of safety systems; Many control systems are vulnerable to attacks of varying degrees. These attack attempts range from telephone line sweeps (a.k.a. "wardialing"), to wireless network sniffing (a.k.a. "wardriving"), to physical network port scanning, and to physical monitoring and intrusion (Nikitakos, 2017)

It is also necessary to mention that there are several types of exploiting maritime ICS/SCADA. A limited number of them is discussed next: **Direct physical damage to affected equipment and systems.** By exploiting an ICS, the controlled mechanism can fail with catastrophic results, damaging a single piece of equipment, interrupting a larger system, or disabling or destroying an entire ship; **Small-scale, local disruptions.** They can damage or interrupt individual systems or single ships within a single organization, without widespread impact beyond the affected function or service; **Injury or death to operators, passengers or the general public**. An incident can affect a single operator or a larger number of crewmembers or bystanders. Targeted attacks on a critical for safety equipment can result into a fire, or explosion that could injure or kill hundreds of people; **Catastrophic disruptions to the transportation system.** A vessel sunk in a shipping channel, an explosion at an oil or LNG facility, sabotage to canal locks, or a series of mishaps involving cargo container cranes in critical ports can have long-term impacts to the safety, stability and reliability of very crucial elements of the wider transportation system (Nikitakos, 2017; Boyes et al, 2020).

Knowledge areas

The most important knowledge areas for concerned professionals have been identified, by taking into account the existing ICS/SCADA Cyber Security Certification schemes and other relevant studies. The following uses as reference the work done under the ERNCIP (European Reference Network for Critical Infrastructure). One of its subgroups has focused on defining the competences, qualifications and experience needed by ICS Cyber Security Professionals. The result is a high level overview of the knowledge areas that need to be developed; they are summarized with the help of Figure 3. Of very specific interest are the following (ENISA, 2014): **General Information Technology.** This domain includes an introduction to IT architecture to Networking and Communications, systems development and software, data management and finally an overview of standards and processes. It is considered as the basic step for any certification related to Maritime SCADA taking into account the complexity that the trainee will face in the next steps; **Cyber Security & Information Risk Management.** The vulnerabilities and the complexity of several attacks makes risk management very essential for the Maritime SCADA Knowledge area. Risk management includes several methods for risk identification, (PHA/HAZOP usage), methodologies and procedures for risk acceptance, application of possible risk control options and finally risk/mitigation plan); **Industrial**

Automation Control and Safeguarding. This is the main area given the variety of several maritime SCADA on board of ships. It includes topics such as maritime networking and Architecture, embedded device and control for maritime SCADA, Operating environment and hazards particularly on board of a ship. Maritime process Safety management, relevant standards and procedures from other sectors.

Figure 3 Knowledge areas relating to education and training activities for maritime SCADA. Created by the Authors, via adaptation from European Union Agency for Cybersecurity. (2014). Certification of Cyber Security skills of ICS/SCADA professionals: Good practices and recommendations for developing harmonized certification schemes. Retrieved from https://www.enisa.europa.eu/publications/certification-of-cyber-security-skills-of-ics-scada-professionals

Proposed curriculum development

Benjamin Bloom was one of the first scientists who systematically categorized the educational objectives and the related educational goals. The so-called "Bloom's taxonomy" is one of the main principles of the educational sciences, which has been revised and updated in the last years (Bloom, 1956; Bloom 1969). In general, the taxonomy forms a hierarchical model for the classification of educational learning objectives into levels of specificity and complexity. The overall method tries to enhance the communication between educators on the design of curricula, exercises, and examinations. It has been adopted by related teaching philosophies that lean more on skills rather than on content. It consists of 6 layers, with the 3 bottom levels (remembering, understanding, and applying) denoting the basic understanding of the examined topic, while the coverage of the 3 top ones (analyzing, evaluating, and creating) reveals that the trainee has achieved a higher-order of thinking. The first three layers assess the trainee's knowledge about the teaching content while skill development is promoted with "higher-order thinking". This also forms the final aim of the Bloom's taxonomy—building a culture of thinking. The Blooms taxonomy was chosen for the scope of our study, but since the topic of cyber security in relation to maritime SCADA systems is also associated with a very practical

element in terms of training requirements, it was combined with so called Work Based Learning (WBL), which is an educational strategy that provides students with real-life work experiences where they can apply academic and technical skills and develop their employability.
The discussion revolves around a series of educational courses which will integrate the theoretical curriculum with the workplace to create a different learning paradigm. It has already been pointed out that: "Work-based learning deliberately merges theory with practice and acknowledges the intersection of explicit and tacit forms of knowing" (Raelin, 1997). Most WBL programs are generally university accredited courses, aiming at a win-win situation where the learner's needs and the industry requirement for skilled and talented employees are both met. WBL programs are targeted to bridge the gap between the learning and the doing. Work-based learning strategies provide career awareness, career exploration opportunities, career planning activities and help students attain competencies such as positive work attitudes and other employable skills (Hamilton, S.F. & Hamilton, M.A. 1998; Stasz & Brewer, 1998). WBL encompasses a diversity of formal, non-formal and informal arrangements including apprenticeships, work placement and informal learning on the job. The key driver is the need for active policies to secure learning that meets the need of the workplace.

Indicative WBL strategies could include the following (Hamilton, S.F. & Hamilton, M.A., 1998; Stasz & Brewer, 1998; Axcelerate, 2020): **Apprenticeship or internship or mentorship.** An apprenticeship involves the student working for an employer where he or she is taught and supervised by an experienced employee of the chosen organization. The student is periodically evaluated for progress as per the skills and knowledge acquired, and maybe granted wages accordingly. At the end of the course, the student receives a certificate of service. The student learns in a realistic environment and gets the opportunity to apply his or her knowledge in real-world scenarios; **Job shadowing.** Job Shadowing is a short term opportunity that introduces the student to a particular job or career by pairing the student with an employee of the workplace. By following or 'shadowing' the employee, the student gets familiar with the duties and responsibilities associated with that job; **Business/industry field trip.** Field trips offer the students an insight in the latest technical advancements and business strategies of an enterprise. Students also gain awareness of the various career opportunities available and understand the driving forces of the community's economy; **Entrepreneurial experience.** This includes setting up of specific business, right from the planning, organizing and managing stage to the risk control and management aspects of a business; **Cooperative education.** In cooperative education, the work experience is planned in conjunction with the technical classroom instruction. This method is used by universities that do not have access to state-of-art equipment required to transact the technical course practically; **School-based enterprise.** A school-based enterprise is a simulated or actual business run by the school. It offers students a learning experience by letting them manage the various aspects of a business; **Service learning.** This strategy combines community service with career, where students provide volunteer service to public and non-profit agencies, civic and government offices etc.

Summary and Conclusion

During recent years, the wider maritime industry (ports included) has been undergoing a digital transformation in order to effectively meet emerging business challenges, optimise existing business and operational processes, as well as introducing new capabilities, such as automation and real-time monitoring of operations. Especially in the maritime sector, a large volume of data is produced from a very extended pool of relevant sources (i.e. systems supporting the conduct of navigation and/or ship's machinery, as well as related marine fleet management

systems etc.), on a daily basis. This digitalisation trend has been based on the interconnectivity of Information Technology (IT) and Operation Technology (OT) assets and the introduction of new technological enablers, such as cloud computing, big data and Internet of Things (IoT). However, this phenomenon is also creating numerous challenges, since in an "interconnected world" the whole security chain is as strong as its weakest link. On the positive side, the various implications of Cyber Security have been discussed at the International Maritime Organization (IMO) and as a very timely response, the adoption of Resolution MSC.428(98), which aims to address cyber risks in the shipping industry, is pushing forward with the first initial step: raising awareness thought all involved stakeholders. Furthermore, this IMO resolution is creating a framework of effectively addressing cyber risks as a part of the already existing safety management systems, within the ISM Code. It clearly establishes the obligation of Maritime Administrations and concerned shipping companies to ensure that the existing safety management systems appropriately address cyber risks and cyber security for ships by their 2021 annual verification.

The field of risk assessment related to cyber security and especially with ICS/SCADA is a new and quite complex domain; concerned maritime personnel, most often receive "random" training offerings by several different manufacturers and are then expected to effectively deal with an extended portfolio of security incidents. In this paper, targeted knowledge areas that were considered as essential for certification were identified first; then, by using Bloom's taxonomy and in combination with a work-based learning (WBL) approach, relevant training strategies were discussed and their advantages and drawbacks were also highlighted. Cutting a long way short, WBL is an educational method that immerses students in the workplace, prompting them to learn about the environment in which they'll be working, and to complete typical tasks for the company. The WBL approach is relatively new in the maritime sector, but it looks like it fits with the particular complexities for security risks related with maritime SCADA. As it was already very clearly explained, WBL encompasses a wide portfolio of formal, non-formal and informal arrangements including apprenticeships, work placement and informal learning on the job. Needless to mention: the maritime industry is already relying on the job training and mentoring to create and further improve competencies in relation to the maritime profession; this transition towards WBL will not require a significant paradigm shift. Last, but not least, the "hot to implement" these particular training strategies should be included as a future research topic; examining more carefully the adoption of the "right" methods and tools for the concerned instructors and facilitating the easy understanding of the trainees must also be included into the portfolio of future investigations.

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New education tools for Electro-Technical Officer (ETO).

Axel Rafoth [2]; Jens Borchhardt [3]
[2]Professor, Dr.-Ing., [3] Master of Business Administration, both *University of Applied Sciences, Technology, Business and Design Wismar (UW), Dpt. Maritime Studies, Systems Engineering and Logistics (MSL), Rostock Warnemünde Rostock, Warnemünde*
axel.rafoth@hs-wismar.de; jens.borchhardt@hs-wismar.de

Abstract : Electrical systems in seagoing ships have been rapidly developed and changed over the last years. Not only in passenger ships large scale electrical drives have been implemented. The number and the complexity of electrical consumers has also increased significantly. Based on Manila amendment 2010 STCW focus is set on new developments on board and so influenced the newer education path for electro-technical officer (ETO). This paper should give ideas for useful experimental setups to prepare trainees for their future job onboard. Focus is set to laboratory, practical education to be defined more detailed.

Keywords: electro-technical officer ETO, education, laboratory

Introduction

Electrical systems in seagoing ships have been rapidly changed in the last years. Not only in passenger ships large scale electrical drives have been implemented. The number and the complexity of electrical consumers has also increased significantly.

Control systems have grown from a handful of sensors with local alarms to more than 10,000 sensors per ship with online connection to fleet monitoring centres. So the normal education path for ship operating officers is not sufficient any more. Even more green technology will not work without automation. According to this development, the Manila amendments to the STCW has defined a special training course for ships electrical engineers, the so called Electro-technical officer (ETO).

The paper is intended to provide a view of the development on board and the influence of these changes in technology that have to come into the current curriculum and the laboratory equipment. Here we want to show experiences after five years of educating ETO. Many of our finalists have been in contract with cruising companies like AIDA from Carnival corporation already at the beginning of their studies.

Definitions - Manila amendment 2010 STCW

Definitions for electrical training in the widely more general defined requirements of the Manila amendment 2010 STCW: when the company is requested to carry an electro-technical officer they should comply with the new competency requirements under A-III/6.

electrical equipment:

a) generator and distribution systems
b) preparing, starting, paralleling and changing over generators

c) electrical motors including starting methodologies
d) high-voltage installations
e) sequential control circuits and associated system devices, electronic equipment:
f) characteristics of basic electronic circuit elements
g) flowchart for automatic and control systems
h) functions, characteristics and features of control systems for machinery items, including main propulsion plant operation control and steam boiler automatic controls

control systems:
a) various automatic control methodologies and characteristics
b) Proportional–Integral– Derivative (PID) control characteristics and associated system devices for process control

Function and performance tests of equipment and their configuration:
1 monitoring systems
2 automatic control devices
3 protective devices
4 The interpretation of electrical and simple electronic diagrams

All this has been implemented into the original course set up at the UW right from the introduction of the ETO course five years ago. In order to take into account on the one hand the educational program of technicians for maritime ships operation and on the other hand the increasing number of electrical systems on board, the electrical content of the teaching plan has been widely expanded.

To ensure proper electrical knowledge of the ETOs, the first two years of the course are held in the faculty of electrical engineering in UW together with students of electrical engineering. The last two years of the ETO course will be completed in the department of maritime studies in Warnemünde. Due to the fact that marine industry and marine transportation is a worldwide business, many education centers offer maritime education and some of them also offer courses for ETO.

Some examples are here:
- Lithuania, Lithuanian Maritime Academy
  (https://ec.europa.eu/ploteus/en/content/marine-electrical-engineering)
- Southampton, The Corporation of Trinity House
- Greek Maritime Academies, Merchant Marine Academy of Makedonia,

Marine Engineering Department
- Ghent, Belgium, MSc in Electromechanical Engineering - Maritime Engineering (finished)
- Croatia Split: Croatia is the University of Split, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture, MSc in Marine Electrical Engineering Technologies
  Master in Maritime Electrical Engineering and Communication Technologies
- Gdynia, Faculty of Electrical Engineering
- Paço de Arcos, Portugal, Bachelor Degree Maritime El. Engineering
- Further offers in EU here: https://www.marinetraining.eu/provideroverview

Training skills for the 21st-century in Marine Engineering Technology is not a closed process, it needs lifelong learning in the maritime context. This is also valid for teachers.The

requirements for ETOs future knowledge also require Engine Room Simulator (ERS) training. This will need continuous development of ERS, which also allows application for research and development. The typical classroom for engine control rooms usually look like the following:

Figure 1: Gdynia Reproduced from Internet (https://umg.edu.pl/en/studies-faculty-electrical-engineering)

Figure 2: Lithuanian Maritime Academy Reproduced from Internet

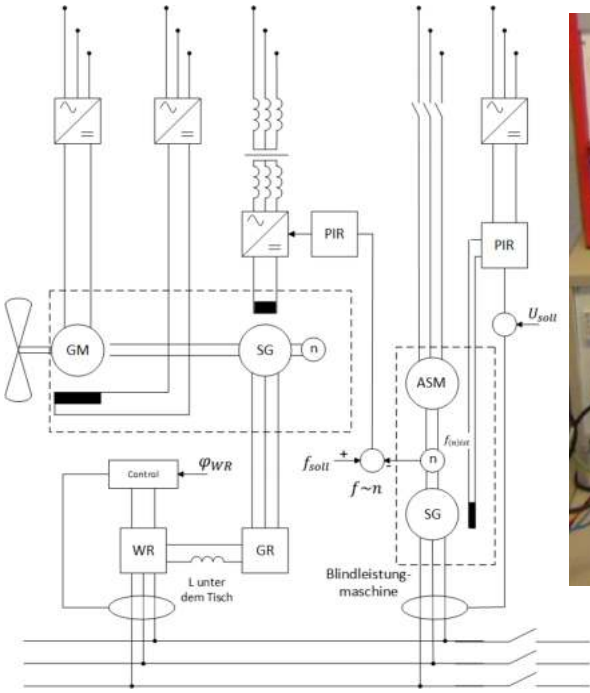
However, if we look into STCW/Manila we find here: "Manage operation of electrical and electronic control equipment" we find only general: "Marine electro technology, electronics, power electronics, automatic control engineering and safety devices". There is no list of components given. One of the most growing areas of technology is, in the eyes of UW, not covered: Power electronics and Power management as well; here a lot of new components enter the ships as:

- widely extended complex power management systems including automatic power recovery after Black Out
- large scale frequency converters in ships drives
- Frequency converter for auxiliary drives like any pumps or fans
- Exhaust gas scrubbers and washing systems and their controls,
- Batteries, power controllers and chargers for hybrid drives
- Electrical Starters for diesel Engines (e.g. Emergency generator)
- Ignition systems for LNG engines
- Automatic and manual operated electrical shore connection systems

To teach the required content practically it is very difficult to get access to proper experimental setups. Therefore, simulation is preferred.
This is valid for Power Systems as well as for all Automation Systems. UW and here MSL has invested in a number of modern experiments in recent years:

1 The first new setup is a frequency converter with an Asynchronous Motor and a load generator. Here the students get familiar with commissioning of FCs, the input of parameters and the definition of limitations and protection functions.
2 A current source converter (CSI) used in a shaft generator system has been available. Due to the fact that a cycle converter has the same structure, this has been adopted to simulate a drive system also.
3 One setup presents a ship's drive with a double winding motor, a second part simulates a POD drive.
4 One experiment on electrical starters including measurements at a real test setup
5 Ships Engine Simulator experiments with updated models for hybrid ships and on board Power Management Systems (PMS)
6 Regenerative systems consisting of solar cell, fuel cell, batteries, heat store and/or hydrogen storage experiment

CSI Drive (cycloconverter)
Synchronous generator = Drive, here active power can be taken out by windings (shaft generator operation) or taken out by Shaft (CSI electrical motor drive)



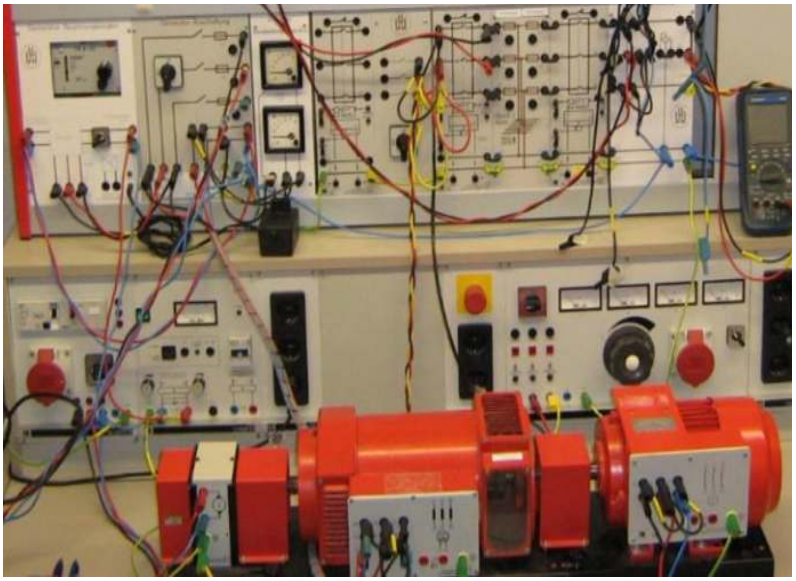


Figure 3: CSI drive/Shaft generator schematic

FC setup: frequency converter (ABB ACS 800) with an asynchronous motor and a load generator. Training content:

- Commissioning under aspect of cable routing, check lists (ABB manual),
- input of parameters, priority of limitations.
- Investigation of incremental encoder and its signals
- Parameter input for protection, functions, adaptation to process, soft starting drive.
- Showing electrical values from FC using digital storage oscilloscope

Figure 5: frequency converter (ACS 800) with Asynchronous Motor in Box

Ships drives
two Ships drives, controlled
locally or
remote (MKR), having ramps, and limitations, logging functions
a) tandem Siemens drive with supplying 3 winding transformer
b) ABB Azipod drive with ABB ACS 800 FC

Figure 6: Tandem drive

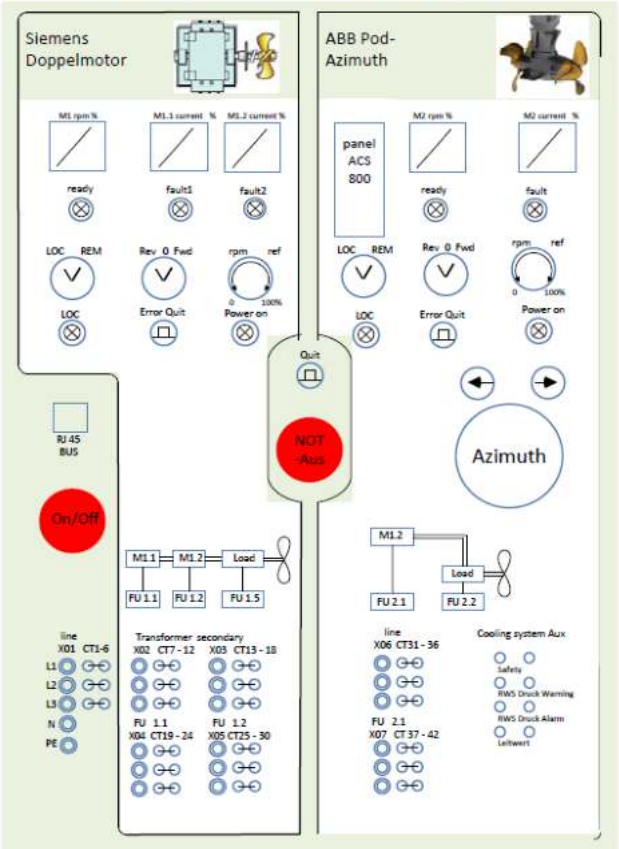


Figure 7: scheme panel

BUS controller of tandem Siemens drive

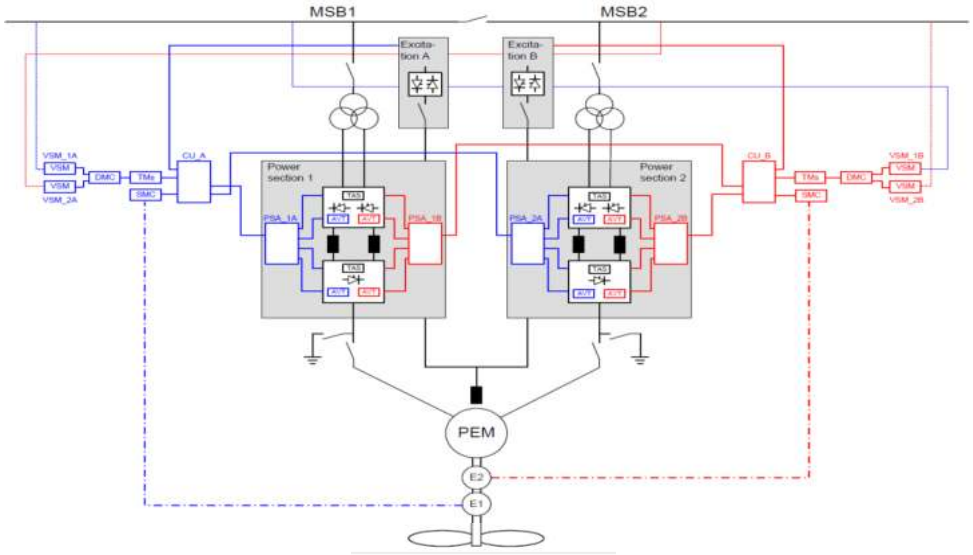


Figure 8:
Bus System in use adopted from Siemens

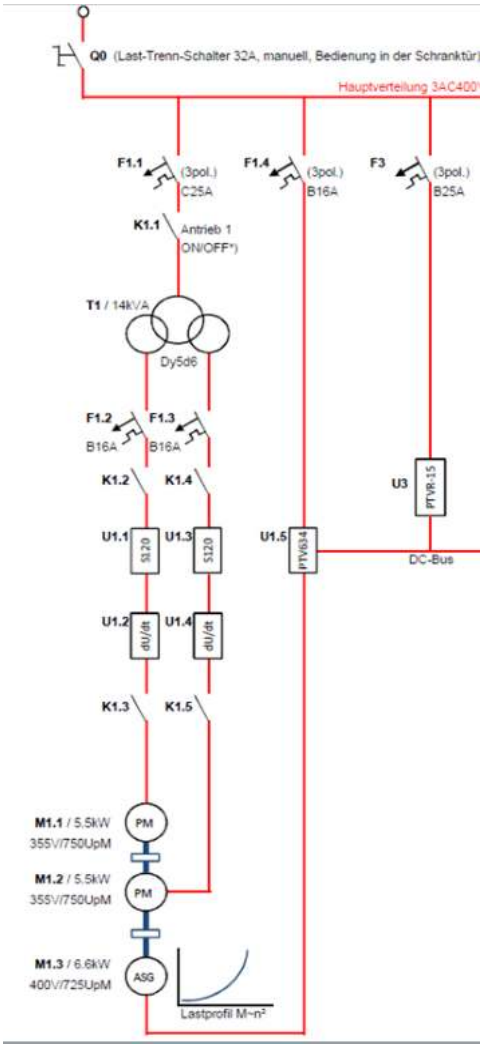


Figure 9: power diagram

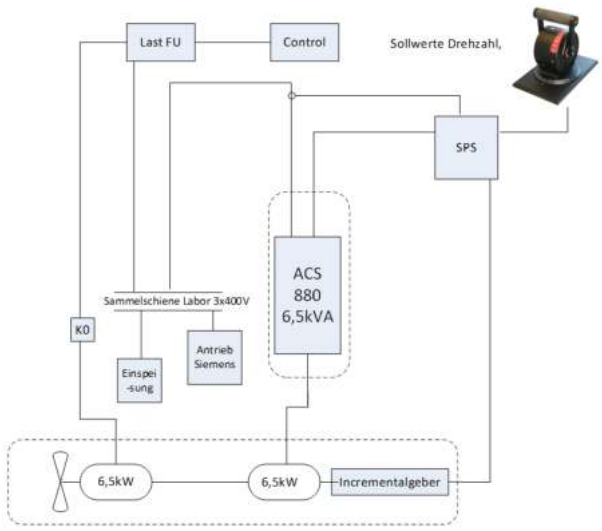


Figure 10: Drive overview

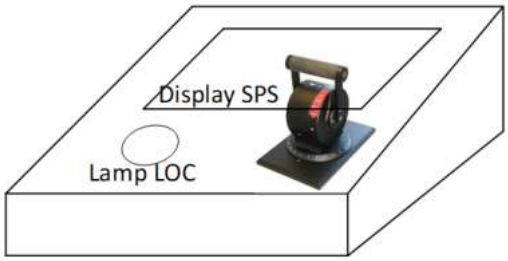


Figure 11: remote control panel

PMS model definition

Generators and E-motors are modelled by power balance (efficiency about 1) Diesel generators are already available in Ships engine simulator (SES). To model PMS under operation, they have to comprise power consumption of auxiliary systems like pups, fans, batteries, scrubbers etc.
Total accuracy is not the most important result, but tendency has to be right. So different scenarios can be compared. (e.g. shore power supply, sea mode, available power reserve as a parameter)

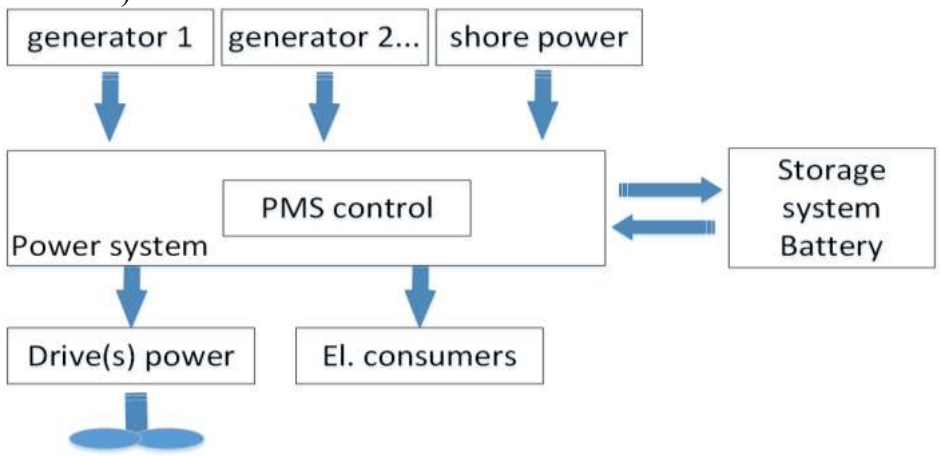


Figure 12: PMS model

System 2 Hybrid ship system

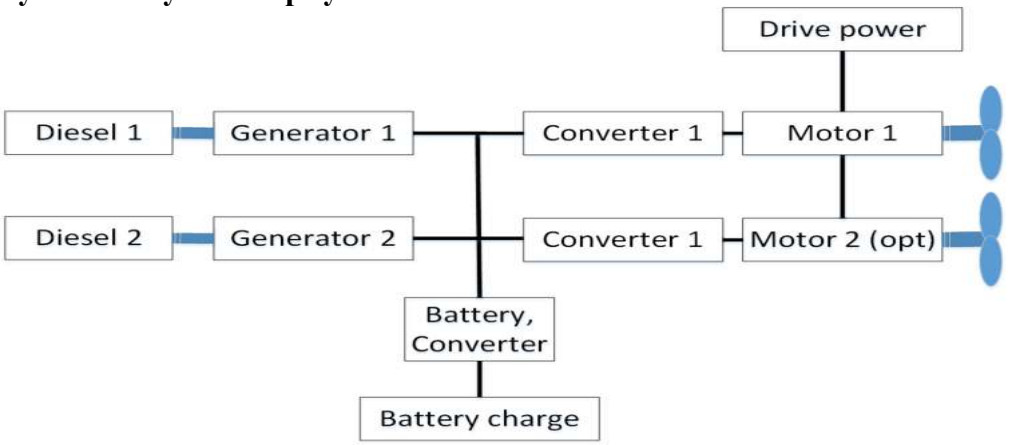


Figure 13: hybrid ships model

Influence of time table (ships speed) and route on charging cycles and thus battery aging can be estimated.

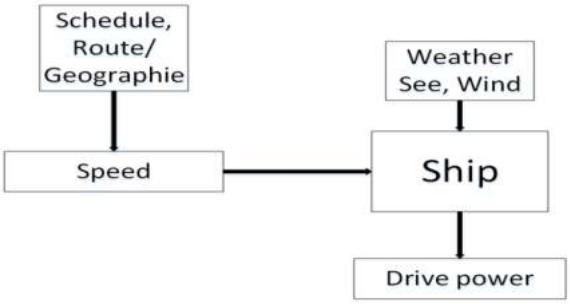


Figure 14: ships power definition system

Laboratory test - power recovery after Black Out

a) with PMS
b) without PMS

Ships engine simulator from Siemens is available for such tests.
So the automation system model is very close to reality due to the same human machine interface (HMI).
In preparation of this experiment/simulation students get familiar with generator protection functions including short circuit at a stand alone Stamford generator and control panel.

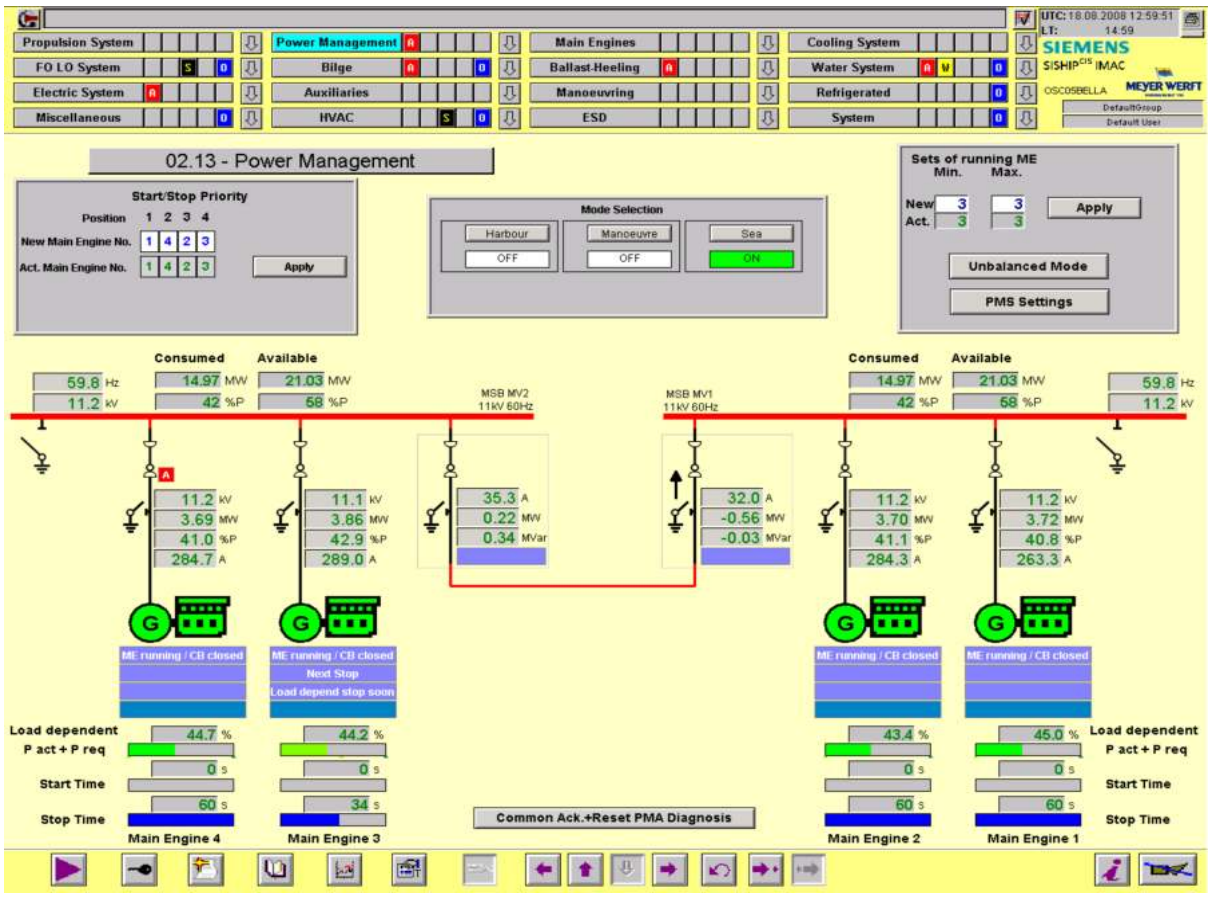


Figure 15: PMS picture Reproduced from Siemens Simulator Manual

Other aspect from industry:

At the time when a new ETO course at the UW was introduced surrounding shipyards like "MV-Werften" started to construct large passenger vessels. Due to the amount of electric and electronic equipment on board, the shipyards asked UW for highly qualified personnel able to commission these passenger vessels. Looking at that need, UW started to double, split of ETO course in higher semesters into two education paths

1. common ETO education (since 2014)
2. Ship electrical engineer without STCW,

by taking out all STCW material and focusing more on maritime and electrical technology (starting in 2020).

One more path has been introduced. Sometimes technical officers want to be educated to finish their studies as ETO. They already have extensive ship handling knowledge. Extended electrical aspects have to be trained. So UW in such a situation manages to conclude studies for such a person in one year. This is the minimum to get the required knowledge in automation, electrical and power systems. At the chair of Ships electrical engineering, research work is also done in the field of modelling for:

- Electrical properties of grids on board,
- Optimized use of batteries on bard of ships,
- optimized energy efficient power management systems on board of ships having electrical drive systems.
- Introducing Hydrogen into ships drives.

As a result, conference papers have been published on:
„Entwicklung von Modellen zur Simulation von (FU) Frequenzumrichter-Ableitströmen in IT Netzen" (methods of simulation of capacitive grid currents for frequency converters in IT power systems)
„Simulationsmodelle für Batterien und Dieselmotoren zur Bestimmung der Energieeffizienz auf Hybridschiffen" (Simulation models for batteries and diesel engines to calculate efficiency on hybrid ships)

Summary

- ETO course in Rostock is ongoing with about 8 students /year,
- Ships electrical experiments have been introduced into laboratory to keep course up to date
- Shipping Companies satisfied with "ETO results" as the finalists are.
- Surrounding shipyards and industry are interested in personal with special ships electrical knowledge.

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STCW water survival training needs basic swim evaluation

James Downey
Professor, *Maritime Technology and Operations Department, State University of NewYork Maritime College, Bronx, NY, USA*, jdowney@sunymaritime.edu

Abstract: The study reveals the current supplemental water survival training best practices of American, Spanish and Japanese maritime universities. This research reviews ongoing institutional training above the required STCW practical assessments, Table A-VI/1 and NVIC 08-14. The purpose of this paper is to highlight and share the best practices of participating schools. This vital supplemental training showcased in this study is meant to promote this accessory training throughout all maritime universities. Additionally, the study encourages further discussion on how much supplemental training is needed for today's mariners. This research will give administrators and instructors valuable insight into their counterparts training methods. The analysis reveals each participating school's rationale involving the supplemental training. Moreover, the level of importance given to this training in their curriculum and academic schedules. The study reviews training methods, equipment and whether there is an emphasis on swim instruction. The paper intends to be a water survival reference guide, imparting training policies and procedures wherever possible.

Key words: Swim instruction, water survival, and STCW

Introduction

In 2010, the IMO approval of the Manila Amendments to the STCW Convention, provided a detailed description of requirements for in-service physical abilities of seafarers. The requirements are: maintain balance and move with agility; step over high sills; strength; dexterity and stamina to manipulate mechanical devices; lift; pull and carry a load; reach upwards; stand; walk and remain alert for an extended period. Table A-VI/1-4 also requires seafarers to have, "swimming ability in suits and floating ability without suits". (IMO, 2010) These standards established uniformity and a basis for mariner fitness, but are woefully incomplete in swimming assessment and training. As an example, the STCW minimum standards erroneously assume all trainees can swim by requiring them to already know how to float.

This conjecture leads to safety issues when conducting STCW in-water survival training. Additionally, the study probes data on non-swimmer populations and their likely effect on the maritime industry, military, and maritime academies. The research reviews how these groups vary in their training methodologies, but points to their embrace of basic swim instruction and training procedures. Finally the study compiles a list of water survival best practices advocating the use of some or all of these modifications to the next amendments in the STCW water survival standards.

Why swim evaluations and training is necessary

The STCW minimum standards do not include swim evaluations or a water acclamation before conducting training. This causes costly time consuming interruptions in the dissemination of valuable group and individual STCW training. While certifying institutions cope with non-swimmer distractions, these entries also grapple with the decision making dilemma of whether to expand their curriculums to include basic swimming training or terminate potential employees if they cannot swim.

A broader understanding of global non-swimming populations allows for some clarity in this issue. The latest World Health Organization data shockingly indicates half of the global population does not know how to swim, or about 4 billion people, and drowning is the third leading cause of unintentional deaths. (WHO, 2020).

The American Red Cross stipulates over half of all American adults cannot actually do all of the skills needed to potentially save their own life including: floating or treading for 1 minute; jumping into deep water and coming up for air; spinning around in the water; getting out of a pool without a ladder and swimming one pool length without stopping. (Kyung, 2018).
These statistics inevitably morph to seafarers and those who work in dangerous conditions. For example, the British Royal Navy reports that 20 percent of its recruits fail their swimming test and further reports, some recruits are petrified of water and cannot even find the courage to jump into a swimming pool. (The Journal of Commerce Online, 1998).

Maritime academies such as the State University of New York Maritime College also report a relatively high percentage of non-swimming freshmen, about 18%. (Downey, 2017).To address this issue, swim training has been implemented in some organizations. This paper discusses examples from the offshore wind industry, military, and maritime institutions which are forced to devise supplemental swim training on top of the STCW minimums or scrap the minimum standards altogether, and develop separate water survival, and swim training.

Off-shore wind industry water survival training

As the need for sustainable wind energy grows, opportunities abound offshore, wind companies see the ocean surface becoming a viable option. For example, large wind farms projects are in place or being planned in many areas of the globe. Such projects require transporting of huge amounts of equipment and personnel to large staging areas off-shore in all weather conditions. The offshore wind industry recognizes the necessity for swim training in its safety preparation. Acknowledgment of STCW limitations has led to the Global Wind Organization (GWO) development of water survival instructional methodologies going beyond the minimum standards. In the most recent, *Global Wind Organization Safety Manual,* employees are required to receive water survival training in: controlled entry into the water from a height; Heat Escape Lessening Posture or (H.E.L.P.); individual swimming techniques; collective or group swimming, and techniques to prevent hypothermia. (GWO, 2019)

Military water survival training

The British Royal Navy members train using life rafts and in-water personal survival techniques that form the central part of its sea survival course. Participants are taught how to launch rafts and subsequent actions in a raft. They receive training on survival swimming, and study the design and use of lifejackets, survival suits and medical emergencies such as hypothermia. (Royal Navy, 2020).

The U.S. Navy and Marine Corps take similar approaches to water survival training. Both services require a basic swimming competency for all recruits at entry-level training. For Marine recruits, the minimum requirement is called water survival basic. It requires Marines, clad in battle dress uniforms (BDU) and boots, to strip off protective gear, including body armor and a rifle, while in the water under 10 seconds; jump into the pool from a 15-foot tower and swim 25 meters in deep water; employ a floatation device made from a pack; tread water for 4 minutes, and complete another 25-meter pack swim. This qualification is valid for two years and must be renewed. (Military.com, 2020).

The Coast Guard has similar training philosophies, but requires a jump from a platform of 1.5 meters, a 100 meters swim (or just under 100 yards) unassisted. (USCG, 2020). This rigorous, and demanding water survival and swim training demonstrates the military's philosophy on how important it is to be a proficient swimmer.

The Tokyo University of Maritime Science and Technology's (TUMSAT) instruction is extensive in all areas. However, for survival training, the institution follows STCW Code A-VI/1 minimum standards to fulfill the requirements. In addition, cadets are required to have swim training that involves swimming for over 3 hours in the ocean at one time. Cadets are not required to have additional training to obtain the Certificate of Proficiency" (Mori Yusuke, personal communication, Aug 11, 2018).

Maine Maritime Academy has a unique approach to its water survival supplemental training. The school does not offer a standalone water survival course; instead, it offers training for incoming freshmen during August indoctrination. The school's supplemental activities include the *TS State of Main,* ship jump, and making a Personal Flotation Device, or (PFD) out of mariner work clothing. The ship jump is a time-honored tradition as each new cadet is required to don a lifejacket and jump off the ship's stern, about 25 feet high; once in the water, cadets must swim back to shore.

In addition, students must make a personal flotation device or (PFD) from clothing. The activity requires the student to tread water while making a PFD from clothing. (Gardner, D. personal communication, Feb 12, 2019). Maine's supplemental activities clearly enhance students' water survival training above the minimum standard.

Like Maine Maritime Academy, Massachusetts Maritime does not offer a standalone water survival course. Instead, its water survival training is done during indoctrination. The school's STCW water survival instruction takes about 7 hours during the August orientation period. Where one company or about 70 students at a time. (Bosanquet, B, Personal communication, Jan 30, 2018)

One activity done during their indoctrination that stands out is called, "Unconscious Victim Relay Race," Bosanquet (2018) explains, "The orientation population is broken into even groups of 10 with about six groups per class. Each group starts with two swimmers, one as a victim the other as a rescuer. They swim to the end of the pool. Then, they switch roles and swim back. Then they tag in the next pair of students, and it goes about five times". This activity reinforces teamwork during a catastrophic situation at sea and the need to work together to survive. Water rescue training enhances student learning outcomes utilizing a hands-on application and analysis of emergency rescue procedures.

SUNY Maritime College water survival training begins during the school's Indoctrination period. Part of the training is a day-long introduction to water survival done at the college swimming pool. The water survival section starts with a swim evaluation. If the student's swimming is inadequate to pass the water survival course, the student must take a remedial swim class before undertaking the more vigorous water survival course. Also included in indoctrination is the Unconscious Victim Relay Race. (Downey, 2017)
The water survival course is offered in both fall and spring semesters, swim training along with the STCW minimum water survival requirements. However, because the minimum standards lack rigor, additional supplemental training has been included: the boiler suit challenge and the 500-yard swim.

The boiler suit challenge requires the cadet to jump into the deep end of the pool wearing his/her boiler suit or coveralls. He is then required to take the suit off in the water, wearing only his/her bathing suit. He/she then needs to tie off the sleeves, zip up the garment, tie the legs together and inflate using various procedures, creating a PFD. There is no time limit for this activity. (Downey, 2017)

The 500-yard swim requires students to swim the distance in 12 minutes or less using a combination of, front and back crawl, or side stroke and breast strokes. Failure to complete either activity requires the student to retake the course at a later date. (Downey, 2017)

The Study findings

The study's findings listed in Table 1 highlight industry, military, and maritime educational institutions' additional water survival training and swimming methodologies. The findings suggest that all of these entities understand the value of swimming even in the basic sense. Their training philosophies may vary but the research clearly indicates that swim assessment and training are beneficial. Whether the additional swim activities are essential for insurance or employment safety obligations or just common sense is undetermined.

Study recommendations:
The supplemental activities listed above have one thing in common, swimming and the acclamation to the aquatic environment is important in water survival training. Moreover, the ability to swim even in the most basic sense develops aquatic awareness, physical fitness, self-confidence, and teaches teamwork.
As mentioned earlier, the American Red Cross suggests the basic swim skills are: floating or treading, jumping from a height, spinning around in the water, getting out of the water without assistance and swimming one pool length without stopping. (IMO, 2010)

Displayed in Table 2 is the non-swimmer basic swimming lesson plan. The plan will take about five half-hour lessons to achieve proficiency. Key aspects of this abbreviated training should include the HELP or Heat Escape Lessening Posture, elementary breaststroke, and front crawl stroke. Floatation devices are encouraged. (Downey, 2018)

The study compiled a list of water survival best practices advocating the deployment of these modifications to the next amendments in the STCW water survival standards. Moreover, other maritime industry players should consider updating their water survival curriculums and add some, or all, of these supplemental practices to strengthen their water survival training programs.

Table 1

Additional Water Training and Swimming Methodologies

ACTIVITY	US NAVY/ MARINES	ROYAL NAVY	TUMSAT	WIND/ SOLAR	MAINE	MASS	SUNY
1	Swim eval & training	Swim eval & training	Swim eval	Swim eval & training	Swim eval & training	Swim eval & training	Swim eval & training
2	Make a PFD				Make a PFD	Make a PFD	Make a PFD
3	Water entry from a height	Water entry from a height		Water entry from a height	Ship jump	Water entry from a height	Water entry from a height
4	Victim rescue					Victim rescue	Victim rescue
5	Distance swim		Distance swim		Distance swim		Distance swim
6	H.E.L.P			H.E.L.P	H.E.L.P	H.E.L.P	H.E.L.P

Table 2

Non-swimmer Basic Swimming Lesson Plan

Lesson 1 ***(buoyancy)***	Lesson 2 **(swimming)**	Lesson 3 **(swimming)**	Lesson 4 **(treading)**	Lesson 5 **(putting it all together)**
Basic Floating, front and back	Review of flouting and gliding	Review of beginner breaststroke w/& without float	Review of breaststroke & front crawl w/& without float	Review of all topics and practice, practice, practice
Prone glide face in the water	Basics of beginner breaststroke w/float	doggy paddle	Basics of treading water w/float	
HELP position	HELP position	Basics of front crawl stroke w/float	Basics of treading water w/float continued	

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SESSION 3:
QUALITY MET FOR A SUSTAINABLE FUTURE

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MAAP transition from ISO 9001:2015 to ISO 21001:2018 the new quality standard in education organization

VADM Eduardo Ma R Santos AFP (Ret.)
President**,** *Maritime Academy of Asia and the Pacific, Kamaya Pt., Mariveles, Bataan, Philippines,* emrs_66@yahoo.com

Michael A. Amon, MEM
Quality Management Representative, *Maritime Academy of Asia and the Pacific, Kamaya Pt., Mariveles, Bataan, Philippines* maamon@maap.edu.ph or amon.mike@gmail.com

Abstract: Sustainable success has become an ever-more-important future goal in all industries but challenges arise from the advent of fourth industrial revolution and revisions of national and international regulations directly affect the shipping industry trickling down to the Maritime Education and Training Institutions (METI). Thus, a metamorphosis of standards for a maritime school like the Maritime Academy of Asia and the Pacific (MAAP) transitioning to a more tailor-fit Quality Standards is inevitable to manage the changes in educational organizations. ISO 21001:2018 has been published in oder to replace IWA 2:2007. This prompted the Academy to evolve from the traditional ISO 9001:2015 standard. This paper aims to discuss the STCW '78 (as amended) requirements for Quality Standard System and how the new standard in educational and training organizations complies with it. The paper shall also serve as a resource and reference for those schools that are looking for standards that can attune their management systems gearing towards safer, cleaner, and excellent shipping by having a competent seafarer through a certified Educational Organization Management System. With the vision of the academy to be the leading institution of excellence in maritime and training the Asia-Pacific region and beyond, certification with the standard is indeed a milestone and breakthrough.

Keywords: ISO 21001:2018 requirements, Educational Organization Management System, QSS

Introduction

The world has changed and is currently in the transition from traditional or so called the old normal to the new normal education system due to the overwhelming pandemic crisis that greatly affected humankind and the maritime education system. Educational organizations, leaners, and lecturers' have no choice but to adapt to a warping speed of Fourth industrial revolutions (4IR) in teaching and learning. "Characterized by a fusion of technologies that is

blurring the lines between the physical, digital and biological spheres" (Schwab, 2016) most maritime higher education institutions have adapted the eLearning systems in its core services to sail forward in this wave of unprecedented passage. How can we maintain quality education is the next question in these challenging times? This paper shall discuss how the Maritime Academy of Asia and the Pacific have adopted not only to the rigors of the premature 4IR requirements but also to the new ISO 21001:2018 requirements from the generic ISO 9001:2015. As the world has traversed to the new era of education, MAAP has navigated to the waters where educational organizations should chart its course overcoming the challenge of the worldwide crisis at hand. This paper can be a resource of hope and a framework for learners, educational organizations, and interested parties to determine what education quality standard system is tailor-fit for them may it be pandemic or not.

Methods

This paper shall use historical research methods that involve studying, understanding and interpreting past events related to ISO 9001:2015 and ISO 21001:2018 to reach insights or conclusions about occurrences. This also entails compiling and presenting factual information and emphasis on the interpretation of the information.

Furthermore, a look back on how MAAP has transitioned to the new standard amidst the plight of world changing event with both primary and secondary sources that may came from eyewitness reports and original documents, as a description of an event by someone other than an eyewitness, or a textbook author's explanation of an event or theory. Our advantage in this research is the authors and the organization are the main eyewitness of this historic certification to the new standard. This brings more credence to this paper serving as a primary source for other researchers.

With this method the paper "attempts to systematically recapture the complex nuances, the people, meanings, events, and even ideas of the past that have influenced and shaped the present". (Berg & Lune, 2012, p. 305)

Statement of the Problem

Since 1984 to the present the majority of education has been certified to ISO 9001 standard, which covers quality and customer satisfaction. During this more than three decades of adherence, debates and interpretation dysfunctions have risen among the non-manufacturing organizations like the maritime education sector. In 2003 and 2007 ISO tried to resolve this issue by providing guidance for a quality management system in educational organizations called International Working Agreement (IWA) 2. Unfortunately, the guidelines contained within IWA 2:2007 and are not intended for use in contracts for conformity assessment or for certification.

With the publication of ISO 21001:2018, a certifiable standard for educational organization, the question is MAAP going to transition to this standard or do schools need to transition? What are the benefits of the certification this ISO 21001 from ISO 9001? When can the

transition be done? Is the transition cost effective for schools? How can MAAP transition in the midst of the pandemic crisis? These are the questions and problems that this paper aims to resolve and provide historical accounts for others to follow and learn from.

Review of Related Literature

Quality Control Background

Long before the formal publication of ISO 9001, a known American physicist, engineer and statistician named Walter Shewhart, published his book Economic Control of Quality of Manufactured Product in 1931. Since then, he has been recognized as the father of statistical quality control and grandfather of Total Quality Management. He also created the Shewhart Cycle or PDSA (plan, do, study, act) cycle, the scientific method for learning through action as well as observation.

He worked with the well-known William Edwards Deming during World War II regarding productivity. W. Edward Deming championed Shewhart's ideas in Japan after the war and has been credited with the PLAN-DO-CHEK-ACT (PDCA) Cycle, known today as Deming's Cycle and still used as ISO 9001 key foundation and framework.

With great contributions from these quality trailblazers in quality control, Joseph Juran in 1954 focused on managing for quality and started Quality Management Courses in Japan. Widely credited with adding the human dimension to quality management, his contributions include the Pareto principle and Juran's Trilogy consisting of quality, planning, quality control and quality improvement which are still integrated in the current ISO 9001 requirements.

ISO 9001 Brief History

Rooted in US and UK standards of military defense procurement and manufacturing organizations released their own quality management standards. The UK's Ministry of Defense drove BSI to publish the very first quality management standard known as BS 5750 which specified management of manufacturing processes.

According to Taormina (2019) after World War II devastation, many aspects of business were incompatible from country to country as treaties advanced and nations were rebuilt. A single standard was then a necessity as the International Organization for Standardization was contracted to create a non-binding quality standard.

The first ISO 9001 was published in 1987 following the BS 5750 structure created by Technical Committee 176 (ISO/TC 176) formed in 1979 the has three certification parts as follows:

- ISO 9001 - for organizations that conducted design, production and servicing.
- ISO 9002 - for production and servicing companies that did not do design.
- ISO 9003 - for engaged in testing and distribution.

Early practitioners created the motto "Write down what you do, do what you write down, and make sure you are doing it" as the basic essence of the standard. "Write down what you do" refers to documenting the processes and their interactions within your organization. "Do what

you write down" is taking actions written to realize your products and services and yield the desired outcomes. "Make sure you are doing it" refers to what we know today as QMS auditing.

The governmental bodies that controlled their version/translation of the standard certainly did not want to take on a policing function. That led to the evolution of certification organizations. Early on, agencies such as the American Bureau of Shipping (ABS) and Det Norske Veritas (DNV) added ISO 9000 certification services to their core businesses of certifying sailing vessels. The national accreditation bodies created a credentialing system for the certification companies to audit and grant certificates of conformance to individual organizations that demonstrated compliance with the standard.

From that beginning, the processes of desk audit, initial certification, periodic surveillance audits, three-year recertification and transition certification evolved into the current formal conformance process. The outcome of the TC 176 continual improvement process led to the following revisions:

1994. The first revision emphasized preventive action and made a first attempt at slowing down the documentation paper mill.

2000. The second revision was a complete rewrite and did away with the three separate standards. It focused on process management instead of reactive quality assurance and quality control. It placed a higher burden on senior management to integrate quality management into business management.

2008. This revision introduced clarifications from the ongoing work of TC 176 and began harmonization with ISO 14001:2004.

2015. Another complete rewrite of the standard, this version introduced a new era of Quality Management Systems. It suggested replacing preventive action with risk-based thinking. Further, it created a focus on business performance instead of quality metrics and greatly streamlined the required documentation.

Brief ISO 21001 History

Due to the specificity of the education sector making it different from manufacturing and other services sector activities, ISO published the IWA 2:2003 Guidelines for the application of ISO 9001:2000 in education. These guidelines were written by a group that included education experts along with experts representing national organizations for standardization (El Abbadi et al.,2013), however these guidelines are not intended for use in contracts for compliance assessments or for certification. Unfortunately, the application of ISO 9001 in Higher Education has been generically limited to the institution's services and not their core functions, namely teaching and learning (Rosa et al., 2016).

It was argued then that the idea of the student as a customer can lead to a damaging commodification of learning knowledge and the service that the schools and university provides. For ISO 9001 a customer focus is a quality management principle that has many negative connotations and is widely misunderstood by the education community.

According to Cuthbert (2010) the commodification and the rise of academic capitalism encourages a utilitarian instrumentalism that distances the student from the deep learning and personal growth that most people believe is the most valuable part of the university experience for students, and is also the best way for universities to meet their broader social responsibilities.

The IWA 2:2007, the upgraded version of the guidelines was withdrawn in 2013 that prompted the set up of a project committee in 2014 to draft a new standard specifically dedicated to educational organizations. The project committee was given a wide mandate to consider any and all factors which have a bearing on the operation of educational organizations (Camilleri, 2017). Within the framework of WG1 of the project committee, 140 experts from 34 countries have prepared 9 iterative drafts of a standard over 10 meetings.

Finally in 2018 the ISO published 21001 standard that specifies requirements for a management system for educational organizations (EOMS) when such an organization:

a) needs to demonstrate its ability to support the acquisition and development of competence through teaching, learning or research;

b) aims to enhance satisfaction of learners, other beneficiaries and staff through the effective application of its EOMS, including processes for improvement of the system and assurance of conformity to the requirements of learners and other beneficiaries.

Discussion

MAAP QMS History

Since 1999, when MAAP started its operation, the certification to ISO 9001 was number one priority not only because of its benefits but it was a regulatory requirement for Maritime Higher Education to have our program permit to operate going to recognition. As it was said by the late Capt. Gregorio Oca, “It’s not the quantity we are after but the quality of education for future Filipino seafarer”, it has been the beacon on inspiration in establishing our vision and mission to provide quality Maritime Education and Training (MET) and be the leading institution of excellence in the Asia-Pacific region and beyond.

On June 22, 2000, DNV country manager Mr. Antonio Leosala, awarded the certification ISO 9001:1994 version to the Academy and DNV Rules for Maritime Academy. After a year, certification on DNV Rules for Training Center on March 8, 2001. Understanding that the standard was designed after manufacturing, the institution has undergone to adapt the certification to MET standards with emphasis on design and development and course delivery requirements. As ISO evolved the academy also adapted ISO 9001:2000 version certification from elemental approach into process-based approach.

MAAP continued to understand the unique operation of an educational institution that is why it shifted its standards from DNV Rules to PSB 100:2002 QMET standards because the standard does not only focus on MET but STCW ’78 as amended requirements. Strides to comply with PSB 100:2002 standard paid off when on March 13, 2006 EMSA started to audit maritime schools. During the audit, according to Dr. Veiga, MAAP’s Quality System was very

impressive for there were no major deviations or problems during the course of the assessment. Formal certification to PSB 100:2002 was received on December 20. 2006 with Mr. Subir Mukerji as lead auditor.

Come ISO 9001:2008 version with minute update, MAAP was certified on June 8, 2009. With the major revision to ISO 9001:2015, MAAP was the first MEI to be certified by DNV in the Philippines adopting Risk-based management. With revision of ISO 9001 the PSB standard cannot keep up to the update leaving our standards in MET outdated.

A year before the publication of ISO 21001 during our celebration of Quality Day, in 2017 we learned about the coming new standards and announced that the academy will pursue this certification.

MAAP Transition

While awaiting the publication of the new standards, the drafts have been studied already by the Quality Assurance Department. Upon publication of the new standard last May 2018 by ISO/TC 232 Education and learning services Technical Committee, Vice-President Felix Oca had purchased from ISO the ISO 21001:2018 standards that started the formal transition to Educational Organization Management.

Based on the Deming Cycle, we have planned the certification transition in our Annual Quality Plan and revised the quality manual which we now call Educational Quality Standard System (EQSS) to cover standard documentation requirements. Then we start the DO with orientation covering 7.3 Awareness and 7.1.6 Organizational knowledge requirements to jumpstart the transition. After the manual had been revised, we conducted 9.2 Internal Audit and 9.3 Management review to comply with requirements as part of the CHEK and ACT cycle part.

DNV-GL as one of the leading certification body in the maritime industry have been contracted to certify the school and long-time management system partner. Starting with Stage 1 Desktop Audit we have sent relevant documents resulting to zero major and major nonconformities. There were two (2) Observations and one (1) finding during the desktop audit concerns 4.3 Scope, 5.2 Policy, and 9.3.2 Management Review Input.

Passing the certification stage 1 was a breeze; however, when the actual certification audit was scheduled last March 16-17, 2020, the community quarantine for Luzon and Manila was announced by President Duterte. This means we had to reschedule on week 13 dated March 23-27, 2020 for we could not pursue an on-site audit due to travel restrictions. Unfortunately, we all know the situation escalated to a worldwide pandemic and Enhanced Community Quarantine was enforced and the proposed new schedule was further moved.

On May 1, 2020, finally DNV sent an email stating that Accreditation Bodies have set out rules to make remote audits for certain industries possible. Hence, another transition milestone for MAAP has been etched to its QMET journey to have its first remote certification audit scheduled last May 13-15, 2020.

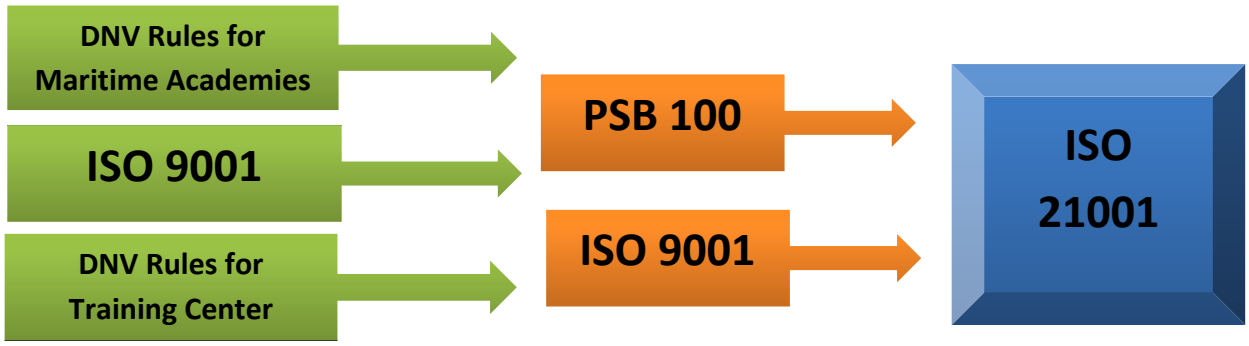
A taste of the 4IR has been laid to the MAAP table and it was a learning experience for all parties to participate in a remote audit. With minor internet lags all went well with Ms. Marita Bayon as Lead Auditor having zero (0) major and minor nonconformities, two (2) observations, and four (4) opportunities for improvement. Indeed, in every difficulty lies an opportunity as the saying goes.

Requirements that need to be improved on were as follows:

- 6.1 Action to address risk and opportunities – pandemic related
- 7.1.2.2 - commitment to social responsibilities, ethics as input to management review
- 8.4 - Control of externally provided processes, products and services
- 8.5.5 - Protection and transparency of learners' data
- 9.1.2 - Satisfaction of learners, other beneficiaries and staff
- 9.3.2 – Management review inputs

Transition Reflections

Looking back at MAAP management system history it was evident that the institution has understood that ISO 9001 standard alone will not suffice to provide QMET for the learners and other beneficiaries. The Academy has always been subscribing to standards that focus on education and training as shown in Figure 1. From having three standards, then two standards and now one standard transition has been one of the key highlights of the transitions.



Unlike the ISO 9001, which has a primary focus "… to consistently provide products and services that meet customer and applicable statutory and regulatory requirements …" As stated in Clause 1.a of ISO 9001:2015, the ISO 21001:2018 navigates its course leaning toward competence as stated in 1.a Scope "… to demonstrate its ability to support the acquisition and development of **competence** through teaching, learning or research; ".

Furthermore, according STCW '78 as mended Article 1.2 "… The Parties to promulgate all laws, decrees, orders and regulations and to take other stipe which may be necessary to give the Convention full and complete effect, …, seafarer on board ships are *qualified and fit for their duties*.", refers to seafarers **competence**. On June 7, 2019, the Philippine's Maritime Industry Authority (MARINA) and Commission on Higher Education (CHED) issued a Joint CHED-MARINA Memorandum Circular No. 1, Policies, Standards and Guidelines (PSG) for the Bachelor of Science in Marine Transportation and Bachelor of Science in Marine

Engineering Programs. In Article I Section 1. Rational and Background stated that. "… this PSG implements the shift to learning **competency-based** standards (CBS)/outcome-based education. (OBE)"

Therefore, when we analyze STCW, ISO 21001 and CHED-MARINA joint memorandum circulars their intended outcome boils down to **COMPETENCE**. With this transition in the education system of content-based into the CBS/OBE framework the transition to ISO 21001 indeed is responsive to the times and not force-fit like the ISO 9001.

Key benefits that the academy have gained with transition to ISO 21001 were as follows:

1. Cost effective certification - having to pay for three and two certifications before now we fund savings since we only have to pay for one certification.
2. Tailor-made EQSS – no more wrong interpretation of ISO 9001 for service organization all requirements in the standard are fit for an educational organization such as MAAP
3. CBS/OBE compliance – Shifting to the standard is like four birds in one stone that the academy has adhered to STCW, ISO, and CHED-MARINA as the national and international bodies implementing statutory and regulatory standards.
4. Two-in-one Standards compliance – ISO 21001 as partially framed from ISO 9001 the institution has the benefits of a risk-based educational organization management system a combination of two standards
5. 4IR certification and operations - the school have experienced the applied fusion of physical, digital, and biological during the remote certification audit and managing the academy's EQSS and MET operations.

After ISO 21001 Certification

After certification to ISO 21001 it was worth mentioning that the academy has continued operations in spite of the global lockdowns. More sponsors are eager to get scholars from the school. Other maritime schools have benchmarked on MAAP operations and admission. Cloud-based simulation has been initiated with Kongsberg. Full development and implementation of our Learning Management System. An online Assessment system was implemented called Student Examination and Assessment System. Most of the office processes have been made online and digital. Classrooms have adopted flexible mode synchronous online sessions using Google Meet and asynchronous using Google Classroom and LMS.

Accolades from the industry partner, Mr. Francesco Garguilo, IMEC Chief Executive Officer, officially lauded MAAP for ensuring that its cadetship program in the Philippines continued in spite of the challenges posed by the pandemic during an interview with Marino World's Maritime Viewpoint last February 2020. Just recently MAAP bags the 2nd Prize winner on CHED and University of the Philippines Open University during the 1st Philippine Higher Education Internationalization Award last May 19, 2021 marks that our Transition was indeed value-adding to the organization. Furthermore, the bottom line is our graduates' performance on the National Licensure Examination by MARINA with the recent results MAAP have Deck OIC 98% passing rate and Engine OIC 85% passing rate exemplifies and effective EQSS transition to ISO 21001.

Conclusion

MAAP and other maritime schools or training centers need to use the correct management tool to provide quality education and training to learners to develop their competency needed by the industry to ensure safety of life, property, and environment at sea for sustainable shipping industry. With MAAP trailblazing the transition from manufacturing-based standard 9001 into educational organization standard fit standard 21001 have paved the way for others to follow. In this era of passage in a new mode of teaching and learning brought about by the pandemic and turbo boosted the 4IR, the management system is also another venue that education and training must evolve itself just like using a rudder moving steadily forward for ships instead of a fin used for cars. The benefits of transition were very evident in terms of cost, competence focus, risk-based thinking, and flexibility to adapt to the ever altering fabric of history. The best time to transition is now because even if the pandemic ends, the new standard and practice in the education system may be the norm of the future of MASS, IA, robotics, internet of things, cybersecurity and many more. As the old saying goes, change is the only constant thing in this world. We need a metamorphosis to a new and better system for our learners and other beneficiaries using ISO 21001 as our management system is fully aligned to the nature of an educational organization.

Recommendations

1. Inspire by being a benchmark school and assist other education and training organizations to convert their management system into ISO 21001 for them to benefit from guidance of international standards at single cost by promoting national MET associations like PAMI and PAMTCI.

2. MAAP to further pursue to other education quality standard accreditation at the national level such as PACUCOA level IV, Philippine Quality Awards, Center of Excellence, Asia Pacific Accreditation, NI and IMAREST accreditation and other relevant standard that will level up the academy's systems and standard at par with its international peers.

3. To develop an online ISO 21001 awareness course for other schools and other beneficiaries to appreciate the value-adding benefits to the new standard overcoming fear and lack of understanding on the new standard.

4. Innovation Team to come up with other recommendations and projects that will propel the academy MET systems ready for the next wave of maritime industry global maritime profession competency requirements and demands.

5. Full automation of MAAP EQSS to include strategic planning, risk management, internal audit, feedback system, program/course monitoring and review, and management review inputs that will fast track analysis and report generation of PLANS, ACTIONS(DO), CHECK, ACT cycle of ISO 21001.

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The critical role of government and key industry players for sustainable development of maritime education and training institutions: The case of institutional development in Kenya

Talib Ibrahim Mohammed
The Technical University of Mombasa, Mombasa, Kenya, talyib@yahoo.com, tmohammed@tum.ac.ke

Abstract: Maritime Education and Training (MET) in Kenya has developed over the years at the university in addition to Technical and Vocational Education and Training (TVET) levels. However, despite the apparent growth, funding of MET is still a challenge. This is clear through lack of defined stakeholder engagement of key industry players and the government to guarantee sustainable training needs collaboration between the industry and the institutions is still a challenge. The paper investigates the challenges of funding for MET through a descriptive and analytical approach to address sustainability of MET in Kenya. Data was collected through the statistics for disbursements of Higher Education Loans Board (HELB) and institutional funding for public instructions of post-secondary training. A meta-analysis of fees paid by MET students to selected Maritime Training Institutions (MTIs) and Universities was used to determine the median for comparative analysis. The study revealed comparative challenges in funding of MET in Kenya in addition to lack of enabling policies to ensure funding. Study also revealed a lack of structures that define government and industry stakeholder roles in MET. In conclusion the paper recommends a scenario based approach to determining funding and development of enabling policies in MET in harmonising training.

Keywords: Maritime, Education, Training, Sustainability, STCW.

Introduction

Through a concerted effort to its best of intentions, the Kenya Maritime Authority (KMA) presented to the IMO the draft Kenyan syllabus on Maritime Education and Training (MET), which was accepted and led to the country's inclusion in the white list. As a result, a number of institutions launched maritime training programmes especially in the field of maritime engineering, with the most prominent being the Jomo Kenyatta University of Agriculture and Technology (JKUAT), the Bandari Maritime Academy and the Technical University of Mombasa (TUM) which are publicly funded. Maritime education and training in Kenya has been largely incorporated in the existing departments and faculties. This can largely be attributed to insufficient teaching staff and resources for establishing new departments and faculties. It has largely been placed rather conveniently and conspicuously under the Faculties/ Schools of Engineering with the exception of Bandari Maritime Academy. The Bandari Maritime Academy[1] was established in 1980 as a training and staff development institution for

[1] Under the old name as The Bandari College, it was previously owned by the Kenya Ports Authority. The college has been upgraded to a Maritime Academy pursuant to the Executive Order under LEGAL Notice No. 233 dated 28th November,

the Kenya Ports Authority as Bandari College; however, with time it transitioned into a MET institute catering for the training needs of the Maritime industry.

Funding of MET in Kenya is a critical element of the success and competitiveness of the sector. The research is aimed at establishing the challenges posed by the inadequate funding and the funding structure implemented through existing educational policies.

Funding in Maritime Training and Higher Learning Institutions

Funding of postsecondary education is a major challenge to not only developing countries but also developed countries (Ayonmike, Okwelle & Okeke, 2015; Okoye, 2013). One of the advantages cited by stakeholders in education is the orientation of the trainees to the work environment hence the necessity to adopt training curriculum emphasising on acquisition of employable skills (African Union, 2007; Terblanche, 2017). This paradigm in TVET training includes MET which expressly addresses seafarer training and certification of competences. It therefore highlights the maritime industry players as key stakeholders in MET (Lamb, 2011; Okoye, 2013; Preddey, 2009). In addition to the maritime industry, the government and its agencies regulating MET form the core of the stakeholder caucus in MET (Preddey, 2009; Shirley, 2015; Zirkle & Martin, 2012).

The development of MET and the use of technology in MET has influenced funding of training resources. It should be realised that the cost associated in Maritime Education and Training (MET) is not only the direct costs but rather it also incorporates the indirect resources associated with the training. MET is by design an apprentice-based programme. This has faced more complexities due to differences in learning environments, resources available and the business models of the industry stakeholders. This is further complicated by the interest of employers, which at most times is maximizing their revenue through reduction of costs, hence lesser berths for cadets. Industrial placement (internship) has been globally acknowledged and acclaimed as an extremely valuable component of education and training. In MET particularly as the training is highly technical and professional, the government has the obligation to approach principal stakeholders in the Maritime Industry to fund cadetship of seafarers indirectly through berths for cadetship in ships; in lieu of incentives. This follows a matrix of supplementing government funding in the long through funding diversification (seeking alternative sources), which can be represented by Fund Augmentation, Cost Sharing and infrastructural support for Income Generation.

The nature of maritime training is expensive and therefore requires many resources in monetary allocation. This has been so far realised by a number of concerned maritime entities that have established maritime related funds. It is proven that to build the knowledge and skills base in maritime training, the states need to provide adequate resources to the institutions to provide quality vocational training for seafarers. Singapore for example has established the Maritime Innovation & Technology (MINT) Fund and the Maritime Cluster Fund (MCF). This has realised an injection of S$150 million to support development programmes for the maritime technology cluster. However, this does not stop at that level but rather the disbursements and sponsorship to develop maritime expertise through funding of maritime-based training for employees of Singaporean nationality or others with permanent residency status. It is therefore incumbent upon the government of Kenya to follow suit and institute the measures needed to revive seafarer training and in general MET in Kenya.

2018 in the Kenya Gazette Supplement No. 149. The board has already been established and consultations are underway in restructuring the institution to an autonomous institutions running independent of the Kenya Ports Authority

Methodology

Sustainable development is defined by (Baylon, Panaitescu, & Panaitescu, 2020) as "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs". The paper focuses on analysis of sustainability in MET in Kenya through a meta-analysis of literature and studies focused on sustainability in METand Higher education. This is augmented with analysing elements best practices and global median average for fees charged by MET institutions within the same economies as Kenya. Systematic review of the level of government funding during the academic period 2013/2014 and 2014/2015 is applied. Government funding for institutions of higher education has not changed through its capitation system over the last two decades, hence the sampling of the two academic years.

The result of the analysis from the gathered data is presented in this summary. The analysis was based on the following research objectives: (1) analyse training costs of selected countries per student based on average fees chargeable to students); (2) assess the deficit of training in comparison to the chargeable fees in Kenya; (3) identify policy gaps in funding of Maritime Higher Education Institutions (MHEIs) and Maritime Education and Training Institutions (METIs); (4) assess the level of integration of industry stakeholders in MET; (5) propose a framework for stakeholder engagement in funding MHEIs and METIs for sustainability.

Results and Discussion

National Government Spending As much as the maritime sector development cannot be ignored, in the context of a national strategy, so far it is not clear whether the government has already put in place the necessary structures for the development of MET institutes in Kenya. MET institutes are broadly but not definitively categorized under Technical and Vocational Training (TVET). Therefore, it should be realized that the cost associated is not only the direct costs but rather it also incorporates the indirect resources associated with the training (Tsang, 1997). Grants and student loans from the government do not quite meet the desired amount for MET training per year. The Table 1 below shows the disbursement for the period 2010-2013.

Table 1:
Amounts per Beneficiary disbursed by the Higher Education Loans Board

Year	Undergraduate Loan				Scholarships			
	Beneficiary	Total KES (M)	Amount per Beneficiary	USD	Beneficiaries	Total KES (M)	Amount per Beneficiary	USD
2010/11	77,141	3,434.0	44,515.89	445.2	50.0	15.0	300,000.0	3,000.0
2011/13	363,241.00	15,746	43,348.63	433.5	260.0	78.0	300,000.0	3,000.0

Note: Adapted from The Higher Education Loans Board (Kenya) - Education Sector Report FY 2013/2014

The amounts disbursed per beneficiary on loans prove the inadequacy of alternative funding through tuition fees hence reliance on the government and stakeholders for sustainability. This leaves the burden on the government to fund the deficit through infrastructural and capacity

building in providing the necessary technological tools and equipment. Thus, alternative funding in the form of increased fees becomes a necessity. This is clearer with comparison to global median training cost per student. Table 2 shows the deficit in funding annually while Table 3 shows the deficit in funding per student for 3-4 year study. The global cost estimation for Tables 2 and 3 has been done through assumption of a median cost of training using fees structure for international students in maritime institutions including the Arab Academy for Science, technology and Maritime Transport, the UK and EU countries

Table 2:
Cost inadequacy in Training USD (Cost deficit per student)

Field of study	Average Annual Fees			
	2014		2015	
	Global	Deficit	Global	Deficit
Nautical studies	12,000.0	(9,000.0)	13,500.00	(10,500.0)
Marine engineering	12,000.0	(9,000.0)	13,500.00	(10,500.00)

Table 3: *Cost inadequacy in Training USD (Cost deficit per student)*

Field of study	Average Cost of Training on Cadet + (3-4 yr) Study			
	2014		2015	
	Global	Deficit	Global	Deficit
Nautical studies	36,000.00	(27,000.00)	40,500.00	(31,500.00)
Marine engineering	36,000.00	(27,000.00)	40,500.00	(31,500.00)

Challenges

Maritime Education and Training is an expensive undertaking and it has much been proven in research for the EU with (Gekara, 2009) highlighting ship-owners co-financing cadet training. Current tuition fees paid by MET students clearly show the deficit in terms of funding for the programmes. This deficit translates into lack of financial resources to equip the university with desired resources and equipment to produce very competitive graduates in the industry. Therefore, the university is forced to align its priorities within the minimum required standards of certification and as such, qualifications and training beyond the minimum standards becomes a mirage. This limits the competitiveness of both the university and the graduates in the ever-dynamic maritime and offshore industry.

Table 4:
Current tuition fees paid by students in both Nautical Science and Marine Engineering

Field of Study	Average Fees Paid Per Trimester				Average Fees Per Annum (2 Semesters)				Diploma (3 Yrs) USD
	2014 (forex 95)		2015 (forex 98)		2014 (forex 95)		2015 (forex 100)		
	KES	USD	KES	USD	KES	USD	KES	USD	
Nautical Studies	32,000	336.84	38,000	387.76	64,000	673.68	76,000	760	2,280.00

Marine Engineering	32,000	336.84	38,000	387.76	64,000	673.68	76,000	760	2,280.00

Note: The fees are average fees. The numbers in bracket are foreign exchange rate for respective year

This is a huge deficit in the MET budget at international standards where it stands at 94.3%, which is untenable for sustainable growth in the MET sector.

Table 5:

Deficit cost of training per student in comparison with median global fees per year.

Field of study	Average Annual Fees (USD)			
	2014		2015	
	Global	Deficit	Global	Deficit
Nautical studies	12,000.00	(11,326.32)	13,500.00	(12,740.00)
Marine engineering	12,000.00	(11,326.32)	13,500.00	(12,740.00)

Table 6:

Deficit cost of training per student in comparison with median global fees per year.

Field of study	Average Cost of Training on Cadet + (3-4 yr) Study			
	2014		2015	
	Global	Deficit	Global	Deficit
Nautical studies	36,000.00	(33,720.00)	40,500.00	(38,220.00)
Marine engineering	36,000.00	(33,720.00)	40,500.00	(38,220.00)

The analysis of the trends in funding from tuition fees from the students gives a rather alarming signal for the sustainability of the MET to meet international standards and enhance competitiveness for graduates. Figure 1 shows the analysis of global trends in cost of training and deficit realised in comparison to the cost per student in Marine Engineering and Nautical Science.

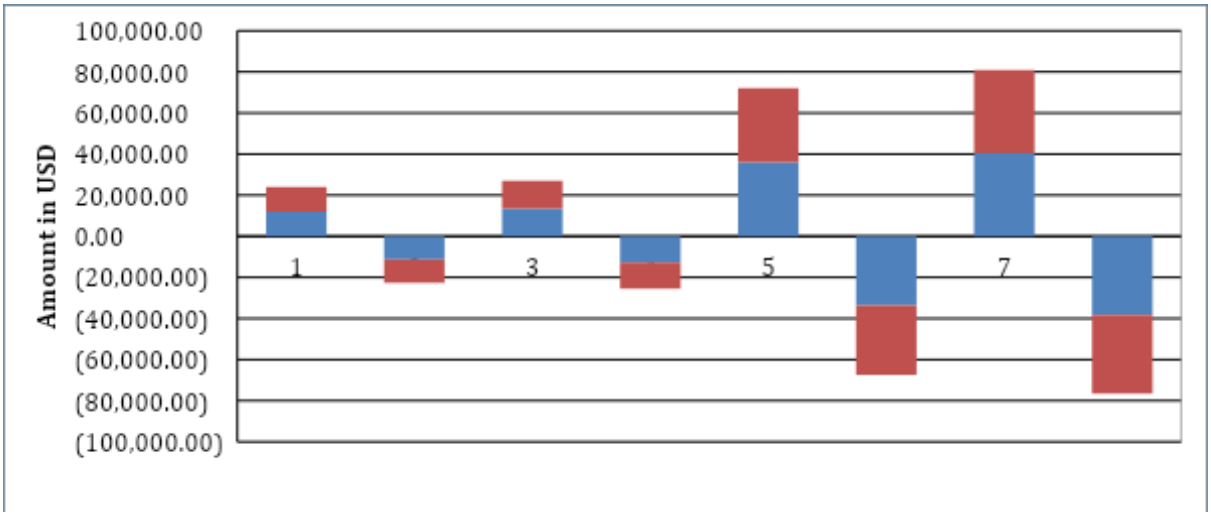

Figure 1: Financing Deficit in comparison to global financing trends of MET

With continual admissions of MET students, the burden of funding and financing increases with a downward trend on the deficit. This as such calls for urgent measures to curb the downward trend. The Figure 3 below shows the comparison of the deficit realised through the current financing model through fees charged against global average cost of study.

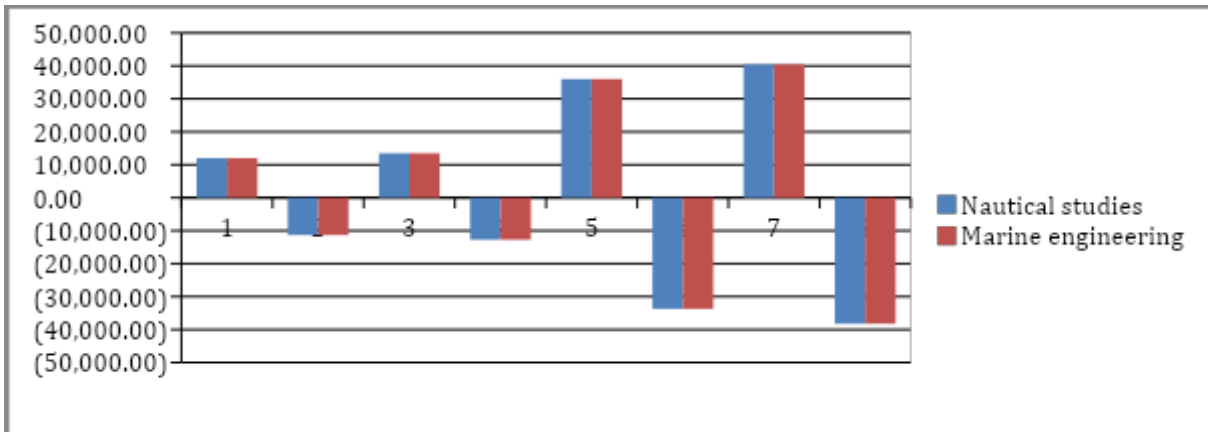

Figure 3: Comparison of Admission Trends vis-a-vis Financing Deficit

Stakeholder Functioning and Stimulus

This has been quite a challenge due to no-specific guidelines for maritime training, industrial placements and attachments guidelines. The burden of such has been left in individual guidance from tutors and lecturers who are overwhelmed. It is understandably clear that most maritime industry players are profit making ventures that are quite intent on profit taking, thereby with the lack of training infrastructure in most met institutions, a lot is left to be desired. Stakeholders ought to be aware that the relevance of Education and training to sustainable development cannot be underscored thereby it is only prudent that in the initial stages of Maritime Education and Training (MET) it such needs are made available both widely and methodically. The integration of maritime education and training in matters relating to the maritime and shipping industry would be encouraged and enhance with a view to reflect the proper attitudes hence the right people being trained for the absorption in the industry. This, with special regards to the fact that it is the basis of development of professional values and practices (McConnell, 2002). It should be therefore of concern on the degree of professionalism and proper training of the maritime labour force to the industry stakeholder.

Sustainability in MET

Sustainability is a key issue in running and operations of a maritime training institute. The maritime industry has seen tremendous global growth being global industry and as such encompasses and absorbs the emergent boundary-spanning roles within its academic, educational, entrepreneurial and industrial spheres (Youtiea & Shapira, 2008). It is therefore prudent that sustainability is a core factor in MET. As maritime education and training is clustered under Technical and Vocational Education and Training (TVET), it is therefore prudent that MET - TVET institutions are adequately facilitated to develop sustainable partnerships in the maritime domain through a multi-prong approach that enhances sustainability. To meet such obligations, first it is important that the government and stakeholders realize the global nature of the industry which has a labour market that is increasingly defined as non-national and neither nation specific (Alderton, et al., 2004). An example is the shift in recruitment process and methodology worldwide, where the pattern has

shifted to predominant employment of affordable labour from labour supply countries e.g., the Philippines, Singapore, India and Malaysia[2] (Lillie, 2006; Selkou & M, 2004; Alderton & Winchester, 2002). This has greatly affected traditional maritime nations and as such opening frontiers and opportunities for other nations although they do not have shipping fleets. Thus to benefit from the prevailing conditions, Kenya must invest in quality MET which requires capital investment in infrastructure and running costs.

With the new regulations and standards in training, it requires that certain standards are met hence installation of specialised equipment and simulators. Students are mainly admitted through the central placement of universities with admission to technical institutes and universities through direct admission through localised applications. MET institutions therefore are obliged in the use of new technology for mutual benefit. This however should be realised through rational planning and sustainable staged growth (Muirhead, 2004). This technology revolves around the use of computer-assisted learning (CAL) and computer based training (CBT), which has placed pressure on the MET institutions because of the student's expectation that such technology is provided within their learning and training environment. This has become the challenge in the Kenyan context as technology is expensive, and as a result development of the necessary and competent workforce is a critical factor in the support for development and maintenance has now become more of a critical factor. This has left the institutions exposed to imminent collapse, as other sources of funding are not yet accessible to facilitate grants and donor aids. These grants for research and donor aids have a basic criterion of realistic approach to the output of such grants and most MET institutions in Kenya lack the necessary work force, resources and personnel in the fields of proficiency and expertise. It is therefore incumbent on the government in its essence to create funding structures either by inclusion on the existing budgets, drawing and implementing new policies for development within the maritime cluster. The interlinkages within the cluster has also proven to be weak, notwithstanding the 'disconnect' between research, education and training in the maritime sector and the maritime industry components especially core stakeholders and the supporting and ancillary industries to maritime operations.

Sustainability has been approached through different perspectives hence defined with respect to the essence of use in certain disciplines, projected results and operational environment. These perspectives are dependent on views and interests (Clugston & Calder, 1999). Other definitions have approached through the paradigms of regenerative growth, dynamic equilibrium, efficiency and regenerative growth (Sonetti, Brown, & Naboni, 2019). This therefore presents a matrix of definitions which in some instances are convergent and at others divergent. Corporations define sustainability around 'corporate behaviour' (Baumgartner & Winter, 2014). The Brundtland Commission (1987) defined it around the existence of mankind on the planet. This provided a directional approach towards intergenerational equity. In Education, to address intergenerational equity, we need to interrogate the responsibility of education. This manifests through the cycle of generating continuous challenges that includes critique of existing knowledge and generation of new knowledge. (Wals & Jickling, 2002). This is realised through the learning process which forms a critical component of the paper's definition for sustainability in MET. The learning process thus requires resources; financial, material and human resources (in terms of human capacity) to realise a continuous process for an MET organisation to learn and unlearn. To achieve sustainability in MET, we need to address achievement of competences and proficiency, resources to make the learning process

[2] This is mainly as a result general deregulation in the maritime and shipping industry as expedited by the establishment of international open registers for ships which has seen shipping companies maintaining competiveness due to low operating costs.

achievable, accountability and verification of processes and the framework for organisation learning. Therefore, the paper defines sustainability in MET as the ability of an METI or MHEI to deploy the required resources that ensures quality education and training for achievement of competences through enhanced learning processes guided by a quality standard system within a sound institutional framework.

Funding of Technology: Theoretical, Practical and Simulator Training to Enhance Competitiveness

The nature of maritime training is expensive and therefore requires many resources in monetary allocation. This has been so far realised by a number of concerned maritime entities that have established maritime related funds. It is proven that to build the knowledge and skills base in maritime training, the states need to provide adequate resources to the institutions to provide quality vocational training for seafarers (Muirhead, 2004). Singapore has established the Maritime Innovation & Technology (MINT) Fund (The Maritime and Port Authority of Singapore (MPA), 2015a) and the Maritime Cluster Fund (MCF) (Maritime and (MPA, 2015b). This has realised an injection of S$150 million to support development programmes for the maritime technology cluster. However, this does not stop at that level but rather the disbursements and sponsor to develop maritime expertise through funding of maritime-based training for employees of Singaporean nationality or others with permanent residency status (MPA, 2015c)

It is therefore incumbent upon the government of Kenya to follow suit and institute the measures needed to revive seafarer training and in general MET in Kenya. The Technical University of Mombasa in its inception as Mombasa Institute of Muslim Education (MIOME) was the only seafarer-training institute in East and Central Africa. With time due to lack of funding for the MET sector and change of policy, the programmes collapsed. Through adequate funding MET has taken a pivotal point as flagship programme hence the acquisition of the Marine Engine Room Simulator. It is critical for the government to offer incentives to the industry as maritime service companies, whether small enterprises or big corporate will always stay aloof of basic training mainly in terms of maximising revenue hence profits, therefore they covertly rely on governments to provide the much needed vocational training especially for seafarers both officers and rating (Sampson, 2004)

The maritime industry has moved towards more specific personnel especially on-board with relevant and additional qualifications due to the technological demand for safer ships to both the ocean environment and manning requirements. Without proper investment for technological funding, the risk is training an unemployable workforce. This requirement for technical and specialised qualification in technology comes from special courses therefore more requirements at most time beyond the capacity for most developing nations, Kenya included. It is therefore beyond doubt that for competitiveness Kenya must invest in technology through proper funding of technology in MET.

Conclusions and Recommendations

Proposed MET Funding Structure

The government should adequately finance MET being primarily vocational. Relevant policies have to be implemented and reviewed over time with demand and necessity. The current model for MET-TVET funding in Kenya has been largely an all-funding structure for all TVET

institutions and capitation for Universities. The conspicuous flow is lack of identification for thematic areas for enhanced training and funding through relevant technology tools of education and training. To beat the odds Kenya needs to look into key areas beyond traditional TVET Training as apprentice-based programmes have become more complex due to differences in learning environments. This is primarily complicated by the interest of employers, which at most times is maximizing their revenue through reduction of costs.

Industrial placement (internship) has globally been acknowledged and acclaimed as an extremely valuable component of education and training. In MET particularly as their training is highly technical and professional, the government has the obligation to approach principal stakeholders in the Maritime Industry to fund cadetship of seafarers indirectly through berths for cadetship in ships in lieu of incentives. This follows a matrix of supplementing government funding in the long through funding diversification (seeking alternative sources), which can be represented by Fund Augmentation, Cost Sharing and infrastructural support for Income Generation (Ziderman, 2001).

Table 7:
Proposed funding Matrix and Structure for MET

Level of training	**Role of government**	**Stakeholders**	**Level of funding**
Basic MET and Cadetships	● Increased quota for institutional and capacity building for the institution. ● Increased size of the funding pool available for distribution to training institutions. ● Incentives on enterprise training for stakeholders. ● Facilitation of Instructors and Trainers in MET	Enterprise training with: ● Training grants. ● Apprentice Wages. ● On-demand training funding for employees.	● Increased Higher Education Loans Board (HELB) grants to MET Students ● Where possible creation of MET pool training kitty ● Structured MET apprenticeship/Cadetship with incentives.
Mid-Level MET			Through individual and other sponsorship channels
Maritime Industry Research and Graduate Research Programmes		● Funding of Research Programmes undertaken by Institutions.	● Project Grants ● Research Grants ● Grants of bonded and disposable equipment and training assets

The financing and stakeholder functions in the funding can be articulated by the following graphic representation.

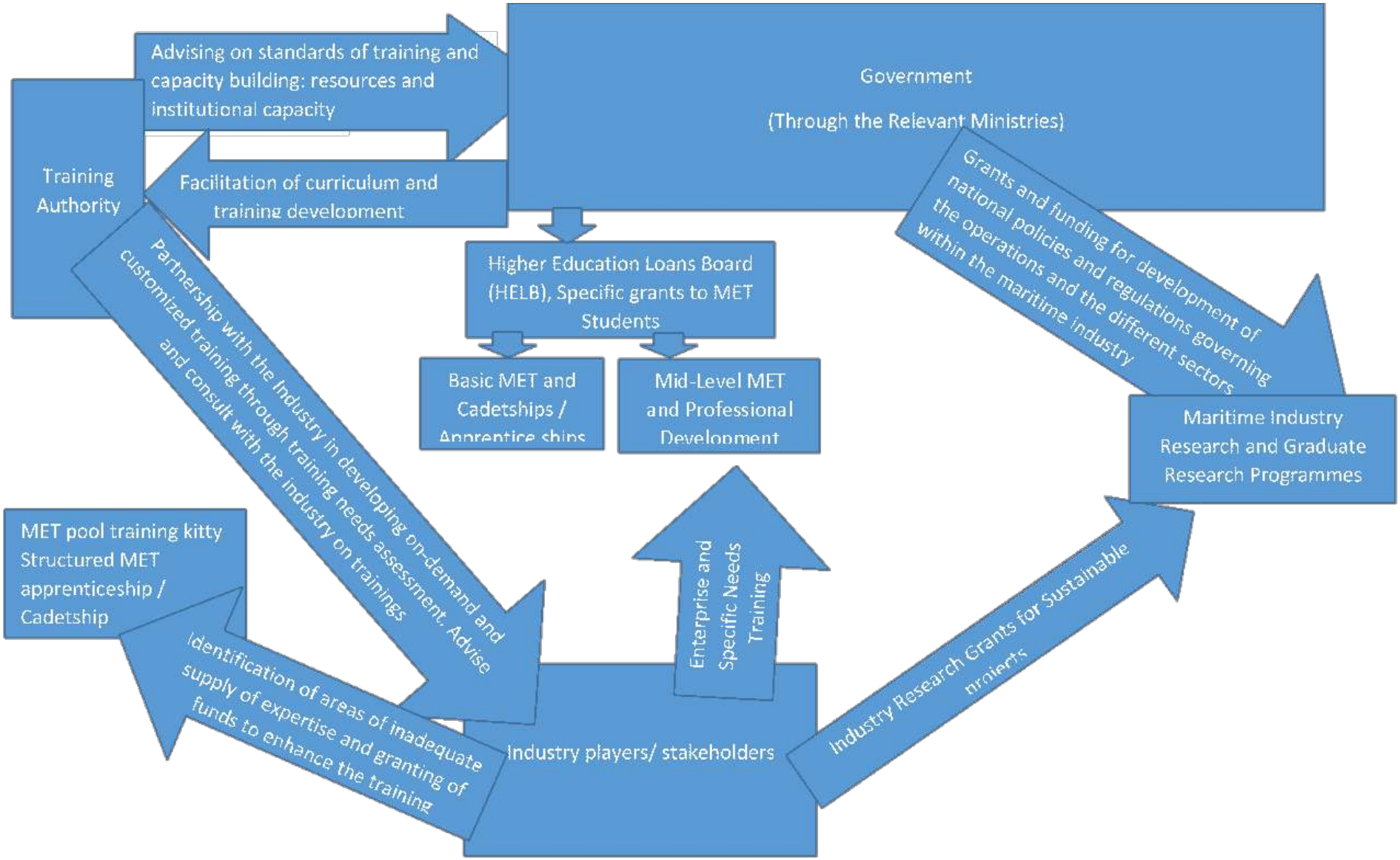

Figure 3: Model-funding structure for resource and institutional capacity building in Kenya for ME

Recommendations

From the analysis, it is evident that the level of funding available for MET is very low. This directly affects the quality of training. Therefore, drastic and strategic measures that are a necessity in order to arrest the situation and thereby give the domain a lifeline.

i. The establishment of a forum that shall provide for standardisation of training in MET and advising the government and consulting with stakeholders in areas of TVET-MET is critical. An example is the Merchant Navy Training Board of the UK (MNTB) which developed a set of occupation standards for seafarers.
ii. Establish practicable and executable Government-to-Government MOUs and Quasi Consular agreements in terms of MET and maritime industry facilitation. In addition to that, establishment of clear guidelines to Kenya's diplomatic representation in different countries on maritime related issues.
iii. Tripartite agreements between maritime administration and industry players/stakeholders with the inclusion of training institutions; to enhance and develop quality standards and as such the finality being proficient and competent seafarers.
iv. Rationalising government subsidies and grants, and creating special grants and funds for maritime education and training campaigns.

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Are ships Communities of Practice?

Josephine Nthia
Kenya Maritime Authority, Nairobi, Kenya, mabutijn@gmail.com.

Captain Quentin N Cox
Teekay Shipping, Glasgow, United Kingdom, Quentin.cox@teekay.com

Abstract: The purpose of this paper is to explore the idea that a merchant ship aligns with the academic notion of a Community of Practice. Through secondary qualitative research, the paper identifies several characteristics which provide compelling evidence. Young seafarers face multiple challenges joining their first ship, not only in terms of mastering the technicalities of their roles but also in terms of social behaviour and interaction. As anyone contemplating the training of school leavers will realise, the people from whom they learn, will inevitably influence their conduct. Learning on the job is not exclusive to the apprentice. Ship staff will endeavour to learn the techniques of the future role they aspire to, by a similar process. Bandura (2001 p1) asserts that human behaviour may be "shaped and controlled automatically and mechanically by environmental stimuli" and this is a theme referenced by Nthia in her excellent 2018 paper relating the techniques of social learning at sea. Compelling evidence of this type of learning was provided and the next logical step is to pose the question *Are ships Communities of Practice?* based on the theories of Lave and Wenger (1991). Conclusions suggest the desire to improve is the one characteristic commonly missing.

Keywords: Communities of Practice, Social Learning,

Introduction

The purpose of this paper is to explore the idea that the community of seafarers on a merchant ship aligns with the academic notion of a Community of Practice. Through secondary qualitative research, the paper identifies several characteristics which provide compelling evidence they could be. Young and impressionable seafarers face multiple challenges when joining their first ship, not only in terms of mastering the technicalities of their roles and the operation of equipment but also in terms of social behaviour and interaction. As anyone contemplating the training of school leavers in their late teens will realize, the source of guidance, that is, the people from whom they learn, will inevitably influence the way in which they conduct themselves. Learning on the job is not exclusive to the apprentice. All ship staff other than perhaps the Master and Chief Engineer will endeavour to learn the techniques of the future role they aspire to, by a very similar process. Bandura (2001, p1) asserts that human behaviour may be "shaped and controlled automatically and mechanically by environmental stimuli" and this is a theme referenced by Nthia in her excellent 2018 paper relating the

techniques of social learning at sea. Compelling evidence of this type of learning was provided and the next logical step is to pose the question *Are ships Communities of Practice?* Based on the theories of Lave and Wenger (1991). Such communities bear three essential qualities:

The Domain - the group has an identity defined by a shared domain of interest. Membership therefore implies a commitment to the domain, and therefore a shared competence that distinguishes members from other people.

The Community - the group is active in engaging with each other in order to learn from each other.

The Practice - defined interest and activity alone is not sufficient to gain the attribute, the activities must be self-reflective and focused on improving the efficiency and effectiveness of the practice.

This paper sets these three criteria against the activity and social interaction amongst ships' staff in order to address the question.

What is Social Learning and how does it manifest itself aboard ship?

Social learning is a key proponent in the theory of social learning, which correlates the individual and their environment during the learning process and replicating behaviour. Bandura (2001) points out the environment as a critical element of social learning, and as the stimuli which initiates the learning process. Bandura further alludes that people learn through families, communities within which they live or the media.

Social learning theory provides the link between behaviourist and cognitive learning theories as it includes attention, memory and motivation. Social learning as theorized by Bandura (2001), posits that people learn from one another, via observation, imitation, and modelling. The theory related closely to the proposals made by Vygotsky, (1978) proponent of social development theory and situated learning with the objective of social learning. In constructivism, learning is seen as a dynamic, constructive process. New information is related to previous knowledge. Practical or competency-based professions such as seafaring and medical training have noted practical experience of social learning where students observe trained professionals during the learning process. Moreover, past research in social learning asserts that in order to underpin knowledge in social learning, the learner has a listening and observation role to play (Esye et al., , 2016).

McDonald & Cater-Steel (2016) assert that community of practice members may be physically co-located and how social media can be used to connect members across geographically diverse locations. Their study analyzes higher education communities of practice within the broader community of practice and social learning literature and articulates the importance of community of practice leadership roles such as learning from superiors on-board ships. Their study observes multiple perspectives reflecting on existing CoPs and sharing insights and reflections on implementation strategies, practical guidelines and ideas on how community of practice's theoretical underpinnings can be tailored to different contexts.

According to Powell (2019) compared to traditional formal learning techniques, social learning focuses on how learners interact with peers for just-in-time learning and skill acquisition. He is a proponent of the 70:20; 10 learning framework which suggests that about 70% of someone's learning happens through on-the-job experiences, 20% through interactions with

their peers, and 10% in instructor-led classroom environments. Powell adds that organizations are increasingly adopting social learning to deliver more stimulating learning experiences, for example through e-learning, collaborative learning and its application in the flow of work to drive organizational performance. He leverages social learning with modern technology approaches to learning such as e-learning platforms. Shipping companies have in the recent past embraced technology including allowing internet onboard ships and e-learning endorsed by the IMO (STCW, 1978 as amended). Young seafarers may be effectively engaged in social learning onboard ship by using the technology they are endeared to.

Heyes (2015) discusses social learning strategies and circumstances when it might be suitable to copy behaviour than continue with previously learned behaviour through social learning. The author recommends copying successful individuals, when social learning is costly or when copying the majority. Furthermore, the study considers how social learning may impact talent or knowledge retention. It is noted that learners are social beings with a need to be associated with a group. This is most applicable onboard ship where teamwork is inevitable. Knowledge sharing by teaching, mentoring in social learning gives satisfaction to the disseminator (Powell, 2019). Knowledge sharing in organizations has been noted to improve employee satisfaction, engagement and committed to the company.

Powell (2019) proposes social learning as a tool of retention in employment by helping employees adapt rapidly and be agile in the changing environment and more so onboard ships. It improves professional development, increases employee efficiency and effectiveness, and via relevant training, helps to educate the workforce on security, safety and compliance.

Seafarers' training either onboard ship on shore cannot ignore the influence of social learning as competency based training involves observation, whereby trainees observe their trainers for example the Bosun or a senior officer. The trainee takes instructions from the mentor or trainer as well as observes how the trainer is carrying out various responsibilities known as observational learning (Bandura, 1977). Observation learning, a facet of social learning, may take place through observing an actual individual, verbal instructional model including description and explanation of behavior or symbolic models such as simulators onboard ships. All the while, social learning is taking place and therefore it can safely be said that ships are communities of practice. In contrast, Sternberg and Williams (2009 note that not all observed behaviors are imitated. Learning may be attained through reinforcement which involves rewarding a particular behavior either directly, another party receiving a reward or self-reinforcement. Cherry (2012) proposes motivation as a trigger for observation learning. Motivation may take the form of reinforcement or punishment.

What are Communities of Practice?

This section describes communities of practice by initially defining the terminologies "community" and "practice" and later discussing the phrase "communities of practice". Communities may be described as members engaging in joint activities to help one another and share information. In doing so, they build relations in order to learn from each other. Having the same job does not necessarily make a community unless members interact and learn together. Members of a community of practice do not necessarily work together on a daily basis but they could be a community if they make deliberate effort to meet and interact. Ships by nature of sailing away from the usual relations of family and friends provide a potential community whereby seafarers meet during watches and after watch at the mess room for recreation facilities.

Practice in the phrase "communities of practice" denotes members of a community who are practitioners. They develop a shared repertoire of resources: experiences, stories, tools, ways of addressing recurring problems that is shared practice. Developing a community of practice takes time and sustained interaction. For example, professionals such as engineers make a concerted effort to collect and document the tricks and lessons they have learned into a knowledge base. In contrast, nurses who meet regularly for lunch in a hospital cafeteria may not realize that their lunch discussions are one of their main sources of knowledge about how to care for patients. The shipboard environment which provides an environment of informal interactions for the crew makes it possible for engagement as a community of practice. It may well be that informal discussions during rest periods between watches provide on unplanned safety lessons and even development of a safety culture onboard ship. Seafarers are in many instances multinational and multicultural and to survive onboard ships during the long durations in isolation, they learn from each other different cultures and may develop and international perception in certain beliefs or cultures previously learned from their home countries.

The concept of communities of practice was proposed by Lave and Wenger (1991) as a model of learning. This concept was initially used as a model of learning during internship whereby the learner or apprentice learns from the trainer or master. Their studies reveal a more complex set of social relationships through which learning takes place during apprenticeship. This led to the coining of the term community of practice making reference to the living curriculum for apprentices. The scholars note that learning in a community is not limited to apprentices or novices but also to senior members. Ship-board environments require continuous learning and updating due to the dynamic nature of the maritime industry (Peter, 2005) as well as changing situations onboard ships due to weather, changing technology or even geographical factors.

Social scientists have used versions of the concept of community of practice for a variety of analytical purposes, but the origin and primary use of the concept has been in learning theory. Anthropologist Jean Lave and Etienne Wenger coined the term while studying apprenticeship as a learning model. People usually think of apprenticeship as a relationship between a student and a master, but studies of apprenticeship reveal a more complex set of social relationships through which learning takes place mostly with journeymen and more advanced apprentices. The term community of practice was coined to refer to the community that acts as a living curriculum for the apprentice. Once the concept was articulated, we started to see these communities everywhere, even when no formal apprenticeship system existed. And of course, learning in a community of practice is not limited to novices.

Wenger and Snyder (2000) communities of practice are different from teams in that teams may be created by the management in a company. Companies may use cross-functional teams or work groups to develop ideas or knowledge. Communities of practice may achieve much more by complementing existing structures and radically stimulate knowledge sharing, learning and change. They are groups of people informally bound together by shared expertise and passion for a joint project. This concept has been utilized by engineers engaged in deep-water drilling, for example. The following is a snap shot of communities of practice, formal work groups, teams and informal networks which are useful in complementary ways and which are applied onboard ships. The snap shot aims at clarifying the concept of communities of practice and its relevance onboard ships. Communities of practice are developed by members with the objective of building and exchanging knowledge. Seafarers at sea require each other's support and knowledge sharing as no one can claim to have solutions to each situation at sea. They are voluntary and therefore, no one is forced or coerced to join a community of practice and they

are driven by passion, commitment and identification of the groups' expertise. These communities of practice may last for a voyage or as long as the members are working onboard ship together.

A Snapshot Comparison

Communities of practice, formal work groups, teams, and informal networks are useful in complementary ways. Below is a summary of their characteristics.

	What is the purpose?	Who belongs?	What holds it together?	How long does it last?
Community of Practice	To develop members' capabilities; to build and exchange knowledge	Members who select themselves	Passion. Commitment, and identification, with the group's expertise.	As long as there is interest in maintaining the group
Formal work group	To deliver a product or service	Everyone who reports to the group's manager	Job requirements and common goals	Until the next reorganisation
Project team	To accomplish a specified task	Employees assigned by senior management	The project's milestones and goals	Until the project has been completed
Informal network	To collect and pass on business information	Friends and business acquaintances	Mutual needs	As long as people have a reason to connect

Figure 1: Summary of characteristics

From Wenger & Snyder (2000). *Communities of practice: the organizational frontier.* Harvard Business Review. January-February 2000, pp. 139-145.

What is the link between Social Learning and Communities of Practice?

A number of academic theories which were initially developed as a result of research into child psychology have since been found to have similar relevance to the process of learning at any level, school, vocational or professional. Vygostky's Zone of Proximal Development (ZPD), according to Bruner (1984, p93) is a "form of mental sharing. In the case of the growing child, it is made possible by parents and more "expert" peers". Chaiklin details application of Vygotsky's ZDP in professional fields such as, nursing, psychoanalysis, psychotherapy and occupational therapy (Chaiklin, 2003, p40) activities which are by no means exclusively within the domain of child psychology.

The same might be said of Albert Bandura' Social Learning Theory, which was based on the notion that an individual observes, then imitates the behaviour of those around them. These references demonstrate the association between popular theories initially related to child psychology and growth but have since been found to have substantial benefit to research into education and education at almost any stage of adulthood, not merely the formative years as a

child. Whilst Bandura latterly channelled his study into the more disingenuous aspects of the behaviour of children in their formative years such as aggression and bullying, aspects not disassociated with concerns of the behaviour of certain seafarers today, there are several more broad factors observed by Bandura that are worthy of note in a more positive perspective. Nthia (2018, p3) relates in detail how Bandura's theories apply as much to seafarers on cargo ships just as closely as they have to the formative stages of an individual's learning experiences.

In the same light, Vygotsky's ZDP may also be applied, when exploring the means by which junior seafarers gain knowledge, skill and experience during their own formative stages as a seafarer. With reference to Vygotsky, Lave and Wenger (1991) developed their own theory eventually known as Communities of Practice. This gets to the core of the paper. Lave and Wenger re-phrased the basis of ZDP with their own Legitimate Peripheral Participation (LPP) though this is not a direct duplication of ZDP, there is a clear association with the ideas of *peripheral* and *proximal*, both implicating that the proximity of the learner to the experienced or experience itself, will expedite the learning process. Researchers studying child psychology and development recognised how the influence of those surrounding the individual child manifested itself in their behaviour, whether in a positive sense (learning) as noted by Vygotsky for example, or even negative (aggressive or bullying) as noted by Bandura's later studies. The models of LPP and situated learning developed by Lave and Wenger did not explicitly cite child development as an environment in which their model routinely applies; it may be legitimately applied to the learning process taking place in the learning environment of school. Another significant point about how Lave and Wenger's model distinguishes itself from Bandura's earlier work is that situated learning "focuses on learning as a social practice in social settings' ' (Kirk and Macdonald, 1998, p380).

So as explained in the previous section, Vygotsky's ZDP theory is very much within the social domain on the understanding that the proximal element of the theory involves social interaction. "Vygotsky (1982) reiterates the fact that social interaction with cultural artifacts forms the most important part of a learner's psychological development" (Shabani, Khatib, and Ebadi, 2010, p238). It is significant that the phrase 'psychological development' is employed in this statement, rather than simply 'learning'. The same can be said of the trainee seafarer, they are not on board simply to learn individual tasks by imitating in a Pavlovian manner but to develop a means of assimilating to a culture hitherto alien to them as individuals.

Vygotsky defined the ZPD as "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86) (Chaiklin 2003 p40)

Having linked the theories of Social Learning and ZDP, the next logical step is to illustrate how they both may be associated with the education of seafarers. Citing Chailkin's citation of Vygtosky's own explanation of his ZDP theory, development takes place under guidance or 'in collaboration with more capable peers'. This arrangement could be said to exist under any training or educational scenario, whether teaching young children to the most experienced top professional or academic and anything in between. The training and education of seafarers would certainly fit into the scenario. As Nthia explains, "Social learning and social pedagogy has proven its efficiency with the application in practical professions, such as nursing, where the student can observe a trained professional in professional/work settings, where they learn nursing and its aspects. Maritime Education and Training involves practical training, just as training in nursing (Nthia, 2018, p2).

This paper is not the first to hypothesise the association between social learning on board ship with Communities of Practice. Wahl and Kongsvik (2018, p394) suggest that the social and cultural context of shipboard work and importantly, the implicit learning therein, creates "a shared repertoire of practices and common ways of problem-solving develop". The authors of that paper (2018, p393) go on to suggest that task specific teams, for example the bridge team, train together in order to embed an *esprit de corps*. The authors of this paper are more of the opinion, as evidenced, that a new joiner to shipboard life would be as well to learn from each and every shipboard task practicable, to achieve the same ends.

The apparent association between Social Learning and Communities of Practice is not lost on observers. One implication of the mechanism of a Community of Practice is that learning does not depend upon the exclusive effort of the learner but is a social process (Farnsworth, Kleanthous and Wenger-Trayner, 2016, p139). The results of a failure of that social process can be unpalatable, with many casualty investigations identifying a breakdown in the socio-technical as a significant contributory factor (Pyne and Koester, 2005, p196).

How will defining ships as Communities of Practice facilitate and expedite learning?

As detailed earlier, a CoP will only function effectively if each member of the community commits themselves to the cause. Of course, employers make every effort to motivate the ships' staff to encourage this commitment, whether to safety or efficiency and preferably both. The means to achieving this commitment may be through incentive (reward for negative Lost Time Incidents) or veiled threat (disciplinary action) but the encouragement is present in most commercial companies who practice any duty of care for their sea staff.

Let us re-visit the notion of a Community of Practice as it might apply to a ship and its crew but this time with a view to assessing whether the notion could apply in practical terms. Does the crew of a commercial cargo or passenger liner automatically qualify as a domain in the CoP definition. The criterion for this factor seems to rest on whether the members of the community (that includes every member from each department, officers and ratings) share a common interest. This point is well worth questioning, since casual and false assumptions can be made all too easily. For example, would we naturally assume that seafarers:

Have a mutual interest in the safety of life (their own and fellow crew members)

Have an intrinsic motivation to improve their seamanship skills

Have an interest in being promoted

Have an interest in keeping their job

Have an interest in supporting their families

Approach their work with the intention of applying the minimum effort possible to keep their jobs

Approach their work with the intention of applying the maximum effort possible in order to preserve their own life, the lives of those around them and to climb the promotional ladder

It is plausible that any permutation of these factors could apply and some of these listed are clearly contrary. Studies have shown (Cox, 2018, Acejo, 2013) that it cannot be taken for granted that each seafarer is motivated by the same factors. So here we are at the very first factor and little scrutiny is required to expose possible contradictions even at this stage.

Moving on to the analysis of the second criterion, the community. Can we assume the group is active in engaging with each other in order to learn from each other? Well, a brief reflection on the issues surrounding the domain question addresses that point. If we cannot be led to believe that every crew member concerns themselves with the preservation of their own life, we certainly cannot make the assumption that each would be actively monitoring the compromise of the safety of anyone else on board. We might hope that to be the case but providing evidence of this is less practicable. At this point in the discussion it may be easier to adopt a more cynical attitude yet there is much research to suggest that there are plenty of seafarers who are eager to learn and apply the most professional approach in order to contribute to the best interest of the community, with regard to both safety and commercial efficiency (Saeed 2016, Saeed, Bury, Bonsall, Riah, 2016, Dunham and Lutzhoft, 2015).

If we are questioning whether each crew member is eager to learn from each other, it is not likely to be an issue that can be answered straightforwardly. One counter question might be, learn what from each other? The job, or the path of least resistance, how to perfect a strategy to expend the minimum effort but to keep their employee status? Again, assumptions made by researchers outside the industry may be inclined to think the best of the individuals, in terms of applying professional standards and of course employers implore the crews on their ships to do just that. Yet the shipping industry is still littered with unpalatable statistics, whether they be of incidents, near misses or even inspection observations which illustrate aspired standards are not being achieved. If ships really were communities in the genuine sense of the word, these lapses in professional standards would not occur, or at least occur on a statistically less frequent basis. Regrettably the shipping industry does not mirror the commercial aviation industry, which can apparently go a whole year with only five recorded fatalities, according to the Flight Safety Foundation, in 2017. In the same year the European Maritime Safety Agency recorded over 600 fatalities in the shipping industry globally and that was one of the better, safer years. So, whilst it would not be pertinent to attribute each and every loss to a lack of professional application on the ships incorporated into these statistics, the balance of probabilities suggests many were.

The same could be said of the final criterion, practice. As explained earlier, even if we have the domain and the community, bearing all the necessary characteristics with which we associate professional conduct, a true CoP does not exist unless there is evidence of continuous improvement of practice. Again, this is a phrase employed as a mantra by responsible ship owners to convince customers (charterers) or even to endeavour to attract professional talent to their pool of employees. The Tanker Management Self-Assessment (TMSA) initiative, issued by the Oil Companies International Marine Forum, is an example of a voluntary self-improvement mechanism. Yet any ship owner's management system is principally designed to facilitate continuous improvement. The North of England P&I Club May 2017 Loss Prevention Briefing for members insisted the TMSA initiative "has been shown to succeed" in providing a safer environment for seafarers.

Conclusion

This paper has demonstrated substantial association exists between learning theory and shipboard practice. Formal continuous improvement management systems have received favourable assessment by industry bodies, such as the TMSA. Yet the statistical evidence of continual harm and fatality, cited in this paper, has also demonstrated the aim of reducing accidents has yet to be achieved. In conclusion, the benefits of the application of learning theory such as Lave and Wenger's Communities of Practice will only succeed in practice if each practitioner (seafarer) makes a conscious effort to engage in the practice. The day-to-day work

of both of this papers authors, in Port and Flag State ship inspection and Maritime Education and Training, identifies that not all workers make such effort and the instinct to apply the least effort in order to maintain their employment status still prevails at such a level that the industry is not yet ready to declare that ships are always communities of practice.

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An evaluation of MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10): Trainees' perspectives and reverberations

Lester C. Malabanan
Captain, *Maritime Academy of Asia and the Pacific, Bataan, Philippines*,
lestermalabanan07@gmail.com

Leonora T. Dela Cruz, Ph.D.
Professor, *Maritime Academy of Asia and the Pacific, Bataan, Philippines*,
delacruzleonor29@gmail.com

Abstract: The study aims to analyze how the trainees evaluate the "Train the simulator trainer and assessor" (IMO Model Course 6.10) provided by the Maritime Academy of Asia and the Pacific (MAAP) for free in cooperation with the Maritime Industry Authority (MARINA) and the Commission on Higher Education (CHED). The training is regularly rendered as one of the extension services of MAAP. The study utilized the data from the evaluation form accomplished by the eight batches corresponding to 94 trainees in 2019. Results showed that the trainees regarded the training as "Excellent" in terms of the General Information. The trainees likewise rated the training as "Excellent" in terms of the Topics/Exercises. Statistics showed that there was no significant difference between the evaluation of the trainees on the training on IMO Model Course 6.10 when they are grouped according to batches both in General Information and Topics/Exercises.

Keywords: Evaluation, IMO Model Course 6.10, General Information, Topics/Exercises

Introduction

Maritime education and training are universally carried out through simulations. Simulators have become the primary tools for shipboard education and training. Numerous research and position papers described the importance of simulators. Ecdisorg (2017) mentioned that maritime simulators are now the modern way to gain competence. Sendi (2015), on the other hand, claimed that maritime training simulators at all events are valuable instructional and pedagogical tools. The conduct of simulation training helps to prevent marine accidents and environmental pollution (Salman, 2013).

There are two performance standards concerning Maritime simulators: applying to simulators used for training, and for simulators used to assess competence. (ecdisorg, 2017)

Simulation is the most significant and innovative advancement in maritime training to date. Maritime training and education professionals use simulation to train and assess mariners on a variety of technical skills, such as navigation, rules of the road, and ship handling. It is widely held to be the most effective method of teaching non-technical skills like information

processing, situational awareness, decision making, judgment, leadership, teamwork, communication, multitasking, and stress and fatigue management. (Huhnke, n. d.)

Khodayari (n. d.) enumerated reasons why simulation is useful. They are as follows: simulation involve and motivate learners; it improves the capability to connect learning to real-life scenarios; it provides freedom to experiment with new behaviors in a risk-free environment; it provides opportunity for immediate feedback from actions taken and decisions made; no damages and no expenses incurred due to making mistakes, and it enhances the ability to teach teamwork and leadership.

The Maritime Industry Authority (MARINA) and the Commission on Higher Education (CHED), in full cooperation with the Maritime Academy of Asia and the Pacific (MAAP), conduct the Train the simulator trainer and assessor course (IMO Model Course 6.10). This forms part of the Administration-approved requirements for simulator instructors and assessors. MAAP provides the training course for free as one of its extension services regularly rendered. (MARINA STCW Advisory No. 2017-09)

The training on IMO Model Course 6.10 aims to train the simulator trainers and assessors. The training course was developed by IMO through the Sub-Committee of Standard of Training and Watchkeeping. The course was adapted to maximize the usage of MAAP Type A, B, C and S simulators. (IMO Model Course 6.10 Course Manual)

The scope of the training course is to establish a reliable simulator training program for the instructor to impart comprehensive simulator training to the seafarer that will include the amalgamation of classroom teaching, simulation training, special working environment onboard a ship and human element, and psychology of learning. The training course also aims to foster sustainable training skills to the instructor within the changing maritime environment. Furthermore, it intends the trainees to acquire simulator training skills that include the psychology of learning. (IMO Model Course 6.10 Course Manual)

They are posted on the website of the National Academic Press (NAP) that the role and qualification of marine simulator instructors evoke considerable discussion and debate. Some people in the marine simulator field believe the instructor is the most crucial training element; others believe the trainee is the most essential part of the simulation because beneficial changes in trainee behavior and performance are the desired product. A third view is that the simulator and the simulation produced are particularly important.

Asghar Ali (2006) conducted a study that examined the use of the marine simulator and future perspective, and in parallel how the importance of simulator instructors is on the rise. His dissertation emphasized that existing tools available for the qualification of the simulator instructor need to be augmented with new measures so as to show the quality of the simulator-based training. Only through these measures, effective and efficient preparation of the seafarers can be achieved in line with training objectives of the STCW Convention.

This research was conducted to analyze the trainees' responses on the Training Course Evaluation Form administered at the end of every series of Train the Simulator Trainer and Assessor (IMO Model Course 6.10) provided by MAAP. The evaluation form provides an assessment of the Model Course and can serve as the basis for any future improvements or adjustments.

It is essential to periodically assess and adapt your activities to ensure they are as effective as they can be. Evaluation can help you identify areas for improvement and ultimately help you realize your goals more efficiently. Evaluation enables you to demonstrate your program's success or progress. The information you collect allows you to better communicate your program's impact on others, which is critical for public relations, staff morale, and attracting and retaining support from current and potential funders. (meera, n. d.)

The primary purpose of evaluating a training program is to gain knowledge about whether it has achieved or failed its objectives. Analyzing the training event by using appropriate evaluation tools can improve the outcome of future training to a considerable extend. Even if the evaluation process of training is essential, it must always be incorporated within the available framework of time and cost. Defining the appropriate questions is the key starting point of every evaluation. (Keller, Stefanie, n. d.)

The main problem of the study was, "How may the trainees evaluate IMO Model Course 6.10"? Specifically, it sought answers to the following questions:

1. How may the trainees evaluate MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10) in terms of the General Information given in the training?

2. How may the trainees evaluate MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10) in terms of Topics/Exercises?

3. Is there a significant difference between the evaluation of the trainees of MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10) when grouped according to batches?

The hypothesis tested in the study was, "There is no significant difference between the evaluation of the trainees of MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10) when grouped according to batches."

Methods

The study utilized the document analysis approach. It made use of the Training Course Evaluation Form accomplished by the trainees at the end of every IMO Model Course 6.10. The evaluation form consists of two parts. Part A is the evaluation of the trainees on the General Information of IMO Model Course 6.10 and Part B is the assessment of the trainees on the topics/exercises given in the model course.

The responses of the respondents were interpreted using the following scale:

Point	Descriptive Equivalent
5	Excellent
4	Very Satisfactory
3	Satisfactory
2	Fair
1	Poor

The study covered the eight batches of the IMO Model Course 6.10 in 2019. These batches were 47, 48, 49, 50, 51, 52, 53, and 54. Table 1 presents the breakdown of the frequency and percentage of the respondents per batch.

Table 1.
Frequency and Percentage Distribution of the Respondents per batch

Batch	**Frequency**	**Percentage**
Batch 47	12	12.77
Batch 48	12	12.77
Batch 49	13	13.83
Batch 50	12	12.77
Batch 51	8	8.51
Batch 52	10	10.63
Batch 53	14	14.89
Batch 54	13	13.83
Total	**94**	**100**

The data presented in Table 1 show that the highest number of respondents was of batch 53, with 14 trainees corresponding to 14.89 percent. The lowest frequency of respondents was of batch 51, with only eight (8) trainees representing 8.51 percent of the respondents. Batches 49 and 54 have the same frequency of respondents or 13 trainees; batches 47, 48, and 50 each have 12 trainees; and batch 52 contributed ten (10) respondents equivalent to 10.63 percent.

3. Results and Discussion

This part presents the summary of the data collected accompanied by an interpretation in an attempt to answer the problem of the study.

Table 2 presents the frequency distribution of the responses of the trainees on the IMO Model Course 6.10 evaluation on General Information.

Table 2.
Frequency Distribution of Responses on Evaluation of IMO Model Course 6.10 in terms of General Information

	5	**4**	**3**	**2**	**1**	**Mean**	**Descriptive Equivalent**
1. The course was suitable for the attainment of the objective of the program.	64	28	2	0	0	**4.64**	**Excellent**
2. There was adequate/sufficient teaching facilities/laboratory equipment which is readily available	72	20	2	0	0	**4.72**	**Excellent**
3. The course was taught with appropriate and available textbooks references and hand-outs/handbooks.	64	27	3	0	0	**4.62**	**Excellent**
4. The length of time of the course was suitable to meet all the requirements of the training.	60	33	1	0	0	**4.62**	**Excellent**
5. The theoretical aspect and the practical application of the course were logically sequenced.	64	27	3	0	0	**4.62**	**Excellent**

6. The content of the course covers all the required/necessary topics/requirement of the training.	61	31	2	0	0	**4.61**	**Excellent**
7. Instructions on the procedure for each laboratory/practicum were clearly emphasized.	70	23	1	0	0	**4.72**	**Excellent**
8. The practicum site and necessary equipment was readily setup before conduct of practicum exercises.	69	22	3	0	0	**4.67**	**Excellent**
9. Practicum performed reflected the application of the concepts learned.	70	22	2	0	0	**4.70**	**Excellent**
10. All the topics covered by the course were relevant and applicable to our present job.	61	31	2	0	0	**4.61**	**Excellent**
OVERALL MEAN						**4.65**	**Excellent**

The respondents' highest mean rating for the IMO Model Course 6.10 evaluation in terms of General Information was 7.2 interpreted as "Excellent" to both items 2 and 7. The lowest mean evaluation rating, on the other hand, was 4.61, also interpreted as "Excellent" for both items 6 and 10. The overall mean score of the respondents was 4.56 interpreted as "Excellent." Hence, the respondents rated the IMO Model Course 6.10 evaluation in terms of General Information as "Excellent."

Table 3 presents the mean rating of the respondents on the IMO Model Course 6.10 evaluation on General Information per batch.

Table 3.
Average Ratings on General Information per Batch (Batches = 8)

	B47	**B48**	**B49**	**B50**	**B51**	**B52**	**B53**	**B54**
1. The course was suitable for the attainment of the objective of the program.	4.67	4.58	4.38	4.75	4.88	4.90	4.98	4.31
2. There was adequate/sufficient teaching facilities/laboratory equipment which is readily available	4.83	4.67	4.54	4.74	4.75	4.80	4.86	4.77
3. The course was taught with appropriate and available textbooks references and hand-outs/handbooks.	4.33	4.58	4.62	4.50	4.88	4.70	4.86	4.77
4. The length of time of the course was suitable to meet all the requirements of the training.	4.50	4.58	4.54	4.58	4.63	4.60	4.79	4.77
5. The theoretical aspect and the practical application of the course were logically sequenced.	4.42	4.67	4.46	4.58	4.63	4.80	4.79	4.85
6. The content of the course covers all the required/necessary topics/requirement of the training.	4.42	4.50	4.46	4.58	4.88	4.60	4.86	4.77
7. Instructions on the procedure for each laboratory/practicum were clearly emphasized.	4.75	4.50	4.54	4.83	4.88	4.60	4.93	4.85

8. The practicum site and necessary equipment was readily setup before conduct of practicum exercises.	4.58	4.67	4.54	4.50	4.75	4.90	4.93	4.77
9. Practicum performed reflected the application of the concepts learned.	4.75	4.75	4.46	4.75	4.75	4.60	4.86	4.85
10. All the topics covered by the course were relevant and applicable to our present job.	4.58	4.50	4.54	4.67	4.63	4.80	4.86	4.36
Mean Ratings	**4.58**	**4.60**	**4.51**	**4.65**	**4.77**	**4.73**	**4.87**	**4.71**

The highest rating on the IMO Model Course 6.10 evaluation in terms of General Information was 4.87, which was given by batch 53, followed by 4.77 batch 51. Meanwhile, batch 49 gave the lowest rating of 4.51.

A non-parametric Friedman Test of differences in the ratings among the eight batches of trainees in terms of General Information given in the training provided by MAAP was conducted. The test is done using the IBM SPSS. Results show that there was no significant difference between the ratings by the eight batches of trainees of 'Train the Simulator Trainer and Assessor' (IMO Model Course 6.10) provided by MAAP in terms of the General Information given in the training, $X^2(7) = 5.155$, p = .641.

Table 4 presents the frequency distribution of the responses of the trainees on the IMO Model Course 6.10 evaluation on topics/exercises.

Table 4.
Frequency Distribution of Responses on Evaluation of IMO Model Course 6.10 in terms of Topics/Exercises

	5	**4**	**3**	**2**	**1**	**Mean**	**Descriptive Equivalent**
1. Introduction to Simulator & Its Importance	64	30	0	0	0	**4.68**	**Excellent**
2. Types of Simulators, Design, Configuration & Classification	67	23	4	0	0	**4.67**	**Excellent**
3. STCW 2010 & Simulator Training in the Philippines	68	23	3	0	0	**4.69**	**Excellent**
4. Simulator Familiarization	63	27	4	0	0	**4.63**	**Excellent**
5. Conceptualizing and Planning a Simulation Program	62	30	2	0	0	**4.64**	**Excellent**
6. The Simulator Instructor & Effective Interpersonal and Communication	66	25	3	0	0	**4.67**	**Excellent**
7. Conducting a Simulation Exercise	68	25	1	0	0	**4.71**	**Excellent**
8. Assessment, Evaluation and Verification	59	34	1	0	0	**4.62**	**Excellent**
9. Practicum: Conduct Simulation Exercises/ Assessment	67	27	0	0	0	**4.71**	**Excellent**
OVERALL MEAN						**4.67**	**Excellent**

The respondents' highest mean rating for the IMO Model Course 6.10 evaluation in terms of Topics/Exercises was 4.71 interpreted as "Excellent" both for items 7 and 9. The lowest mean evaluation rating, on the other hand, was 4.62, also interpreted as "Excellent" for item 8. The overall mean score of the respondents was 4.67 interpreted as "Excellent." Hence, the respondents rated the IMO Model Course 6.10 evaluation in terms of Topics/Exercises as "Excellent."

Table 5 presents the mean rating of the respondents on the IMO Model Course 6.10 evaluation on Topics/Exercises per batch.

Table 5.
Average Ratings on Topics/Exercises per Batch (Batches = 8)

	B47	**B48**	**B49**	**B50**	**B51**	**B52**	**B53**	**B54**
1. Introduction to Simulator & Its Importance	4.75	4.58	4.54	4.83	4.75	4.40	4.79	4.77
2. Types of Simulator, Design, Configuration & Classification	4.58	4.58	4.54	4.67	4.75	4.60	4.79	4.85
3. STCW 2010 & Simulator Training in the Philippines	4.67	4.67	4.46	4.67	4.75	4.80	4.79	4.77
4. Simulator Familiarization	4.50	4.67	4.31	4.75	4.75	4.50	4.79	4.77
5. Conceptualizing and Planning a Simulation Program	4.67	4.58	4.46	4.58	4.63	4.80	4.71	4.69
6. The Simulator Instructor & Effective Interpersonal and Communication	4.42	4.58	4.46	4.58	4.88	4.80	4.86	4.85
7. Conducting a Simulation Exercise	4.75	4.50	4.69	4.67	4.88	4.60	4.86	4.77
8. Assessment, Evaluation and Verification	4.67	4.50	4.54	4.58	4.50	4.70	4.71	4.69
9. Practicum: Conduct Simulation Exercises/ Assessment	4.67	4.50	4.62	4.75	4.75	4.80	4.79	4.85
Mean Ratings	**4.63**	**4.57**	**4.51**	**4.68**	**4.74**	**4.67**	**4.79**	**4.78**

The highest rating on the IMO Model Course 6.10 evaluation in terms of Topics/Exercises was 4.79, which was given by batch 53, followed by 4.78 by batch 54. On the other hand, batch 49 gave the lowest rating of 4.57.

A non-parametric Friedman Test of differences in the ratings among the eight batches of trainees in terms of Topics/Exercises given in the training provided by MAAP was conducted. The test is done using the IBM SPSS. Results show that there was no significant difference

between the ratings by the eight batches of trainees of 'Train the Simulator Trainer and Assessor' (IMO Model Course 6.10) provided by MAAP in terms of the Topics/Exercises given in the training, $X^2(7) = 6.051$, $p = .534$.

Findings

In light of the results presented earlier, the following findings were enumerated

1. The mean rating given by the respondents on their evaluation of the MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10) in terms of General Information is 4.65 interpreted as "Excellent."

2. The mean rating given by the respondents on their evaluation of the MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10) in terms of Topics/Exercises is 4.67 interpreted as "Excellent."

3. There is no significant difference between the ratings of the respondents on MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10) in terms of General Information among the eight batches of respondents.

4. There is no significant difference between the ratings of the respondents on MAAP's Train the Simulator Trainer and Assessor (IMO Model Course 6.10) in terms of Topics/Exercises among the eight batches of respondents.,

Conclusions and Recommendations

In accordance with the findings presented earlier, the following conclusions were formulated

1. The "Train the simulator trainer and assessor" (IMO Model Course 6.10) offered by MAAP is "Excellent" both in terms of General Information and in terms of Topics/Exercises as evaluated by the trainees.

2. The respondents grouped according to batches have statistically the same ratings on the MAAP IMO Model Course 6.10 training in terms of General information.

3. The respondents grouped according to batches have statistically the same ratings on the training in terms of Topics/Exercises.

Based on the findings and conclusions of the study, the following recommendations were formulated

1. The trainees rated the training provided by MAAP on the IMO Model Course 6.10 as "Excellent" both in terms of General Information and Topics/Exercises. Hence, it is recommended that MAAP continues to provide the training for free in cooperation with CHED and MARINA as its regular extension service and as part of its objective to maximize the usage of MAAP Type A, B, C and S simulators.

2. Since the training on the IMO Model Course 6.10 is being done several times per year, it would be helpful to come up with an online evaluation procedure.

3. To maximize the training provided by MAAP on the IMO Model Course 6.10 it is recommended to have equal numbers of Deck and Engine participants.

4. Future researchers can study the training provided by MAAP on the IMO Model Course 6.10 in terms of other variables satisfactory and effectiveness.

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The needs, challenges and prospects of maritime education and training in Georgia

George Gabedava
Associate-Professor, *Batumi Navigation Teaching University, Batumi, Georgia*, e-mail: g.gabedava@bntu.edu.ge

Guram Kakabadze
Coordinator of BNTU International Maritime Training Center, *Batumi Navigation Teaching University, Batumi, Georgia*, e-mail: g.kakabadze@bntu.edu.ge

Abstract: Georgia is a maritime country. It has been associated with the sea since ancient times, and therefore maritime education in the country has existed for more than seven decades. Even today, highly trained maritime specialists graduated from the maritime institutions of Georgia continue to work successfully on ocean-going vessels flying under the Georgian flag and the flags of many other countries. About 80 to 90 percent of maritime accidents are attributable to human error. Hence it is important that seafarers be well educated and trained, able to understand and execute commands, manage risks, and solve problems in order to ensure safe and effective navigation at sea. In order for maritime training centres to graduate qualified and competitive officers and engineers for the world fleet, they must constantly upgrade equipment and techniques, improve curricula and teaching methods, attract experienced personnel, provide cadets with practice, and enhance cadet's language competence. The main purpose of this article is to study the maritime education market in Georgia, in particular, to identify problems and barriers in Georgia's maritime education system and their impact on seafarers' subsequent employment. It also identifies challenges facing Georgia's maritime training centers and proposes solutions.
Keywords: Maritime Education, METs of Georgia, Seafarers, Challenges, Solutions

Introduction

When we talk about the education of seafarers and its development, it is important to define the role of educated and qualified personnel in the field. Service flexibility is an important issue to be achieved by staffing with experienced and educated staff. Maritime education in Georgia dates back more than a few decades. The first maritime courses were opened in 1901 in the city of Poti. In the 1920s, evening maritime courses were opened in the port of Batumi, on the basis of which the Batumi Maritime Technical School was established in 1929. On March 5, 1944, by the decision of the State Committee of Defense of the USSR, the Batumi Maritime Academy was established on the basis of a Maritime Technical school.

Batumi Maritime Academy, in the half-century of its existence, has played a major role in the development of maritime affairs, not only for Georgia but for the entire Soviet Union. Highly qualified specialists trained by the school still successfully work on ocean-going ships flying under the flag of Georgia and the flags of many countries around the world. In 1992, by the

decision of the government, Batumi Higher Maritime School was established, which in 1994 received the status of "Batumi State Maritime Academy", but the current status of the Maritime Academy was determined by Resolution № 84 of October 2009: Legal Entity of Public Law - Teaching University - Batumi State Maritime Academy.

Currently, there are two higher maritime higher education institutions and six seafarer training centers in Georgia:

- Batumi Navigation Teaching University and the adjacent seafarers' training center;
- Batumi State Maritime Academy and the adjacent seafarers' training center;
- Seafarers' Training Center "ANRI";
- Seafarers' Training Center "Equator";
- Poti Maritime Training Center;
- Qualship Georgia

Their main purpose is to train qualified personnel in accordance with modern requirements for employment in the merchant fleet and maritime transport infrastructure. Today, about 12,000 sailors are registered in Georgia, who are employed on merchant ships of different countries.

Accordingly, in the main part of the article we will review the main challenges of maritime education in the country.

Current status of MET in Georgia

In order to determine employment prospects in the maritime field, it is important to analyze what knowledge and competence different educational institutions provide to the graduates; To what extent do the existing training system, programs, and training courses comply with the legislation of Georgia and the requirements of International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW).

The International Maritime Organization - IMO pays particular attention to providing adequate education and training for seafarers. Its requirements for the qualification of maritime personnel are set out in the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW), adopted by the International Maritime Organization on 7 July 1978. The Convention entered into force on 28 April 1984. By this act, the IMO member states undertook to transpose the standards and regulations set out in the STCW Convention into national law to ensure that all Member States' seafarers are qualified and have the professional knowledge to perform their duties to the fullest.

This convention has a "white list". The "White List" includes a list of countries in which full compliance with the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) is presented and established. The list was developed by competent and impartial members of the International Maritime Organization in accordance with Administrative Licensing, Training Center, Certificate Re-validation, and Navigation Regulations. Georgia is also a member of this list. In addition, it should be noted that Georgian maritime higher education institutions are authorized and the educational programs are accredited by the National Center for Education Quality Enhancement and comply with the European standard.

Table 1 shows the maritime faculties of each Georgian maritime higher education institution, and appropriate educational programs (educational programs at the undergraduate and graduate levels).

Table 1

Georgian Maritime Higher Education Institutions

Batumi Navigation Teaching University	
Maritime-Engineering Faculty	**Educational Program**
	Maritime Navigation (GEO) – Bachelor
	Ships Power Plant (GEO) – Bachelor
	Maritime Navigation (ENG) – Bachelor
	Ships Power Plant (ENG) - Bachelor
Batumi State Maritime Academy	
Navigation Faculty	**Educational Program**
	Maritime Navigation (GEO) – Bachelor
	Maritime Navigation (ENG) – Bachelor
	Port Operations Management (GEO) – Master
Engineering Faculty	Ship Electro Mechanics (GEO) – Bachelor
	Ships Power Plant (GEO) – Bachelor
	Operation of Ports And Transport Terminals (GEO) – Bachelor
	Ship Power and Electrical Systems and Installations (GEO) – Master

Note. Adapted from the institution's websites: www.bntu.edu.ge / www.bsma.edu.ge

Once a student has successfully completed their program and has completed maritime practice on board, he or she will gradually gain the necessary onboard experience required for a work license on board, which is necessary for a seafarer to undertake their responsibilities on board.

The graduate also has the opportunity to be employed in private crewing, stewardship, consulting and other companies related to maritime transport.

As for the certification of seafarers, the 2020 report of the Maritime Transport Agency presents the statistics of certificates issued by the Seafarers' Certification Division during the reporting period 2020 y. (see Figure 1):

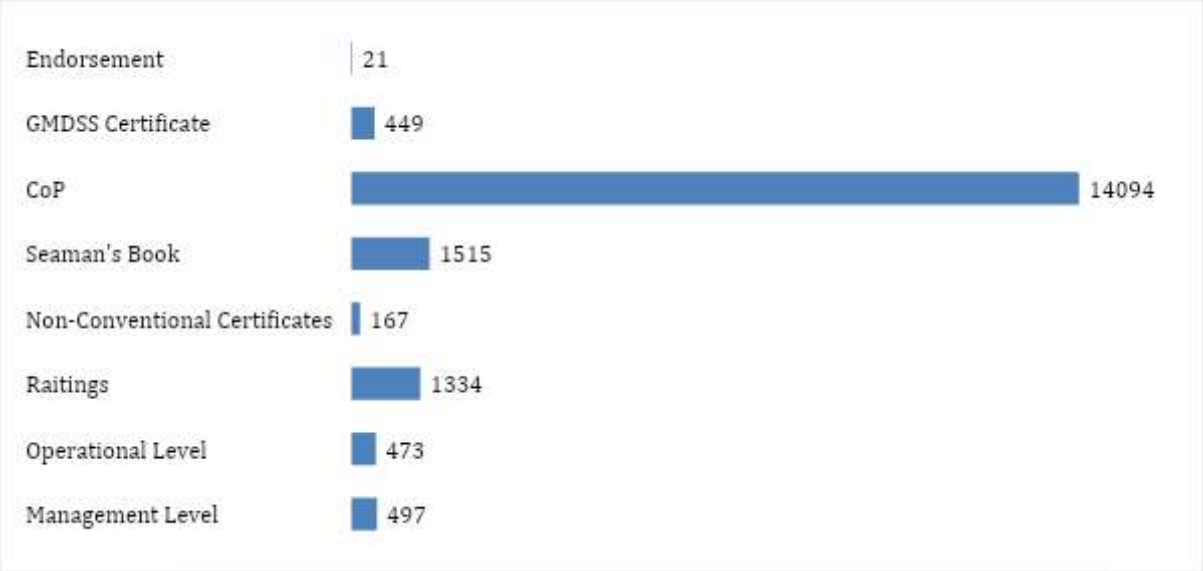

Figure 1. Certificates Issued by The Seafarers' Certification Division

Reproduced from Maritime Transport Agency of Georgia (2020). *Annual Report*: http://mta.gov.ge/uploads/2020___1.pdf

Today, 12,000 sailors are registered in Georgia, and maritime education is in demand in the country. As can be seen from the presented statistics, the certified seafarers rate and the number of active seafarers are also high.

Challenges to MET in Georgia

Although the country's highest maritime education institutions are authorized and programs accredited by the relevant authority, and comply with STCW requirements, there are still a number of challenges in maritime education. Maritime higher education institutions in Georgia face problems in different directions:

❖ One of the main is weakness of practice - cadets face serious obstacles in completing sea-going practices; Crewing companies operating in Georgia have low motivation to take cadets to the sea. All maritime institutions have a memorandum of understanding with existing crewing companies, which consider for the cadets to be provided with maritime practice, with the prospect of further employment. (ISSA, 2019) However, the main problem is that the cooperation is based on good will and it is quite unstable. Crewing companies periodically interview students and offer them cadet vacancies but that number is very small.

❖ A significant obstacle is the low level of English language teaching, which poses a serious obstacle to the employment of both students (cadets) and graduates in finding jobs on ships engaged in international navigation. Knowledge of English Language remains one of the major challenges despite the fact that many efforts are being made in this direction by maritime institutions. Learning the English language is important, not only for finding a job, but also for

a good opportunity for the student to use exchange programs, such as Erasmus + ICM; Through exchange programs they are given a chance to communicate with students from another institution, another country, and this experience, in turn, will help them improve their language competence.

- Another challenge is shortage of academic staff in maritime institutions. However, active seafarers have low motivation to engage in training (mainly due to low pay); The maritime sector is rapidly evolving, where active seafarers are most informed about the nuances, specifics and technical characteristics required by today's maritime employment market. (ISSA, 2019) Institutions therefore try to attract as many active seafarers as possible; however, it is difficult to invite existing captains, or Chief Officers, and Chief Mechanics as teachers to an educational institution for two reasons: low salary and low motivation.
- Library resources of maritime institutions in Georgian Language are scarce - Maritime literature in Georgian is quite scarce; therefore, lecturers employed in educational institutions have to translate them and provide them to students within each lecture. Which is quite a lot of work, and the translation of a foreign textbook is quite expensive.

Conclusion

Despite the identified problems and challenges, Georgia's maritime education system is well-structured, meets the requirements of the STCW and meets the requirements of the country's quality assurance standards set by the National Center for Educational Quality Enhancement. Consequently, Georgian seafarers are quite in demand and competitive in the world market. However, a number of measures to address these challenges would be helpful in eliminating these gaps.

It is desirable that institutional cooperation between maritime higher education institutions and crewing companies (major employers) be intensified in terms of student maritime practice. Also, it is desirable if the ships flying under the Georgia Flag will offer cadets positions to Georgian cadets with them.

It is important to strengthen the English language teaching component, and it will also be good if the institutions offer several specialty courses to students in English. By doing this, they will improve their level of English proficiency in the specialty and be ready for an interview.

It would be good if the institutions would establish relationships with their outstanding alumni for future collaboration, or this, it is desirable for the institution to assist the graduate in professional development and to train him / her in accordance with the requirements of the education standards, because in the future these graduates will be employed as invited specialists.

It is necessary to find financial resources (international and local grants) in order to translate specialty textbooks into Georgian.

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Psycholinguistic features of successful transformation of engineering thinking in speech

Olena Tyron
Associate Professor, State University of Infrastructure and Technologies, Kyiv, Ukraine
tyronolena@gmail.com

Svitlana Korieshkova
Associate Professor, State University of Infrastructure and Technologies, Kyiv, Ukraine
flamingo-light10@ukr.net

Abstract: In this article, we try to answer the question of what makes it difficult for future engineers to express their ideas on technical topics in oral speech. The theoretical basis of the organizational procedure of the study was the concept, according to which a comprehensive description of the professional linguistic personality can be conducted on the verbal (professional speech) and cognitive (professional picture of the world) levels. We studied future engineers' thinking patterns and found out which parts of speech were their first associations in technical, business, and everyday communication. The purpose of the study was to identify the fundamental tendencies of engineers' thinking that influence the speaking process. The results create psychological conditions for the actualization of the mechanisms of thought for speech. This mechanism involves the use of an algorithm that has common features when speaking in both a native and a foreign language. We worked out practical recommendations on how to make this process less time consuming and offer a hypothesis on how to successfully convey ideas into a statement. Identifying the peculiarities of thinking for speaking both in native and foreign languages allows the development and application of techniques to improve engineers' speaking culture. The combination of understanding the features of engineering thinking in general and features of thinking for foreign language speaking contributes to the effective formation of the linguistic personality of a technical specialist.

Keywords: tendencies of engineers' thinking; thinking for speaking in native and foreign languages; verbal and cognitive features of linguistic personality, an algorithm of transforming thought into speech, ship engineers' speaking abilities

Introduction

The traditional system of future engineers' training is aimed at both the formation of technical thinking in all its components (conceptual, imaginative and effective) and the development of verbal-logical thinking. Any employer in the field of engineering wants new employees to have a set of skills, such as teamwork, communication, and time management, that have been ignored in the past. In response, many universities have begun to implement program changes to have well-trained engineering graduates (Bucura & Ban, 2019).

Modern engineering is determined by high levels of automation and computerization. Requirements for engineers' cognitive competencies have been updated. Scientists have identified 16 cognitive competencies of systems engineers (Frank, 2012), which we believe are universal for representatives of all specializations in the engineering field, namely: to see the system and understand the system as a whole, not to get caught up in the details; understand the interconnections, interdependencies and interactions of elements of different nature; go beyond engineering thought; think creatively; understand the application of changes in the system; understand new concepts immediately after their presentation; understand analogies and parallels; be inquisitive and ask the right questions; be able to take into account non-engineering factors and see perspective; and be able to optimize (understand the ratio of efficiency, cost and timing).

Engineering thinking is a special kind of thinking that is formed and manifested in the solution of engineering problems, aimed at providing activity with technical objects, carried out at the cognitive and instrumental levels. Engineering thinking includes (Teriokhina, 2017, p.25) technical thinking - the ability to analyze the composition, structure and principle of operation of technical objects in the changed conditions; constructive thinking - the construction of a specific model for solving a problem, which means the ability to combine theory with practice; research thinking - determining the novelty of the task, and the ability to compare among known classes of tasks, the ability to reason actions and results obtained and draw conclusions; economic thinking is a reflection of the quality of the process and the result of activity from the standpoint of market demands.

There are different theories of thinking styles that come from psychology. Sensory thinking is characteristic of all people, especially representatives of the creative professions (writers, artists, artists, directors, choreographers, etc.). Technical (practical) thinking is carried out without the participation of language. It, like visual thinking, is characteristic of higher animals and humans. Practical and effective thinking is inherent in all people, but most of all specialists in technical professions. Sometimes it is easier for an engineer to create a new machine than to present and prove a project (difficult to find the right words and expressions). Moreover, specialists who work with computers show evidence that they think in machine (computer) language. Conceptual thinking is realized through language. The Royal Academy of Engineering (2014) researched engineers' habits of mind and found six such habits: system thinking, problem finding, visualizing, improving, creative problem solving and adaptability.

Besides the scientific works on engineers' thinking, we find works on the formation of engineers' communicative competence. Burganova and Valeev (2015) formulated criteria for the assessment of technical students' communicative competence, Shamshina (2014) explained the content of communicative readiness, and Singh and Kaur (2019) give practical advice on how to develop future engineers' communicative skills.

However, there is a lack of scientific works that explain how engineers convert their thoughts into utterances – the skill that makes their communication efficient. The activity of thinking takes a particular quality when it is involved in the activity of speaking. In the evanescent time frame of constructing utterances in the discourse, one fits one's thoughts into available linguistic forms. A particular utterance is never a direct reflection of "objective", a perceived reality or an inevitable and universal mental representation of a situation. Within any given language, the same situation can be described in different ways; each language provides a limited set of options for the grammatical encoding of characteristics of objects and events. "Thinking for speaking" involves picking those characteristics that (a) fit some

conceptualization of the event, and (b) are readily encodable in the language (Slobin, 1987, p. 435).

An evolutionary approach to language comprehension, thinking and cognition gives impetus to finding new approaches to language development and innovative approaches to foreign language learning. Cognitive evolution is characterized by an increase in the complexity of thought, while social evolution is characterized by an increase in cultural diversity. A common factor in cognitive-social evolution is language. According to Chernikova (2015), through the lens of global evolutionism, language-thinking-cognition is considered in unity. The evolutionary approach to language analysis examines it at three levels. The last level involves interacting with the world. New cognitive mechanisms are formed here, including logical-verbal thinking and symbolic thinking that is realized through language, traditions and morality.

It is important to study and properly use linguistic means in expressing thought, depending on the purpose and content of the expression, which is achieved through a culture of speech. Therefore, the culture of speech is also the culture of thinking and the culture of social and spiritual relations of an individual.

Thus, we consider the process of forming the language personality of an engineer in the unity of thinking, cognitive processes and speech.

Materials and Methods

The study was conducted at the Kyiv Institute of Water Transport of the State University of Infrastructure and Technologies. The survey was conducted among 1st, 2nd and 3rd- year students of ship engineering and electrician departments (60 questionnaires of 30 students were analyzed). These professions are related to the engineering domain, so our task was to study the tendencies of engineering thinking and its impact on the speaking process of future engineers.

The theoretical basis of the study was the concept that a comprehensive description of the professional linguistic personality can be determined on verbal (professional speaking) and cognitive (professional picture of the world) levels. The professional language of the future ship engineer is presented verbally with terminological and grammar materials. As a rule, technical material is presented at the same time in a visual-shaped and abstract-conceptual form (e.g.: schemes, graphs, diagrams); an essential feature of technical thinking is conceptually-shaped connections.

At the cognitive level, there is an actualization and identification of relevant knowledge and representations inherent in the linguistic personality that creates an individual or collective cognitive space. Based on the ideas recorded in the language, the mentality of the future engineer can be judged. The professional picture of the future engineer's world is characterized by a particular type of knowledge organization and has specific language implementations. Some scientists are still discussing the relations between language and thought. Some claim that the function of language is communication; it is an instrument of thought, and a tool for the expression of thought. Asoulin (2016) argues that language does more than merely express pre-formed thoughts. There are two ways to construe the claim that language is an instrument of thought: a weak and a strong claim. The weaker claim is that language is used primarily for the expression of thought, whereas the stronger claim is that language to some extent structures thought (or at least a subset or particular types of thought). The specific character of the

cognitive processes of a professional linguistic personality determines the practical nature of its activity.
The purpose of the study was to identify the fundamental tendencies of engineers' thinking which influence the speaking process. The study was conducted in distinct stages and our tasks were to:

1) analyse linguistic tendencies of future engineers' professional thinking;
2) identify the algorithm of transforming future engineers' thinking into speaking in their native language;
3) identify the algorithm of transforming future engineers' thinking into the English language.

Results

In the first phase of the study, we asked participants to read 10 technical questions and write down in one word, a diagram or drawing the first association that came to their mind. Students were told that they did not have to answer the question but that the first association was important. We have not included the entire questionnaire in this article but give examples and reasons for our choices. An example of a question used in the first questionnaire was, "Do you agree that the quality of the high-pressure fuel pumps is checked by the ease of running the rail in the extreme lower and upper position of the plunger?" The first association may be "a pump" or "measure", or "don't know", etc (an object or an action). We chose a question to which the answer could be "yes" or "no" so it cannot influence the choice of the first association. Among the 30 questions analyzed, 80% of respondents mentioned a procedure (actions), 10 % - an object and 10% graphs or drawings as the first association. To sum up, we concluded that students in purely technical matters are more inclined to think spatially and procedurally. Even in the questions unknown to the students, the first associations were "ask", "read", "don't know".

The result has shown that the main tendency of the technical thinking of future engineers is spatial-procedural. Won't this be a problem in terms of communication skills of engineering students as a whole? Language and thinking operate in different units (phoneme, morpheme, word, sentence versus concept, judgment, reasoning).

In order to identify an algorithm for transforming future engineers' thinking into speaking in the native language, we used one more questionnaire with 24 statements with the variants of associations provided. Association words represented a choice from the following grammatical categories - nouns, verbs, adjectives. We prepared 6 statements of different types: 1) about a professional fact or state; 2) about the personality of a respondent, 3) about another person 4) about a group of individuals.

Table 1. *The results of the study of the linguistic tendencies of future engineers' thinking (percentage)*

№	**Statements about:**	**associations**		
		verb	**noun**	**adjective**
1.	a professional fact or state	55	33	12
2.	personality of a respondent	51	34	15
3.	the other person	40	26	34
4.	a group of individuals.	60,1	19,5	20,4

We examined whether the interviewed students exercised a tendency to use a certain part of speech (syntactic component), and whether the type of assertion influenced the choice of programmed association (lexical component).

As can be seen from Table 1, general tendencies are the following: the most used part of speech is a verb; the least used is an adjective. The statements about professional facts and states relate to the business discourse of future ship engineers' activity (conventions and regulations), not technical issues. With technical issues, students showed 80% of verb preference, and in professional business communication – 55%. This can be evidence that technical speaking differs from other components of engineers' communicative competence.

In the statements about the personality of a respondent (a statement about yourself), the interviewees demonstrated the preference to use a verb as the first association; the choice, first of all, depended on the content of the word (its connotation). But it is precisely in the statements about themselves that we observed a high percentage of unanimity in the choice of association. This fact gave us the opportunity to assert a collective consciousness in the student group. Collective consciousness influenced the thinking of the respondents.

The difference between the choice of the part of speech as the first association is the smallest in the statements about the other person. There was no unanimity in the answers either. It is in relation to others that the respondents have shown their individuality through their attitude to the successes and failures of others. Some respondents tend to rate others, thus favouring the adjective and others are trying to be objective and state facts.

In statements about a group of people, students again prefered to use a verb and unanimity was found in the choice. The priorities were arranged as follows: the highest percentage was given to the verb, an equal number of choices to adjectives and nouns. We explain this by the fact that the respondents have included themselves into this group and, above all, projected joint activities within this group. Respondents are aware of the objects, their connections and properties, as well as their importance to themselves.

We studied the thinking patterns of future engineers and determined which parts of speech were their first associations in technical, business, and everyday communication. The results will create psychological conditions for the actualization of the mechanisms of thought for speech. Our hypothesis was that in order to convey an idea into a statement it is necessary to have a subject, so to transform a thought into a statement would be much easier if the first association of thought were a noun. The next phase of the study was to identify the impact of thinking in one's native language on foreign language speaking.

Thinking for foreign language speaking of engineering students

Proficiency in a foreign language has become an integral part of international cooperation. In this regard, special requirements for graduates include not only the presence of high level professional qualities but also the ability to communicate with partners who are representatives of other linguistic communities. English language communication is very important for marine engineers because they are required to work in crews which could be recruited from several countries by a manning agency and engaged in trading worldwide (Tyron, 2017, p.198).

Ships' crews are now multinational and culturally diverse. However, about half of the officers are drawn from the Organization of Economic Cooperation and Development (OECD) states

and the ratings predominantly from Asia and the former socialist countries. There is now a major world shortage of officers since the traditional maritime countries have not been recruiting and training sufficient numbers for these posts over the past decades. There are tensions onboard many multinational vessels leading to poor levels of maintenance, accidents and low morale (Couper, 2000).

Teachers of a foreign language for Professional Purposes actively teach technical terms andreading of technical texts. In speech, the result is similar to the situation described below. We provide a typical situation - an interview that clearly reflects the problem.

Expert: How does the fuel get into the cylinder?
Student: There's a nozzle.
Expert: Why is it necessary to cool the engine?
Student: Friction.

These mini-dialogues prompted us to study how the student's thinking process takes place. It should be noted that students felt complete psychological satisfaction with their response. We relate such pleasure to the joy of finding a word that reflects a concept that has arisen in the mind of a student in a particular communication situation.
The process of thinking for speech in the communication process is as follows:
1 - the emergence of the concept in consciousness;
2 - search for the word that most accurately reflects this concept;
3 - formulation of thought in internal speech;
4 - search for grammatical-syntactic forms;
5 - reflection on the correctness, logic, clarity of expression.

Thinking for speaking in a foreign language involves searching for a word in a foreign language to reflect the concept. It is the third stage - the formulation of thought in internal speech must come from words in a foreign language. A situation where students formulate their thoughts in their own language and then translate the thought becomes a psycholinguistic barrier to foreign language communication. Search for grammatical-syntactic forms occurs within the formed interlanguage. The student learns a foreign language, and the interlanguage is the result, the competencies that are in the long-term memory of the student (Tyron, 2018). Speaking on technical topics is related to knowledge of the subject matter and skills to build a foreign language utterance. It is well known that English is characterized by a fixed order of words. The basic unit of speech is the subject and the predicate. If the first association in thinking is a noun, it is easier for the speaker to construct an utterance, but if it is a verb, then it is necessary to re-think so that the first association is a noun. This adjustment is time-consuming and not always easy. More time is needed to find appropriate lexical units in long-term memory. The structure of the sentence and its lexical content are the main components of foreign language speech. This is the kind of algorithm in thinking for speaking that makes it difficult to speak a foreign language. The third component is the intricacies of language (phonetics, stylistic techniques, features of grammar).

Creating psychological and pedagogical conditions for the formation of a culture of the professional technical language of future ship engineers implies motivation to control thinking for speech. Thinking for speech is a special form of thought that is mobilized for communication. It is a thinking activity that involves such thinking operations as analysis, synthesis and comparison. Thinking for speech is a deep, non-verbal process.

The key characteristics of an engineering profile are scientific mind; spatial imagination; analytical skills; the ability to reasonably state a point of view and ability to prove it; understanding the work of mechanisms and technological processes; ability to evaluate logic and consistency of information. We expect the thinking and speaking of an engineering student to have the following features:
• ability to follow logical continuity in the presentation of information;
• ability to prove their own judgments;
• application of certain principles of argumentation, namely: no contradiction, evidence and objectivity.

These are characteristics which can be formed. We share our experience of introducing exercises that train the skill of translating spatial verb concepts into linear linguistically designed concepts.

1. "Process description". Prepare 10 cards with pictures showing a process, for example, pumping out ballast water with a pump, a piston that pushes exhaust gases, the process of filling a tank with fuel. Present the drawings to students, and allow time to evaluate what they see. Then ask students to describe situations in one sentence, which will begin with the subject, which the teacher attaches to the drawing. At the first presentation of the drawing, students fix attention on the action, at the second presentation, relying on the subject, students transform spatial-procedural thinking into linear.

2. "Simplifying a language". Present students with a long sentence overloaded with complex grammatical constructions from an authentic text on a technical topic. Ask students to rephrase the sentence by minimizing it, but retaining the information.

Nevertheless, we would like to caution teachers not to overload students with such exercises. We use them from time to time, combining them with other types of educational activities. In addition, the substitution of teaching a foreign language for teaching a speciality in a foreign language is dangerous. We believe that in terms of humanistic, interdisciplinary content, teachers can make a valuable contribution from a broader perspective than that offered in specialized engineering courses. We can help students reflect on the social, ethical, and historical aspects of engineering, and discuss the impact of scientific and technological development on society. Promoting reflections on science, technology and society among engineering students through an online learning environment (Arno-Macia & Rueda-Ramos, 2011). Such topics will help develop communication skills.

Discussion

In everyday life, we come across such statements: "He is a technician, his presentation will not be successful", "It is difficult for him to learn English, he is a technician". The idea that it is unlikely to expect a successful level of development of communication (humanities) skills from engineering students is a theory of psychologists about the natural abilities of the individual. According to Gardner (2003), there are 9 natural faculties of personality, including linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, interpersonal, intrapersonal, naturalistic and spiritual. And these abilities are given to personality by nature in different quantities. If the most developed are logical and mathematical abilities, then it is true that linguistic natural abilities are less developed. Thus, the difficulty in speaking for specialists in technical specialities is natural. Individuals like Einstein, Marshall, Curie, and Jennings are

“geniuses” in different ways, and a single conception of “intelligence” is not adequate to account for the varieties of intelligence they display. Sternberg’s (2012) triarchic (three-part) theory of intelligence extends the concept of intelligence to include not just the mental operations you perform (analytic intelligence) but also the ability to vary your approach to problems (creative intelligence) and manage your cognitive resources (practical intelligence) to get the job done. Sternberg and his colleagues have developed new intelligence tests designed to assess analytic, practical, and creative intelligence. They offer evidence that scores on these tests can predict success at some jobs at least as well as standard intelligence tests.

The results of our research prove that engineers’ thought transformation into speech can be successful even if we accept the fact that they have more developed logical-mathematical and less developed linguistic natural abilities. In support of our ideas of natural abilities and presentation skills, we refer to the names of the writers-inventors who successfully combined technical thinking and fiction writing: Leonardo da Vinci, Mark Twain, Robert Heinlein, Lewis Carroll, etc. Following the evolution of tech writing, we would like to mention Jules Verne, Herbert Wells, Arthur Clarke, Isaac Asimov, Ray Bradbury.

We offer a discussion as far as possible to teach engineering students to express their thoughts easily in technical matters. Studying the differences between more efficient and less effective university students learning a foreign language, it was determined that students belonging to the art, law, or medical faculties achieved the highest results, whereas most of the less effective students came from the university's engineering and science faculty (Wong & Nunan, 2011). Nevertheless, we think that the issue of engineers’ thinking and speaking features are not sufficiently studied, their characteristics are not fully taken into account in the language courses for future engineers.

Conclusion

Engineers’ technical thinking is a part of engineers’ communicative competence and is mostly presented in the spatial and procedural form. If the person wants to transform such thinking into speech, the way of thinking must be converted into linear thinking according to the laws of linguistics. Our hypothesis is that in order to convey opinion in a statement it is necessary to have a subject, so to transform a thought into an utterance would be much easier if the first association of thought were a noun. Collective consciousness influences the thinking of the students of the same group and they show their individuality through their attitude to the successes and failures of others.
The process of thinking for speech in the communication process is as follows:
- the emergence of the concept in consciousness;
- search for the word that most accurately reflects this concept;
- formulation of thought in internal speech;
- search for grammatical-syntactic forms;
- reflection on the correctness, logic, clarity of expression.

Thinking for speaking has similar features in a foreign and native language, but speaking in a foreign language involves searching for a word to reflect the concept. A situation where students formulate their thoughts in their own language and then translate the thought becomes a psycholinguistic barrier to foreign language communication. The results of our research prove that engineers’ thought transformation can be successful if formed.

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SESSION 4: EFFECTIVE COMMUNICATION AND MET

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Communicating with VTS via VHF: An approach to teaching the essentials for successful communication in English based on the recommendations in the SMCP and proposed from the perspective of VTS

Uwe-Michael Witt
Freelance Teacher of English, post@kontor06.de

Abstract: This session will present ideas of how to prepare future nautical officers for VHF communication with VTS or MRC Centres as part of the Maritime English curriculum. It will refer to the SMCP as the basis for clear and unambiguous communication between a vessel and a shore station. It will introduce the essential communicative situations together with ideas for selecting the key vocabulary, language structures and communication control devices. It will also present ideas for teaching the presented material. The focus will be on the perspective or expectations of a VTS Operator when called by a Master.

Keywords: *VTS, SMCP, VHF, vocabulary, communication*

Introduction

Selecting the contents for the training of Maritime English at maritime colleges and academies can be a challenge. Using the IMO Model Course 3.17 has always been a good guideline for the selection of the contents. Finding the proper amount of it in the actual training can be difficult. Regarding the entrance requirement of nautical colleges and academies, the actual command of the English language should be of no concern for planning the curriculum. Referring to the recommendations in the IMO Model Course 3.17 regarding the use of the SMCP, it is key to select the main VHF communication situation/scenarios which are really of importance for the future watch keeping nautical officer at the beginning of his or her career. Situations/scenarios which are regarded as less important can be internalized by learning from senior nautical officers.

The IMO Model Course 3.17 is also not very specific about the number of phrases to be considered nor the methodological approach of teaching them to students.

It also does not make sense to make students learn the recommended phrases by heart. The SMCP should be regarded as a recommendation regarding the vocabulary and the structures with a hint to intelligent communication control devices. It is key for future nautical officers to understand that the SMCP offers a collection of useful ideas which have to be adapted to the real-life scenario which can be expected when speaking over VHF with other stations and particularly with shore stations. The following ideas focus on the (SMCP based) English language used in a communication between a vessel and a Vessel Travel Service centre or a Maritime Rescue Coordination centre.

There is a comment to be made: If the SMCP are checked for the level of English which is required to make use of them, it can be estimated that it is most probably Level A2 (the second level out of six in the European Framework of Language Reference). The SMCP are basically

simplified English with only 5 tense forms (with 2 of them used in passive voice) and a very limited number of structures to be required when using them (e.g., some/any, much/many, a limited/artificial use of modal verbs, a reduced use of adverbs, a limited but focused use of prepositions of time and place). Looking at the recommended tense forms the level can even be regarded as being as low as A1 (the entrance level). It can be assumed that the entrance level of cadets at maritime colleges, academies or universities is B2 (level four) or C1 (level five) after finishing the necessary schooling to be allowed to enter a college, academy or university (possibly even C2 (level six = near native use of English) after spending a year in an English-speaking country as part of their school education). Considering this, it is obvious that an instructor (1) has to make the cadets somehow limit what they are already able to say in English when applying the SMCP in the recommended manner with reference to the language structures and (2) to make sure the cadets use the SMCP-recommended vocabulary (mainly verbs) in the specified meaning (that means learning to "blank out" all the other meanings he or she might have already been using in everyday situations).

When creating a lesson plan as a part of a curriculum aimed at preparing nautical cadets to be watchkeeping officers in charge of communication with VTS or MRCC, the following questions should be considered:

1) What are the general principles of using the SMCP (regardless the actual situation/scenario), i.e. are there any general ideas or principles that always apply when using the SMCP regardless of the actual communication scenario?
2) What are the situations/scenarios in which watchkeeping officers will have to speak with shore stations?
3) What vocabulary will have to be used to speak clearly and unambiguously with the shore stations?
4) Which language structures can be expected to be useful to manage the situations?
5) Which intelligent communication control devices might be used to eliminate possible misunderstandings?

General Principles for Using the SMCP Regardless of the Actual Communication Situation

Using the following six general principles when speaking over VHF with a shore station are just a recommendation. When carefully analysing the SMCP, it is obvious that these guidelines or principles are very helpful for facilitating understanding even when the reception is poor due to causes beyond the actual use of the English language. Although there is probably no expectation from the shore station for the nautical watch officer to make use of these general principles, applying them is also in the interest of the shore station when being called by a vessel.

A) Always try to keep the message as short and simple as possible.
VTS will always appreciate clear and precise messages. On the other hand, there might be cases in which it can be advisable to expand the conversation and use controlling devices to make sure there is no misunderstanding, e.g. if one of the two speakers has a strong accent which the other speaker is not familiar with.

B) Always try to avoid synonyms.
It appears that the recommendations in the SMCP always choose one particular meaning of a certain word (which is especially true for verbs). The word should always be used in this particular meaning. A VTS operator who only speaks English in the VHF communications

during working hours might be confused if the nautical officer does not use a word recommended in the SMCP in the meaning recommended.

C) Always try not to use contracted forms.
Although contracted forms might save time and thus might keep the message as short and simple as possible, they might also contribute to misunderstandings if key words are not said in full, e.g. auxiliary verbs which provide a clear time reference in the message.

D) Always try to produce fully worded answers to "yes/no" questions.
Again, although it should always be the intention of the nautical officer to keep the message as short and simple as possible, using only "yes" or "no" as an answer might cause misunderstandings or uncertainty because by switching the hand-held device the one word might get lost or just anticipated by the recipient.

E) Always try to avoid ambiguous words, especially ambiguous modal verbs.
The SMCP offers ideas for how to use modal verbs either in only one meaning, e.g. "can" only in the meaning of "ability" and not in the meaning of "permission". Permission is recommended to be expressed with "have permission".

F) Always try to produce one message for one event.
Even if three pieces of information are to be transmitted by the nautical officer, they should not be communicated in one long sentence. They should be communicated in three short sentences, possibly even numbered so VTS can keep track of the incoming facts.

What are the situations/scenarios in which future nautical officers can be expected to speak with VTS or MRCC even at the beginning of their career?

a) the first or second contact with a VTS centre when approaching a port or a Traffic Separation Scheme during which (depending on the area) certain routine traffic data are required to be transmitted, e.g. ETA at a pilot station, last port of call, port of destination, number of persons on board, dangerous goods, security level, fresh water draft, air draft (when entering a canal where bridges will have to be passed);
b) traffic information service for the area transmitted by VTS on a regular basis (and requesting a confirmation of the information in the report) including the weather situation (e.g. winds and visibility), hydrographic information (e.g. the tides), the traffic flow (e.g. vessels constrained by draft or extraordinarily large vessels and their present positions), obstructions to shipping (e.g. hampered vessels), information about seamarks (e.g. buoys unlit or removed), closed anchorages, suspended services (e.g. tug assistance or pilotage);
c) SECURITE message (and requesting confirmation of the information) about out-of-the ordinary actions or incidents in the area (vessels not under command, areas closed for navigation, oil clearance operations, gunnery exercises, suspended traffic lanes in a TSS);
d) responding to questions or advice by VTS during a port approach (e.g. the present position, one's own intentions, traffic in one's own vicinity);
e) informing about proceeding to an anchorage, having the anchor position confirmed by VTS, giving the anchor and notice time, informing when getting underway again;
f) when approaching the fairway asking for and understanding information about the pilotage;
g) giving information before leaving a berth (ETD, persons on board, dangerous goods, next port of call, tug assistance, linesmen);
h) transmitting the final information after the pilot's disembarkation when leaving the port.

It can be assumed that in case of an emergency on board the Master or senior nautical officers will be in charge of communication with other stations (MRCC, law enforcement vessels). However, it would be advisable to introduce some basic vocabulary that can be expected to be used in a VHF communication regarding the incident. Possible situations/scenarios can include: fire on board, grounding, not under command (adrift), person over board, requiring medical assistance (e.g. a helicopter transfer of an injured crew member).

What vocabulary will have to be used to speak clearly and unambiguously with the shore stations?

Based on the situations/scenarios listed above, the SMCP should be scanned in order to create a list of either vocabulary or phrases which can be used in the listed scenarios. It would be advisable to establish contact with VTS centres or MRCCs in one's vicinity. One could ask to be allowed to listen to the "real-world" VHF communication at the centres, create sample communications based on this information while using the SMCP, having the sample conversations checked by the VTS or MRCC team for plausibility (but always stressing that these are samples for training purposes and that is why they have to be in the "extended" SMCP version).

It is not always easy to assemble these phrases because the SMCP are organized to present phrases centred around a general communication topic (e.g. "Position", "Avoiding dangerous situations"). They do not present comprehensive sample conversations (with one exception – for the communication with a VTS centre – A6.1.1 "Acquiring and Providing Routine Traffic Data" – which covers nearly completely the phrases necessary for the "First/Second call when approaching a port" scenario).

Which language structures can be expected to be useful to manage the situations?

It was mentioned above that the grammar in the SMCP is simplified, i.e. only 5 tense forms (with 2 of them used in passive voice) and a very limited amount of structures is required when using the SMCP (e.g., some/any, much/many, a limited/artificial use of modal verbs in order to avoid ambiguity, a reduced use of adverbs, a limited but focused use of prepositions of time and place).

Communication over VHF always has a specific purpose. VTS or MRCC always aim to be able to have an overview of the traffic flow in real time and to be able to anticipate future movements of vessels and to establish the consequences of past actions of vessels. That is why the proper use of tense forms seems important to make sure that all time references in messages transmitted to VTS or MRCC are expressed simply and clearly. That is why only the five tense forms recommended in the SMCP should be used by the nautical staff on the vessel. These tense forms are Present Continuous, Simple Past, Simple Present Perfect, Simple Future and Simple Present (only to be used for stative verbs, e.g. require, have, agree).

Which communication control devices might be used to eliminate possible misunderstandings?

The future nautical officers should be able to make use of the following communication control devices (some of them are recommended in the SMCP; some are just applied by seafaring personnel and also shore stations because experience shows that they are very useful):

a) eight message markers to prepare the recipient for the contents of the message;
b) repetitions of the received message content;

c) fully worded answers to “yes/no” questions;
d) the international alphabet when spelling (i.e. using a code for a letter);
e) numbers to be given in digits;
f) procedure words like “repeat”, “say again”, “mistake”, “correction”, “over”, out”.

Experience shows that VTS or MRCC always try to keep any communication over VHF short in order not to block the channel for possible important transmissions. That is why the devices listed above are not always used (they are regarded as what they are – recommendations). But they are used when the VTS or MRCC controller realizes that a critical scenario is developing and that the conversation over VHF must be precise, efficient and completely unambiguous. Then, every nautical officer is expected to “switch” as well and should be able to use all of these devices.

What is a possible approach to teaching nautical cadets how to communicate professionally and safely with VTS or MRCC?

Here is a possible procedure for teaching the above mentioned ideas:
1) Create VHF sample conversations to cover the above mentioned situations/scenarios (by using expertise from VTS controllers);
2) Check the conversations for the used vocabulary and create vocabulary lists (experience shows that the proper use of verbs is key);
3) Check the conversations for the used language structures and create an overview of those structures (especially the used tense forms);
4) Introduce the cadets to the SMCP and explain the organisation of the phrases (part A6 VTS (Vessel Traffic Service));
5) Show cadets two or three parts (e.g. A6.1.1 “Acquiring Routine Traffic Data” and A6.2.3.1 “Clearance, Forward Planning”, A6.2.3.3 “Arrival, Berthing and Departure”) to make them aware of the special arrangement, i.e. the fact that the phrases are usually not structured like sample conversations but that the words to be expected in a certain situation/scenario are “scattered” all over the complete collection of phrases;
6) Show cadets or, even better, have them listen to a short and “unsafe” sample conversation, i.e. a version without the communication control devices, produced as an audio file by you and ask them to think about and discuss how to make this version ”safer” by incorporating the communication control devices;
7) Show the extended version (i.e. the one with all the possible communication control devices incorporated) and have the cadets listen to this version, possibly while stopping your audio file and asking them to discuss possible words to fill in the gaps;
8) Create a version of the sample conversation (maybe a digital presentation) where the part of the vessel is given in the cadets’ native tongue and have them translate while either you read the part of the VTS controller or another cadet reads it;
9) Create further sample conversations in a similar way (i.e. as a digital presentation) and have cadets work through these ones like the first one; always be strict about the recommended word (from your list) and the recommended tense form and the “logical” communication control device.

Conclusion

A nautical cadet should be prepared for unambiguous and clear communication with a shore station via VHF. It can be assumed that there will be an “introduction phase” on board during which he or she will have time to learn from senior officers. However, the approach explained

above provides a procedure for the planning and implementation of this preparation and might be useful for cadets after they have started their first assignment as a nautical officer.

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Utilization of non-verbal language in engine room training

Emi Yutaka
Professor, Chief Engineer, *Japan Agency of Maritime Education and Training for Seafarers, Yokohama, Japan,* emi-y5t4@jmets.ac.jp

Muramatsu Nagisa
Onboard Instructor, Second Engineer, *Japan Agency of Maritime Education and Training for Seafarers, Yokohama, Japan*, muramatsu-n7p1@jmets.ac.jp

Abstract: The Engine control room in a vessel is covered with a soundproof wall. Therefore, crews can not communicate with each other with normal voices. Therefore, crews in the engine room communicated with colleagues by hand signals instead of loud voices in the noisy space when there was no control room yet in a vessel. An example of a hand signal that Japanese crews used to use in the past was putting your right hand into your left armpit, which means "measure". One of the advantages of hand signals is that they are a useful communication tool in such a noisy environment. In addition, as another advantage, if there are internationally common maritime hand signals, it would be a useful communication tool among multicultural and multilingual crews on board. This paper focuses on engineer instructors on training ships. They use megaphones when they need to explain something or give orders to cadets in noisy engine rooms. Thus, taking into account the past hand signals used by Japanese crews and the diversity of meaning of gestures in different countries, we study the potential for utilizing hand signals during training in noisy engine rooms.

Keywords: hand sign in engine room, multicultural crews' communication, communication in engine room.

Introduction

It is sometimes difficult for non-native English speakers to communicate in a multicultural environment. One of the reasons for such difficulties is that the syllabic accent and/or pronunciation of English is often affected by their own mother tongues. In addition, especially in the engine room, communication is also hard for crews because of noisy circumstances. Before engine control rooms came into wide use, Japanese engine crews used to communicate with each other by utilizing "hand signals", which are made with one hand and have a common meaning, in the engine room. One example is "measure", which is expressed by putting your right hand into your left armpit. This is the same motion as measuring your body temperature with a clinical thermometer. In this paper, "hand signal" is distinguished from "sign language" and "gesture". Basically, sign language is composed of hand gestures, body language and facial expressions to build up the intended meaning. Moreover, sign language is mainly used by people who have experienced hearing loss. According to the Oxford Advanced Learner's Dictionary of current English, gesture means a movement that you make with your hands, your head, or your face to show a particular meaning. However, in this paper, "hand signal" is defined as a communication tool by use of only one hand. We would like to introduce examples of current use of hand signals and study future possibilities for utilization of hand signals.

Non-verbal communication with partners on a vessel

While crew in the deck department utilize gestures with interphone, walkie talkie and whistling during communication between bridge and bow, engine crew tend rarely to use non-verbal communication in the engine room. An example of a rare case of non-verbal communication in the Training Ship Kaiwo Maru of JMETS (Japan agency of Maritime Education and Training for Seafarers) is manual operation at the engine side. Engine crews utilize gestures between partners: one is the main engine operator and the other is the clutch operator. A main engine operator sends a message to the clutch operator by showing his/her hand: spreading all his/her fingers and showing his/her palm. If the main engine operator bends all his/her fingers and shows his/her hand, the meaning is the request to disengage the clutch of the reduction gear. Taking the above two cases into account, non-verbal communication is an effective way of communicating the sender's intention to another who is especially far away from the sender.

Past communication in engine room

At present, communication relating to operational work in the engine room is mostly conducted between the engine control room and the engine room by interphone or walkie-talkie. Unlike the current situation, before not only the engine control room but also walkie-talkie appeared, Japanese engine crew utilized hand signals when communicating with each other in the noisy engine room. One of the advantages of communication by hand signals is to be able to understand mutual intentions without relying on auditory perception. Thanks to the control room and walkie-talkie now, engine crews can exchange their information without loud voices. As a result, hand signals are no longer important skills for engine crew.

Possible miscommunication among cross cultural environments

Adequate communication contributes to preventing human error; however, nationalities of seafarers who are onboard seagoing vessels are diversified. Therefore, Maritime English as an official language on a vessel is one of the most important skills for seafarers, especially those whose mother tongues are not English. Key factors of English skills are vocabulary, grammar, listening, and speaking. Thus as far as cross cultural circumstances are concerned, pronunciation could be an important factor for smooth communication. This is because different pronunciations can result in different recognition by others. For instance, if you pronounce the alphabet from A to Z, you might pronounce it differently from others depending upon your mother tongue. Such diversity sometimes leads to misunderstanding others' intentions.

Similarity between hand signal communication in the engine room and communication in multicultural environments

Hand signal communication in the engine room seems to prevent misunderstandings due to utilizing visual information rather than auditory information. Then one of the features of difficulties for maritime English communication in multicultural environments is possibly cultural diversity of pronunciation. In order to deal with the diversity of pronunciation, utilization of visual information as an assistant tool for communication is helpful.

Model of utilization of hand signals: adjusting the pressure for main engine lubricating oil

A typical example of possible misoperation caused by miscommunication is valve handling while adjusting fluid pressure. When a duty engineer and a duty rating try to line up the main engine lubricating oil (hereafter, lub. oil) system, the duty engineer checks the lub. oil line pressure and gives instructions on how to operate the return valve to the rating after starting the main engine lub. oil pump. The role of the engineer is checking the main engine inlet

pressure for lub. oil and giving instructions to the rating about how and how much to operate the return valve in order to adjust the inlet pressure on one hand, and the role of rating is turning in the direction to open or close the return valve depending upon the engineer's instruction on the other. (In this operation, the return valve is fully opened when starting the pump and will be closed to increase the pressure.) Causes of errors that might occur in this case are as follows:

- rating paid attention to the valve itself but not the pressure;
- rating operated the valve the wrong way;
- engineer gave the wrong order;
- engineer and/or rating confused which operation should have been done because of alternative repetition of operation; and
- engineer used the word "increase" or "decrease" because his/her intention is pressure increase or decrease instead of "open" or "close" to rating.

Taking the above causes into account, especially in the last case, it is easier to avoid the error if hand signals are used. Thus, while adjusting the lub. oil line pressure, both engineer and rating communicate through utilizing hand signals as Table 1 shows.

Table 1.
Meanings of hand signals

Stop	Bending all fingers and hold on your hand
Open	Open your right hand as you show your palm to your colleague and then turn it counter-clockwise (turn to thumb side) twice.
Close	Open your right hand as you show your palm to your colleague and then turn it clockwise (turn to opposite side of thumb) twice.
Speedy	Stretch your forefinger (or index finger) like pointing out at the sky and then turn your forefinger as you draw a horizontal arc with your fingertip of forefinger.
Slowly	Stretch your little finger (or fifth finger) like stretching your little finger to the sky and turn it.

The reason why the hand signals for "open" and "close" are defined as in the above table is that they correspond to the direction, clockwise or counter-clockwise, in which you need to turn a valve if you want to open or close it. You can open a valve when you put your right hand on the top of the spindle of the valve and turn it counter-clockwise no matter which direction the valve is installed vertically or even upside down. This instruction is often used for cadets of initial stage or familiarization level. The above "Speedy" is also possible to use as "More" and "Slowly" as " A little bit"

The detailed operation including the hand signals shown in the above table after starting lub oil pump is as follows:

(1) Sending the message "Slowly" and then "Close" by hand signals (The rating closes the return valve gradually and keeps turning the valve as long as the engineer is moving their hand);
(2) Changing the message to "Speedy" until the pressure rises when the engineer confirms no deficiencies in the system. (The rating changes the speed of closing valve to relatively speedy.);
(3) Showing "Slowly" again, when confirming the pressure is rising;
(4) Showing "Stop" when the pressure reaches the target level;
(5) Showing "Slowly" and then "Open" when the actual pressure is beyond the target level on one hand, and "Slowly" and then "Close" when the actual pressure is still below the target level on the other. Maintain the operation until the actual pressure reaches the target level.; and

(6)Showing “Stop” when the pressure adjustment is complete.

Hand sign as a support tool for communication in the engine room

Engineering crew are exposed not only to noise but also to high temperature or vibration from machinery. Therefore, communication in the engine room is always carried out while paying attention to such a hazardous environment. In particular, the disadvantage of auditory perception has considerably affected communication in the engine room. In addition to this shortcoming, English communication in a cross-cultural environment sometimes leads to difficulties for crew in understanding each others’ intentions. Communication under a combined hazardous and noisy environment with multicultural circumstances should be settled in. To compensate for this difficult condition, the utilization of hand signals will be one solution to improve communication in multicultural circumstances in the engine room. As mentioned in the introduction, the definition of “hand signal” in this paper is distinguished from both “gesture” and “sign language” in the viewpoint of “visual information using only one hand”. For further study, we would like to analyse possible incidents caused by miscommunication, and develop systematic hand signals for better multicultural communication.

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Needs Analysis of English for Specific Purposes (ESP) courses in vocational higher education

Nurmala Elmin Simbolon
Associate Professor, *Department of Marine and Fisheries, Pontianak State Polytechnic, Pontianak, Indonesia*, simbolon73@gmail.com

Abstract: Due to the ratification of Standards of Training, Certification, and Watchkeeping for fishing vessel personnel 1995 (STCW-F 1995), Standard Marine Communication Phrases (SMCP) should be incorporated in the curriculum of the Maritime Education Training (MET) institutions for fishing vessel industries. This study examined the curriculum of a Maritime English course in vocational higher education in Indonesia. Data were extracted from the SMCP document, past Maritime English examination papers of Certificate of Competency, and the current syllabus of English for Specific Purposes (ESP) courses. Interviews with three seafarers who had work experience in fishing vessels were also conducted. The SMCP document was analyzed using NVivo 12 Plus software. The results showed that the examination lacked spoken language skills mainly required in the SMCP. According to the interview, there was a need for a review of the ESP curriculum to sufficiently equip graduates with English language skills in occupational and social settings within the workplace. Furthermore, there is a need to adopt a genre-based approach and include the digital-era-related skills for the review of the current ESP courses curriculum.

Keywords: Maritime English, ESP, genre-based approach, vocational higher education

Introduction

Since English is used as a *lingua franca* in regional institutions worldwide, its proficiency is vital for graduates from non-Anglophone countries. Indonesia is a member of the Association of Southeast Asian Nations (ASEAN) Economic Community (AEC). Therefore, its university graduates need to be proficient in using English to enrich their communication skills. The importance of English proficiency is emphasized in the definition of the regional community below.

A region that is fully integrated with the global economy, which includes a coherent approach to building external economic relations, such as Free Trade Area (FTA) negotiations, Comprehensive Economic Partnership (CEP), and increasing participation in global production and distribution networks (Nizar, 2014, p. 6)

The ASEAN Qualification Reference Framework (AQRF) states that the mobility of professionals should be developed (ASEAN, 2015). For this reason, university graduates may experience high competition in the global job market. This prediction is in line with the McKinsey Global Institute (MGI), which stated that in the next decade, the demand for semi-skilled and skilled workers may triple (Handayani, 2015). This underscores the importance of English language skills for Indonesian job seekers globally.

In 2017, the English Proficiency Index (EPI) ranked the Indonesian population 10th in the Asian region (Renandya, Hamied & Nurkamto, 2018). It was preceded by neighboring countries, such as Singapore, Malaysia, the Philippines, and Vietnam. Some factors, including approaches and curriculum used in English Language Teaching (ELT) programs, could be associated with this ranking. Inadequacy of English-speaking skills affects the competitiveness of Indonesian labor in the world. A survey by the Institute of Management Development (IMD) in 2012 in 59 countries revealed that Indonesia's labor productivity was relatively lower, occupying the second last position. A subsequent study conducted a few years later ranked Indonesia 50th out of 142 countries, dropping 5 ranks from the previous year. It was outperformed by its neighboring counterparts, such as Malaysia and Thailand. (Schwab, 2015). The features of the millennial and post-millennial era reflect the skills demanded by industries globally. Some categories used to measure the competitiveness of the world's labor was based on the adoption of Information and Communication Technologies (ICT), skills, and labor market (Schwab, 2015). Since English is currently used as a lingua franca in many fields, Indonesian graduates should master it to gain a competitive advantage in the global market.

Since the ratification of the Standards of Training, Certification, and Watchkeeping for fishing vessel personnel 1995 (STCW-F 1995) by the Indonesian government in 2019, there has been an urgent need to improve the quality of Indonesian graduates. This is especially true for those in the Fishing Technology study program, where the current research was conducted. For example, one of the regulations in the STCW-F 1995 regarding the minimum requirement for the certification of seafarers in charge of a navigational watch on fishing vessels of 24 meters in length states that:

[The officers should have] adequate knowledge of the English language enabling the officers to use charts and other nautical publications, and to understand meteorological information, and messages concerning the ship's safety and operation. [They also should have] ability to understand and use the IMO Standard Marine Communication Phrases [SMCP] (Regulation 2 Article 17 of STCW-F 1995).

The SMCP is a document with a glossary of terms and oral expressions used by seafarers in maritime fields. To ensure the safety of ships and crew, the International Maritime Organization (IMO) developed this document using the standard navigation communication that is accepted across the world. It also provides some of the guidelines for the Maritime English course curriculum implemented by global MET institutions in one of its model courses: the IMO Model Course of Maritime English (IMC 3.17).

There are consequences for Maritime Education Training (MET) providers, including one Indonesian vocational university, that motivated this study. Including SMCP in the curriculum presents a challenge and an opportunity for the institution. Students enrolling for English as a Foreign Language (EFL) may encounter challenges because of limited Basic English skills. As a result, they may need extra effort to succeed in this program. On the other hand, the ratification of the STCW-F 1995 enables graduates to globally compete in the Marine and Fisheries sector. Hence, Maritime English is key to the success of graduates in the Marine and Fisheries labor market.

1.1. English for Specific Purposes (ESP) and Genre-based Approach

Maritime English is an approach in ELT that employs content knowledge and skills like those of Fishing Technology to guide language learning objectives (Hutchinson & Waters, 1987).

English for Specific Purposes, or ESP is often associated with a genre-based approach due to its precise discourse community, where members (seafarers) have a specific communication goal (Swales, 1990). Though the genre-based approach allows for guidelines to develop an ESP course curriculum, it is arguably limited and prescriptive (Freedman & Meadway, 1994). To maintain safety and conformity to global recognition, the Maritime English course is characterized by fixed terminology and specific expressions. (Zhang & Cole, 2018; Noble, 2017). To address this flaw, Dudley-Evans and St. John (1998) proposed an overarching approach that combines English for Academic Purposes (EAP) and English for Occupational Purposes (EOP), helping students improve their learning experience. EAP is known for providing learners with transferrable language skills, such as listening to lectures, note-taking, and discussions, widely used in their social setting. The introduction of the EOP to the Maritime English curriculum prepares learners for communication at the workplace.

1.2. Studies on ESP Courses

Several studies on ESP courses have been carried out. For example, Belyaeva (2015) conducted a needs analysis study at a university in Ukraine. The study focused on approaches used in developing the ESP course curriculum and recommended that EAP courses be introduced, followed by ESP. To help students learn their ESP, the survey suggested the incorporation of the four language skills on listening and note-taking. While Belyaeva based the findings on the students' experience, a similar study by Tran (2018) focused on the importance of the English language by police officers at their stations in Vietnam. The results showed that listening and speaking were the main skills needed in this field (Tran, 2018). Action-based research conducted by Morgan and Alfehaid (2019) in Saudi Arabia's university supports the recommendations of Belyeva's study. By placing ESP in tandem with GE, the study showed that GE helped students learn ESP. This underscores the need for students to devote more time to learning and practicing GE (Morgan & Alfehaid, 2019). Therefore, this research emphasizes the need to examine in detail how the phrases in SMCP should be presented in the ESP course curriculum. It also explains how the incorporation of GE or EAP could be implemented in the ELT curriculum.

Some studies on Maritime English courses have been conducted (Zhang & Cole, 2018; Noble, 2017). Zhang and Cole (2018) examined the curriculum revision of the IMO Model Course of Maritime English (IMC 3.17). They focused on the ability of an ESP-based framework to connect Maritime English to a communicative language teaching approach. This revision process involved conducting workshop questionnaires and interviewing stakeholders from the Maritime field. Apart from seafarers' listening and speaking skills, in emergencies, cross-cultural understanding was also highlighted by Zhang and Cole (2018). Their proposal divided the Maritime English syllabus into two, including General Maritime English (GME) and Specific Maritime English (SME). Like EAP, GME focuses on pronunciation and listening, and speaking as the language's core activities. SME encourages professionals with maritime-related skills to focus on English learning. The latter category refers to what Dudley-Evans and St. John (1998) would categorize as EOP. This proposal seems to be comparable with the incorporation of GE and ESP courses in Belyeva (2015) and Morgan and Alfehaid's (2019) studies. Since it provides two aspects of communication skills, it can enable the graduates to improve their performance at work.

For students to communicate efficiently in English in their workplace, Zhang and Cole's (2018) study suggested a variety of learning approaches. Chambers and Main (2016) examined the use of tools for learning and teaching in a Maritime English course. In particular, they utilized a

simulator in the course and tested its benefits. Testing 21 ship captains' performance under poor weather conditions and mechanical issues, the results indicated that simulator-based training was effective (Chambers & Main, 2016). The simulation-based curriculum study stresses the importance of including digital training methods (Schwab, 2015) in an ESP course. From a different aspect, Noble (2017) examined the need for global standard English testing for seafarers around the world. By examining the Maritime English test provided by 'Marlins' and 'Seagull', the study showed that they lacked international recognition for excluding cross-cultural aspects, proposed in Zhang and Cole's (2018) study. This article also discusses the method and content of the assessment of the Maritime English course.

In Indonesia, few studies have examined the effectiveness of Maritime English teaching in MET institutions. With informally discussing the institution instructors, some voiced the problem of limited English proficiency among cadets. However, there is limited documentation of this particular concern, with Ownie (2010) and Dirgayasa (2014) being the only available studies. In 2018, Dirgayasa investigated what MET students need and established that apart from SMCP and the specific terminologies, listening and speaking skills were important in learning English. This finding stressed why speaking proficiency is valuable for Fishing Technology graduates. It aimed to establish whether the current curriculum of ESP courses met the learning requirements. In this research, the essential communication skills by Indonesian seafarers are analyzed in relation to the ratification of the STCW-F 1995 by the state. The intention is to shed light on the arrangement of ESP courses and give recommendations on directions to be taken by Indonesian vocational universities including MET. To enhance the competitiveness of fishing vessel personnel in light of these objectives, the research questions focus on:

1. Communication skills required for a seafarer according to the SMCP document
2. Language skills assessed in the Maritime English examination
3. The ESP courses syllabus structure in vocational higher education
4. Indonesian seafarers' attitude on the use of the English language when working in the fishing vessel industry

2. *Research Methods*

This study was conducted at the Advance University in Indonesia using a mixed-methods approach for data triangulation (Creswell & Plano Clark, 2011). To answer the research questions, interview notes, the SMCP, past Maritime English examination papers in a Certificate of Competency, and the syllabus of the Maritime English course were examined.

2.1. Research Context

Fishing Technology is a three-year study program at Advance University, where students are required to take an examination to obtain a Certificate of Competency for fishing vessel personnel. To apply for a job in any Indonesian fishing vessel company, the seafarers should produce this certificate and comply with the STCWF-1995, articulated in Regulation 2 Article 17, English proficiency. The certification examination is designed to assess the student on several courses, such as Maritime English, Radar Navigation, Oceanography, Communication (at sea), and International Regulations for Preventing Collisions at Sea, (COLREGs). This makes the Maritime English examination the guideline for the Maritime English syllabus. The study program offers this course in its first three semesters with different approaches. In Semester 1, GE is taught while the subsequent two semesters introduce ESP courses relating

to the Marine and Fisheries field. Apart from the program's incapability to enhance learners' English proficiency, it does not set minimum English skill is required for enrolment.

2.2. Data Collection and Analysis

Data was collected by examining the SMCP, the past Maritime English examination papers of the Certificate of Competency, and the curriculum of the English course at the study program. Furthermore, interviews were also conducted with the respondents. The analysis of SMCP was essential to examine whether the standards required by IMO in the STCW-F 1995 have been met.

The analytical methods used were determined by the data collected. NVivo 12 Plus software was employed to organize, analyze, and capture some details from the data of the SMCP document. The analysis of the past examination papers was conducted quantitatively using the Excel program. These examination papers, the syllabus, and interviews were analyzed using iterative content analysis for uniformity in the results (Krippendorff, 2004). The validation of interpretation was conducted in the initial stage of data analysis. Two content lecturers at the faculty were invited to examine the relevance of ideas and topics captured from the data. For instance, the use of 'general terms' in the topic elicited from the question items of the Maritime English examination was clarified and was important in differentiating between general and specific terms in Marine and Fisheries field. To authenticate the interview notes, there was follow-up communication with the participants. By incorporating triangulation data using 3 types of documents and 3 unstructured interviews with the seafarers, the reliability of this research was maintained.

2.3. Research Participants

Purposive sampling was used in selecting participants (Creswell & Plano Clark, 2011). A participant was required to have worked as a seafarer on-board a fishing vessel. Two participants were current University staff while the third one was their former colleague working at a different institution. Before the interviews were done, the participants were informed about the purposes of the research, and their consent was provided in informal communication. The unstructured interviews were conducted by phone and some follow-up communication was arranged through social media. Table 1 summarises the profile of each participant's work experience on-board a fishing vessel.

Table 1.
The Profile of The Faculty Members

Name (pseudonyms)	**Length of work at a fishing vessel**	**Types of the fishing vessel**	**The language used in the vessel**
Barus	1 year	Long Line	Indonesian with limited English
Ikang	Less than 2 years	Long Line	Japanese
Budi	5 years	Long Line	Indonesian

2.4. Research Procedures

The research was conducted in 2019 after the Indonesian Ministry of Higher Education and Research Technology (now RISTEK-BRIN) approved the research proposal. Data collection involved two steps: document collection and conducting interviews. The data comprised

information from the SMCP, current syllabi of English courses, and Maritime English examination past papers (between the year 2012 to 2017). The interviews were then conducted with three faculty members in the Indonesian language by the researcher. In translating direct quotes from the interview, the article employs a non-verbatim English translation.

3. Results

3.1. RQ1: Which Communication Skills are Required for A Seafarer According to the SMCP Document?

The findings showed that oral communication is the main language skill required by the seafarers. The following figures from the analysis of the SMCP document using the NVivo software. Figures 1 and 2 show the top ten of the most frequently mentioned words in the SMCP document.

Figure 1. Top 10 most frequently used words in the SMCP document

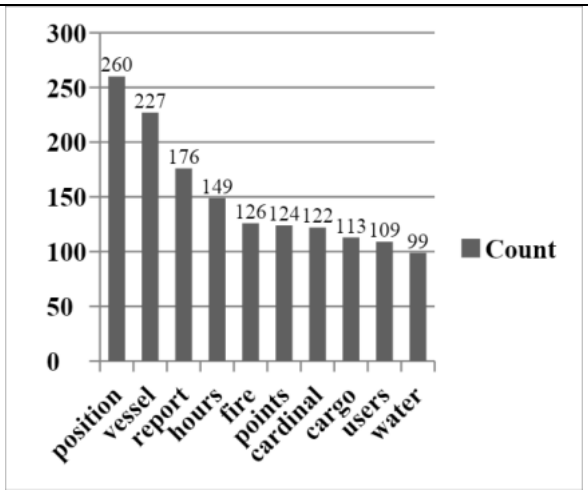

Figure 2. The word counts of the top 10 most frequently used words in the SMCP document

Maritime communication features eight types of messages including instruction, question answers, and information. The following extracts taken from different pages (in brackets) of the document exemplify the commonly used phrases in oral communication.

"Do not overtake the vessel North of you" (13)
"I will not overtake the vessel North of me." (13)
"Are dangerous goods on fire?" (29)
"Yes, dangerous goods are on fire" (29)
"My ETA at distress position within ... hours / at ... UTC" (33)

The oral expressions indicate the specific features of prescriptive English for Occupational Purposes (EOP), showing that learning should emphasize specific and fixed patterns in Maritime English. This is exemplified by the *instruction* message on page 13 and *questions* on page 29 that necessitates specific patterns of responses. Moreover, the message on page 33 shows the time and needs to be expressed using the Universal Time Coordinated (UTC) method in separate digits. For instance, when the time is 15.50 UTC, it should be expressed as *one five five zero-hours local time.* Since seafarers from a diverse linguistic background might express time in a way affected by their first language, the UTC system was meant to mitigate this

problem. These findings suggest a specific prescription of communication at sea, which has become the specialty of ESP in the vocation at sea.

3.2. RQ2: Which Language Skills are Assessed in the Maritime English Examination?

The results from the analysis of this research question suggest there is a weak correlation between the examination, the document, and the SMCP. Table 2 shows the structure of the examination, the coverage of the topics, and some samples of the examination items.

Table 2.
The Items of Maritime English Examination Questions (Years 2012-2017)

Forms	Number of items	Topics
Multiple choice	20	See Figures 1 and 2
Reading comprehension	1	Ship Building
English-Indonesian sentence translation	5	Fisheries, Collision Regulations

As indicated in Table 2, the examination tested the reading and comprehension skills of the language because they are frequently used on Marine and Fisheries issues. Figure 3 shows the range of vocabulary included in the examination.

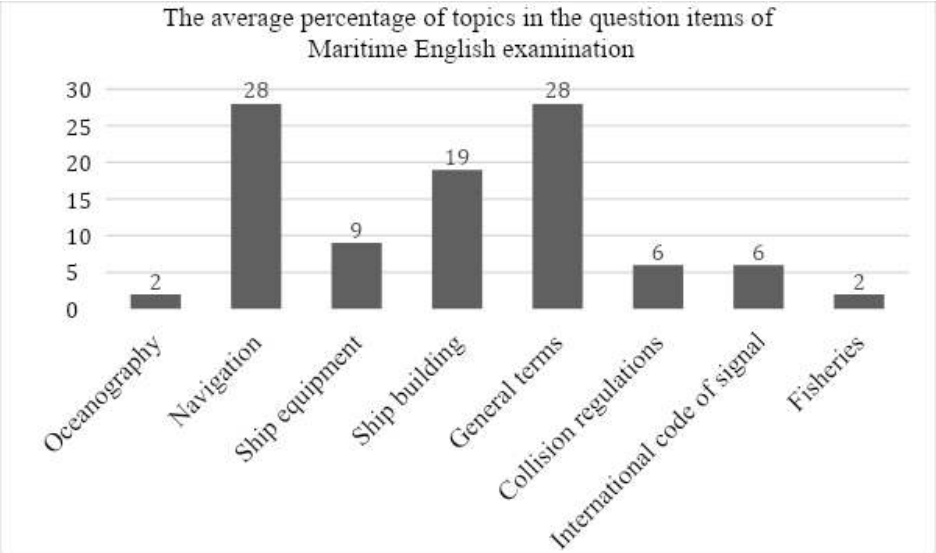

Figure 3. The average percentage of the number of topics in Maritime English examination questions.

Figure 3 shows that the topics of the examination cover terminologies related to different courses offered in the program. Several items relate to the topics of 'Navigation' and 'General terms.' Consequently, some key points can be grasped from the content presentation of the assessment. The first category 'General terms' comprises common vocabulary, which is important in supporting the learner's' foreign language learning process. This practice singularly assesses reading and comprehension skills. The current Maritime English examination only assesses basic language skills of the cadets' reading ability on vocabulary and comprehension. This passive language skill is relevant when dealing with manuals or written instruction. According to the findings, the current understanding of the assessment value of Maritime English skills in the global industries might be limited. Instead of using international standards, they consider the Certificate of Competency used by the local industries only. This

is shown by the interviews with the seafarers, presented in Section 3.4. The limited scope of this ESP assessment could also be attributed to the absence of STCW-F 1995 ratification by the government.

Another flaw identified from the analysis of past examination papers is that examination on oral expressions used in the fishing vessels was done in a written form. This makes it difficult to test the cadets' English-speaking proficiency. A few sample examination questions can be found in Appendix 1.

The current assessment of English proficiency of the seafarer through the Maritime English examination emphasizes the mastery of technical terminology in Marine and Fisheries field but fails to assess spoken English language skills. Therefore, this examination lacks the assessment of listening and speaking skills that are required by seafarers in the world.

3.3. RQ3: What is the Structure of ESP Syllabus Courses in Vocational Higher Education?

The results of the research question meet the requirements specified by the global organization of Maritime English. However, a closer examination reveals a lack of specific details to support its implementation in the classroom. The details of the syllabus of the ESP courses for the institution are shown in Appendix 2.

The language syllabus is divided into two GE for Semester 1 and ESP for Semesters 2 and 3. English 1, offered in Semester 1, accommodates Basic English speaking skills, while English 2 done in Semester 2 employs presentation of a procedural text. Its objective focuses mostly on the field of Marine English using one-way communication. In semester 2, there is an intensive mastery of the technical vocabulary of the program. Semester 3's syllabus is designed to prepare students to face the Certificate of Competency examination with emphasis on accommodating the curriculum recommended by the IMO. The topics covered in each lesson follow the SMCP document with a limited assessment of oral skills in the Maritime English examination as shown on RQ2. This confirms that spoken English language skills are considered less important in classroom learning.

3.4. RQ4: The Indonesian seafarers' attitude on the use of the English language in the fishing vessel industry?

Two main questions were asked in the interview, including how the English language was used in their workplace, and how the crew communicated to individuals that spoke the different first language in the fishing vessels. Their responses varied greatly, as summarized in Table 3.

Table 3.
Seafarers' Perspectives on the Language Used When Working in a Fishing Vessel

Participant's Name (The Nationality of Fishing Vessel Owner)	**Ikang (Japanese)**	**Budi (Indonesian**	**Barus (Australian)**
1. Use of General English	No	No	Yes (interpreter)
2. Use of Maritime-related terminology/phrases (SMCP)	No (The radio operator only)	Yes	Yes (interpreter)
3. Use of English in social interaction among the crew	No	No	No

Based on these findings, the following can be deduced. First, although working on fishing vessels from different nationalities, all seafarers interviewed had limited social interaction using the English.

Second, all interviewees did not use English in their social interactions among the crew. Despite being the same, these responses have different implications. For example, Ikang, working on a Japanese vessel, had good Japanese skills and maintained social communication with fellow seafarers in Japanese. Budi's often used the Indonesian language for two reasons. First, the owner of the fishing vessel company that Budi worked for was Indonesian. Consequently, there was no need to use a foreign language in informal situations. Also, fellow seafarers mostly from Korea used Indonesian instead of English. The responses expressed a willingness to practice English as he expressed in this way "I could not express it in English, as he [Budi's co-worker] had limited English, so I used the Indonesian language. He had already learned some Indonesian when applying for the position at the vessel" (Budi, Personal communication, 24 August 2019). A similar sentiment was also articulated by another seafarer-participant. The crew saw the need for a common language for all seafarers to help them socially interact at sea. This proposition is supported by the other seafarer-participant. Barus shared the experience in the following

> We often have an interpreter provided by the company to helps us during fishing. However, when I wanted to talk with my colleagues during the off-duty time, I felt reluctant to ask for the interpreter's help. I always used body language when communicating with the other crew fellow at the vessel. (Barus, Personal communication, 25 August 2019).

The interviews also established that Maritime-related oral expressions presented in the SMCP document were used by everyone, except one person. According to Ikang, "It is the Fishing Master, who communicates with the radio communication officer and the crew on the fishing ship" (Ikang, Personal communication, 20 August 2019). When Ikang mentioned the two types of communication, each context used a different language. The officer in charge of radio communication used English when communicating with the Master of the vessel, who utilized the Japanese to communicate with the crew, including the participant of this study. Although the first language choice is in line with the requirement of the STCW-F 1995, the other one seems to be dictated by the context of the industry. Ikang stated that "In the vessel where I worked, the crew did not need to master phrases in the SMCP, except for the radio communication officer." (Ikang, Personal communication, 20 August 2019).

4. *Discussion*

4.1. Limited GE Means Limited ESP

Some key issues stand out from the findings of this study. First, the language skills assessed in the Maritime English examination and the research context do not fully address the needs of global industries. Although the examination focuses mostly on reading, as part of the receptive skills of the language, the job market needs specific vocabulary in the Marine and Fisheries sector. Spoken communication that involves the speaking skills of the language is imperative. Vocabulary learning is key in developing reading skills, a component of the language tested at the Maritime English Certificate of Competency examination. It is argued that the assessment strategy should be used in occupational-related texts encompassing vocabulary and grammar. For example, the assessment including the use of these terminologies is a sentence dialogue between the officer and the captain instead of asking the definition of each term. This improves the learners' English language communication skills, hence enhancing their labor competitiveness. The argument proposes a need for the examination to include assessments on listening and speaking skills. Oral expression examination should be tested in speaking form. This helps students practice actual speaking. According to Dirgayasa (2018) and Zhang and Cole (2018), lack of a comprehensive assessment of the English skills leads to limited listening and speaking skills. This finding was in line with the findings of Noble's (2017) study that proposed the need for further evaluation of current English assessment for the seafarers to meet global standards. This means the current assessment in the ESP course examination for the seafarers of fishing vessels does not satisfy the need for world industries.

The study also recommends that the current arrangement of ESP courses in the institution be reviewed for various reasons. First, seafarers need to practice English language skills to exploit future relevant opportunities. Upon improving the current method of assessment in Maritime English, this problem will be addressed. Second, setting procedural texts within the course syllabus is not useful since the cadets mostly require listening and speaking on specific types of messages. Third, the curriculum offers students insufficient time and content in learning GE. This affects the learners' capability to master the language. Unlike the setting in Morgan and Alfehaid's (2019) study, these learners did not have an English background before the study. One-semester for the GE course is insufficient to support ESP learning. Fourth, the implementation of EAP where transferrable language skills, such as listening and note-taking are taught, should be included in the GE course (Dudley-Evans & St. John (1998). Therefore, this study suggests that the GE course be reviewed to cater to the students' learning needs and equip them for learning ESP (Belyaeva, 2015; Hutchinson & Waters, 1987; Morgan & Alfehaid, 2019). The finding may reflect the experience of some seafarers in Indonesia, including Budi and Barus.

Lack of reliable features of the current local regulations may be attributed to limitations of the ESP courses curriculum and the lack of comprehensiveness of the English language assessment. This study incorporated the findings from the examination papers before the STCWF-1995 had been ratified. English, being a lingua franca, egged the comprehensive assessment of its proficiency among the global citizens. All these findings explain the low English proficiency of Indonesian graduates worldwide (Renandya et al, 2018). According to this study, it is prudent to immediately rearrange the language's curriculum in vocational higher education in Indonesia to meet the needs of the global market. The following section shows the potential rearrangement that can be made.

4.2. Genre-based Approach for An ESP Course Development

Adopting a genre-based approach for ELT courses, which comprises ESP, would help accomplish certain learning objectives. The seafarers' community has a specific discourse (Swales, 1990) with types of communication purposes at the sea. The communication is meant to give responses to the messages heard, such as 'question' and 'instruction'. For this reason, the syllabus should be redirected by adopting the genre-based approach. For example, in the Maritime English course in Semester 3, it is not advantageous to present the subtopics as 'Terminologies 1' and 2' to the students'. These could be substituted with a topic 'Types of Messages' to guide the whole syllabus and improve the oral language skills relevant to the industry and students' needs (Tran, 2018; Hutchinson & Waters, 1987). Employing the use of a set of simulators would provide learners with a similar context to their future work setting (Chambers & Main, 2016). Furthermore, the use of simulators is necessary where learners have to match the features of the digital era (Schwab, 2015). The study shows that a genre-based approach can be implemented even in the GE course. Similar to Morgan and Alfehaid (2019) and Belyaeva's (2015) studies, this study advises stakeholders to adopt the EAP approach for students to enhance their communication skills. The academic settings provide a generic discourse for the students to practice the language skills. For example, note-taking activities and discussions are likely to support the graduates' listening and speaking skills. Additionally, these skills are valuable in the broader context of social life, including their social interaction with colleagues (Dudley-Evans & St. John, 1998).

It is vital to include competence in cross-cultural understanding in the language assessment platform and ESP course design (Zhang & Cole, 2018). This is because many crews work in a diverse environment with seafarers from various backgrounds and different languages and cultures. Adopting a genre-based approach into the ESP course design would make it easy to relate the learning goals to the needs of a specific discourse community. Therefore, the graduates would be equipped with communication skills for both occupational and social purposes.

5. Conclusions

This study examined the current curriculum of the ESP courses in a vocational university by analyzing specific communication skills needed by seafarers at fishing vessels in Indonesia. The data were extracted from documents (the SMCP, past paper of examination, and English course syllabi) and interviews with relevant participants in the Maritime industry. The results showed that the current Maritime English course examination is ill-equipped in preparing students for the requirements of the global standards for seafarers. Moreover, the ELT course curriculum can be reviewed to gain the needed cross-cultural knowledge. This requires the adoption of a genre-based approach for English language courses. This should include the ESP (Maritime English) for students to comprehensively learn the language. Helping university graduates grow their English proficiency through comprehensive language learning enhance work skills and communication between individuals with different backgrounds. The ability to communicate in this lingua franca help improve work performance, gaining a competitive edge in the labor market.

Making a broader application of the findings on this subject is a challenge since the research was limited to only one institution. Concerning the generic features of a language, the adoption of a genre-based approach in ESP courses could apply to a similar discourse practice.

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Prosodic interference in maritime communication: nature and means of elimination

Bozhena B. Dokuto,
Professor**,** *Novorossyisk Branch of Pyatigorsk State University, Russia,* bojena20009@rambler.ru

Igor O. Smirnov
Professor**,** *Admiral Ushakov Maritime State University (Russia)***,** Zeherd@yandex.ru

Abstract: The paper is devoted to the analysis of typical phonological mistakes made by Russian-speaking maritime cadets and the teaching tools enabling maritime English instructors to correct them and to improve the phonological competence of maritime students. Today, addressing the issues of foreign accent in the speech of maritime professionals, one cannot underestimate the importance of the correct implementation of the prosodic system of the language being studied, since the quality of the implementation of a coherent text is undoubtedly the result of the adequate use in speech of both segmented and suprasegmental language means, that is separate phonemes and intonation. The comparison of the requirements of the Model Course 3.17 in phonology with cadets' test results assessment have displayed the phonological specificity of their accent which is allegedly caused by cross-cultural interference. The results of the study allow concluding that cognitive factors along with the prosodic system of the mother tongue belong to the interfering elements that cause phonological accent in speech in situations of professional communication, The main outcome of the research is determined by the opportunity to use the structured list of most typical prosodic errors in the process of forming cadets' Maritime English competence.

Keywords: prosodic competence, prosodic accent, prosodic interference**,** cognitions

Introduction

Nobody denies that maritime English being a global professional language possesses its specificity on the lexical and grammatical levels. However, we should admit the phonological level is also worth being taken into consideration in this respect. Displaying itself on the two sublevels: on the level of segmental phonemes and prosody, the Maritime English is affected by the interference of the mother tongue phonological system, which can create significant barriers in the process of professional and informal communication among seafarers. Such problems should be solved in order to prevent hazardous situations at sea and to maintain safety on board.

Thus, the relevance of the topic is conditioned by the necessity to further study issues of prosodic interference in the course of maritime professional communication taking into consideration the latest trends not only in the area of linguistics, but also in a number of adjoining areas.

The problem statement involves an assumption that prosodic interference in maritime English is revealed in the subsystems of the pitch, loudness and tempo. Consequently, a list of most

typical prosodic errors made by Russian cadets speaking English can be used as a resource for elaborating tools of removing foreign prosodic accents.

The object of this study is the phenomenon of prosodic interference in maritime English caused by the influence of the mother Russian language.

The study is aimed at researching the nature of prosodic interference and analyzing tools of getting rid of prosodic accent in situations of professional communication at sea. The aim of the study determines the necessity to solve the following tasks:

- To characterize the concept of prosodic system and interference as well as the concept of phonological competence;
- To identify prosodic features most susceptible to foreign accent;
- To compare the influence of prosodic interference in cadets' reading aloud and quazi spontaneous speaking;
- To work out a series of tools aimed at correcting prosodic interference with cadets speaking Russian as a mother tongue.

The study involved methods of auditory, perceptive and comparative analysis with the further statistical treatment of the obtained results.

The Concept of Prosodic Interference

The formation of a foreign language system on the basis of the already formed system of the native language is a very complex process that directly affects human consciousness. In this process, factors such as the level of the professional's language proficiency, the usage area and degree of the two languages play a significant role. Prosodic interference is the least studied type of language interference. However, it is difficult to overestimate the role of prosody in the process of communication in general and professional communication in particular. It is necessary to note here that the term "prosody", "prosodic system" are interpreted here in a broad sense, as a term integrating elements of connected speech manifesting themselves in the form of sound simplification, rhythm and intonation (Wharton, 2012). It is widely known that prosody performs certain functions in creating the informative structure of the text in any language. Firstly, prosody is a means of expressing an attitude to a listener, to the situation and to the content of the utterance. Secondly, prosody performs a grammatical function in two aspects. It can distinguish a sentence type, and signal syntactic boundaries. This ability of prosody enables interlocutors to perceive speech in appropriate units. Thirdly, prosody is a tool to organize discourse. It reflects the information structure of the discourse and the logical connections between utterances (Underhill, 2005).

Psycholinguists claim prosodic interference is most stable in comparison with the native language influence on the vocabulary and grammatical layers of the foreign language. It is explained by the fact that prosody is formed even in the pre-speech period of the child (Bunina, 2004). However, the reasons for the appearance of a prosodic accent in a foreign language cannot be attributed only to the articulatory and prosodic differences of the contacted languages. Many scholars admit that prosody carries nationally specific cultural information that is directly related to the mentality of a certain ethnic group (Fomichenko, 2013).

This study understands the term "interference" as deviations from the language norm under the influence of the cognitions of the native language that arise as a result of the interaction of language systems in the conditions of bilingualism (Fomichenko, 2013). Cognitions are treated in this work as a set of mental processes that affect the perception of the world. They are

present in human consciousness in the form of mentality, encyclopedic knowledge, linguistic knowledge and language abilities (Bunina, 2004; Fomichenko, 2013). Having realized the role of cognitions in causing prosodic interference makes it possible to model ways to eliminate them. The interfering influence of cognitions causes difficulties that arise in adults when learning a foreign language. Unlike a child, an adult has knowledge of the world in the form his native language presents it to him. Therefore, when learning a new language, one should see the world through the prism of another culture, another mentality.

The study of speech at the level of texts allows looking at this problem from the inside and constructing a prosodic model of the interfered system. The interfering influence of the prosodic system of the native language, along with cognitive factors, serves as an obstacle for maritime English students in the absolute mastery of maritime English.On the other hand, the influence of the national mentality on the prosodic organization of speech is one of the most significant reasons for the emergence of a prosodic accent in a foreign language. The role of cognitive factors of the native language in generating a prosodic accent should not be underestimated. The interfering influence of cognitions in the form of mentality, encyclopedic and linguistic knowledge, as well as language abilities predetermines the difficulties that naturally arise in the process of speech production in a foreign language, which is an integral part of professional communication at sea (IMO, 2000).

The Perceptive Analysis of prosodic interference in quasi-spontaneous speech

The influence of the mother tongue prosodic system on the prosodic features of a foreign English seafarer speaker has been analyzed perceptively in three main prosodic areas that characterize distinctive features of connected speech: sounds modifications to dictionary pronunciation, rhythmic organization of connected speech and intonation or speech melody.
It is common knowledge that connected fluent native English speech is characterized by such features as vowel reduction of various degrees, elision or sound omission, contractions, liaison, juncture and assimilation (Underhill, 2005). These modifications are regular and predictable in English connected speech as it comprises a system. However, for Russian speaking learners they present a significant difficulty in both listening and speaking. Most first and second-year cadets do not reproduce such simplifications in their English speech. They tend to articulate all sounds fully as if they were reading separate words, which is caused by the influence of the Russian prosodic features of connected speech. Such ignorance of connected speech simplifications can make a speaker not only sound foreign, but also, cause phonemic mistakes that, in their turn, can lead to interruption and misunderstanding in situations of professional communication. For example, in the experimental test several Russian-speaking cadets pronounced one of the IMO phrases "*Standby for mooring!"* ignoring the phenomenon of juncture. They made a syllable boundary between "*stand*" and "*by*" in the verb "*standby*" which misleads the listener to the meaning "stand *by*…" (stand *near*). In this case, the phrase can be perceived as meaningless, like "*Stand near for mooring*!" which sounds incomplete as if missing an object.

It is interesting to stress that prosodic interference of the Russian language in the area of sound modifications in connected speech has a negative impact mostly on the adequacy of perceiving by ear. The well-known rule of devoicing voiced consonants word-finally in the Russian speaking is applied by inexperienced Russian-speaking cadets to the English discourse that can lead to serious distortions of meaning in professional communication. For example, the sentence "*There's been an explosion in* ***hold*** *number four!"* can be understood as meaningless due to the devoicing of [d] in "*hold*" and the absence of differentiation between [ou] and [o:]

in the same word, as a result of which an interlocutor can hear "*halt*" (stop) instead of "*hold*". The experiment has also shown that not knowing the rule of elision, Russian-speaking undergraduates can mistake "*Stand there*!" for "*Stan there*!" (Stan as a male name) due to the prosodic interference which affects in this situation the process of listening.

The second essential element of the English prosodic system which is interfered by the Russian prosodic system in Russian seafarers professional communication is rhythm understood in this work and for teaching purposes as stress timing (Underhill, 2005). Stress timing as a tendency for stressed syllables together with preceding or following unstressed ones to occur at approximately equal intervals of time does not exist in the Russian prosody. Therefore, it requires special effort from Russian learners to master this feature. On the surface, it does not seem obvious that this typical element of the English prosody performs a relevant communicative function like sound modifications in fluent connected speech. Although it, certainly, creates a foreign prosodic accent, its absence does not lead to mistakes in communication. However, the experiment has shown that the prosodic interference of the Russian prosody reveals in this area either as the absence of distinction between notional (content) words and functional (grammar) words or as the wrong placing of the boundary between stress groups. The former error leads to eliminating distinction between neutral and emphatic structures, for instance, in the fragment of dialogue below "*has failed*" pronounced by the Russian speaker in two stress groups "*'has |'failed*" with the stressed *"has"*, is understood as the speaker's insistence on the pump failure, which is not implied in the situation.

- *Have you spoken to the engine room yet?*
- *Yes, Sir*
- *It seems the starboard pump* ***has | failed.*** *The jacket water temperature is very high.*

The wrong disposition of the boundary between stress groups due to the influence of the prosodic interference illustrated below can even cause a communication failure.
"I started the stand-|by pump manually."
The preposition *"by"* joining the following noun "*pump*" signals that this word combination performs the function of adverbial modifier of manner, i.e. it denotes a way of starting the stand. The sentence pronounced like this means that the speaker started some stand with the help of a pump, while in the real situation it should be timed as follows "*I started |the stand-by pump| manually.",* which means that "stand-by" is a type of a pump.

The third prosodic element which undergoes the impact of prosodic interference in our experiment is intonation or speech melody that is regarded in this work as pitch patterns of the voice which serves to distinguish syntactic structures, attitudes, informative structure of the discourse and links between utterances.

It is necessary to take into consideration essential differences in Russian and English pitch patterns. According to some Russian scholars (Bunina, 2004; Fomichenko, 2013), national specificity of modal and emotional relations manifests itself in the prosodic organization of speech in different languages. The British, considered to be traditionally reserved, are distinguished by a diverse range of pitch varieties in speech. Russians are traditionally characterized as tending to express emotions freely. This feature of their national mentality according to Fomichenko (2013) is expressed in the predominance of dynamic and temporal prosodic parameters in speech over tonal ones. The tonal modifications, presumably, play a secondary role in the prosodic system of the Russian language.

The perceptive analysis has revealed that first-year Russian speaking cadets do not always distinguish communicatively significant information typical of English speech, focusing on other information centers. Incorrect distribution of energy on the key semantic segments of the phrase and insufficient knowledge of the English prosodic system lead to pitch inconsistencies between the use of the tone and the location of the semantic center in the phrase.

The conducted experiment and the analysis of its results enables us to construct a model of the Russian language intonation interference in the English speech in situations of professional communication at sea. This model includes tonal, temporal and dynamic characteristics (table 1).

Table 1
Model of Russian intonation interference

Tonal interfered elements	Temporal interfered elements	Dynamic interfered elements
general monotony of speech melody the uniformity of tonal characteristics on pre-nuclear and nuclear parts of semantic centers; the use of low fall or low rise in the nuclear segment; rise on the nuclear syllable of the non-final nuclei in the middle register of the narrow range; narrowed tonal range of the terminal zone; incomplete fall of the narrow or middle range in the nuclear segment in final semantic centers; reduction of nuclear components of semantic centers; tonal variations on functional parts of speech	increased duration of stressed short vowels; slower speech tempo due to ignoring reduction of functional words and hesitation pauses; dislocation of numerous hesitation pauses that disrupt stress timing	dynamic highlighting of pre-nuclear components of semantic centers; dynamic highlighting of functional words in the initial position of the intonation group; absence of secondary stress in polysyllabic English words. absence of bright dynamic contrasts

It is essential to note that pitch pattern interference turned out to be the most significant in the prosodic space of maritime English since it always results in communication errors such as the violation of the topic-comment structure of the sentence and discourse, deviations from the intended attitude or communicative type of the syntactic structure. For example, the straightforward statements *"We have checked all the /tanks. There's a rupture in /cargo tank."* pronounced monotonously with a level, sometimes rising tone of a very narrow range as a result of the Russian language prosodic accent can be perceived by the interlocutor as questions. In addition, due to the Russian prosodic interference, Russian learners of maritime English at the beginning of the course cannot differentiate between proclaiming tones (Fall and Rise-Fall) and referring tones (Rise and Fall-Rise). They subconsciously build English speech into the Russian prosodic system levelling English pitch configuration and narrowing English pitch

range. This effect is also achieved thanks to reducing the contrast in length and loudness between stressed and unstressed syllables.

Tools of eliminating prosodic interference

The results of the experiment conducted among first-year students revealed the problem areas and enabled working out a system of exercises capable of eliminating the consequences of prosodic interference of the native language determined by a number of cognitions. This system can be used as a means of improving cadets' communication skills both as listeners and speakers, and bring them closer to the quality of "comfortable intelligibility" [5]. The concept of "comfortable intelligibility" implies an ability to understand and to be understood when speaking in a foreign language on professional matters without undue effort, which corresponds to careful colloquial speech.

The teaching mechanism aimed at eliminating prosodic interference described in this paper consists of two phases; the receptive and productive ones. The work should be started with the listening phase. This receptive type of activity enables cadets to recognize prosodic features by ear. In this way, they gain knowledge of the English prosodic system and improved awareness of how prosodic features are related to British speaking culture and mentality. A maritime English learner listening menu at the first stage contains a wide selection of authentic texts of the total length of 120 minutes pronounced by native English speakers selected from free learning English resources such as BBC learning English site in the form of both monologue and dialogue. At the second stage, learners are offered to listen to authentic samples of professional maritime communication of the same length selected from Videotel and Marlins training resources.

At both stages, cadets are asked to write the transcript of the text in alphabetic spelling before listening and read the transcribed version. After that, they listen to the recording and compare their transcripts with what they actually hear, guided to identify cases of sound modifications. This inductive approach enables learners guided by teachers to make up a list of typical connected speech sounds modifications. Adult learners cannot skip this phase of analyzing and synthesizing distinctive features of fluent connected speech as they have a formed model of the native language prosodic system in their language consciousness. The next step of the receptive phase includes developing learners' rhythm (stress timing) awareness. At first, they listen to a sample of an authentic text and are offered to read it aloud straight after it is finished. They are offered to identify the difference in the number of prominences in order to attract their attention to their regularity. The next step involves a teacher's reproducing the same text fragment exaggerating the stress timing a little. Then students try shadowing the instructor's stress-timed speech lagging behind by one notional word at most, which is followed by the task to merge their speech with the instructor's, attempting to imitate the rhythmical patterns of the text. A curious approach also involves students' attempt to retell the text in Russian but within the framework of English stress timing. It works successfully since this prosodic discrepancy is revealed most brightly in this case. Finally, cadets record their reading and analyze their progress.

The same procedure is used for working out students' intonation competence. The observation step is followed by the analysis step when cadets mark relevant pitch movement in nuclear centres within intonation groups. The shadowing step is followed by parallel speaking and an attempt to impose English tonal contour on the Russian text of the same content. Then comes a rehearsing step when students try to reproduce all prosodic features of connected speech in

juxtaposition. The final step includes recording students' attempts to imitate English speech and reflecting on their progress.

The third stage in the teaching mechanism presupposes a productive activity or modelling and acting out situations of professional communication at sea where learners can use maritime English rather than quoting it, being aware of the English prosodic system laws. It is important that this activity should be a holistic experience combining all prosodic features of fluent connected speech such as sound modifications, stress timing and speech melody. It should be based on learners' awareness of the prosodic requirements instead of an imitation mechanism since only such an approach can result in eliminating prosodic interference. Cadets are offered concrete situations within the range of such navigators' professional activities as entering or leaving a port, communication on the bridge, areas of navigational risks such as passing through narrows, shallow waters, mooring, towing, bunkering, berthing operations, etc. They first think over the ways of achieving their communicative goals by means of vocabulary and grammar resources, and then they rehearse speaking in groups several times. By the end of the rehearsing phase, they start concentrating not only on what is said, but also, on how it is said. Finally, they dramatize the situations to the whole group while listeners are to note down any signs of the Russian prosodic interference. In this way, cadets obtain an opportunity to give feedback on the presence of prosodically interfered features or their absence, which also reveals their improved prosodic awareness.

The practical application of the prosodic interference elimination mechanism described above has proved its efficiency in the classroom and self-training process at Admiral Ushakov Maritime State University.

Conclusion

By way of conclusion, it is necessary to stress that the nature of prosodic interference is determined by such cognitions as national mentality, encyclopedic knowledge and linguistic knowledge. This fact indicates that prosody can be approached through cognitive intervention, though only partly, as, according to many scholars, prosodic elements are controlled by a different part of the brain, which linguistically means subconsciously to some extent (Underhill, 2005; Wharton, 2012).

Learners' unawareness of cultural and prosodic differences lead to their inability to hear the discrepancies and to reproduce them in their speech when communicating also professionally. It is displayed in violations the prosodic norms of the English speech such as the rules of combining words in connected speech, functioning of rhythmic units in the form of stress timing, intonation groups and phrases in the text, the lack of necessary pauses between phrases, the inability to divide a phrase into semantically relevant chunks.

If the prosodic skill of the foreign language being studied is not purposely developed in learners, the prosodic design is built fully subconsciously, relying on the already formed prosodic model of the native language. That is why functional (grammar) words, which are usually not emphasized in English by stress and are not marked by pitch variations, are the most vulnerable interfered segments in maritime English spoken by Russian learners. The perceptive analysis demonstrates prosodic contrasts between semantic centers and pre-nuclear as well as post-nuclear parts of the intonation groups are not distinct, which prevents the adequate information exchange in the process of professional communication.

The prosodic interference elimination mechanism used in training navigators at Admiral Ushakov Maritime State University includes three phases. The two initial stages are of the receptive nature. They are aimed at providing cadets with awareness of the prosodic specificity of the English speech conditioned by the specificity of the British mentality and culture of speech. The third most important productive stage encourages cadets to apply their knowledge of the prosodic system by practicing quasi-real situations of professional communication. There is a transition step between the receptive and productive stages that implies modelling and rehearsing professionally-oriented dialogues.

We hope the results of this study can be of interest to researchers into methods of teaching as well as those who deal with issues of intonology. However, they are of more topicality to practicing maritime English instructors.

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"What's wrong with these folks?" Developing intercultural competency as the key to "merge" different world views

Carmen Chirea-Ungureanu
Associate Professor, *Constanta Maritime University, Constanta, Romania*,
carmen_chirea@hotmail.com

Abstract: The main problem of working in multilingual crew onboard ships is that it is a double-edged sword. While it can boost the number of ideas achieved due to various perspectives coming together to solve a problem, it can also lead to higher levels of conflict other than what may be in conventional crews. If crew members are unable to set aside their differences and communicate effectively, that generates mutual understanding, the solution of bringing together all the most excellent minds in the world will not have the ability to solve that problem. When seafarers with a single cultural perspective on the world happen to come together, they will quickly finish asking themselves: *"What's wrong with these folks?*" When seafarers with intercultural competence come together something surprising happens. The multilingual crew members can help each other to talk about their perceptions. They have the power to present to each other their new ways of thinking. They can work together to solve problems in ways that they have never tried before. *Ultimately, they can "merge" their different worldviews into a "commonly accepted" way of thinking beyond the constraints of everyone's cultural custom.* This paper tries to identify the reasons for developing the ability of seafarers to shift their mindset from national to international, redefining which group they belong to, saying: *I am an international seafar*er **vs.** *I am a Romanian/Finnish/Swedish/Filipino/Indian/….. seafarer.*

Keywords: multilingual crews, effective communication, cultural background, intercultural competency

Introduction

People *differ* from each other. The way they differ is less clear and is the subject of the study of individual differences. The related question is that of *similarity* because people differ in their similarities to each other as well. Questions about specific groups connected by culture, age, ethnicity, or sex are similar to questions of individual differences. Research in "*Individual Differences"* addresses three broad questions: 1) developing an adequate descriptive taxonomy of how people differ; 2) applying differences in one situation to predict differences in other situations; and 3) testing theoretical explanations of the structure and dynamics of individual differences. *Taxonomic work* has focused on categorizing the infinite ways in which individuals differ in terms of a limited number of latent or unobservable constructs, such as the case of differences in vocabulary in English language (see *Classical Test Theory (CTT*) and *The Pearson Product Moment Correlation Coefficient*) (Kazdin, n.d.)

Although the term *personality* refers to all aspects of a *person's individuality*, typical usage divides the field into studies of *ability* and *personality*. Tests of ability represent the maximal

performance measures. *Ability* is the best one can do on a specific measure in a limited time (the speed test) or unlimited time (the power test). *Personality* measures are estimates of average performance and typically include reports of preferences and estimates of what one usually does and how one perceives oneself and is perceived by others. Individual differences are significant only to the extent that they make a difference (Brody & Ehrlichman, 1997)

Hence…what makes you different?

It is *personality*, which makes us different from each other. Personality is our unique individuality. It includes how we think, feel and act differently in the same given situation. Our thought process, problem-solving capacity, the way of expressing emotion, behaviour, attitude, each of them generally varies from person to person.

I like to think of a Japanese proverb, because it makes some sense to all these: "*You have three faces. The first face, you show to the world. The second face, you show to your close friends, and your family. The third face, you never show anyone. It is the truest reflection of who you are*".

All the time we try to satisfy some needs of our life: *Survival, Attention, Acceptance, Entertainment, Power*. That is why some people pretend around their boss because they need the job in order to survive. Some people pretend around their peers because they need acceptance. Some people pretend around their parents because they need approval. Some people pretend around other people because they are trying to get attention. Some people might pretend around anyone because they want a certain need to be met etc. For sure, we all play different roles according to our environment …Why am I saying this? We are humans, so we are social beings, and our connections are based on interests and a common ground. Essentially for a group of people to like each other they must water down their personality and interests in order to function in that group.

Measuring our cultural competency

Cultural competency describes our ability to interact with people from different cultures and social and economic backgrounds. It measures our ability to effectively work with people who do not share our native language, who celebrate different holidays than we do, who may not share the same beliefs, principles, or lifestyle as we are doing. Nowadays, at the workplace, being *culturally competent* is critical not only to our success but to the success of our organization, as well.

All the definitions of *culture* affect the workplace. Mainly, in the workplace, we blend the cultures of every individual and group to form the organization's culture – and even the teams within this organization. How the individuals and their cultures blend and come together will determine the *culture of the workplace*. The culture of the workplace will affect our success, as well as everyone else in our organization.

In the English language, there are many definitions for the word *culture*, but *culture* might have just one meaning at the workplace. We may refer to the Muslim culture, the Mexican culture, etc., due to the gradual blending of native culture. Cultural *competence* is not something we can learn by working in class and taking a test. More than this, like most diversity issues in the workplace, *cultural competence* requires that we examine our thoughts and feelings and then develop the cross-cultural skills needed to excel in our career and within our organization.

Several research works identify four components to *cultural competency*. These four components are **awareness, attitude, knowledge,** and **skills.**

In short:
Awareness is our reaction to people who are different from what we are. If someone sees persons from Syria and automatically wonders if they are illegal immigrants, then that is his/her reaction to that group of people. People must be aware of how they react. If needed, they can change their thoughts and reactions to create a more positive culture in their workplace.

Attitude examines any cultural biases that we have and our own beliefs about cultural differences. An example is believing that Muslims are wrong and Christians are right. This attitude will affect how people work with mates from Islamic cultures.

Knowledge is related to the beliefs and values regarding equality that may affect our behaviors. It is demonstrated that those who hold prejudices display behaviors that reveal their prejudices. However, someone may be unaware they are displaying these behaviors. For example, a captain must entrust the seal of the bonded stores to a crewmember. Rather than choosing the person who used to take care and control them most often, let us say a European, he chooses another crewmember, who is Indian, instead.

Communication is the most critical skill we can have in the workplace since this is the primary way we interact with our colleagues or how crew members belonging to the bridge work together with their mates in the engine room department onboard ship. It includes verbal and non-verbal communication and knowing how these tend to vary from culture to culture. Skills require working on and perfecting our cultural competence.

We must take the time to reflect on our awareness, attitude, and knowledge. We must be honest with our inner self, and we must not feel bad for any biases or prejudices we may harbor. These are human nature features. Prejudices and biases are instilled in us based on our background and experiences. What is essential is acknowledging them so that they can be overcome.

Language versus culture: does language change culture or does culture change language?

There is much exciting research on the interaction between language and culture, and it can often be challenging to tease them apart. Language and culture are intimately related. Language and culture change together. We pass on our culture through our language, and our language guides us to determine our culture. Our culture and our language, to some extent, determine possible changes in both. Frequently, people of one culture think that people of another culture are strange because they do not and cannot conceive the conceivable aspects of their culture with their language.

Language and culture are systems that reinforce each other and exclude something they cannot conceive. After all, their language does not allow them to think of those things because their culture does not contain them. International students frequently have a difficult time learning the language of another culture without living in that culture. To be bilingual in the truest sense of the word requires a learner to be bicultural. *To be, or not to be, that is the question!*[1]

Quality of nationality index. Rank and how

[1] William Shakespeare, *Prince Hamlet*, Act 3, Scene 1

Everybody has nationality in one or more states. States differ significantly: Russia is huge, while Swaziland is tiny; Luxembourg is rich, and Mongolia is less rich. Just like states, nationalities themselves differ too. The fundamental premise of the QNI (Quality of Nationality Index) is that it can compare the relative worth of nationalities — as opposed to, simply, countries. The QNI, therefore, provides a comprehensive ranking of the quality of nationalities worldwide. To ensure a high level of reliability, the creators made a moral choice not to make it a perception-based index. A variety of quantifiable data is used instead to assess the opportunities and limitations that our nationalities impose on us. For that purpose, the QNI measures both the internal value of nationality, related to the quality of life and opportunities for individual development within the home country, and the external value of nationality, which classify the diversity and quality of events that our nationality allows us to seek outside our home country (where the majority of the holders of the nationality have the absolute right to reside) (Brody & Ehrlichman, 1997). The Henley & Partners – Kucherov Quality of Nationality Index (QNI) explained the methodology of what they rank and how by choosing France, Somalia, Sweden, Iraq, New Zealand, Tajikistan, South Africa, and El Salvador:

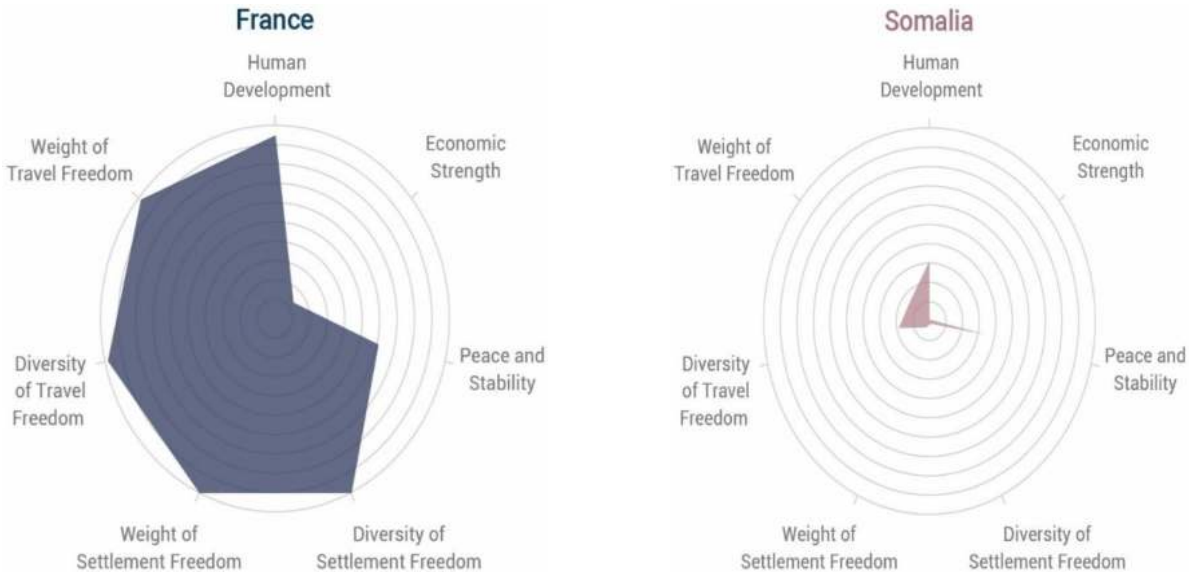

Figure 1: Human development: France and Somalia
Reproduced from Quality of Nationality Index (2018). How does it work? The QNI in a nutshell. https://www.nationalityindex.com/methodology

Internally, the QNI looks at how successful a country is in terms of human development, economic prosperity, and peace and stability. It is better to have the nationality of a country whose citizens have long life expectancy, a good schooling system, and a high level of prosperity — such as France or New Zealand — than that of a country that offers lower levels of security, schooling, and healthcare to its nationals — such as South Sudan or El Salvador.

Figure 2: Human development: Sweden and New Zealand
Reproduced from Quality of Nationality Index. (2018). How does it work? The QNI in a nutshell. https://www.nationalityindex.com/methodology

Updating this index annually will make sure that an up-to-date picture of the quality of world nationalities is readily available at any moment in time, illuminating medium- to long-term trends in nationalities' development.

Figure 3: Internal and External Factors
Reproduced from Quality of Nationality Index. (2018). How does it work? The QNI in a nutshell. https://www.nationalityindex.com/methodology

People differ within any given nation or culture more significantly than differences between groups. Education, social standing, religion, personality, belief structure, experience, affection shown at home, and other factors will influence human behavior and culture.
Are some people *better* than others? You might wonder what kind of a question that is. On the one hand, there is no controversy—some people are more intelligent than others, some are

much more creative, some are stronger or faster, and some are kinder or more virtuous. So, if that is all we are asking, the answer is obvious. In certain respects, and domains, some people are *better* than others. However, if we ask whether some people are just better human beings in general, it becomes much harder to answer the question.

I am an international seafarer! Communication skills and cultural awareness onboard ship

The sea has always been a challenging and hazardous friend to humankind despite its all benefits. The ships today are technologically advanced and highly reliable. But the maritime casualties rate is still high. Why? Because the maritime system is a people system. "*Communication within the maritime industry in general and at sea, in particular, requires a high level of competency and that is axiomatic*" (Brody & Ehrlichman, 1997). Not only communication but cross-culture communication is very important in the shipping industry. "*The safe operation of vessels depends on effective and efficient maritime communication, which requires seafarers to communicate linguistically, cross-culturally, and interpersonally*" (Cole, 2005). The fact that ships' crews are multinational, and multilingual needs no emphasis, but the fact that English language is not the native language of many seafarers needs reiteration. Accident reports frequently cite poor communications as a contributory factor. "*We, therefore, need to actively encourage higher levels of English language competency through effective language education and training, which closely reflects the practical communication skills required by the shipping industry. The key to this being spoken fluency and proficiency in Maritime English through using it in practice* (Eysenck, & Eysenck, 1985).

MET institutions train seafarers and keep pace with the developing technologies but developing onboard cultural and communication skills training can be more fruitful. All stakeholders in the maritime domain must join hands to eliminate accidents occurring due to human factors through comprehensive training by creating joint ventures. Institutions need financial and technical support to keep pace with the advancement in technologies. Seafarers should adhere to quality training. But there is a gap in the training MET institution curriculum and ship technology. Ships are built by the most advanced countries using high techs, like Japan, Korea, Europe, and China, but sometimes the seafarers are from underdeveloped countries. Their technology is rarely transferred to the MET institutions. Syllabi take a lot of time to harmonize with the pace of technology.

Therefore, if crew members are unable to set aside their differences and communicate in an effective way that generates mutual understanding, the solution of bringing together all the most excellent minds in the world simply will not have the ability to solve that problem. When seafarers with a single cultural perspective on the world happen to come together, they will easily finish asking themselves: *"What's wrong with these folks?"* Diverse true stories demonstrate that the problem arises when the crew members lack intercultural competency.
When seafarers with intercultural competence come together something surprising happens. The multilingual crew members can help each other to talk about their perceptions. They have the power to present to each other their new ways of thinking. They can work together to solve problems in ways that they have never tried before. Ultimately, they can "merge" their different worldviews into a "commonly accepted" way of thinking beyond the constraints of everyone's cultural custom.

Conclusion and recommendations

"Life is a team effort. No one gets very far alone" [and] "this planet is a crowded place, and the only way we are going to survive is to learn to get along with one another" (Iaccoca, 2007). Shipping industry is a globalized world. It has an indispensable role in the world trade and economy. There is no doubt that without shipping, the world will freeze and starve. We can imagine the role of shipping in world trade, but ships can only sail with trained seafarers onboard. Connected with other global issues, culture and language barriers foreground another life-sized issue. There are a lot of civilizations, cultures, languages, and dialects in the world. Religions have great influence on individuals and societies. Every individual thinks, and acts in his/her own way and manner. We share the same goal and aim of safer shipping and cleaner oceans, but we cannot fix these without sharing the only way that is to dignify and respect each one's belief, culture, language, and religion. In this context, there are some words often used: *harmonization, unity in diversity, tolerance, understanding*, but they cannot be applied easily for description of life and work on board ship. It is not easy unless we have strong beliefs that a Filipino, Indian or Pakistani seafarer has the same feelings, beliefs and values as the ship-owner or CEO of the shipping company. It is difficult to change one's culture, values, ethics, and beliefs. What we can do from our position as teachers, trainers, or employers is simply making aware of our seafarers about knowing and respecting each other's cultures and values. In short, we can design the way to this '*mutual understanding'*. For years, we have struggled to harmonize and improve upon training standards in the form of STCW, legislation, model courses and instructions by IMO and other related organizations. A lot has been done to improve upon the communication skills and cultural awareness. but still, it is not enough. The seafarers' training is not the sole responsibility of MET institutions. Every stakeholder like IMO, shipping companies, ship-owners, flag states, port authorities, manning agents, and seafarers themselves are responsible. So, shifting of seafarers training responsibility from one shoulder to the other will not serve the purpose. Everyone should equally share this responsibility.

1. IMO needs to embark on a comprehensive model course on "Developing communication skills and cultural awareness onboard ship".
2. *International* Regulation of Education is required to include *Developing communication skills and cultural awareness onboard ship* issues in the curriculum of every MET institution. It should be made part of STCW, introducing a distinct table of competence.
3. It is mandatory for MET institutions to tailor this course according to the requirements of their seafarers.
4. Shipping companies should be involved in the development of this course considering the multilingual crew they employ on board ship.
5. Manning agents should have a pre-sea joining training for the seafarers. They should provide instructions and first-hand information to fresh- joining seafarers about the crew they will work with.

A recent graduate seafarer without any multicultural training, when he/she joins a ship with twenty-five people speaking twelve different languages, he/she will be in a very awkward situation. At this point of time one can realize that either he/she chose the wrong profession, or his/her communication skills and cultural awareness were not addressed properly by the MET institution. Can this be avoided? Maybe, maybe not.

" Now it matters not to waste time but to begin to adapt, update or newly develop the curricula of Maritime English courses, the teaching materials and assessment tools in order to embrace the new or amended requirements set out in the Convention..[…] All this is no easy task but necessary not only to satisfy the new provisions but also to simply benefit our students by

enhancing their safety in the fleets they will serve and the safety of shipping in general" (Trenkner & Cole, 2021).

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DIGITALIZATION AND MET

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Adaptive training with cloud-based simulators in maritime education

Simen Hjellvik https://orcid.org/0000-0002-2338-4698
Assistant Professor & Doctoral Research Fellow & Chief Engineer, *University of South-Eastern Norway, Horten, Norway,* simen.hjellvik@usn.no

Steven Mallam https://orcid.org/0000-0003-1713-2977
Associate Professor, *University of South-Eastern Norway, Horten, Norway,* steven.mallam@usn.no

Abstract: Maritime cloud-based simulation is an emerging technological development that creates a new condition for decentralized interaction where it's content and functionality mirrors traditional on-site-simulator software. This paper uses a quasi-experimental study to examine a training design that is adaptive to the trainee. The training goal is to deliver traditional learning outcomes of comprehension and familiarity with the operation of steering gear systems. The simulator training was administered through novel cloud-based simulator technology to a sample comprising of first year students in nautical sciences (n=12) and marine engineering (n=6) at the college and university level in Norway who had no previous education or operational level experience with steering gear systems in their respective programmes. All participants (N=18) were first subjected to a knowledge acquisition phase of video conference lectures before conducting a simulator training scenario of a standardized pre-departure procedure. Data was collected from 3 sources: (1) a multiple-choice knowledge test, (2) programmed simulator performance indicators, and (3) the Self-Efficacy for Learning and Performance scale. Initial results show that the level of student's self-efficacy predicts the final training performance, and the level of knowledge prior to training is not significant for the outcome.

Keywords: Maritime Education and Training (MET), Simulator Training (ST), Cloud-Based Simulator (CBS), Virtual Reality (VR), Self-Efficacy, Engine Room Simulators (ERS).

Introduction

By provision of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW, 2017), the pedagogical structure of the competence development in professional maritime education and training (MET) incorporates both theory and practice through lecture-based education, simulation-based training, and on-board training. Cloud-based simulators (CBS) expands MET technologies as a potential alternative or supplemental solution to more well-established on-site campus simulators. CBS is a simulator technology that works on similar platforms as E-learning, where the simulator itself is located on a server which a user connects to through the internet. This creates new opportunities and challenges for how and where trainees, instructors and administrators access, interact and engage with the simulators and training content. CBS and decentralized learning removes, reduces or reorganizes the traditional supportive structures found in traditional on-site, in-person classroom and simulator laboratory interactions and collaborations between trainee-instructor and trainee-trainee peers. This emerging format for simulator training requires

differing expectations, skills and motivation from trainees and instructors. The effect of self-efficacy is an individual characteristic that is important for self-regulatory learning and in effect, task performance (Zimmerman, 2008). Self-efficacy can be defined as the trainee's self-perception of their performance during repeated training (Kraiger et al., 1993). With a move towards decentralized learning and CBS solutions, issues related to trainee self-efficacy, motivation and supportive structures during simulator exercises may become important for attaining learning outcomes.

This paper explores a CBS training scenario with substitutes for the loss of supportive structures of the on-site simulator training which traditionally includes a present peer-colloquium and simulator instructors. Maritime simulator developers have been aware of the gap in technology for *"personalized, immersive, mobile and accessible platforms"* (Mallam et al., 2019) and the present development of CBS is an initial response to accommodate these features for optimized on-demand and asynchronous simulator training. An important aspect for asynchronous decentralized training is to provide adequate feedback to trainees throughout their CBS sessions. CBS exercises require programming for automated feedback and correctional instruction, including different levels of supportive structures and thus adapting to the trainee`s level as the task complexity and goal is programmed to be alternatives selected by the trainee. From these concepts the study investigates the research question: *How can CBS adapt to individual training needs?*

To evaluate the sufficiency of the training design and administration, it is hypothesized that the training itself will be the major contribution to the overall task specific learning process.
Hypothesis 1 states: (H_1) *Knowledge prior to training will be significant to the final training performance*.

With the decentralized training delivery designed for this study the trainees themselves decide, based on their confidence, when they are ready to proceed from the training scenario to the test scenario. Hypothesis 2 states: (H_2) *the level of self-efficacy will positively predict the final training performance*.

The outcomes of the study could provide inspiration and preliminary research-based evidence for MET educators when administering decentralized simulator training for novice trainees.

Theory

Learning Outcomes

Lower level of cognitive learning outcomes, including acquiring fundamental declarative knowledge, traditionally precedes training. Establishing a knowledge foundation prior to task-specific simulator training aid to not overwhelm the cognitive capacity of trainees for solving problems (Chernikova et al., 2020). Thus, simulator training develops both knowledge-based outcomes, as task-specific comprehension is necessary for the training, and skill-based outcomes, as technical skills is necessary for performing the task successfully. Declarative knowledge in the knowledge-acquisition phase is often evaluated by memory power tests which probe the accuracy and accessibility of retaining memory of the specific knowledge items, or by recall tests which probe the amount of knowledge acquired (Kraiger et al., 1993). Such knowledge tests, e.g., typical grade exams, should probe beyond reiteration and require application of knowledge to a context.

Skill-based outcomes involve an initial skill-acquisition in which declarative system knowledge is transformed into procedural knowledge as it is repeatedly and adequately applied with a goal orientation (Smith et al., 2019). Proceduralization is the outcome occurring when reproducing trained behaviour beyond the initial stage, and accumulates decomposed steps of the task in less error-prone performance (Kraiger et al., 1993). Just as variance in trainee knowledge is expected to be larger at the initial stage of the knowledge-acquisition phase, variance of trainees performance should converge at the final stage of the skill-acquisition phase and is in training research argued to be an indicator of training effectiveness(Bell et al., 2017).

Self-Efficacy in Learning

Self-efficacy is the perceived performance capability for a task, and by decomposing a task, as steps in a procedure, the training facilitates development of stronger perceptions of self-efficacy concurrent with the capability to perform (Kraiger et al., 1993). Self-efficacy is a skill-based learning outcome that shows numerous positive relations with performance and should be considered when designing training programmes, as greater confidence in one`s task capabilities empower resilience towards challenges when applying knowledge and skills (Bell et al., 2017; Ford et al., 1998; Kraiger et al., 1993). Furthermore, self-efficacy has been shown to be positively correlated with both performance goals and actual performance (Zimmerman, 2008).

In training, feedback is an essential element in the process of performance approximating the goal. It can enhance self-efficacy or have no positive effect at all, depending on the trainee's reception (Hattie & Timperley, 2016). How familiar the material is to the trainee impacts if they accept, modify, or reject feedback, thus the effect of knowledge on performance is contingent on connecting the new information to the trainee`s knowledge foundation (Hattie & Timperley, 2016). Trainees with a low level of preceding knowledge benefit more from guiding instruction than self-regulation and reflection activities in comparison to trainees with higher preceding knowledge (Chernikova et al., 2020). If conceptualized as a unitary variable, the complexity of feedback can be adapted with increments as a response to the training progress with a transformation of the form in which the feedback is structured and administered (Figure 1). The objective of feedback is to eliminate the gap between the current performance and the training goal. In a successful self-regulatory learning process, the feedback loop will be dynamic and involve multiple cycles (Zimmerman, 2008).

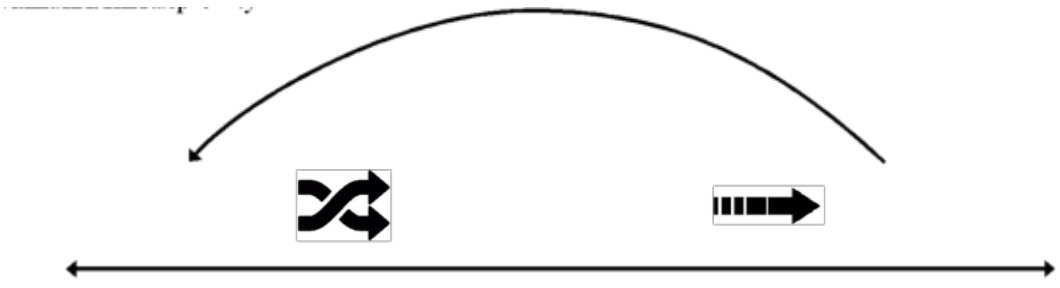

Figure 1. Feedback complexity model based on Hattie and Timperley (2016) and Kulhavy (1977)

Decentralized Training Delivery

Little is known to whom simulations are particularly useful and what supportive instructions are effective for the individual trainee (Chernikova et al., 2020). Thus, devising decentralized

training and learning with a high level of learner control creates both challenges and opportunities. The social supportive structures in the traditional simulator training context, including instructor- and peer- support, will not be present with strictly asynchronous CBS configuration, which in general is a deficit, as learning is somewhat dependent on the environment of and around the training interaction. Decentralized platforms with a synchronous configuration do exist, where the instructor can monitor and communicate with the trainees in real-time. More important than the comparisons between technology effectiveness, research should focus on the pedagogical features and the conditions where technology-based training is likely to be effective (Bell et al., 2017). The opportunities for CBS training subsume generalized theory from training research where the trainee characteristics influencing performance should correspond with the design. Although real-time individual instructor-trainee feedback, i.e., synchronous interaction, is presently unavailable with this CBS platform, the technology allows programming exercises leveraging the theory on feedback, which generically can correspond with the procedure stages and task performance. Simulations that leverage the use of different mental modes and abilities (e.g., reasoning combined with motor skills) gains higher learning than simulations that require the involvement of less skills (Chernikova et al., 2020). Thus, the delivery of training can be adaptive to the trainee's knowledge- and performance level, and practical needs.

Methods

Participants

The sample (*N*=18) were recruited from second semester first-year students enrolled in a Nautical Sciences (*n*=12) and Marine Engineer (*n*=6) programme at university and college levels in Norway. The study was integrated in their respective machinery courses, as the specific learning outcome is relevant for both disciplines. Collecting data was only conducted after written consent according to the approved Norwegian Centre for Research Data notification (no.753508). The average age of the sample was 23,7 years (*SD*=5.39) and their prior maritime work experience was on average 2,9 years (*SD*=3.31).

Cloud-Based Engine Room Simulator

The cloud-based K-Sim Connect platform was used with the K-Sim Engine MAN 6S70ME-C SCC simulator. The simulator is a duplicate of the K-Sim Engine L11ME-SCC on-site desktop simulator model based on a Suez max crude oil carrier. The CBS platform allows simulator access from the individual trainee`s personal computers, requiring only an internet connection to operate, and is not contingent on an active simulator instructor. As such, the trainee is free to access the simulator at all hours from any location. The simulator interface operates on a 2D level (See Figure 2) where the machinery systems are replicated as line diagrams with components which can be manipulated. Components and parameter values in the system change according to the simulator programming or the trainee`s interaction, simulating the real-life system.

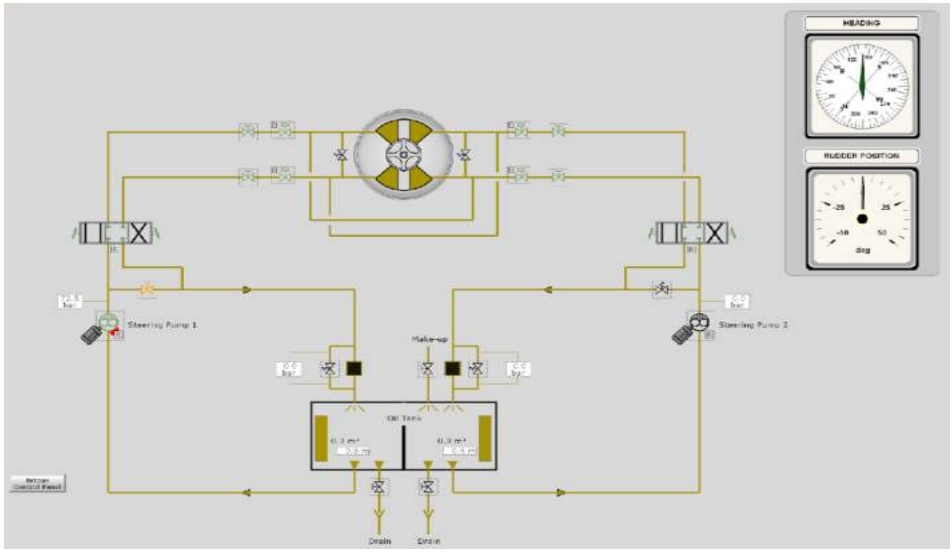

Figure 2. The simulator steering gear systems as presented to the trainee.

Experimental Design and Procedure

The experimental procedure is outlined in Figure 3.

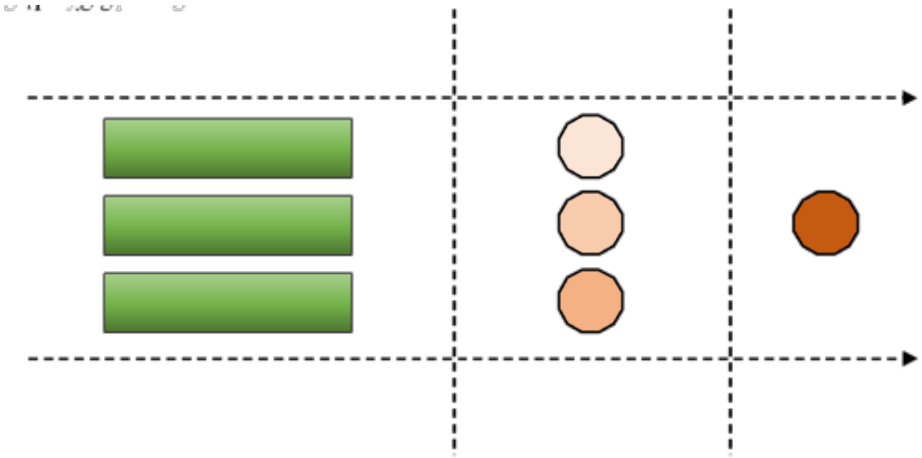

Figure 3: Experiment procedure and data collection

The specific goal of the training was to perform a successful pre-departure procedure with the steering gear system, involving the tasks conducted locally in the steering gear room and remotely from the bridge. After completing the knowledge acquisition phase, the trainees were given access to the CBS and instructed to use the Information and Explore scenario to aggregate their knowledge foundation before performing the procedure in the Training scenario. It was possible for trainees to revisit these during training to improve performance and address any emerging knowledge gaps. No threshold defining a successful performance, nor any other external expectancy was defined for the trainees. The Training scenario was to be repeated until trainees were confident enough to progress to the final Test scenario.

Knowledge Acquisition Phase

To establish a declarative knowledge foundation the trainees were given three lectures:

- Lecture 1 (45 minutes): Focused on the different types and functionalities of steering gear systems through live video conference, provided generic system knowledge.

- Lecture 2 (45 minutes): Focused on the pre-departure procedure in the context of the simulator through live video conference, provided system specific and procedural knowledge.
- Lecture 3 (30 minutes): The instructor conducted the procedure in 3D virtual reality (VR) with audio voiceover lecturing (Figure 4), through a pre-recorded video lecture, providing visuospatial knowledge of the specific system to be trained. In this application the interaction with the simulator used a first-person view, as in most video games and all manipulations of components are animated in the virtual environment. The 3D VR module of the simulator was not available to the trainees through the CBS for practice, only the 2D interfaces as in Figure 2.

Figure 4. The simulator steering gear system as viewed through the 3D VR application.

Skill Acquisition Phase

The K-Sim Neptune Instructor software was used to program the exercise and simulator metrics for data collection. The exercise was programmed for training and assessment purposes to give text responses to the trainee upon manipulation of variables in the simulator. The variable manipulations were comprised to represent independent or stepwise task achievement which was used to represent performance of the instructed task. This metric assessment was accumulated with positively- and negatively- weighted actions which accretes to a final assessment scale that is automatically shared with the trainee upon completion of the exercise. The exercise was programmed with three training levels and one test level as displayed in Figure 5. When starting the exercise, the trainees select the scenario alternative at their own discretion.

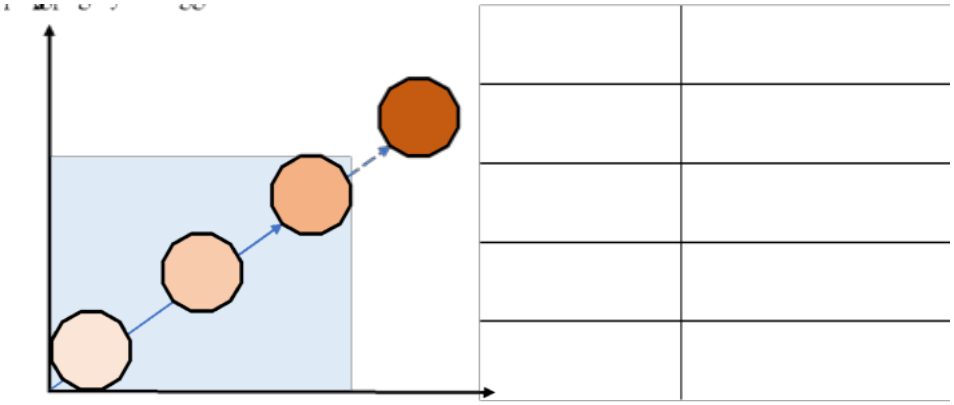

Figure 5. The different complexity level of the exercise

When activating the exercise in the CBS, a popup window appears with the selection of the four complexity levels.

- The *Information* scenario was programmed with descriptive text in popup windows appearing each time a component or system function was activated by the trainee, providing both component information, normal parameter values and functionality in the system.
- The *Explore* scenario was programmed with no information, goals, or support, with the purpose of testing the systems functionality and components interaction in a condition with impunity from error or faults.
- The *Training* scenario, the core of the exercise, was programmed with instruction to perform the pre-departure procedure. A narrative set of popup windows advised trainees on the system status, provided positive feedback upon completion of procedural steps, provided correctional instruction on errors or inadequate parameters, and gave cues and reminders throughout the exercise. Once the exercise was completed and exited correctly, the CBS provided the trainee an assessment with a score of their performance. The goal of the assessment was to motivate repeated practice until (1) a error-free 220-point score was obtained or (2) a score obtained which the trainee was confident in or contempt with, to proceed to the test scenario alternative.
- The *Test* scenario gave trainees instructions to perform the same pre-departure procedure, but without any supportive structures, and provided an assessment with the same 220-piont scale as in the training alternative. For each attempt, the exercise was programmed to record and store simulator metrics and assessment scores. The score from the final training attempt and the test was collected for analysis.

Data Collection and Analysis

Each phase of the procedure resulted in data collected:

- The knowledge test after the knowledge acquisition phase probed important elements from the lectured content by 10 multiple-choice items. The test was only available with one attempt.
- Training scores from the skill-acquisition phase were recorded according to the programmed metrics of the simulation.
- After the Test scenario the trainees inscribed an online 7-point Likert questionnaire with the Self-efficacy for Learning and Performance (SELP) scale of the Motivated Strategies for Self-regulatory Learning Questionnaire (MSLQ) (Duncan et al., 2015). The 8-items of the SELP were calculated to a factor average to capture the level of self-efficacy related to the training. Test scores according to the programmed simulator metrics were recorded.

The quasi-experimental within-group design has no control group. Collected data was analysed in SPSS 26.0.

Results

The paper's research question, *"How can CBS adapt to individual training needs?"*, tested two hypotheses: (H_1) *"knowledge prior to training will be significant to the final training performance"* and (H_2) *"the level of self-efficacy will positively predict the final training performance"*.

The knowledge test resulted in MD=8.670, SD=1.495 in a range up to 10 possible correct responses. The sample (N=18) was not normally distributed as the Shapiro-Wilk resulted in W=0.184 and p=0.002.

The final training scores resulted in MD=163.33, SD=59.606 (out of a possible 220-point score). The sample (N=18) was not normally distributed as the Shapiro-Wilk resulted in W=0.827, p=0.004. The coefficient of variation was CV=0.365.

The Self-Efficacy for Learning and Performance (SLEP) factor score resulted in MD=4.729, SD= 0.966. The sample (N=18) was found to be normally distributed with the Shapiro-Wilk test reporting W=0.924, p=0.152. The dataset was found to have good internal consistency, with a Cronbach's alpha α=0.873.

The test scores resulted in MD=183.611, SD=39.400 (out of a possible 220-point score). The sample (N=18) was not normally distributed as the Shapiro-Wilk resulted in W=0.803, p=0.002. The coefficient of variation was CV=0.214.

Testing the hypothesis H_1 was performed by measuring the correlation between the knowledge test and the final training scores. A Spearman's rho test resulted in r_S=-0.039, p=0.878. This suggests that there is no correlation between the knowledge test and the final training score, and thus rejection of hypothesis 1.

Testing hypothesis H_2 was performed by measuring the correlation between the level of self-efficacy and the final training score. A Spearman's rho resulted in r_S=0.471, p=0.048. This suggests that there is a significant correlation between the level of self-efficacy and the final training score. Second, a linear regression tested the prediction of the final training score based on SELP and found F(1,16)=5.323, p=0.035, r^2=0.250. A univariate analysis of variance was then produced to provide a F-test for heteroskedasticity of the residuals, which found an insignificant relationship F(1,16)=.794, p=.389. Further, distribution of residuals contained no outliers and hold a close to normal distribution according to the PP plot. The regression model suggests a significant prediction, thus acceptance of hypothesis 2.

Discussion

The statistical analysis found no significant correlation between the knowledge test and the final training score, and thus hypothesis 1 was rejected. A similar result was found by Chernikova et al. (2020) which states that prior knowledge is expected to hold a large influence over learning, however the effect of simulation is greater when compared. The two measures capture two different outcome constructs at different stages in the overall process, as by the definition of Kraiger et al. (1993). A measure after a knowledge-acquisition phase, with a

uniform time dissipation and a standardized delivery, will be prone to the influence of trainee characteristics, i.e., individual differences. The declarative knowledge development exceeds through the skill-acquisition phase, i.e., the simulator training, as declarative knowledge is transformed into procedural knowledge. Through the training process, general system knowledge is applied to the specific task and the trainees keep aggregating new comprehension to their knowledge foundation.

Hypothesis 2 was accepted, as self-efficacy was able to predict the training scores. Self-efficacy develops in connection to the training process (Kraiger et al., 1993), as chronologically it exists before the training start and develops during, between and after the repeated training. This empowers the trainee`s development towards better performance as increased self-efficacy provides resilience to the difficulties encountered during training (Ford et al., 1998). As each training scenario attempt gives a metric performance assessment, the perception of one's own capability to perform should be free from false expectancy. The hypothesized relation between self-efficacy and the final training score proved significant, arguing for a contextual development through multiple training attempts. During this skill-acquisition phase, proceduralization of knowledge occurs as knowledge is applied to succeed the task procedure and approximate a satisfying level of goal completion. As there was no extrinsic pressure to train repeatedly or to which level of proficiency was considered sufficient, all performance was at the discretion of the trainee. Chernikova et al. (2020) challenges future research to identify effective types and sequences of scaffolding in simulation-based learning with a focus on trainees at different levels of prior knowledge and experience. Feedback at different levels was utilized to capture the initial engagement of trainees with different levels of prior knowledge, to keep engagement and facilitate development during the training. Hattie and Timperley (2016) states that both providing and receiving feedback requires much skill by the instructor and trainees.

The descriptive data of the final training score and the test score show some interesting trends. At the point of self-evaluating their final training score, the trainees decided to conclude their training and proceed to the test. The mean difference in scores increased from the training scenario to the test scenario. Considering that the training scenario had an automated system feedback and ques throughout the exercise procedure while the test scenario was without any such supportive structures, a logical assumption would be to expect no mean difference or a lower test scenario performance if the trainee was not ready to be assessed. However, the higher training scenario score reveals that there are effects of the training that were not captured by the training scenario measurements, i.e., learning is a process that also occurs beyond the training scenario. Furthermore, the central tendency reduces towards the test scores as evident with the standard deviations. In standardized terms of the coefficient of variation, the standard deviation of the final training scores is 36,5% of its mean and the standard deviation of the test scores is 21,4% of its mean, with a larger mean score than in the former condition. These phenomena argue for the effectiveness of the training, as would be expected in repeated learning- or training processes (Bell et al., 2017). Early proficiency, as with prior knowledge, is thus not a good predictor of the training outcome as a sufficient training design is able to mitigate trainee characteristics that creates individual learning curves (Bell et al., 2017; Kraiger et al., 1993).

Decentralized simulator training, as explored in this paper, offers some effects that on-site simulators may not. Results indicate that CBS is an operable technology for its purpose, although training delivery as designed for this study it is not likely to be a substitution to on-site simulators. The software might be the same between CBS and on-site simulators; however,

the CBS is fundamentally more reliant on objective automated assessment, where in comparison, training with on-site simulators traditionally utilizes more assessment methodologies more prone to subjectivity of the present instructor. The different training delivery conditions should rather be explored in an intertwined design along with lecture-based learning, to exploit beneficial effects from all conditions of learning, and thus find the balance between objective and subjective evaluation as requested by the STCW (2017). The training condition of this study addresses a relatively simple procedural task with a training design that leverages feedback at different levels and task complexity at different levels. Although tailored to the specific task while operationalized, this approach can be applied to a variety of scenarios in MET.

Considering the programming of exercises to a varied target population it is recommended to create simple and decomposed tasks rather than more encompassing scenarios for a uniform population with high prior knowledge, at least when working with comparatively novice students. To implement asynchronous CBS training as applied in this study, CBS training should be organized as a supplement to the traditional on-site simulator training or lecture programme, as an individual repetitive session over an adequate period. To retain control over how the automated feedback is received and thus the effect of it, the training programme can be designed with one or more synchronous sessions, either individually or collectively, also providing direct feedback at the correct level according to Hattie and Timperley (2016). An individual synchronous session would imply the instructor and trainee to interact through live video conference while the trainee is casting the simulator, preferably at a point of stagnation in the training progress. A collective synchronous session would require an instructor to interact real-time with a group of multimedia-distributed trainees, while casting the simulator and lecturing during the task prosecution.

Limitations

The sample (N=18) were recruited with different programme and institutional affiliations in nautical sciences at college level (n=11), nautical sciences at university level (n=1), marine engineering at college level (n=1), and marine engineering at university level (n=5). A larger sample would allow group discrimination for between-group comparisons and better generalization to other populations, e.g., other cohorts.

The sample size raises some statistical concern where the robustness of the tests used, and the resulting effect sizes need to be addressed. The effect of the regression model categorizes as large, which should be favourable of a fit model considering the sample size, although the sample is small in absolute terms (Field, 2009) there is no clear violation of the assumptions for a regression model. Sample size also influences the accuracy of correlations, where simulations have proposed substantially larger samples before confidence in the estimate is established (Schönbrodt & Perugini, 2013). The sample size and the effect sizes give the H2 correlation and regression a 1-β power of .657 and .633, respectively, according to G*Power. This probability of falsely rejecting the null hypothesis mainly derives from the sample size. Similarly, the external validity of this paper's result may be low due to the sample size, however Hackshaw (2008) notes that small samples should be sufficient in hypothesis-generating studies if statistical power is attained. The Norwegian Universities and Colleges Admission Service (2020) can inform that a total of 588 students who started the first semester in these aforementioned education programmes in 2020. The actual number of active students at the second semester is not controlled for dropout at the time of the study, but the Database for Statistics on Higher Education (2020) indicates a 9,2% dropout across all maritime studies

between these semesters for this cohort. If the sample can represent any population is an issue of judgement, where this study's sample is a 3,4% extraction of the full national cohort.
The knowledge test could have been expanded with more items to constitute two merged scales, one addressing the content of the lectures and one addressing the procedure. Such an instrument could have been administered pre- and post-treatment to capture the change in declarative knowledge. The self-efficacy instrument could also have been administered early in the training to capture false expectancy and the consolidation of self-perception through the training. These two propositions would provide additional measures that could further describe training effectiveness and the individually adaptive features of the training design.

Conclusion

This paper investigates whether Cloud-Based Simulators can adapt to individual training and offers some reflective inspiration for the MET educator. It is apparent that individually adaptive training is possible with current CBS technology, yet it remains to the MET community to establish what approaches to take. A research-based approach will facilitate application of CBS that leverages constructs deemed as positive to the learning process, such as self-efficacy. The preliminary research-based evidence of this paper could provide MET educators inspiration for initiating decentralized simulator training for novice trainees; however, a larger confirmatory study is necessary to be able to generalize results. Future contributions from the authors of this paper will explore the positive effects of CBS and to whom these effects apply.

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Abooks and the AIM project

Magne V. Aarset
TERP and Norwegian University of Science and Technology, NO-Aalesund, Norway, maa@terp.no

Leiv Kåre Johannessen
TERP, Norway

Michael Esplago
TERP, Norway

Abstract: During the last decades, learning has once again become a key topic. However, this time, not only for students and professors but also in political and economic contexts. One reason for this is that a high level of education and skills of nations, organizations, and individuals are considered both necessary and crucially competitive advantages in the present knowledge society and the globalized market. Therefore, obtaining a quality education is fundamental for all of us in today's competitive business world. In particular, adult learning within the maritime sector has been important for the success of this industry for ages. The question now is how to streamline and facilitate the learning process for the learners, the lecturers, the authors, and the learning institutions. TERP has taken on the challenge of improving this learning process by introducing Abooks, electronic textbooks based on principles of *pedagogy* (the science of learning), and *andragogy* (the science of learning focusing on adults) that adapt to the learner through artificial intelligence. Abooks also introduces the opportunity of utilizing immersive techniques. This is being developed in the AIM project; *Adapting to the Individual through Machine learning*, a research project led by the research department in TERP in collaboration with the University of Stavanger and the Norwegian Computing Center.

Introduction

Since the 1980s, the focus in education has moved from *teaching* to *learning*. This is based upon an understanding of learning as a more active process for the learner than the more passive attitude that may be associated with teaching. Teaching was supposed to be actively performed by the teacher, while the learner passively absorbed knowledge. However, this is not how we see high-quality learning today. We realize that high-quality learning can only occur with an active learner where both competence and commitment are essential.

Modeling the learning process

Learning is a complex matter, though, and there is in fact no generally accepted definition of the concept. Here, we are thinking of learning as *a process that leads to a permanent capacity to change, not solely due to biological maturation or aging*.

We believe this learning process implies the integration of two very different processes which both must be actively involved if any learning is to take place (Illeris, 2009);

- an *external interaction process* between the learner and the environment
- an *internal psychological process* of acquisition and elaboration.

Furthermore, this *internal psychological process* is a process of integrated interplay between the two psychological dimensions (Thompson & Aarset, 2012);

- *the competence dimension,* which concerns both the learner's prior competence (understanding, knowledge, skills, etc.) and the learner's ability to learn
- *the commitment dimension,* which provides and directs the mental energy that is necessary for the learning process to take place (motivation, volition, emotions, etc.).

The incentives are influenced by the content and may either be;

- *internal,* e.g., desire or interest
- *external,* e.g., necessity or compulsion.

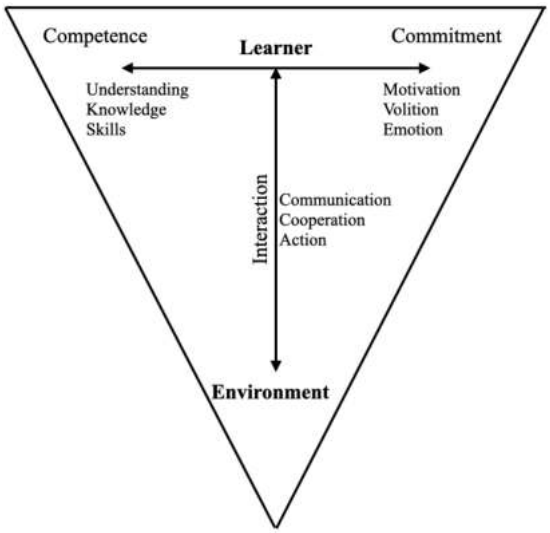

Figure 1. An illustration of the three dimensions of learning (inspired by Illeris, 2009).

How such a learning process is carried out for each individual learner varies, of course. Our goal in the AIM project is to facilitate and improve this learning process by identifying "matches" in the person and the environment concepts and utilizing this knowledge to adapt the available learning resources to the learner. We need to "observe", characterize, evaluate, and adapt to the actual learning process autonomously for each learner.

To do this autonomously, we need to model the learning process in the language of mathematics and statistics. Let us introduce the notion
X = Learning resources
Y = Learning outcome.

We need to identify a mathematical/statistical model for how the learning resources we provide will influence the learning outcome. This may be illustrated in conceptual diagrams, as illustrated in figure 2 (Mulaik, 2009).

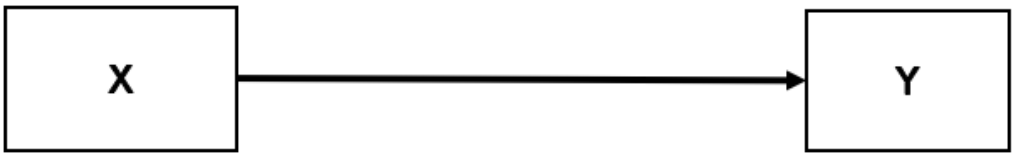

Figure 2. A simple conceptual diagram.

To get closer to a realistic model of the learning process, we need to introduce so-called *mediator variables* (Hayes, 2018). Besides the direct effect an antecedent variable X may have on a consequent variable Y, the variation in X also causes variation in one or more mediators M1, which, in turn, also causes variation in Y, as illustrated in figure 3. Here, a typical example of a mediator is motivation. The available learning resources are directly influencing the learning outcome. Still, they are also influencing the learner's motivation and are thereby also influencing the learning outcome indirectly.

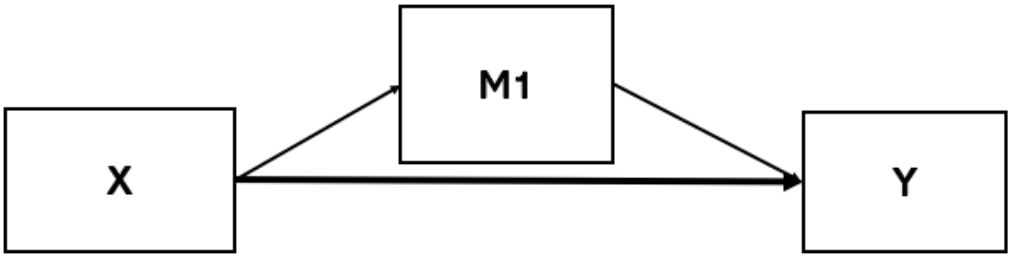

Figure 3. Introduction of a mediator variable in a conceptual diagram.

Furthermore, we need to introduce the concept of *moderator variables* (Hayes, 2018). The association between two variables X and Y is said to be moderated when the effect of an antecedent variable X on a consequent variable Y depends on a third variable (or set of variables) M2. A typical example of a moderator here is competence. We now assume that how the available learning resources influence the learning outcome depends on the learner's level of competence and ability to acquire knowledge.

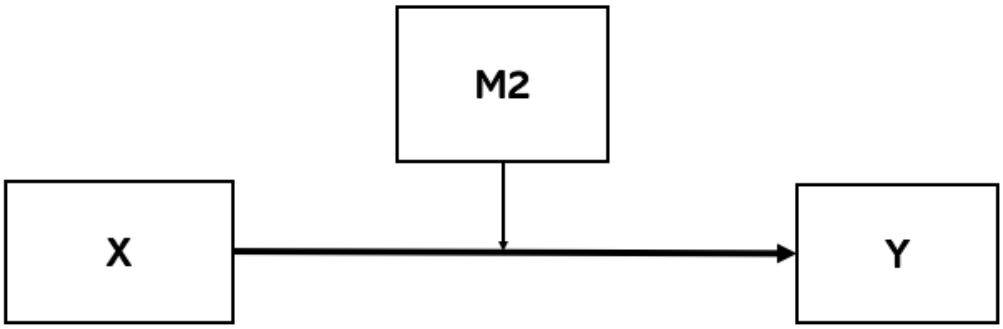

Figure 4. Introduction of a mediator variable in a conceptual diagram.

Now, we are able to identify a conceptual diagram, as presented in figure 5 below, that illustrates the main points in a learning process. A mathematical/statistical model of the learning process may directly be produced from this conceptual diagram, making it possible to characterize, evaluate, and adapt to the individual learner autonomously.

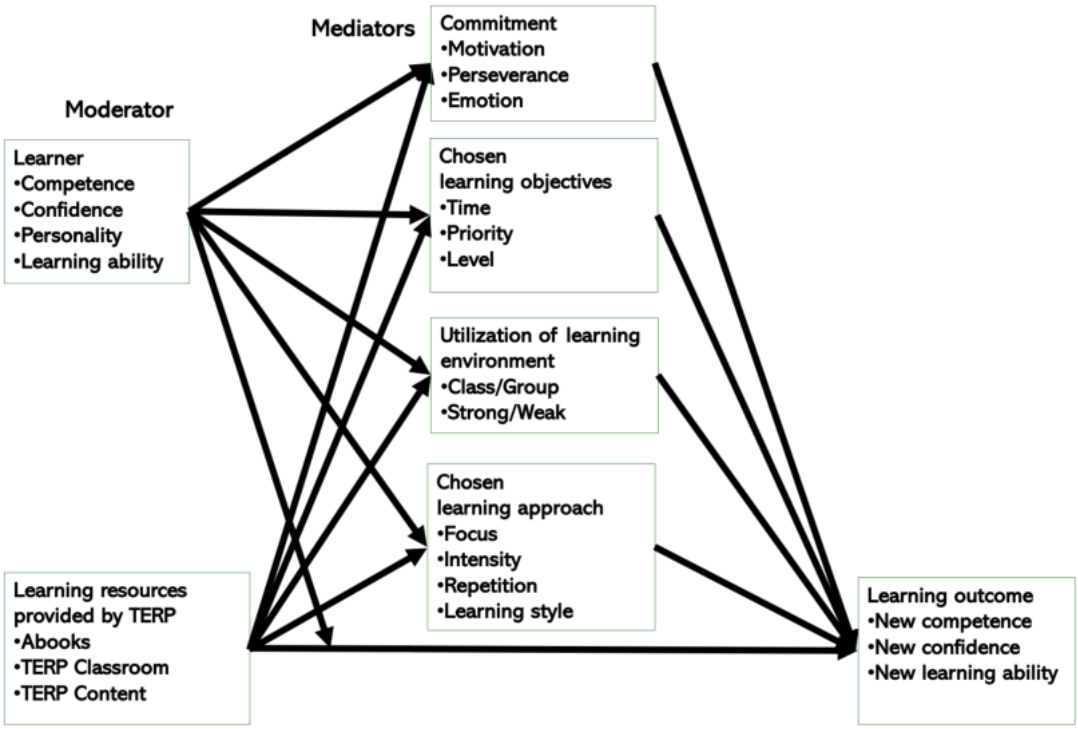

Figure 5. The learning process illustrated in a conceptual diagram.

Input to this model will partly be provided by observing learner activity. In the AIM project, individual learner activity is modeled as a discrete stochastic process where the different states of the stochastic process are defined in accordance with the available learning resources. This may be illustrated as in figure 6.

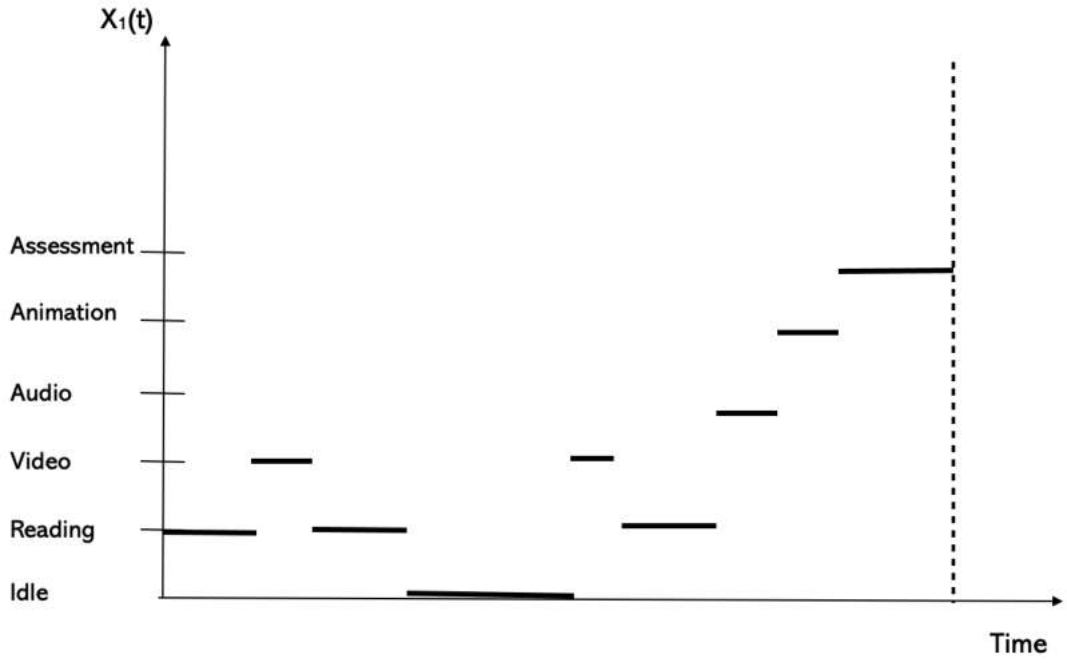

Figure 6. The learning process as a realization of a discrete stochastic process.

Utilizing artificial intelligence (AI) techniques will make it possible to acquire information "hidden" in the realizations of these stochastic processes. Machine learning techniques are utilized in the AIM project to group learners into clusters requiring similar adapted support in the learning process. This information provides input to an autonomous decision support

system which in turn may provide input both to the learners, the teachers, the authors, and the educational institutions. Is it, for example, possible to identify vulnerable students who are prone to drop out or fail their courses if not an early intervention approach is initiated to mitigate their risk of failure?

Utilizing artificial intelligence

With the scientific advancements of big data and artificial intelligence, decision-makers are increasingly relying on machine learning to support decision making (e.g., Evermann, Rehse & Fettke, 2017, Bustince et al., 2013). During this development, cluster analysis, the art of finding groups in data, has reached new popularity as a technique within unsupervised learning.

As illustrated above; before any meaningful computation can be performed as part of unsupervised learning with respect to the learning process, human intervention is called for in the following four steps;

1. selection of attributes to characterize the objects (the learners)
2. selection of metrics to quantify the selected attributes
3. selection of dissimilarity to measure the distance between objects, objects and clusters, and between clusters
4. selection of algorithm to create the clusters.

The actual choice made in each of these steps will influence the final classification and thereby the reliability and validity of any decision support system. In many applied analyses, however, surprisingly little attention has been put on steps 1 - 3. As stated in Aarset et al. (2021), this should come as no surprise because of all the heuristics coming into action with respect to human attention and perception.

Kaufman and Rousseeuw (1990) illustrated this in a famous example when they characterized four persons by their attributes, height and age, as presented in Table 1.

Table 1. Four persons characterized by their height and age.

Age	**Height in cm**
35	190
35	160
40	190
40	160

As illustrated in Figure 7, measuring the height in centimeters would typically produce two clusters consisting of "the guys" and "the girls". Measuring the height in feet, typically would produce the clusters "the young couple" and "the old couple", while standardizing both variables would suggest no clusters at all.

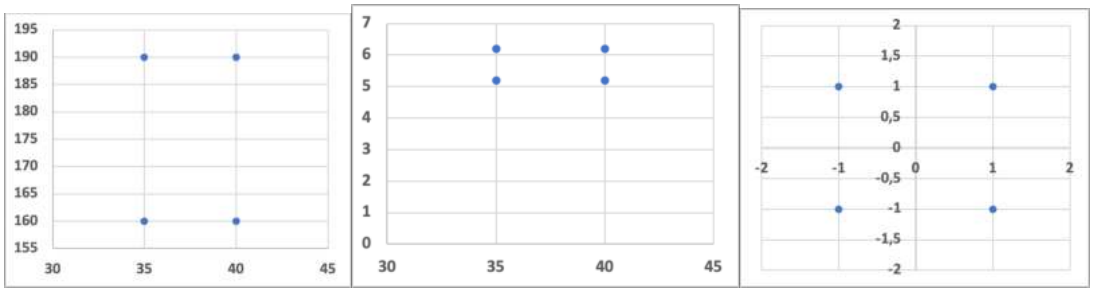

Figure 7. Measuring characteristics of objects by different metrics may produce different clusters.

There are plenty of possible pitfalls while introducing an autonomous decision support system for analyzing a learning process. No such system will have complete information, which on the other hand, neither any learner nor teacher will have. All experience with human behavior tells us that it is not at all clear that a learner (nor a teacher) necessarily will follow advice they don't understand. Therefore, to be successful, we believe such a decision support system will need to be based on what has been named XAI (*Explainable Artificial Intelligence*) in contrast to AI (*Artificial Intelligence*).

Explainable AI is artificial intelligence where the feedback from the autonomous system can be understood and meaningfully be evaluated by humans. It contrasts to the concept of the "black box" principle, where even the system designers cannot explain why an AI algorithm arrives at a specific result. In the AIM project, we believe we need to present results in a «white box» setting where the XAI algorithms are following the principles of

- *transparency*, i.e., presenting which data and procedures the calculations are based upon in an understandable way to the user
- *interpretability*, i.e., presenting the underlying basis for the analysis in an understandable way to the user
- *explainability*, i.e., presenting the underlying basis for how decisions are made in an understandable way to the user.

There is so far no generally accepted definition of these concepts in the scientific literature.

Introducing learning resources

To provide the learning resources both to the learners, the teachers, the authors, and the educational institutions, TERP has developed and is developing further, four apps. They are;

- **Abooks**, which gives learners access to the abooks, including assessments, and provides guidance to optimize learning
- **TERP Classroom**, where knowledge gaps are identified and where teachers and learners are allowed to interact
- **TERP Content,** where it is possible for both learners and teachers to become content developers and create new or update and improve already existing learning material into abooks and assessments
- **TERP Analytics,** where dashboards are provided to the educational institution for monitoring of the ongoing learning processes.

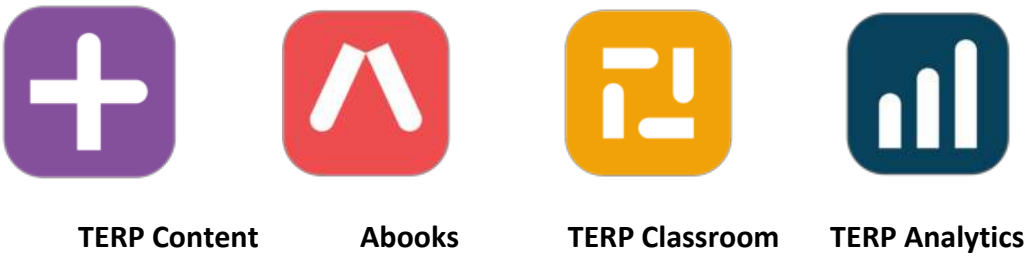

Figure 8. TERP's four interactive apps.

Combined, these apps provide a tool for improving the learning process. The focus is both on the individual learners, the teachers, the authors, the educational institutions, and the (sometimes almost forgotten) important interaction between them. Furthermore, there is no need to leave these apps and log into any other e-learning facility. All features are available here. The Abooks themselves are easy to update, which also makes them environmentally friendly.

Conclusion

When the learners use Abooks and the other learning resources, data on the individual learner from e.g. the realization of the stochastic process in Figure 6 will be registered and the learner classified based on the results from a cluster analysis. The characteristics of this cluster will give input to the learning process illustrated in Figure 5 and a gap analysis will be conducted to identify the difference in performance between what is expected based on the model and actual performance. Then, the learner will receive feedback in the form of a "nudge" based on generic results from andragogy and experience from gaming, and the teacher and the educational institution receive information as decision support for the upcoming activities.

By the introduction of Abooks and the other learning resources available through the apps mentioned above, we hope the results from the AIM research project will provide future learners with both

- new competence
- new confidence reflecting their own abilities
- new ability to learn and acquire knowledge.

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Engineering routine remedial work in manned machinery spaces ship – challenge for maritime autonomous surface ships

Emi Yutaka
Professor, Chief Engineer, *Japan Agency of Maritime Education and Training for Seafarers, Yokohama, Japan*, emi-y5t4@jmets.ac.jp
Nakajima Atsuki
Onboard Instructor, Second Engineer *Japan Agency of Maritime Education and Training for Seafarers, Yokohama, Japan*, nakajima-a0c5@jmets.ac.jp

Abstract: In 1987, the Japanese government launched the project "Pioneer ship" which had an automatic control system and operated with only 11 crew members, utilizing multipurpose officers and ratings. The pioneer ship is no longer practical; however, recently the concept of a more sophisticated automation system and much fewer crew in machinery spaces has become even more radical as exemplified by MASS (Maritime Autonomous Surface Ships). As far as conventional manned machinery spaces watch system is concerned, by utilizing the five senses (watching, listening, smelling, touching and tasting), duty engineering officers and ratings not only identify defects which are rarely detected by alarm systems but also deal with any defects when alarm systems detect malfunctions in machinery. Taking the engine crews' operation into account, we need to consider not only how to introduce digitalization to the system but also train seafarers for new competences. In this paper, we categorized defects according to detectable, undetectable, remediable or irremediable cases. Taking the categorized cases into account, we analysed potential solutions for both new engine plant systems and new training systems of Maritime Autonomous Surface Ships.

Key words：marine engineer, routine work, maritime autonomous surface ships (MASS)

Introduction

This paper focuses upon engineering issues for future MASS. Additionally we divided engineering work into two categories: operational work and maintenance work. As far as operational work is concerned, thanks to the installation of unmanned machinery space systems, plenty of operational work such as remote control systems for the main engine as well as propulsion systems has already been automated. However, maintenance work including remedial work has not been automated yet. Thus, taking into account the role of engineers against automation systems, engineering crews always take care of deficiencies in engine plant systems when they find something wrong in the automation systems. Therefore, as automation systems progress, the role of seafarers as redundancy will be more important. In this point of view, before discussing MASS issues for engineering crews, we decided to identify how current engineering crews tackle remedial work when engine crews hear engine alarms and also find deficiencies in the engine plant systems.

Method

In order to consider marine engineers' knowledge and skills for sophisticated Maritime Autonomous Surface Ships (hereinafter referred to as "MASS"), this paper conducts a fundamental study of remedial routine work done by engineering crews. As shown in Table1, the survey target was the Training Ship Kaiwo Maru (hereinafter T.S. Kaiwo Maru), which was 30 years old at the time. Engine alarms and engine crews' work were analysed over a 91 day voyage, including 38 days at sea, 14 days at anchorage and 39 days in port. During this period, engineering crews heard 592 engine alarms and engaged in 556 operations, including both operational and maintenance work. This data proves that engineering crew must not only deal with alarms but also conduct operational or maintenance work on average once in each watchkeeping period. The frequency of ringing alarms and necessary work made us recognize how busy engineering crews in engine rooms are. Accordingly, in this paper, the term engineer includes electricians because research activities were done based on the Japanese maritime engineering system.

Table 1
Basic data of the T.S. Kaiwo Maru

Age of vessel during data acquisition	**30 years**
Terms of data acquisition	**from 01/04/2019 to 30/06/2019 (91days)**
Days of port	**39**
Days at sea	**38**
Days of anchorage	**14**

Category of MASS

In accordance with the definition of the International Maritime Organization, Maritime Safety Committee's regulatory scoping exercise on Maritime Autonomous Surface Ships, the level of MASS is categorized into 4 degrees as shown in Table 2.

Table 2.
Degree of autonomy

Degree 1	**Ship with automated processes and decision support:** Seafarers are on board to operate and control shipboard systems and functions. Some operations may be automated and at times be unsupervised but with seafarers on board ready to take control.
Degree 2	**Remotely controlled ship with seafarers on board:** The ship is controlled and operated from another location. Seafarers are available on board to take control and to operate the shipboard systems and functions.
Degree 3	**Remotely controlled ship without seafarers on board:** The ship is controlled and operated from another location. There are no seafarers on board.
Degree 4	**Fully autonomous ship:** The operating system of the ship can make decisions and determine actions by itself.

Remedial work

Initially, we divided engineers' work into roughly two types: operational work and maintenance work. Operational work includes, for instance, plant operation, changing fuel oil from heavy oil to marine diesel oil, increasing or decreasing engine speed, adjusting engine

load, and controlling flow of fluid through operation of valves. Maintenance work falls into three categories as follows:

- Time-Based Maintenance (TBM), which is planned maintenance, as it must be scheduled in advance;
- Condition-Based Maintenance (CBM), which should only be performed when certain indicators show signs of decreasing performance or upcoming failure; and
- Breakdown Maintenance (BM), which is performed on machinery that has broken down and is unusable.

Actual data for work done

The engineering crew conducts numerous tasks which are mainly concerned with the improvement of the plant condition or machinery symptoms. We categorized all collected alarms and works as follows:

- Plant operation;
- Remedial plant operation;
- Time-Based Maintenance (TBM);
- Condition-Based Maintenance; and
- Breakdown Maintenance.

Concerning "Remedial plant operation", one actual case of remedial plant operation was that the duty engineer changed the blade angle of the propeller manually in order to decrease the load of the main engine because the level of shaft torque had reached alarm point and the running condition of the main engine and its turbo charger had also reached a critical area. The automation system tried to handle the load of the main engine within a safety area but could not due to adverse weather. Table 3 and Figure 1 show the actual data of work done by the engineering crew for 91 days.

Table 3
Number of operational works and maintenance works over 3 months

Plant operation	Remedial plant operation	TBM	CBM	BM	Total
135	**13**	**173**	**172**	**63**	**556**

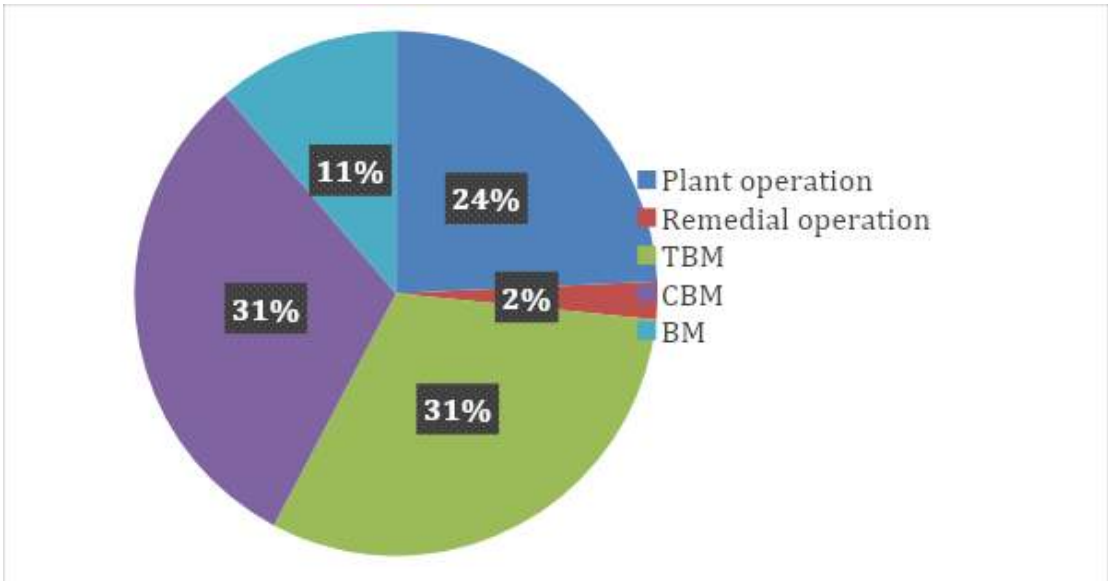

Figure 1. **operational work and maintenance work over 3 months**

As for the total 63 cases of BM, the majority of cases were leakage (19 cases, 30%) and electrical problems (17 cases, 27%). More than 60% of leakage problems were caused by gland packing, bonnet packing or flange packing of valves on the steam line and compressed air line. The majority of BM factors were not necessarily related to the ship's age, although T.S. Kaiwo Maru was 30 years old at the time of data collection. Such leakage could easily occur even in a five year old vessel because of expiration of parts such as gland packing or flange packing.

Remedial operation for alarms

A total of 592 engine alarms were rung in 91 days. These 592 alarms included repetitive alarms, for instance, caused by an electrical problem which often induced repetition. An actual case was the main engine cooling fresh water outlet temperature high alarm ringing 8 times in 4 minutes. The local temperature gauge which is an analogue one showed normal value but the digital gauge frequently detected an abnormal value. Figure 2 shows types of alarms. Alarms are categorized into 3 types: abnormal (295 times), error (64 times) and inevitable (233 times). Abnormal means real malfunction of machinery or equipment. Error means the alarm rang because of human error or some mistakes. Inevitable means the alarm cannot be avoided. For instance, although T.S. Kaiwo Maru has 2 main engines and 2 propellers, it navigates with only one engine and one propeller due to slow steaming and diminishing fuel consumption. This slow steaming voyage keeps the ship's engine stall condition for one side of the engine plant. In regard to the category of abnormal alarms, actual abnormal alarms occurred an average of 3 times a day; however, only 8 alarms indicated a severe situation which affected the navigation schedule. These 8 alarms related to the high torque of the propeller shaft as mentioned above in case of actual "remedial plant operation". These 8 alarms rang in 2.5 hours.

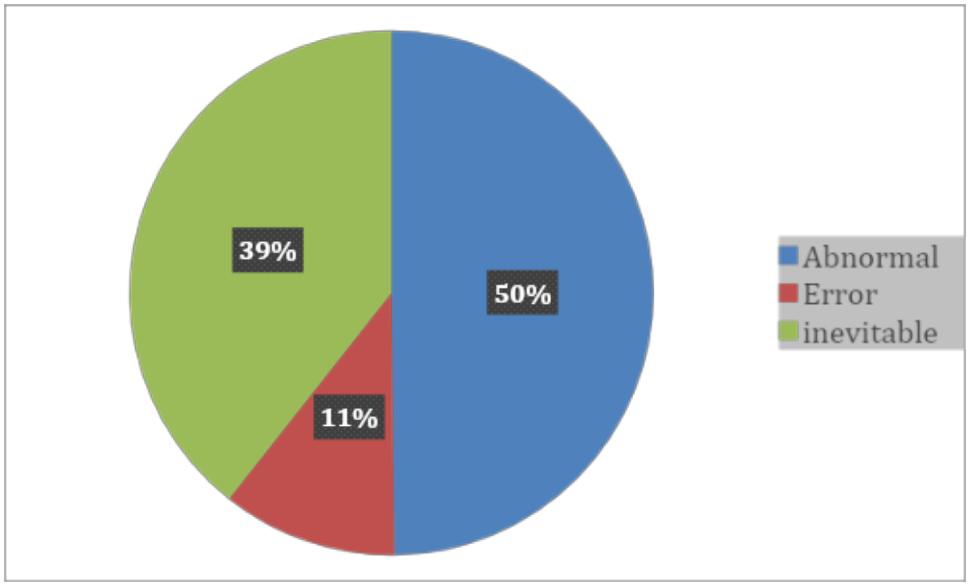

Figure 2. **Type of alarms**

Future aspects for operational work relating to MASS

Before conducting periodic unmanned engine room mode, the duty engineer and rating need to complete a checklist which takes much time. In case of degree 3 or 4 of MASS, the engineering crew must complete a much longer checklist. Moreover, numerous sensors and detectors will be equipped in order to monitor the condition of the machinery. In addition, everything will be operated remotely. Thus, from the engineering point of view, redundancy is one of the most important aspects for safety operation. Almost all machinery has spares on standby for starting immediately without any deficiencies in the system; therefore, manual operation systems or equipment should also be always utilized by engineering staff. In this way, more redundancy for full remote operation will be needed. Without further digitalization, degree 3 or 4 of MASS could hardly navigate a seagoing voyage because every parameter of the whole plant system should be detectable. Otherwise, full remote operation relating to engine plant operation would seldom succeed.

Future aspects for maintenance work relating to MASS

As far as automation systems for engineers' operational work are concerned, periodically unmanned engine room systems have been used successfully in seagoing vessels. As such, from a marine engineering point of view, with relation to degrees1 and 2 of MASS, we can hardly find the need for additional knowledge and skills. However, taking into account engineers' daily maintenance work and remedial work for plant operation, fully unmanned engine room systems, such as degrees 3 and 4 of MASS will require maintenance work to be conducted remotely. According to Figure 1, CBM and BM occupied more than 40% of total work. With respect to CBM and BM, machinery symptoms can rarely be predicted in advance. To deal with CBM and BM, future engineers would require more knowledge and skills relating to big data, artificial intelligence and robotics.

Conclusion

In this paper, based upon the 30 year old vessel, we categorized 592 alarms and 556 works during a 91 day voyage, including 38 days at sea, 14 days at anchorage and 39 days in port.

Sensors detect temperature, pressure, level and signal both electrically and by air; therefore, control systems inform us by way of alarms when something is wrong in the system. However, engineering crews identified some deficiencies through their observation. Owing to automations such as unmanned engine room systems, electronic governors and auto load control systems for the main engine, engineering staff has been relieved from manual operation of the engine plant. However numerical data prove how often engineering staff deal with something wrong in the engine system. Taking into account the frequency of alarms and remedial work carried out by engineering crew as found by the study, we must utilize robotics for remote maintenance work, and AI and big data for monitoring. Thus, future marine engineers should acquire such new knowledge and skills. Otherwise, robotics engineers or AI engineers might be on board vessels when vessels of degree 3 or 4 of MASS are put in practice for seagoing voyages.

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Communicative competence and autoremote operations

Paraskevi Papaleonida, PhD
Maritime English Instructor, *Merchant Marine Academy of Macedonia, Thessaloniki, Greece,* ppapaleonida@gmail.com

Abstract: This paper juxtaposes the communicative needs of the future with the good old concept of communicative competence. Communicative competence, as an STCW requirement for seafarers, is a key notion for Maritime English teaching. New operational functions and concepts are introduced, or existing ones are adapted, for the needs of autonomous and remotely operated (autoremote) vessels. The paper investigates the language requirements within the autoremote operation framework to check if these are covered by the yardstick (STCW) and the standardization tool (SMCP) used in Maritime English. The "remote navigator" needs to reach a good level of "remote situational awareness" through automated remote monitoring, but can resort to two-way communication for navigation functions. What linguistic skills are needed on the part of shore-based seafarers to be able to keep operations within "minimum risk condition"? Experts involved in autoremote design projects and those setting standards through class guidelines find that upgraded ship-to-shore communication is required and appropriate responses must be assured through interaction techniques, but these have not been delineated so far. The paper reviews the discourse used by those setting the foundations of ship autonomy so as to investigate to what degree communicative needs in shore-based seafaring are reckoned with.

Keywords: communicative competence, Maritime English teaching, autonomous and remotely operated ships

Introduction

MV Yara Birkeland, a container ship of 150 TEU capacity, a battery-powered autonomous vessel, was delivered in November 2020 and, after experiencing delays due to Covid-19, is expected to go into operation towards the end of 2021. We are moving from the stage of *conceptualization* (during which, roughly in the past decade, research was devoted to exploring and establishing the feasibility of autonomy in ship operations) to *realization*. This feeling of transition, of getting there, should not disorient us from the fact that it is the way concepts are constructed and the considerations included, prioritized or left out in their formulation, that shapes the future. A paradigm shift is on the way, as remote-controlled and autonomous shipping is, as experts agree, expected to be a reality in 10 years' time (Rolls Royce, 2016).

The autoremote conceptual framework is the platform where required skills and competence levels for future seafarers will be determined (Mackinnon & Lundh, 2019). Future ships will be monitored and supervised by specialized human operators located in offshore control centers. There is constant and growing concern (and my paper aims to contribute to this discussion) over whether the new skills that are required by these operators are delineated clearly enough and whether the industry regulatory standards (i.e. STCW, the International Convention on

Standards of Training, Certification & Watchkeeping, 1978/84, as amended 1995 and 2010) will have to be adapted, to cover for the need for trained and upgraded-skilled seafarers that will act as remote operators. The concern is aired by Simon Bennett from the International Chamber of Shipping: automated systems already present challenges with respect to the knowledge and skills required to manage and operate them safely and effectively (SeaSense, 2018). In fact, an ICS study on the effect of autonomous ships on the work at sea has highlighted that without highly skilled remote-operators, pilots of a new kind and riding gangs, auto-remote ships cannot remain operational (ISC, 2018). At the same time, it is mentioned that "communication will be one of the most important competences for any future seafarer in a technology driven ship operation" (ICS, 2018, p. 24).

The feeling among seafarers is that skills are being neglected in the rush to research autonomous systems, and this is in fact one principal reason unmanned/remotely operated vessels are seen as a safety threat. It was found, after 1,000 respondents were asked (members of the Nautilus Federation), that the fact of this neglect of skills within the research by manufacturers and maritime nations is key to the mistrust that has developed over social and human issues (ICS, 2018). So, the issue of skills that are neglected and are not brought into the equation is one of the social/human factor issues that seafarers are concerned with, which leads them to be reluctant to trust unmanned vessels.

The "competence and required skills of a remote navigator may not be the same as those of a traditional navigational officer" (DNV GL Position Paper, p. 11). As stakeholders have noted, a future hybrid and upskilled role for seafarers is emerging (ICS, 2018). My paper attempts to shed light to the upskilling needed for the human factor in autoremote operations in relation to using English for verbal and written communication. The aim of Maritime English teaching is to provide trainees with appropriate language competence, in other words help them develop their communicative competence in English. What are the features that will determine effective linguistic interaction for shore-based personnel? Within the issue of preparing future operators for managing unmanned vessels, this paper focuses on the competence of using English in oral and written form in specialized maritime communication that is autoremote in nature and has, therefore, certain peculiarities.

It has been 20 years since IMO, under Resolution A.918 (22), adopted in 2001, recognized that English shall be used on the bridge as the working language, and the standardization of language and terminology used in such communications would assist the safe operation of ships and contribute to greater safety of navigation. The emphasis was on setting standards of communication because it was realized, through research into multicultural crews, that English language competency of seafarers is one of the major problems that has contributed to many accidents and incidents at sea (MARCOM, 1999). There is a high percentage of accidents that are due to lack of English skills (it is generally accepted that 80% of accidents at sea are caused by human error, with half due to poor communication). The Standard Marine Communication Phrases (SMCP), promoting/advancing precise simple and unambiguous communication in English, were adopted by the IMO Assembly in 2001, following the 1995 revision of STCW. The ability to use and understand IMO SMCP is required for the certification of a navigational watch.

"Communicative competence" can be defined as a seafarer's know-how to get specific maritime "things" done through English, as per the relevant requirements of the IMO STCW Convention, 1978, as amended (Zhang & Cole, 2018). It is in fact the concept that underpins the specific requirements of the STCW 1995 Code, i.e., that seafarers need to be competent in

using English for professional purposes. When seafarers can demonstrate the ability to "*use* English" to express themselves clearly and comprehensibly in speech and writing and the ability to "*understand* English" by interpreting messages they hear and read and responding to them appropriately, they prove their communicative competence in English (IMO Model Course 3.17).

Research has shown the need of re-skilling navigators to enable the acquiring of more specific competence themes (ICS, 2018; DNV GL Position Paper, 2018; Sharma et. al., 2019; MacKinnon & Lundh, 2019). Since we are dealing with terra incognita here, another point researchers agree on is the need for detailed investigation of the required competences. Of particular interest is a study related to the operation of remotely controlled ships with seafarers on board and STCW KUPs [knowledge, understanding and proficiency items] in STCW Table AII/I. Eighty-two navigation watch officers participated in a survey designed to evaluate the applicability of 66 KUPs. One general finding of this pioneering study is that some of the present KUPs required by the navigator will become obsolete, and re-skilling of the navigators goes hand in hand with new operational demands (Sharma et. al., 2019). The research sheds no light regarding the competence that is of interest to the Maritime English instructor, Competence 7: IMO SMCP - KUP 30, since it was not one of the extracted factors in the exploratory factor analysis and management of the results of the statistics. I believe that one way of approaching the subject of defining the required communicative competence would be to examine autoremote discourse.

Autoremote operations and communicative needs: is the linguistic component a missing link?

The autoremote paradigm is a discourse that is currently being charted as stakeholders set standards. To find out if the concepts that are created take into consideration language needs, I reviewed the following standard-setting analyses:

- The Advanced Autonomous Waterborne Applications Initiative [AAWA] project, based in Finland, aims at producing the specification and preliminary designs for the next generation of advanced ship solutions (Rolls Royce, AAWA Position Paper, 2016).
- The EU-funded research project Maritime Unmanned Navigation Through Intelligence in Networks [MUNIN], a feasibility study on autonomous systems potentials (MUNIN 2016).
- Class guidelines, namely Lloyds Register Code for Unmanned Marine Systems (2017) and DNV GL Class Guideline on Autonomous and Remotely Operated Ships (2018), as well as a national code of practice, the UK Maritime Code of Practice on MASS, Maritime Autonomous Surface Ships (2018).

The word "autoremote" is actually used as an umbrella adjective to denote "any operation, task, function or system where the intention is to create additional support, remote-control or autonomous functionality compared to conventional, crewed ships" (DNV GL Class Guideline, 2018. p. 13). An operation is indicated as autoremote both when the vessel is operated by manual remote control or autonomously by a system, or a combination of the two. Functions are automated in the autoremote framework and at the same time decisions are made by crew off the ship (remote monitor and control) or by the system itself by means of algorithms (autonomous control).

There are four degrees of autonomy, as identified by the International Maritime Organization, Maritime Safety Committee 99. The degrees are non-hierarchical and MASS (Maritime

Autonomous Surface Ships) could be operating at one or more degrees of autonomy for the duration of a single voyage.

I. Ship with automated processes and decision support: Seafarers are on board to operate and control shipboard systems and functions.
II. Remotely controlled ship with seafarers on board: The ship is controlled and operated from another location, but seafarers are on board.
III. Remotely controlled ship without seafarers on board: The ship is controlled and operated from another location. There are no seafarers on board.
IV. Fully autonomous ship: The operating system of the ship is able to make decisions and determine actions by itself.

Within the autonomous ship concept, reference to communication denotes broadband or satellite telecommunication transmission systems, rather than verbal communication. In this respect, and if we embark on a quick visual discourse analysis, I find it interesting that in the following depiction of different levels of autonomy (fig. 1), AL0, "No Autonomy", is depicted with two people talking, whereas human interaction and verbal communication seem to be missing in autoremote operations.

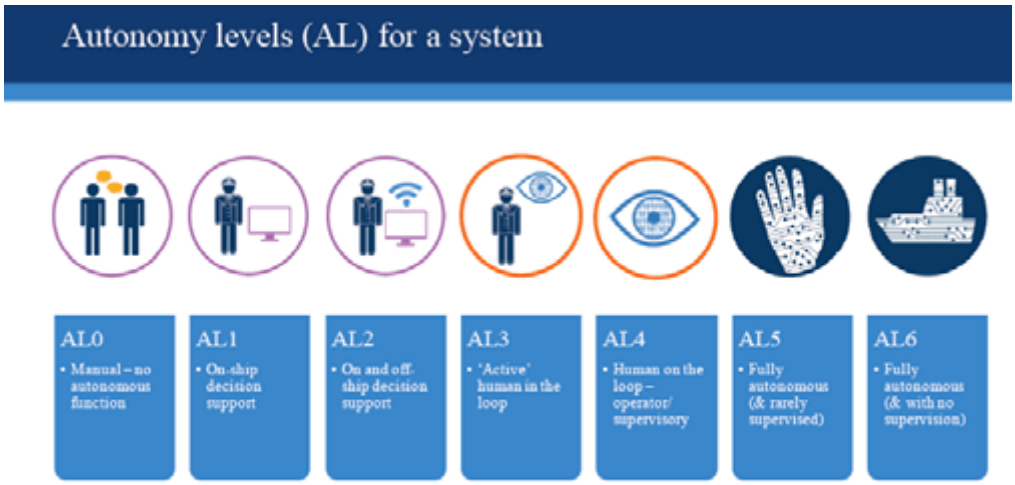

Figure 1. Lloyds Register Levels of Autonomy
Reproduced from Komianos (2018).

At first glance, then, it would seem from such a depiction that it is only on the first level where we have conversation for the operations to be conducted. It would seem that human interaction is inversely proportional to the level of autonomy: the higher the level the less the interactive needs. But it is actually the opposite. In autonomous remote operation degree two or three of the IMO scale we have the most demanding interactive acts. Various linguistic needs can be identified in reference to verbal communication: the on-board seafarers interacting with the shore-based operators for decision support or instructions; the interactions within the remote control centre to solve problems; communication of the remote control centre with VTS, pilots, other vessels. These needs are more intense in emergency situations. The type of language they need in order for operators to be able to work effectively within these remote centers has certain characteristics as well, and these are the ones I wish to analyse here.

Conceptual constructs within autoremote research

MUNIN (2012-2015) is a test-bed development study, a platform for testing autonomous operation that falls within level two autonomy. It envisages autonomous operation of an unmanned vessel during deep-sea voyage, whereas in congested waters tasks are executed by an on-board crew. After it is released by the on-board crew of skilled nautical officers and engineers, the SCC (Shore Control Centre) monitors and controls the autonomously operated vessel. The study regards "ship-shore communication and coordination" as one prerequisite for autonomous ships, especially in port approaches and channels that are difficult to navigate and require a pilot on-board the ship and VTS interactions (MUNIN objectives). Situation awareness is ensured by direct remote control via a shore-side replica of the bridge, in this way combating the physical distance between crew and vessel. It is very interesting that, as a last resort, there is a bridge team and problems are solved through face-to-face interaction that is end-oriented and targeted in nature.

In the case of an encounter with a manned ship, it is recognized that uncertainty on communication between manned and unmanned ships may lead to risky conditions. Guidelines ask for minimum risk conditions to be maintained to cover for such risks. When the ship or some other part of the autoremote infrastructure is forced out of its normal operation, it is essential that the ship, through the relevant response, is put in a state of "Minimum risk condition" (DNV GL Class Guideline 2018). This is referred to as the state of least risk to life, environment and property and it is highlighted that the relevant response to minimum risk condition must be defined (p. 18). Therefore, definitions of the appropriate responses to reach minimum risk condition in various situations are to be developed, and classification societies, in their role of verifying the safety of a product so that it is certified, are leading the process of safety assurance for new autoremote systems.

It is stated that communication calls will be relayed to the SCC from which the human operator will reply and communication equipment must be linked to the SCC to facilitate voice communication with other ships. In the official report on the qualitative analysis that was undertaken, we find that 38% of the respondents found that "to ensure safe interaction of autonomous and conventional ships" is a challenge (p. 32), and that the primary challenge is seen in "a prevention of accidents - both due to technical failures and an interaction of autonomous and conventional ships" (MUNIN D9.2: Qualitative Assessment, p 33).

The results of the MUNIN project are mainly on a conceptual level. Especially because they are on a conceptual level, and setting a paradigm, it is even more important to examine if they make room for linguistic interaction protocols. The main concept is an autonomous ship guided by automated on-board decision systems but controlled by a remote operator in a SCC. So, within this framework, we have the concept of the situation handling rooms as well as the following roles: the operator, the SCC actors (a captain, who is also legally liable, and a marine engineer) and the supervisor. A focal point, from my point of view, is that the operator needs to provide pertinent information to get actors (the Captain and Engineer) "into the loop" as quickly as possible (Mackinnon et. al., 2015). This means a lot of linguistic interaction. The concept of the situation room entails discursive skills, as well, since it is expected that the captain and the operator will go into the "situation room" to conduct precise remote ship handling together.

It is not only with VTS, pilots and other vessels that remote operators need to converse with, not only with on-board teams, but within the SCC there are various linguistic acts to be fulfilled such as interaction between operator, supervisor, and actors to the effect of solving problems.

In fact, the interactions in the SCC comprise a rather challenging linguistic architecture that aims to fulfil demanding tasks. What is required for the concept of SCC as a socio-technical system to work is conversation, real-time communication sessions between two or more users. On a good day, there may be as many as six participants [*operator, supervisor, actors (Captain and Chief Engineer), on-board team, pilot, other vessels*] in the exchange of information. The operator needs to report to others. This reporting will be done in English, which can be used as a common language to avoid potential misunderstandings from switching to different languages even though some of the participants might share a common mother tongue. So, since remote control is the key, and this can be conducted by voice, a common language and a protocol would be needed.

In MUNIN's description of a hypothetical voyage, the "narrative of an unmanned voyage - when all goes well", the issue of multinationality and the danger of miscommunication due to language barriers is indirectly acknowledged, within the autoremote scenario. This narrative, intended as a loose scenario and not using technical vocabulary, is very interesting from the point of view of the verbal communication that takes place. The SCC operator, situated in Vigo, Spain, talks to the pilot at the Port of Gothenburg when the bridge is switched from manned to autonomous/remote. He also remotely operates eight other ships in Bangalore, India. He has two officers in the remote centre with him to converse with. Fifteen days into the voyage, when suspicious echoes are observed on the radar, off the coast of Dakar, Senegal, he decides to take one of his mates with him into the situation room (which is like having a meeting in a bridge simulator). After zooming the vessel's camera and identifying a fishing boat in the vicinity, "He called on channel 16 both in English and in Spanish and finally got an answer back in broken English" (MUNIN'S journey, 2016). Overcoming the linguistic barrier, the short dialogue that ensues, in broken English, with the Senegalese fisherman, saves the day and leads the operator to take appropriate collision avoidance action. As the voyage continues and the narrative ends, it is left to our imagination to imagine (within the scenario) that the Spanish operator, fictional Capt. Felipe Rodriguez, speaks in English to various other parties all over the world, e.g. the pilots in the ports where the vessels under his control sail. This proves my point on the importance of setting standards of communication to mitigate deficiencies in English even in the autoremote set-up.

Operational functions which entail special attention to verbal communication: remote navigation and team situational awareness

New operational functions are introduced for the needs of autoremote vessels. Two of these functions display an intricate arrangement of verbal communications that supports the remote operator: remote navigation and team situational awareness. I will examine the newly emerging trend of co-operation between remote operating centres and ship-centered input within which the remote operating centres will make decisions, to see what type of linguistic input is perceived as necessary to ensure there is no miscommunication. To this effect, and since it is recognized that standardization of future system applications and their implementation is critical, I think that the required linguistic input needs to be standardized too. All these communications (what I have referred to as a linguistic architecture of communicative needs) need to be conducted in English in a simplified yet efficient manner.

Among the hazards for the navigation function is when another vessel is calling to agree on a non-ColReg compliant meeting situation, as well as the handover of responsibilities from one operator to another (DNV GL Class Guideline, 2018). In the AAWA initiative, it is stated that good skills are needed in safety critical and challenging situations, and that there are two

functions that render verbal communication. First, when unmanned ships must facilitate emergency interventions for recovery and rescue at sea (Rolls Royce, 2016). Second, when a vessel is deviating from a planned course, in which case "the operator could choose to use VHF radio to communicate with the other vessel and confirm that action taken by the vessel is safe for both parties, and if modifications are needed the operator can take the vessel in manual control" (p. 10). The class guidelines regarding external communication specify that even though the navigation functions are under the responsibility of remote operation from the RCC, the autoremote infrastructure will still need to be able to communicate with external stakeholders to the ship. This means that the following functions need to be taken care of, either by *relaying the task to personnel in the RCC*, or by automatic systems on board:

- communicating with other vessels, VTS, tugs, pilot station, etc. using VHF transmitter on board the vessel
- transmit emergency messages from the vessel
- relay emergency messages received by the vessel
- reply to messages from other vessels
- voice communication with crew and passengers on board the vessel
- voice communication with humans near the vessel

(DNV GL Class Guideline, 2018, p.93).

Finally, an additional structure of communication can be seen in the description of new roles and responsibilities in the UK national Code of Practice that aims to set initial standards and best practice for those who design MASS. Apart from a Master/Commanding Officer on board who has overall responsibility, a new term is introduced, that of "MASS Watch Officer" who is located either in the operations room or on board, and whose role includes direct communication with equipment operators. The MASS Watch Officer manages the interaction between the Base Control Station (control units) operator, the crane operator, the USV (unmanned surface vehicle) payload operator (UK Code of Practice, 2018).

We saw that in autoremote scenarios the operator monitors several vessels and has a support team that can be called upon to assist in decision making if a problem arises. A recurrent concern is how the operator will reach situational awareness: "when human intervention is expected, special attention is placed on the timing aspect and the ability to establish Situational Awareness" (DNV GL Class Guideline, 2018, p. 28). The key questions, identified by researchers as the gap in human factors knowledge, is how the operator obtains and maintains situational awareness and whether the support team assembles quickly and makes informed decisions (MacKinnon & Lundh, 2019, p. 28). There are two types of situational awareness that arise, whose peculiarities are important: Remote SA and Team SA. In order to effectively reach remote situational awareness, special consideration should be made to "the complexity in describing the condition, event or observation to the remote operator" (DNV GL Class Guideline, 2018, p. 86). The on-board personnel should demonstrate awareness that the way information is relayed by on-board crew will affect SA in the remote operator. Reviewing the concept of team situational awareness, and how it is obtained, maintained, transferred and sustained, we find that it needs to flow between team members, they need to share pertinent situation awareness to avoid critical errors. Critical factors imparted upon team SA include verbal and non-verbal communications and shared information. Shared processes are to be employed by the team, through formal training and operational protocols. And it is important that the data is not just transferred but used for consensus decision making (Mackinnon *et. al*., 2015).

It is clear to me that training approaches that will support individuals and teams within the autoremote framework should include the element of training for language skills if this support is to be adequate and successful. Training in decision-making techniques is even more important here because unlike a vessel where a Master has clear command and control, in a SCC decisions are arrived at through consensus. Also, SA is based on information from onboard personnel, and time is critical. The timing aspect is given special attention whenever human intervention is expected by the systems. Because the remote controller is relying on the on-board personnel to provide descriptions of the condition or event or observations which may be complex, and because this information is crucial for remote SA, there should be a special skill to be mastered: brief, concise and targeted linguistic response.

Having reviewed the concepts, the following analysis lists the new linguistic competences required for the concepts to work. We should note that those involved in autoremote operations might have good linguistic skills in English but they still need specialized training on required performance. In fact, the operators will be highly skilled individuals from advanced countries and job opportunities will move towards highly developed regions with mature technological capabilities and trained staff (DNV GL Position Paper, 2018). We can assume their English language skills are high too. Nevertheless, they still need to be trained in decision-making discourse, to become skilled in co-operation between remote and ship-centered input, and the language requirements should undergo a process of harmonization and standardization.

To start with the Remote Operator the appropriate knowledge, understanding and proficiency would be to use English to:

- Report information obtained during monitoring
- Assess information with the supervisor
- Analyze problems with a situation handling team
- Give recommendations for problem solving to the captain
- Co-investigate and share information
- Talk to the pilot to confirm that s/he is ready to assume full control; confirming the handover of control to the pilot
- Share SA with/in the team
- Consensus reaching
- Give/receive recommendations for corrective action regarding navigation
- In team situation, exchange information for transferring and regaining SA in a clear and unambiguous way.

The Supervisor and the Captain as part of the Situation Team must be able to use English effectively to

- Inform (operator) to take corresponding actions
- Share SA with the team
- Provide and confirm information via VHF such as ETA and rendezvous position when planning for a rendezvous with the onboard control team
- Handover, transfer SA via the situation room

These linguistic acts are mentioned here by way of illustration, and came up by looking within the scenario testing undertaken by MUNIN research. A comprehensive list should be developed and they should be described as the adequate knowledge of the English language to perform the remote operator's duties. It is noted that "there should be training for type and mission specific skills" and new operator skills will evolve and need to be assessed (UK Code of Practice, 2018). Similarly, the need for clear communication in a common language and the

acquisition of targeted linguistic skills becomes pertinent here. To this respect, the following section presents some observations on the areas where special linguistic and communicative skills are required.

Suggestions on required linguistic performance of autoremote personnel

The areas where *specialized* linguistic and communicative skills are required are the following. They are not limited to verbal communication but also involve particular writing and reading skills.

1. Reaching remote situational awareness and team situational awareness. SA is about having all the data through microphones, sound capture cameras, sensors, but not only that. It is important to make sure that verbal communication is recognized in the reaching of SA. Since decision-making on board ships would be cooperative with Remote Operation Centers, the role of successful communication is even more vital, and the use of language for information-sharing and decision-making that is clear, precise and effective is fundamental.
2. Keeping detailed records in an operator record book. A detailed record should be kept on behalf of the competent person, containing comments and reflections, to reflect on each mission dangerous occurrences and good practice observed during the mission (UK Code of Practice, 2018, p. 60).
3. Following linguistic protocol in handover and change-over procedures. It is important to follow clear and unambiguous wording during the handover of responsibilities from one operator to another and change-over procedures. Designers have used data from the aviation industry, where communications are even more standardized, and have noted that in unmanned aircraft systems there are mishaps during change-overs from one vessel to another, when operators overview many vessels, or they hand over to the relieving operator (Rolls Royce, 2016). Unlike the handing over of the watch described in STCW, a handover is revoked when the operator is unsure s/he is competent to handle a situation. Also, clear, standardized procedures, as well as the associated language, should be followed when the manual control is moved to remote control.
4. Harmonization and standardization on VTS response. Verbal communication between VTSOs and vessels forms the basic function in the operation of VTS in order to fulfil its role, which is to offer support to the decision-making process of a bridge team. It is found from simulation experiments that SCC Operators felt that voice communication is essential for safe conduct of passage (especially in heavy traffic). This suggests that voice communication will remain a useful form of interaction between VTSOs, SCC operators and unmanned ships (Chong 2018). Shore-centered communications, like shore-centered technologies, should be standardized so that competent seafaring personnel become competent shore-centered controllers, capable of monitoring many vessels at once. In the same way that VTS communications are harmonized through common phraseology to deliver precise, simple, unambiguous communication to bridge team in manned operations, there must be a similar provision for remote operations, too.
5. Reading instructions for the operation of the Unmanned Marine Systems. Guidelines specify that operators shall be provided with adequate information and instructions for the safe and effective navigation of the UMS. These shall be presented in a language and format that can be understood by the Operator in the context in which it is required (Lloyds Register, 2017).
6. Following supervisors' instructions. In this respect, concepts such as closed-loop communications to safeguard against human error (used in pilotage, for instance, and long established as part of bridge team management) could prove useful. The "closed loop" is a communication protocol where information is given, repeated by the receiver and normally

confirmed by the issuer, and is the only way one can be sure an order is being followed (Blom, 2007).

Recommendations and conclusion: communicative competence as a target in teaching Specialized English

Autonomous ships have introduced new concepts and operational functions and the required communicative competence in English needs to be expanded to incorporate and accommodate these concepts. The discursive requirements for each operational function need to be delineated. For instance, for reaching team situational awareness the user needs to have the appropriate linguistic range to be able to engage in spontaneous interaction, giving recommendations, clarifications and justifying his/her position.

There is a recommendation for a new code that would only apply to autonomous and remote-controlled ships, the ASC (Autonomous Ship Code), anchored in SOLAS (DNV GL Position Paper, 2018). Whether there is an amendment to the existing STCW Code, or a new special code is developed, in both cases the linguistic requirements need to be delineated carefully, leading to a separate competence covering *specialized Maritime English for personnel working in auto-remote operations.*

The idea of Specialized Maritime English was propagated through the Revised 2015 Model Course 3.17 to reflect the Manila Amendments to STCW and cover the required performance of competence in the English language for Electro-Technical Officer, and is applicable here. Reaching communicative competence through a Specialized Maritime English course seems appropriate since linguistic competence, the KUP in the English language, seems to be more essential in General Maritime English, while communicative competence, namely the KUP of the specific duties, takes priority in Specific Maritime English (Yongliang, 2015). The requirement is to have adequate knowledge of English language to enable the operator/personnel in all functions/roles to perform remote operations, so that communications are clear and understood. Also, another suggestion is to include standardized checklists of what to check when assembling the support team; dialogues based on such checklists can be added to SMCP under the heading “Remote/Shore-based control”.

The recommendation of Specialized English relates to personnel with seafaring experience. The class guideline is for operators to have seafaring experience on specialized ships. Even though roles and responsibilities in a Remote Control Centre may not follow the conventional roles and responsibilities as per STCW code, they do have two roles for officer of navigation watch and officer of engineering watch (DNV GL Class Guideline, p. 84). Yet there should be a distinction between SCC operators with seafaring experience and those who do not have one, and adapt the linguistic requirements accordingly, also specifying which part of General Maritime English needs to be taught.

In terms of the appropriate teaching tools, there is wide acceptance of the role of simulators in the preparation of future operators for managing unmanned vessels. Scenario-based teaching should be considered as an appropriate tool, since it involves developing problem-solving and decision making through simulation. Overall, well-designed simulator training would be needed for practicing challenging safety critical situations (Rolls Royce, 2016). Collaborative interaction in simulators using English vocabulary that the designers and other stakeholders will provide teachers as the required one to cover all possible scenarios could be helpful.

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PANEL DISCUSSION: RESILIENCE IN MET IN THE FACE OF COVID-19

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Development of online education and its application in Shanghai Maritime University

Xin Shi
Professor, *Shanghai Maritime University, Shanghai, China,* xinshi@shmtu.edu.cn

Yingming Wang
International Officer, *Shanghai Maritime University, Shanghai, China,*
ymwang@shmtu.edu.cn

Hui Zhuang
PhD Candidate, *Shanghai Maritime University, Shanghai, China*
zhuanghui@stu.shmtu.edu.cn

Zekun Zhang
Postgraduate Candidate, *Shanghai Maritime University, Shanghai China,*
202030610030@stu.shmtu.edu.cn

Abstract: Online teaching is becoming an important alternative approach to maritime education, which traditionally relies on face-to-face instruction, particularly during the period when the COVID-19 has had a devastating impact on the educational system worldwide. On the base of the conceptualization of online education through a literature review, this study demonstrates the case of an innovative online teaching system developed and implemented by Shanghai Maritime University (SMU) that successfully allowed some 20,000 students to resume learning despite the COVID-19 disruption. To realize large-scale online teaching, four phases of development the SMU underwent are introduced. The whole process of planning, preparation, implementation as well as evaluation is elaborated. In addition to class teaching, other major activities delivered remotely are also introduced, including short-term training programs, graduation ceremony, online career fairs, online interviews for postgraduate admission. Difficulties and challenges in shifting to the new teaching method and how SMU developed effective strategies to solve these issues are addressed. This study provides a valuable example of an online teaching system realized in a maritime institution. Furthermore, it may serve as an inspirational reference to peer maritime institutions to adopt or improve their competence of online learning systems.

Keywords: online education, teaching model, smart teaching ecology

1 Introduction

With the rapid development of information and network technology, online education, a novel education model in which students can join classes at home using computers, or mobile phone devices as long as the internet is accessible, has received increasing recognition. Coșofreț and Avram (2020) highlighted the positive aspects specific to maritime online education, including offering quality technical didactic, properly planned teaching activities, and efficient collaboration between students and professors. Cherry and Flora (2017) argued such

effectiveness could be improved with experience in teaching online courses and competence with use of technology, and faculty members with technological self-efficacy were more likely to use technology-enhanced learning methods in the online environment. Doyumgaç et al. (2021) highlighted that quality, flexibility, sensitivity of online education, communication and technical support services, and so on could positively affect student's perceptions of online education. A questionnaire survey designed by Huang (2020) revealed most teachers and students are content with online teaching based on the significant support from technologies and platforms.

Specifically, the significance of online education has been fully demonstrated in fighting the COVID-19 pandemic. The pandemic has brought devastating disorder to the educational system worldwide. Online education is the most efficient way to cope with the lecturing problem caused by such disruption, which is also supported by Aguilera-Hermida (2020). A survey of 15,438 Chinese teachers conducted by Yang (2020) indicated that most teachers are willing to support online education as an epidemic prevention and control initiative. Online education is therefore becoming an important alternative approach to education, which traditionally relies on face-to-face instruction.

In spite of these advantages, without a normative conceptual construction, online education is still diverse and case-by-case. Therefore, several key fundamental issues merit attention, such as architecture configuration, platform selection, standardization of teaching model, and intercommunication between teachers and students.

Based on this concern, a case study of an innovative online teaching system developed and implemented by the Shanghai Maritime University (SMU) that successfully allowed some 20,000 students to resume learning despite the COVID-19 disruption is presented. Based on the case study, this study (1) provides a conceptual framework of online education and (2) proposes suggestions for the development of online education.

The rest of this paper is organized as follows. Section 2 presents the conceptualization of online education, together with a literature review. Section 3 is a case study, which outlines the implementation of online education in SMU. Finally, a discussion and the conclusion are presented in section 4.

2 Conceptualization of online education

Normally, the construction of online education should include four steps: (1) making a teaching plan, (2) preparing at technical level, (3) implementing the teaching plan, and (4) arranging online examination and evaluation.

Based on the aforementioned process, several key elements can be clarified: platform, function, situation, and model.

First, a suitable platform, which functions as the online meeting tool used for intercommunication learning, is the foundation for the smooth implementation of online education. At present, Zoom, Tencent Meeting, Zhumu, DingTalk, and so on are the most popular platforms.

Second, the multiple functions can be provided by online education. Lecturing materials including pictures, videos, and courseware can be presented simultaneously on the terminals

of teachers and students. Real-time communication between the teacher and students or among students can be achieved, and online exams can be conducted under a comprehensive online invigilation mechanism.

Third, the application situation reveals the multiple manifestations of online education, which is not limited to class teaching but can also be extended to online interview, online seminar, and online communication.

Fourth, the online education models are also diversified and can be divided into four types: synchronous live class-based, asynchronous recording and broadcast, online flipped classroom, and online tutoring-based teaching models (Xue, 2020). More macroscopically, it can be classified into normal online learning, online learning without teachers' control, and online learning with group discussion (Root and Rehfeldt, 2020). In practice, synchronous live class and asynchronous recording videos are the most frequently used; herein, the former one is a model with the simultaneous presentation of teachers and students online, while the latter is that with the prerequisite that teachers have uploaded the learning video recorded before the class.

Based on aforementioned conceptual framework, benefits, other than flexibility, of online education are continually discovered, such as saving time and cost in the aspect of commuting and tuition (Behzadi and Ghaffari, 2011), solving the problem of inadequate classroom (Behzadi and Ghaffari, 2011), enhancing diversity and equity among students regardless of the living area and the performance (Afrouz and Crisp, 2020), and helping teachers switch to be a leader and accompanier rather than only the role of transmitting knowledge (Yao et al., 2020). However, some disadvantages and flaws were revealed, such as resulting in no campus life as specific library, classrooms, or communal areas that generate an atmosphere of campus culture are not available (Behzadi and Ghaffari, 2011), making it hard for teachers to control the teaching progress and content for students when they are at different levels (Chen et al., 2020; Yan et al., 2021; Butnaru et al., 2021). In addition, the security and quality of internet connection may be a conclusive factor that affects the process of online education (Zhao, 2020).

Therefore, some suggestions were proposed to cope with the flaws and improve the efficiency of online education. The development of "Web 2.0" could enrich the function and content of online library and make online education more convenient (Maness, 2006; Ram et al., 2011). Similarly, the enrichment of online education may compensate for the lack of campus life to some extent, and the improvement of internet technologies would enhance the security of online education. Furthermore, "AI teachers" are becoming popular (Kim et al., 2020), helping to improve the efficiency of Q&A sessions as some questions with constant answers can be determined by AI teachers (Guilherme, 2019).

3 Case description

Located in Shanghai, SMU is a multi-disciplinary university with special emphasis on shipping, logistics, and oceans. At present, SMU has nearly 1,300 full-time teachers and over 26,600 full-time students, of whom over 16,000 are undergraduates and over 7,200 are postgraduate students. The daily teaching task of the whole school is busy but orderly.Therefore, the COVID-19 pandemic has undoubtedly posed a huge challenge to the regular operation of the university. SMU has taken full advantage of the online education structure mentioned above, and successfully allowed some 20,000 students to resume learning. Through such a practical

case, the specific implementation operations, effectiveness, and development direction can be reasonably concluded.

3.1 Promotion process

The structure of promotion of SMU online teaching is illustrated in Figure 1.

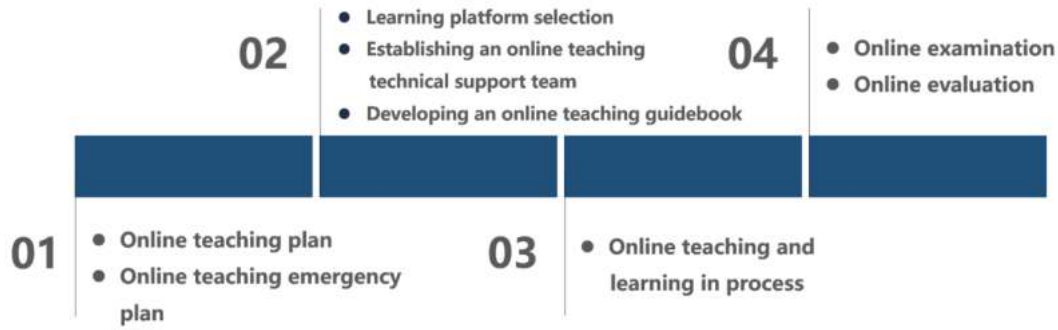

Figure 1. Structure of promotion of online education

Planning

To conduct online education successfully, a well-prepared teaching plan and emergency teaching plan are necessary. Although the pandemic has had an unprecedented impact on education, the planning at SMU dismissed students' and teachers' concerns and has shifted teaching onto a new track.

Preparation

The preparation process of SMU online education is as follows. First, proper selection of online education platform is key to success, and a robust platform can save teaching and material resources as well as achieve satisfaction of teachers and students. Second, SMU has established an online teaching technical team to deal with any emergencies that may arise. When something goes wrong during the teaching process, the team can fix the problems as soon as possible to maintain the regular order. Lastly, developing an online teaching guidebook is also important. The online guidebook of SMU provides brief instructions that have enabled online education to be standardized.

Implementation

Teachers at SMU can upload the asynchronous recording videos to the online platform or conduct a synchronous live class to convey knowledge to students. Students should attend the class on time when the synchronous live class begins. Meanwhile, students are able to choose courses they are interested in and learn from the asynchronous recording videos (Cherry and Flora, 2017).

Evaluation

After finishing a period of learning, students' mastery of knowledge should be tested. Just as traditional examinations, the form of online examination is also an important method to check the learning outcomes. It is a key method to evaluate the success of online education.

3.2 Online teaching model

The online teaching system was designed by SMU to convey knowledge from teachers to students via internet transmission by telecommunication technology. The topological structure of online teaching system of SMU is presented in Figure 2.

Figure 2. Topological structure of online teaching system of SMU

To mitigate the impact of COVID-19, learning continued via the online platform. Teachers prepared lessons at home and created a virtual class using a computer or mobile devices such as smartphones or pads. Mature online education platform such as iCourse, Chaoxing, and many meeting platforms such as Zhumu and Tencent. Homework assigned by teachers can be uploaded to the platform by telecommunication technology and students can receive tasks by logging on to the platform. In this way, teachers and students can conduct real-time communication via the platform.

According to statistics from the SMU Teaching Center, from February 2020 to July 2020, SMU online teaching for undergraduate students was promoted among teaching faculty members. In total, 735 teachers and some 12,500 students attended online teaching and an average of 2,469 classes were delivered per day. The learning resources uploaded include over 10,000 items and more than 16,000 classroom activities were conducted. Regardless of the scale of attending staff or the volume of learning material delivered.

In addition to undergraduate online teaching, the online learning method also successfully applies to short-term training programs, graduation ceremony, online career fairs, online interviews for postgraduate admission, and international conferences. The postgraduate admission interview was different from the previously used model. The traditional admission interview was face-to-face and written examination is also an essential part (Xiao and Li, 2020). However, online interviews were mainly focused on interviews rather than written examinations. This could comprehensively test the interviewee's ability regarding logic and expression. Additionally, an online career fair provided opportunities for graduates to meet potential employers and help graduates find jobs (Wang, 2021).

4 Discussion & conclusion

4.1 Advanced infrastructure support

To support online teaching, advanced infrastructures consisting of intelligent classrooms, ubiquitous learning space, and cloud class production centers are essential and important.

In terms of the intelligent classroom, it always adopts a movable layout and is equipped with modern audio-visual technologies, such as multi-screen display, electronic whiteboard, and resource sharing tools. To provide a discussion and interactive teaching environment for various teaching scenarios such as lecture, group learning, and project exploration, SMU employs the complete set of facilities mentioned above.

The aspect of ubiquitous learning space is composed of course platform, offline facilities, and cloud desktop to meet students' personalized ubiquitous learning needs. In SMU, the course platform integrates 15,000 online courses, 1 million kinds of electronic books, 100,000 academic videos, and 3 million teaching documents. The online learning space is also extended to the offline with advanced facilities. Meanwhile, the cloud class production center is where quality classes are produced, and requires corresponding physical space and hardware. In the case of SMU, it possesses more than 200 square photographic space, more than 15,000 class hours of video production experience, and a professional team with more than 10 people. It shows the teaching resources production ability integrating virtual photography, live-action shooting, teaching discussion, and post-editing.

4.2 Innovative teaching model

Accordingly, an innovative teaching model should be developed to match the advanced infrastructure support and meet online education demands.Such a teaching model must consist of three parts corresponding to three phases of a class. First, before class, teachers should prepare lessons online, set learning tasks, and send them to students, while students are required to complete pre-class tasks online. Second, during the class, group cooperation, peer teaching, puzzle discussion, and other teaching interactions could easily be achieved with the help of modern education technology. Third, after class, teachers should check students' learning data to master the progress and effect of learning, and students can make use of the platform resources to conduct independent exploration and realize the expansion and extension of knowledge.

In 2019, 25 SMU teachers took the lead in adapting to the classroom teaching reform based on the smart teaching ecology and offered 25 trial courses. The entire school curriculum was gradually extended to promote the transformation from the traditional teaching-oriented classroom to the intelligent interactive-oriented classroom. In 2020, relying on the smart teaching ecology, the university's online teaching activities were able to run smoothly during the COVID-19 pandemic.

4.3 Conclusion

In conclusion, the COVID-19 pandemic has accelerated the development of online education, which implies an innovative teaching model. Based on the conceptual framework of online education and referring to the implementation case of SMU, focusing on "intelligent classroom teaching" integrated by the implementation of teaching, learning, management, sharing, interaction, and achieving the reconstruction of learning space, teaching process and academic evaluation are essential for online education. The pattern of SMU online education can be

consulted, first starting from the establishment of the advanced infrastructure which includes intelligent classroom, ubiquitous learning space, and cloud class center; then achieving the transition from "passive learning by traditional classroom instruction" to "the inquiry learning by doing." Through reconstructing teaching scenarios, extending learning space, and focusing on course construction.

Acknowledgments
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Developing Moodle as an e-learning alternative to the kinesthetic approach for Maritime English subject during the Movement Control Order (MCO) period in Malaysia: The conceptualization of distress and routine messages of the IMO SMCP

Shamsul Rizal bin Haji Mohd Rosedi
Malaysian Maritime Academy, Malacca, Malaysia, shamsulrizal@alam.edu.my

Abstract: This paper shares impactful insights on Moodle e-learning which was developed as an alternative to face-to-face Kinesthetic approach in teaching distress and routine messages of the IMO SMCP during the period of Movement Control Order (MCO) in Malaysia. The enforcement of the MCO has resulted in the teaching and learning of the STCW courses (Standards of Training, Certification and Watch-keeping for Seafarers) being drastically shifted from normal face-to-face facilitation to full online distance learning (ODL). Hence, the study aims to discover the potential of Moodle to replicate the effectiveness of the kinesthetic approach in teaching IMO SMCP's Distress and Routine messages to new students. This is a two-tier experiment which covers both e-learning intervention and assessments and concludes with a quantitative study. The results of this study show that the Moodle e-learning, developed to replace the kinesthetic approach, has been successful in teaching the distress and routine messages of the IMO SMCP to novice students. The findings of this study provide clearer direction in online distance learning to Akademi Laut Malaysia (ALAM) and its stakeholders for continuous quality improvement. Moreover, the study also encourages more intensive and extensive involvement of MET trainers in the Moodle learning management system (LMS) development and usage in the teaching of STCW courses.

Keywords: Moodle, Maritime English, IMO SMCP, MCO, Distress and Routine messages

Introduction

The global pandemic of Covid-19 has revolutionized the delivery of STCW courses (Standards of Training, Certification and Watch-keeping for Seafarers) in Malaysia. Indeed, the sudden shift to online distance learning has changed the eco-system of teaching, learning and assessments (TLAs) of the STCW courses which has never been imagined before. Indeed, the Movement Control Order (MCO) enforced by the Malaysian government has encouraged educators in maritime education and training institutions (METIs) to take a bold step in transforming their lessons to digital learning platforms to be accessed effectively by students. This paper, being the first of its kind in Malaysia, shares a practical experience in replacing the kinesthetic approach with Moodle E-Learning, to successfully complete the cycle of teaching, learning and assessments (TLAs) for distress and eoutine messages of the IMO Standard Marine Communication Phrases (SMCP).

Literature Review

The Significance of Moodle in Tertiary Education and at ALAM

Moodle is 'a software package which has been developed to help teachers and educationists to create quality online courses' (Lisnani et al., 2020; Harry et al., 2019 and Sucheta et al., 2018). Furthermore, its acronym stands for Modular Object-Oriented Dynamic Learning Environment and it was developed initially to suit an open-source e-learning platform in the form of a Course Management System (CMS) (Lisnani et al., 2020; Harry et al., 2019; Sucheta et al., 2018; Gunduz and Ozcan, 2017 and Chourishi et al., 2011). Related studies by Reham (2019) and Deepak (2017) reported that Moodle provides the appropriate platform for teaching, learning and assessment resources and tools which feature file uploads, discussion forums, assignment submissions, calendar entries, student grading, interactive quizzes, class modules and tutorials. In its wide practice, Moodle is used for learning language, science, and computer subjects (Mulhayatiah et al., 2019; Handayanto et al., 2018 and Gunduz & Ozcan, 2017). To be instrumental, Moodle promotes self-directed learning which reduces dependability on teacher-guided lessons and as such, it can be used for tutorials to increase students' knowledge of the subject matter (Handayanto et al., 2018; Takaedengan and Santosa, 2018). Most importantly, researchers such as Frisnoiry and Darari (2020), Reham (2019), Mulhayatiah et al. (2019), Hakim et al. (2019), Cohen and Sasson (2016) and Chourishi et al. (2011) claimed that the proper use of Moodle has significantly increased student motivation and learning outcomes. This is the most desired result for educators and educationists for online distance learning especially during the lockdown period in Malaysia.

At ALAM, Moodle has been introduced and integrated into the formal teaching, learning and assessments process (TLAs) since 2016. To date, Moodle has also been an integral part of trainers' annual assessments especially to enrich students' learning experience. This move provides more innovative, engaging, and motivating elements to the delivery of STCW courses, which have been comfortably conducted via traditional face to face learning. Suffice to mention also that all subjects in the two major STCW programmes, namely the Diploma in Nautical Studies and Marine Engineering have their own Moodle LMS platforms to support e-learning. Figure 1 below illustrates the Moodle LMS for Maritime English that was used in this study.

Figure 1.
Moodle LMS for Maritime English in this study.

Problem Statement

In the normal classroom, the teaching of distress and routine messages are done via Kinaesthetic learning in which students learn and practice sending and responding to VHF Radio messages by doing i.e., physically sending messages, and responding to messages. This involves bodily movement of students in classrooms as students get to involve in drills and practice, listening attentively to each word in the message and then responding effectively to the message. 'Learning by doing' like this, as emphasized by the IMO Model Course 3.17 Maritime English (p. 114) enables students to get immersed in the process of communication itself while getting themselves familiarized with the whole context of the message including the specific phrases used and the features of the message. Figures 2 below shows classroom Kinaesthetic lessons during the normal face-to-face facilitation.

Figure 2.
Kinaesthetic lessons on '9 stages of Routine Messages' (students from Mokpo Maritime University, ROK and AWKO Batch, Malaysia)

However, all these are not possible in online distance learning (ODL) during the Covid-19 pandemic (MCO). It is a totally different scenario whereby physical movements and facilitation are limited while students are confined to their homes. Hence, the Kinaesthetic approach should be replaced with another effective approach i.e., intervention. The actual challenge was to allow students to experience the same effects on ODL compared to the normal conventional way, which lead to the same learning outcomes/objectives. Hence, due to these objectives, as the online distance learning is the only way to reach students during the lockdown, the researcher had decided to utilize Moodle LMS as an alternative to the Kinaesthetic approach in conceptualizing the distress and routine messages.

As Moodle has been part of innovative strategies in teaching, learning and assessments of the STCW courses at ALAM, it is therefore the most suitable alternative for students during the Covid-19 pandemic. Moreover, in conjunction with the studies of Frisnoiry and Darari (2020), Reham (2019), Mulhayatiah et al. (2019), Hakim et al. (2019), Cohen and Sasson (2016) and Chourishi et al. (2011), it is timely now for ALAM Moodle to be utilized further due to other engaging functions of Moodle, such as discussion forums, assignment submissions, calendar entries, student grading, interactive quizzes, class modules and tutorials for increasing students' motivation and learning outcomes. This study was therefore hoped to bring more input and new insights not only on online distance learning, but also on the use of Moodle LMS in addressing learning or in providing adequate interventions.

Methodology

Respondents

This study was conducted on four Advanced Watchkeeping Officer (AWKO) students and 87 cadet officers at ALAM, Kuala Sungai Baru, Masjid Tanah, Melaka, Malaysia. In total, 91 respondents participated in the study. Their ages ranged from 18 to 32 years, and they were undertaking a Watchkeeping Officer's Preparatory course and Diploma in Nautical Studies with Maritime English becoming the subject of focus in both programmes. All respondents had undergone a semester-long facilitation of Maritime English with the topic *Distress, Urgency, Safety and Routine Messages* being the last topic in the syllabus and carrying significant weight in the final assessment. Suffice to mention also that the whole subject had been conducted via online distance learning during the MCO in Malaysia.

Research design and instrumentation

This quantitative study mainly involves the use of experiment (Moodle LMS) and survey questionnaire to obtain feedback from respondents. The experiment focused on the Unit 4 subtopic of the IMO SMCP, namely *Distress, Urgency, Safety and Routine Messages.* Two modules of Moodle had been developed for the experiment, as alternatives to kinesthetic learning since respondents were at home during the entire Movement Control Order 3.0 period from March to June 2021.

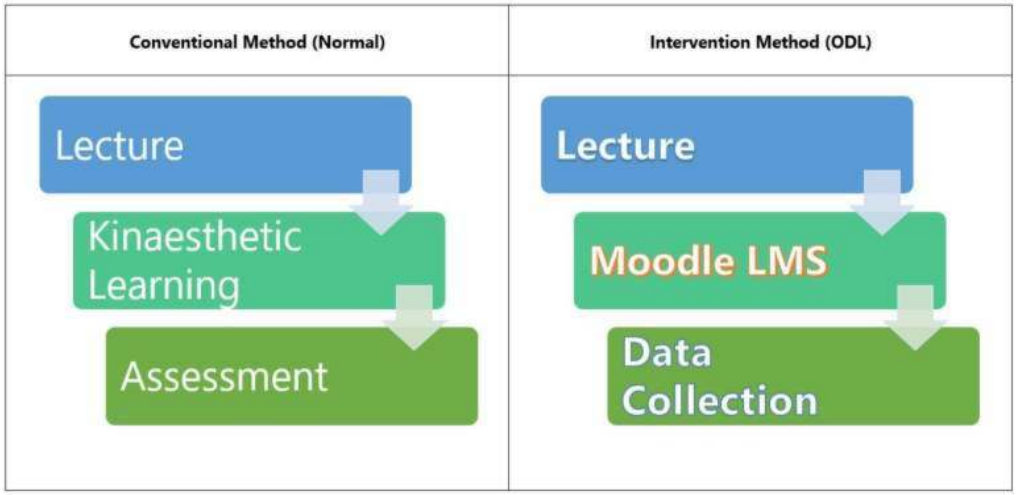

Figure 3.
Research framework of the study

Figure 3 presents the framework of this study that is represented by the 'Intervention Method (ODL)'. For the intended intervention, a lecture was conducted online in Week 15 of the studies via Microsoft Teams (PowerPoint slides lecture) followed by sharing of notes to all students. There had been discussions and Q&A sessions between the researcher and the students for further understanding of the lessons. However, there were requests for more exercises as these two lessons are not only new; but they are also technical to students. In Week 16, the Moodle LMS of *Distress and Routine Messages* were made available to all students with the aim of assisting them in enhancing their understanding and conceptualization of the lessons. The data collection process took place in Week 18 as students were given two weeks to access the modules and then evaluate their experience in determining the significance of the whole

intervention process. The collected data were then analysed by the SPSS programme for further analysis.

Moodle LMS for Distress and Routine messages

The Moodle LMS modules used in the study are *Distress and Routine Messages* which have been derived from the IMO SMCP lesson/topic (Distress, Urgency, Safety and Routine Messages on Marine VHF Radio). Both modules were developed on the ALAM Moodle LMS portal based on the framework of Keller's ARCS Model of Motivation (Attention, Relevance, Confidence and Satisfaction). All students had already been enrolled into the LMS for Maritime English since the beginning of the semester. Figure 4 provides a graphical representation of Question 1 of the Routine module as experimented on all respondents in this study.

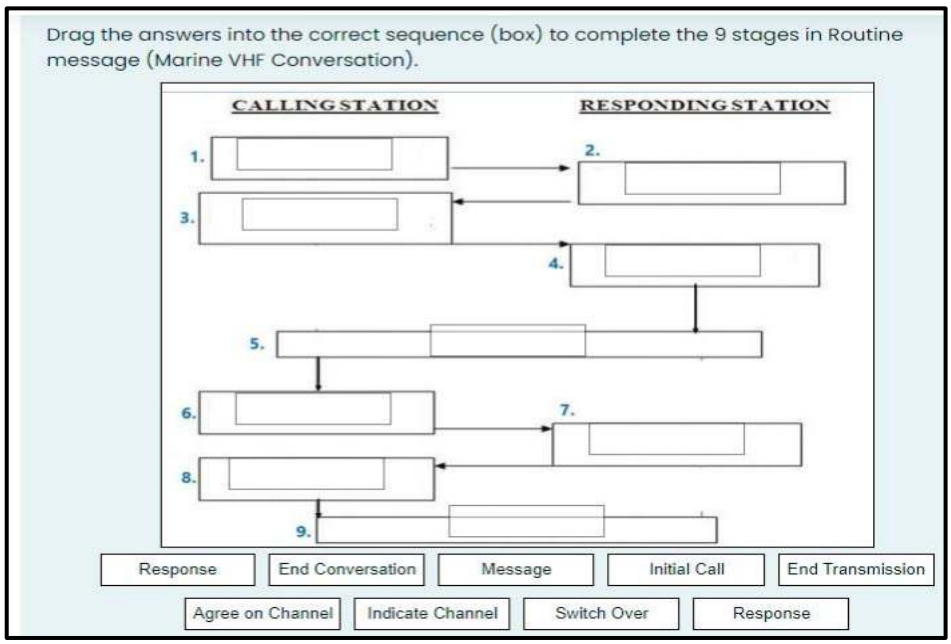

Figure 4.
LMS Module for Routine Message used in this study

There were four questions in the Routine module where respondents were required to label each stage in the Routine Message by dragging the boxes containing the stages (*Response, End Conversation etc.*) to the numbered sections 1-9 (Question 1), familiarizing with the phrases used (Question 2), arranging the whole ship to ship dialogue in correct order (Question 3) and supplying the correct phrases in the context/dialogue (Question 4).

Survey questionnaire

To obtain the respondents' feedback, the researcher selected Keller's Course Interest Survey (CIS, 2006) developed by Keller (2006) at Florida State University, United States. There are 34 questions in the questionnaire and the CIS questionnaire is regarded as one of the most effective measures in assessing online distance learning (ODL) in terms of student engagement, student motivation, student confidence and student satisfaction. To further capture the respondents' experience and feedback on the Moodle LMS, the questionnaire was customized to obtain responses on four major domains of learning: *Attention, Relevance, Confidence and Satisfaction*.

The survey questionnaire set consisted of 34 questions which used a five point Likert Scale ranging from 1) Strongly Disagree, 2) Disagree, 3) Neutral, 4) Agree and 5) Strongly Agree. Data collection was conducted at the end of the experiment (Week 18) where all 91 respondents were asked to answer an online survey containing the self-administered questionnaire for quantitative feedback. Accordingly, a reliability test on all questions was conducted by using Cronbach coefficient alpha of the SPSS software. The Cronbach coefficient alpha value was obtained at 0.830 for all 34 questions. Nunally (1978) proposed the value of 0.7 as the accepted reliability level for research questionnaires. Hence, it can be summarized that for this study, there is a high level of reliability in all questions used. Table 1 presents the Alpha value for the survey questionnaire in this study.

Table 1.
Reliability Statistics of CIS Questionnaire used in the study

Case Processing Summary

		N	%
Cases	Valid	91	100.0
	Excluded[a]	0	.0
	Total	91	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.830	34

Research Objectives

The primary objective of this study was to provide alternative lessons in the form of Moodle LMS to respondents from ALAM who were affected by the Movement Control Order (MCO) in Malaysia. It was meant to help them in conceptualizing the *Distress and Routine Messages of the IMO SMCP*. In guiding the study/experiment, the following objectives were established:
1. To identify respondents' acceptance level of the Moodle LMS.
2. To identify respondents' confidence level with the Moodle LMS.
3. To identify respondents' satisfaction level with the Moodle LMS.

The obtained feedback will help formulate new directions in online distance learning especially in developing more effective online learning interventions for students.

Research Questions

From the above-mentioned objectives, three research questions were formulated:
1. What is the level of respondents' acceptance of the Moodle LMS in this study?
2. What is the level of respondents' confidence with the Moodle LMS in this study?
3. What is the level of respondents' satisfaction with the Moodle LMS in this study?

The answers to the research questions will provide useful feedback on the use of Moodle LMS as an alternative to conventional kinesthetic learning in the teaching of *Distress and Routine*

Messages. In addressing the three research questions of the study, the four domains of the ARCS Model of Motivation were re-aligned accordingly. The Attention and Relevance domains were used to address research question 1; while the Confidence domain was used to address research question 2. Lastly, the Satisfaction domain was used to provide responses to research question 3.

Research findings and discussion

What is the level of respondents' acceptance of the Moodle LMS in this study? (Analysis of Research Question 1)

The overall answer for research question 1 can be found in the grouping of the questions that focused on the ***Attention*** dimension of the CIS questionnaire in the study. Table 2 below presents all survey questions that focused on the dimension of *Attention* in Keller's Course Interest Survey (CIS, 2006) together with their mean scores and standard deviations. Altogether, there were eight questions randomly arranged in the CIS survey questionnaire as questions no. 1, 4, 10, 15, 21, 24, 26 and 29. To increase the reliability and validity of the questionnaire, two out of these eight questions had been constructed by Keller (2006) as 'reversed questions' (negative form). The two reversed questions were questions No. 4 and 26 and they further challenged respondents' perception and also provoked them to provide their actual feelings, experience, and opinion.

Table 2.
Survey questions focusing on the dimension of ATTENTION

No.	Statement	Mean	SD
1.	The instructor knows how to make us feel enthusiastic about the subject matter of this course.	4.41	.869
4.	This class has very little in it that captures my attention.	2.57	1.284
10.	The instructor creates suspense when building up to a point.	3.75	.973
15.	As a student in this class, I am curious about the subject matter.	3.92	.934
21.	The instructor does unusual or surprising things that are interesting .	4.14	.914
24.	The instructor uses an interesting variety of teaching techniques.	4.51	.705
26.	I often daydream while in this class.	1.89	.849
29.	My curiosity is often stimulated by the questions asked or the problems given on the subject matter in this class.	4.38	.771

According to Table 2, the highest score in the Attention dimension was obtained by item no. 24, which is '*the instructor uses an interesting variety of teaching techniques*' with a mean

score of 4.51. On the other hand, the lowest score in this dimension was recorded by item no. 26, which is '*I often daydream while in this class'* with a mean score of 1.89. However, even with a low mean score, this item had been set as a negative item, which in return, needs to be viewed as positive since it provided a positive aspect of a negative perception (low score for negative means high score for positive, as prescribed by Keller, 2006). Another negative item tested in this dimension was item no. 4, *'this class has very little in it that captures my attention'* with a mean score of 2.82. Again, the low mean score for this item reflects a positive situation as indicated earlier by Keller (2006). To conclude this section, all tested items in the dimension of Attention of this were considered high (>3.75) and thus, this helped to address the research question. It can be said that the level of respondents' acceptance of Moodle LMS in this study was high. The next section supports this further.

The ***Relevance*** dimension of the CIS questionnaire in the study also recorded high level scores and feedback from respondents. Table 3 presents all of the survey questions that focused on the dimension of *Relevance* in Keller's Course Interest Survey (CIS, 2006) together with their mean scores and standard deviations. Altogether, nine questions were randomly arranged in the CIS survey questionnaire as questions no. 2, 5, 8, 13, 20, 22, 23, 25 and 28. Again, like in the Attention dimension, two out of these nine questions had been constructed by Keller (2006) as 'reversed questions' (negative form). The two reversed questions were questions no. 8 and 25 which aimed to suggest the opposite situation/option (negative) to respondents so as to be neutral.

Table 3.
Survey questions focusing on the dimension of RELEVANCE

No.	**Statement**	**Mean**	**SD**
2.	The things I am learning in this course will be useful to me.	4.60	.555
5.	The instructor makes the subject matter of this course seem important.	4.49	.639
8.	I do NOT see how the content of this course relates to anything I already know.	1.79	.949
13.	In this class, I try to set and achieve high standards of excellence.	4.40	.535
20.	The content of this course relates to my expectations and goals.	4.45	.703
22.	The students actively participate in this class.	4.51	.639
23.	To accomplish my goals, it is important that I do well in this course.	4.77	.496
25.	I do NOT think I will benefit much from this course.	1.33	.633
28.	The personal benefits of this course are clear to me.	4.65	.584

From Table 3, the highest score in the Relevance dimension was obtained by item no. 23, which is *'to accomplish my goal, it is important that I do well in this course'* with a mean score of 4.77. On the other hand, the lowest score in this dimension was recorded by item no. 25, which is *'I do NOT think I will benefit much from this course'* with a mean score of 1.33. Even with a low mean score, this item had been set as a negative item, which in return, needs to be viewed as positive as it provided a positive side of a negative perception (low score for negative means high score for positive, as prescribed by Keller, 2006). Another negative item tested in this dimension was item no. 8, *'I do NOT see how the content of this course related to anything I already know'* with a mean score of 1.79. According to Keller (2006), the low mean score for this item reflects a positive situation as respondents did not agree with the statement and thus rated it low in their responses. To conclude this section, all the tested items in the dimension of Relevance in this study were considered very high (>4.40) and thus, to answer the research question, it can also be concluded that the level of student's acceptance of the Moodle LMS used in this study was very high.

What is the level of respondents' confidence with the Moodle LMS in this study? (Analysis on Research Question 2)

The Confidence domain of the CIS questionnaire was used to address research question 2. Table 4 lists all of the survey questions focusing on the dimension of Attention in Keller's Course Interest Survey (CIS, 2006) together with their mean scores and standard deviations in an attempt to answer the said research question. There were eight questions under the domain of Confidence, which were randomly arranged in the CIS survey questionnaire as questions no. 3, 6, 9, 11, 17, 27, 30 and 34. All questions/statements were straightforward and related to the domain with two questions constructed as negative (with the word '*difficult'*). They were questions 11 and 17 which were meant to invoke further emotions and feelings of the respondents on their experience. According to Keller (2006), these will make respondents to be more careful and thoughtful upon providing the required feedback.

Table 4.
Survey questions focusing on the dimension of CONFIDENCE

No.	Statement	Mean	SD
3.	I feel confident that I will do well in this course.	4.46	.688
6.	You have to be lucky to get good grades in this course.	2.79	1.346
9.	Whether or not I succeed in this course is up to me.	4,21	.925
11.	The subject matter of this course is just too difficult for me.	2.55	1.310
17.	It is difficult to predict what grade the instructor will give my assignments.	3.48	1.037
27.	As I am taking this class, I believe that I can succeed if I try hard enough.	4.41	.745
30.	I find the challenge level in this course to be about right: neither too easy not too hard.	4.34	.819
34.	I get enough feedback to know how well I am doing.	4.37	.755

Based on the respondents' feedback and mean scores as shown in Table 4, the highest score in the Confidence dimension was obtained by item no. 3, which is *'I feel confident that I will do well in this course'* with a mean score of 4.46. On the other hand, the lowest score in this

dimension was recorded by Item No. 11, which is *'the subject matter of this course is just too difficult to me'* with a mean score of 2.55. However, even with a low mean score, this item had been set as a negative item, which in return, needs to be viewed as positive as it provides a positive aspect of a negative perception (low score for negative means high score for positive, as prescribed by Keller, 2006). Another negative item tested in this dimension was item no. 2, *'You have to be lucky to get good grades in this course'* with the mean score of 2.82. Again, the low mean score for this item reflects a positive situation as indicated earlier by Keller (2006). To conclude this section, all the tested items in the dimension of Confidence in this study were considered very high (>4.40) and thus, to address the research question, it can be concluded that the level of student's confidence with the Moodle LMS used in this study was very high.

What is the level of respondents' satisfaction with the Moodle LMS in this study? (Analysis on Research Question 3)

For this section, the Satisfaction domain of the CIS questionnaire was used to address research question 3. Accordingly, Table 5 lists all of the survey questions relating to the dimension of Satisfaction in Keller's Course Interest Survey (CIS, 2006) together with their mean scores and standard deviations as obtained from the respondents. There were nine questions under the domain of Satisfaction randomly arranged in the CIS survey questionnaire as questions no. 7, 12, 14, 16, 18, 19, 31, 32 and 33. All questions/statements were straightforward and related to the domain with only 1 question constructed as a reversed statement, *'I feel rather disappointed with this course'* (Question 31). According to Keller (2006), this will make respondents to be more genuine in evaluating their experience when accessing the Moodle LMS of Distress and Routine Messages.

Table 5.
Survey questions focusing on the dimension of SATISFACTION

No.	Statement	Mean	SD
7.	I have to work too hard to succeed in this course.	3.96	.942
12.	I feel that this course gives me a lot of satisfaction.	4.26	.697
14.	I feel that the grades or other recognition I receive are fair compared to other students.	4.43	.762
16.	I enjoy working in this course.	4.43	.701
18.	I am pleased with the instructor's evaluations of my work compared to how well I think I have done.	4.23	.920
19.	I feel satisfied with what I am getting from this course.	4.32	.787
31.	I feel rather disappointed with this course.	1.18	.437
32.	I feel that I get enough recognition of my work in this course by means of grades, comments, or other feedback.	4.22	.904
33.	The amount of work I have to do is appropriate for this type of course.	4.49	.673

From Table 5, it is evident that the highest score in the Satisfaction dimension was obtained by Item 33, which is *'the amount of work which I have to do is appropriate for this type of course'* with a mean score of 4.49. On the other hand, the lowest score in this dimension was recorded by Item 31, which is *'I feel rather disappointed with this course'* with a mean score of 1.18. However, even with a low mean score, this item had been set as a negative item, which in return, needs to be viewed as positive; as it provides a positive aspect of a negative perception (low score for negative means high score for positive, as prescribed by Keller, 2006). According to Keller (2006), the low mean score for this item reflects a positive situation as respondents did not agree with the statement and thus rated it lowly in the questionnaire. To conclude this section, all the tested items in the dimension of Satisfaction in this study were considered very high (>3.96) and thus, to answer the research question, it can also be concluded that the level of student's Satisfaction with the Moodle LMS used in this study was very high.

Conclusion

The first conclusion that can be made from this study is that, on average, all respondents have provided a high level of feedback and responses to the questionnaire which reflected their pleasant experience when accessing the Moodle LMS for Distress and Routine Messages in this study. In a more specific situation, all four domains of the ARCS Model as embedded in the CIS questionnaire recorded high scores, which reflected the positive experience of the respondents.

Hence, it can be summarized that the following questions/statements and their respective mean scores reflect this favourable situation/experience. Table 6 summarizes this section by listing all statements from the four domains that obtained high mean scores from respondents (4.26 to 4.65),helping to conclude respondents' perception, opinion, and experience in accessing the Moodle LMS of Distress and Routine Messages used in this study.

Secondly, the positive outcomes of study also indicated the researcher's utmost effort in providing the required alternative to students when the usual/conventional teaching approach could not be used due to physical restrictions during the MCO. Indeed, this study provides valuable input to maritime education and training institutions (METIs) especially in Malaysia as it gives further directions on the learning interventions to be made in online distance learning. It is undeniable that lecturers are responsible for providing effective alternative lessons to students during the time of uncertainty as experienced during the Covid-19 pandemic worldwide. Hence, this second conclusion is well-supported by earlier findings by Tanveer et al. (2020) that online distance learning is not only about the internet communication and facilities, but also concerns about trainer's blended technology skills, competencies, and extra effort. It is a well-known fact that the sudden shift to online distance learning has posed immense challenges to both educators and students (Li and Lalani, 2020; Lisnani et al, 2020; Tanveer et al., 2020 and Tam, 2020).

Finally, the findings of this study provide the missing link in online distance learning of the STCW courses in Malaysia. It is the Instructional Design (ID) and Multimedia Authoring skills that must be further highlighted, nurtured, and mastered in order to be successful in developing Moodle LMS content. It is further anticipated that more related studies could be conducted on the significance of these two skills (Instructional Design and Multimedia Authoring). In conjunction with this aspiration, it is in the researcher's wish that there shall be more descriptive and detailed guidelines/manual in Moodle for everyone's benefit so that more

STCW trainers/researchers could take up the effort to develop interactive content for STCW courses.

Table 6.
Survey questions from all 4 domains that summarize the positive outcomes of this study

No.	Statement	Mean	Dimension
1.	The instructor knows how to make us feel enthusiastic about the subject matter of this course.	4.41	Attention
24.	The instructor uses an interesting variety of teaching techniques.	4.51	Attention
2.	The things I am learning in this course will be useful to me.	4.60	Relevance
5.	The instructor makes the subject matter of this course seem important.	4.49	Relevance
20.	The content of this course relates to my expectations and goals.	4.45	Relevance
28.	The personal benefits of this course are clear to me.	4.65	Relevance
3.	I feel confident that I will do well in this course.	4.46	Confidence
30.	I find the challenge level in this course to be about right: neither too easy not too hard.	4.34	Confidence
12.	I feel that this course gives me a lot of satisfaction.	4.26	Satisfaction
16.	I enjoy working in this course.	4.43	Satisfaction
19.	I feel satisfied with what I am getting from this course.	4.32	Satisfaction

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HANDOVER OF FLAGS

The IMLA flag was virtually handed over from the World Maritime University
to the National University "Odessa Maritime Academy", the next host of the IMLA conference.

IMLA 2021 GROUP PHOTO

WMU/IMLA Joint Conference with ICERS, IMEC and INSLC 2021
08-10 September 2021

Conference Programme

Day one - Wednesday 08 September 2021		
09:00	Welcome address – Dr. Cleopatra Doumbia-Henry (WMU President) Opening remarks – Professor Jin Yongxing (IMLA Chairman)	
09:30	Plenary session ● Keynote speech – Ms. Mayte Medina (IMO MSC Chair)	
10:15	**Break (30 minutes) - Vendor presentation (Kongsberg)**	
10:45	Parallel presentations (15-minute presentations + 30-minute panel discussion)	
Session 1: Lifelong learning in MET		
1	A key component of Continuing Professional Development in the maritime context	Olga Zavalniuk, Volodymyr Nesterenko, Inna Zavalniuk and Halyna Doshchenko
2	Lifelong learning: The 21st century skill to guide maritime training and development	Angelica Sogor
3	New education for ships electrical engineers	Axel Rafoth and Jens Borchardt
4	As an engineer on board a marine research vessel - Education toward the creation of value	Hironori Funatsu
Session 2: Maritime training in safety and risk		
1	A sample of risk management on board of cruise ship - COVID 19	Katsuya Matsui and Nobuaki Nakamura
2	Cyber security training needs: Dealing with maritime SCADA risks	Razali Yaacob, Nikitas Nikitakos and Dimitrios Dalaklis
3	Best practices in water safety and survival training	James Downey
12:15	Plenary session – Highlights of sessions 1 and 2	
13:00	**End of Day One**	

Day two – Thursday 09 September 2021		
09:00	Keynote speech – Murray Goldberg (Marine Learning Systems, Founder and CEO)	
09:30	Parallel presentation sessions (15-minute presentations + 30-minute panel discussion)	
Session 3: Quality MET for a sustainable future		
1	MAAP Transition from ISO 9001:2015 to ISO 21001:2018 - The New Quality Standard in Education Organization	Michael Amon and Eduardo Ma. Santos
2	The critical role of government and key industry players for sustainable development of maritime education and training institutions: The case of institutional development in Kenya	Talib Mohammed
3	Are ships communities of practice?	Josephine Nthia and Quentin Cox
4	An evaluation of MAAP IMO Model Course 6.10: Trainees' perspectives and reverberations	Lester Malabanan and Leonora Dela Cruz
5	The needs, challenges and prospects of maritime education and training in Georgia	George Gabedava and Guram Kakabadze
Session 4: Effective communication and MET		
1	Communicating with VTS via VHF: What a VTS controller expects from a Master. An approach to teaching the essentials for successful communication in English based on the recommendations in the SMCP and proposed from the perspective of VTS	Uwe-Michael Witt
2	Utilization of non-verbal language in the engine room training	Yutaka Emi, Haruto Yamada and Nagisa Muramatsu
3	Needs analysis of Maritime English course in vocational higher education: Transitioning toward the future	Nurmala Elmin Simbolon
4	Prosodic interference in maritime communication: Nature and means of eliminating	Bozhena Dokuto and Igor Smirnov
5	Psycholinguistic features of successful transformation of ship engineers' thinking into speech	Olena Tyron and Svitlana Korieshkova
11:30	Plenary session – highlights of sessions 3 and 4	
12:00	Break	
12:30	IMLA AGM • Historical report/update on IMLA – IMLA Chair (Prof. Jin Yongxing) • Historical report/update on Special Interest Groups – ICERS (Prof. Taskeshi Nakazawa), IMEC (Prof. Alison Noble) and INSLC (Prof. Michael Baldauf) • Treasurer's report – IMLA honorary treasurer (Anne Pazaver)	
13:30	**End of Day two**	

Day three - Friday, 10 September 2021		
09: 00	Panel Discussion – Resilience in MET in the face of Covid-19 (presentations + panel discussion with SIG Heads)	
Development and implementation of online teaching system at Shanghai Maritime University		Xin Shi, Yingming Wang, Hui Zhuang and Zekun Zhang
Building a resilient university: Ensuring academic continuity—transition from face-to-face to online in the COVID-19 pandemic		Inga Bartuseviciene, Anne Pazaver, Momoko Kitada
Presentations by SIG Heads		Alison Noble, Takeshi Nakazawa, Michael Baldauf
10:30	**Break (30 minutes) – Vendor presentation** (The digital disruptions effects on maritime training and training facilities – Wartsilla)	
11:00	Session 5: Digitalization and MET (15 min + 30 min panel discussion)	
Virtual reality simulator experience in marine engineer education		Simen Hjellvik
AIM: Adapting to the individual through machine learning		Magne V. Aarset, Leiv Kåre Johannesen and Michael Esplago
Engineering routine remedial work in manned machinery spaces ship – challenges for maritime autonomous surface ships		Yutaka Emi, Haruto Yamada and Atsuki Nakajima
Communicative competence and autoremote operations		Paraskevi Papaleonida
12:30	**Break (30 minutes) – Vendor Presentation**	
13:00	Introduction of next conferences – Virtual handing over of flags • IMLA – Odessa Maritime Academic, Odessa • IMEC – Admiral Ushakov Maritime State University, Novorossiysk	
13:30	Closing ceremony ● WMU President ● IMLA Chair	
14:00	**End of Day Three/End of Conference**	

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WORLD MARITIME UNIVERSITY

World Maritime University
PO Box 500
S-201 24 Malmö
Sweden
www.wmu.se

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