Maritime Education and Training:

What the Maritime Vision 2030 beholds

EDITORIAL

A Nation is advanced in proportion to the education and intelligence spread amongst the masses.

—Swami Vivekananda

The true sign of intelligence is not knowledge but imagination.

—Albert Einstein

In the arrayed visages, 'becoming a top class seafaring Nation with world class education, research and training' is placed in the last Chapter (Ch. 10) of the Maritime India Vision 2030 (MIV 2030). Strengthening MET (Maritime Education & Training) takes a whale's portion of the wish-list story-board. Translating this into reality requires all hands on deck (and the shoulders) of all the stakeholders. The academia-industry synergy will be crucial to the canvas we will see in 2030 and the Nation's advancement. Else, the Vision Statement will be an exemplary script of our imagination and of course, it will remain a true sign of our intelligence. Nothing more.

In this Thematic issue…

One cannot nurture a narrative of MET in India without IMU. IMU is a unique brew of the old and the new. It is time the blend matures and none would disagree on that. The Thematic Issue opens with a conversation with IMU's Vice Chancellor, Dr. Malini Shankar. Dr. Shankar, with her passionately committed self, lays across the plans for IMU, the largest Maritime University in our country. The establishment of a Chair in Marine Engineering (supported by IMEI), multidisciplinary approach with micro credit courses in curriculum etc., are actions which would make the industry more inclusive (rather than only for placements) as also help build better Marine Engineers. From her words, we may feel the winds of change and the fragrance of the future shape of things to come.

Taking MET into the decade in progress cannot be accomplished simply by an adaptation of neo-pedagogy and new learning tools aided by the digital technologies. We have to build this based on the experience from the past, so that a fit-for-purpose MET may evolve. Dr. Sujata Naik *née* Tolani summarises the valences of many obvious factors affecting holistic education in her essay. While emphasising that the major shaping and conditioning for sea training must happen ashore, a very significant observation Dr. Sujata makes is the erosion of mentor-mentee relationship on board due to the changes in employment patterns. This read is worth reflecting upon.

Though one may wish otherwise, the pandemic has become a point-of-reference in time for trade, training and other global travails. It has turned our approach to conventional training on its head. While the debates perdure for return to classroom [or] for continuing online mode in combination with classroom mode, the writing on the wall (or rather the message on the monitor) is clear: the digital deluge is virtually real. On these digital learning tools, Tracy Plowman and Volker Bertram, two Maritime Training Gurus from DNV, present an easy read, highlighting the software solutions crisscrossing our screens. Apart from interesting titbits on improving presentations (death by power point etc.), a very significant takeaway is the observation on the apparent absence of social interaction (meet and mingle in campus ambience) in the modern format of online teaching.

Following this is the capture of a dissertation work by Kirtan Vakil. Lacuna in teamwork and leadership skills (T&L skills) can certainly cause disasters, especially in offshore and on board operations. The various types of leadership styles, the prevalent perception in maritime groups etc., accentuate the need for inclusion of T&L skills in the MET curriculum. A couple of recommendations worth contemplating on are: introducing 'different learning theories' and the 'scenario role plays' with increased training time on simulators.

Anchoring the theme is another MET heavyweight, Dr. B. K. Saxena, pitching in for a quality check of MTIs. Drawing strength from his Doctoral thesis, BKS juxtaposes MET architecture of MTIs with that of petroleum tankers management. Establishing KPIs and assessing potential etc., are undeniably some tools that would help in 'assess-reflect-improve' models under Quality Systems. While such benchmarking processes are in vogue for quite some time (DNV SeaSkills is one worth a mention), the novelty is in drawing the elements of the Tanker assessments. The model is certainly adoptable by MTIs for certain decision making situations.

Lastly, Lim Kian Chuan presents an insight into development of an Instructional Design (ID) model for Competency based training. The underpinning elements for the model are from offshore training formats. Exposing the trainee to the field operations (Read: on the job) allows a self-regulated learning by way of experiencing the actions. Guidance from mentors and peers contributes to some learning and of course, the rest of the learning is by formal mode. Throwing in a modern tool of virtual reality exposure to this experiential/social/formal learning completes the ID model. The model somewhat resonates with pre-sea competency training.

Under regular Columns, Gopi educates us with an explosion due to Hydrogen emanating from incinerator bottom ash (Spanner in the Works). We conclude the anchor equipment talks (BBSB) and continue with Lube Matters (Technical Notes).

This Thematic Issue (as it happened):

When we tinkered out a theme for MIV 2030, MET and MIV were too tempting a combination, yes.

We also surmised that we would get troves of talks on training in our trawls, considering our knowledgeable community (and ever willing to give opinions) of Indian Mariners. But we were served only after a wait.

Also, we had aligned the Thematic Issue with the launch of the MER flipbook and the Journal Management System. The pandemic pushed all these plans further and hence the delay.

The flipbook will flutter in your fingertips soon…

Hope this August collection holds your interest…

Dr Rajoo Balaji
Honorary Editor
editormer@imare.in

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In This Thematic Issue

Cover: **Head Quarters, Indian Maritime University, Chennai.**
Photo: **K.Srinivasan, IMU Chennai Campus.**

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Interview

■ **Dr. Malini Shankar**

Dr. Malini Shankar is a familiar face amongst the Maritime community. Known for her panache towards technology driven management practices and citizen friendly initiatives during her Administrative assignments, she now dons the mantle of the Vice Chancellor of Indian Maritime University. She is in conversation with HonEd.

The announcement of your current assignment brought in good cheers and the industry sentiment also appears favourable. This brings lot of expectations too. How do you see this and how do you intend to translate this into bringing benefits to IMU?

The Ministry of Ports, Shipping and Waterways has recently enunciated the Vision 2030 document, which lays special emphasis on Maritime Education and Training. It is a very opportune moment for me to take the vision forward. I intend to do this primarily on two fronts: **focus on research**, and constructive and **intense industry-academia collaboration**. The IMU should be a resource centre for technical and policy matters concerning the maritime sector.

IMU has had more than its share of teething troubles all these years. Over a decade long existence has not seen a furtherance one would envisage for a Central University.

How do you plan to give the impetus for growth in the right verticals?

There can be no overnight transformations in education sector. Concerted and constant effort at updating curriculum to meet market expectations, improvement in pedagogy especially in the wake of changes in the ecosystem caused by the pandemic,

and rationalisation of courses are key factors that help in raising the standards. A specialised University in Maritime Sector, in my opinion, should be looking at all subjects related to maritime domain - beyond marine engineering and nautical science. Expertise in the IMU should include fields such as Maritime law and Marine insurance, Occupational health & safety of Seafarers, and Casualty investigation.

We have taken steps to enhance the confidence of cadets and prepare them for excelling in the professional world. For instance, we have launched an individual mentoring programme in collaboration with CMMI, and we hope that more associations will come forward to join hands. Other initiatives are in the pipeline.

In a simple format of short, medium and long terms, do you have tangible targets in sight for IMU's growth?

In fact, yes. The ultimate goal is to place IMU in the top 5 Maritime related Universities globally. As I mentioned, we have already commenced the mentoring programme. In the short to medium term, we are reviewing the academic curriculum and faculty training, and engaging with industry to identify areas of collaboration. Through these measures,

> " A specialised University in Maritime Sector, in my opinion, should be looking at all subjects related to maritime domain - beyond marine engineering and nautical science. "

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Modern Engineering Workshop:
Erection of equipment in progress (IMU Chennai Campus/Semmencherry premises)

we hope to develop the capability to offer short term courses to international participants and take up research projects in the near future.

We plan to establish functional Centres of Excellence in select areas - green shipping, dedicated training for sea and riverine pilots. On our horizon is also partnership with institutions and Universities, both domestic and international, for advanced research. In the long term, I visualise IMU to be the "go to" institution for research, consultancy and policy inputs in the maritime sector.

India, though being a Maritime Nation, has largely been a manpower resource provider and has shied away from any core Maritime research.

What do you see as reasons for this and how can this change?

Research in this sector is necessarily applied research and not really fundamental research in science as is the case with Physics or Chemistry. We are engaging with industry to identify research projects that can be undertaken in the University, to the mutual benefit of academia and industry. Doing so will enable us to enhance the research capabilities of the University faculty and offer the students an opportunity to gain experience on live projects.

Professional competence and adequate infrastructure are *sine qua non* for meaningful and effective research. We are working on both fronts. We have planned a workshop for faculty to revitalise scientific research temper.

You had steered the DGS towards a digital transformation and improving administrative efficiencies.

Do you still see any persisting pain points of MTIs which need to be resolved?

Any organisation is in need of continuous improvement and evolution. To this end, digitisation is an important factor. While the DGS is focussed on administrative/ regulatory function, the human mind is the core of MTIs and Universities. To bring about a significant shift from teaching to learning (as is clearly stated in the NEP), and to steer the approach from granting of

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Dr Malini Shankar IAS (Retd.)

Current Assignments: Vice Chancellor, IMU; Chairperson, National Shipping Board.

Academic Qualifications: Ph.D. in Public Policy/Institutional Economics; IIT Madras.

Master's Degree in Development Management; Asian Institute of Management, Manila.

Master's Degree in Chemistry; Mount Holyoke College, Massachusetts, USA.

Diplôme in International Economics; IIAP (Institut Internationale d'Administration Publique), Paris, France. GoI Nominations for training programmes at Harvard University and at the University of California @ Berkeley.

Awards & Recognitions: National Merit Scholarship, Government of India; International Fellowship for Exchange Studies, USA; Phi Kappa Scholarship for Higher Education; the CIDA Scholarship for Management Studies; and AAA Award of the Asian Institute of Management, Manila, The Philippines.

Best Student Awards in Science and in French (College).

Bureaucratic Career: Water, Power, Industries sectors.

degrees towards independent and industry-useful research – that is the challenge.

With logistics and transportation driving the Nation's growth, many leading Institutions are seen as the academic blockhouses for data analytics and development.

How do you plan to get a share of this for IMU?

We are in consonance with the thinking of the Government to broad base education, and to develop capabilities and attain self-sufficiency in emerging technologies.

36000HP Gas Turbine donated by IN: IMU Kolkata Campus (erstwhile DMET-MERI)

> **We are in consonance with the thinking of the Government to broad base education, and to develop capabilities and attain self-sufficiency in emerging technologies**

We need to create a critical mass of experts that can drive this exercise. Besides nudging the internal stakeholders to shift gears, we are also taking this factor into consideration while recruiting new faculty.

The Maritime India Vision 2030 has ambitious aims and plans put on anvil to achieve tremendous maritime growth.

What kind of strategy should the Maritime industry adopt to fuel this?

How do you think the Maritime Training Institutions should contribute in this scheme of things?

Full Mission ERS panels and Virtual Walk-through Images: IMU Chennai Campus

Some of the initiatives I have described are intended to drive the plans enunciated in the Vision 2030. Collaborative research, partnering industry, interactive learning, drafting micro-credit courses and electives are some of the steps that would contribute to achieving the intended objectives.

Just over a year in IMU… The pandemic has certainly precluded actions you might have planned with alacrity for IMU.

Enhancement of Quality of Maritime Training	Improved onboard oppurtunities and Placements	Promotion of Careers at Sea	Seafarer welfare and attractive alternative career oppurtunities
• Faculty Development • Research Projects aligned with MIV 2030 (with IIT-Madras et al.) • Revision of curricula aligned with NEP • Smart Classrooms; LMS • Erection of modern Workshops (nearing completion)	• Promoting Academia-Industry Interaction • Inviting Industry Leaders for Webinars/ Campuses • Bring Alumni into University activities	• Reaching out to Schools to create sea career awareness • Increase Visibility • Revamp website; Host achievements	• Faculty Recruitment: Filling in sanctioned slots • Establishing Occupational Health & Safety Centre

IMU: Towards Full Ahead
(Under MIV 2030: Four Key Pillars to enhance India's share of Seafarers)

Other Efforts

• Establishing IME(I) Chair

• Developing Training Programmes/ Courses for Port personnel/ Sagarmala

• Breathing Life into MoUs with National & Foreign Institutions

• Promote R&C Culture: Consultancy Project for Inland Waterways etc.

• Establsihing CoEs in Campuses

> **the key aspect is to focus on the present: work on pragmatic financial plans, strive to motivate stakeholders (students, faculty, administrative staff, and our collaborators), ensure that the curriculum is relevant and stimulating**

IMU and the Sea: Glowing and Growing

Resource crunch... legacy administrative bugbears... breathing life into domestic and foreign engagements... How do you visualise the way ahead?

While the pandemic has thrown tremendous challenges especially to the education sector, it has also provided an opportunity to rethink strategies and methodologies. I am sure you will agree that given the difficult situation, the administration and the teaching personnel have responded exceedingly well to ensure that the system continues to function.

I recently read a quote: "*do not dwell in the past, for it might bring tears; do not ruminate on the future, it might bring fears*" ... the key aspect is to focus on the present: work on pragmatic financial plans, strive to motivate stakeholders (students, faculty, administrative staff, and our collaborators), ensure that the curriculum is relevant and stimulating. In my experience, there is no better way than to build an effective team that adopts common principles and objectives, and energise the team to deliver identified deliverables.

Can we say that the coming period could be the point of inflexion for IMU?

I certainly hope so. And that will depend on the level of commitment and involvement of each member of the IMU family.

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Maritime Education & Training: Past, Present and Future
"WHAT THE MARITIME VISION 2030 BEHOLDS"

■ **Dr. Sujata Naik née Tolani**

Chairperson, Tolani Shipping Co. Ltd.
Chairperson, Tolani Maritime Institute
President, Indian National Shipowners'
Association

The ultimate objective of Maritime Education and Training (MET) is to transform adolescent girls and boys into mature maritime professionals. The dictionary definition of a Professional includes and is not limited to elements like appearance, demeanour, reliability, competence, ethics, poise, communication etiquette, etc. The ecosystem of the Maritime Training Institutes (MTIs) must be designed to instil all such attributes into the budding Maritime Professional.

The industrial revolutions have transformed our technological milieu. Centuries ago transport by sea was powered by sails. With the advent of steam power, the latter part of the 19th century witnessed the almost complete disappearance of large sailing ships. In the early 20th century, the use of heavy fuel oil on ships began to replace coal as the fuel of choice. Most ships built since about 1960 have been fitted with diesel engines, either Four-Stroke or Two-Stroke. The greatest advantages were the reduced space requirement for fuel bunkers and the ability to dispense with trimmers and stokers. Digital technology brought in automation, remote operation and control of machines and equipment as well as the periodic unmanned engine room.

STCW 78 as amended

Over the years, while these changes dramatically reduced the man power requirement on-board, they also resulted in a transition from the need of semi-skilled work-force to skilled, trained and formally educated seafarers to ensure safe ship operations. The seafarer producing nations endeavoured to keep pace with the needs of the shipping industry. Needless to say the International Maritime Organisation (IMO), through its Standards of Training, Certification and Watch-keeping (STCW) 1978 Convention was the driving force behind the changes in Maritime Education and Training.
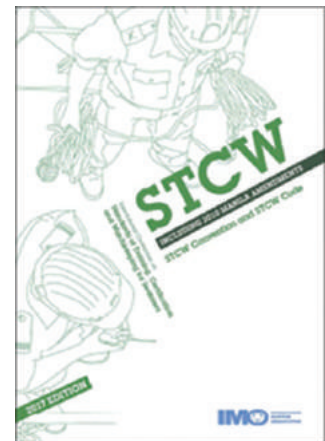
Seamanship training in India dates back to 1910, with the establishment of TS Rahaman. The anthology of the MTIs in India illustrates their evolution. 1927 saw the conversion of the vessel RIMS Dufferin to shore based IMMTS Dufferin. The Directorate of Marine Engineering Training (DMET) was established in 1949. IMMTS Dufferin was succeeded by TS Rajendra in 1972 and then by land based TS Chanakya in 1993. DMET was renamed Marine Engineering Research Institute (MERI) in 1994.

Traditionally during MET, cadets are trained and evaluated for officer like qualities, leadership abilities, adaptability and team spirit. In India, all pre-sea maritime courses are conducted on residential based campuses. Strict discipline is maintained in the MTIs on the lines similar to what is carried out in training establishments for Defence Officers. Over and above classroom teaching, practical training lays emphasis on seamanship,
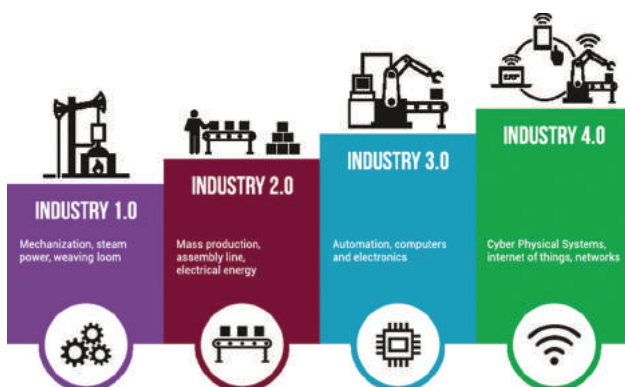
Industrial Revolutions
(Source: 2021 netObejex.com)

Glimpses of Extracurricular Activities at MTIs
(Courtesy: Tolani Maritime Institute, Induri)

boat handling, overhauling-repair-maintenance of ship machinery, etc. It has been compulsory for cadets to take part in physical training, swimming and outdoor games such as basketball, volleyball, badminton, etc. Facilities also exist for hobbies like photography, painting, music, etc. A holistic evaluation of the cadets is carried out; his/her conduct, academic performance, participation in co-curricular and extra-curricular activities, are all given due consideration.

The STCW 1978 as amended in 1995, a game changer, brought in the competency-based curriculum which standardised MET across the world. Additionally the 4 year program at MERI which included elements of an engineering degree program gained acceptance by the Ministry of HRD, GOI, as equivalent to a Bachelors Degree. While this was often to the advantage of the student, it was not yet universally accepted. Around this time in 1996-1997, with the idea to extend MET beyond its resources, to the private sector, the government announced liberalized guidelines for the establishment of MTIs. This privatisation also saw the collaboration of MTIs with Universities to create a Marine Engineering Syllabus which would include an optimal blend of narrow

Indian Maritime University, Chennai
(Courtesy: IMU, Chennai Campus)

competency-based education with the more extensive engineering curriculum. Graduating students could now be conferred a Bachelor's Degree from different Universities, increasing the scope of their employability. This advantage became recognized internationally and led to various countries around the world similarly transforming their maritime educational system; not only for Engineering but also for Nautical Studies.

For strengthening the institutional framework to impart MET in India, an Act was passed in the Parliament on 12th November 2008, to establish Indian Maritime University (IMU), a teaching and affiliating University, with its headquarters at Chennai and regional campuses at Chennai, Mumbai, Kolkata and Visakhapatnam and with a later addition at Cochin.

Empowered with the right attitude, skill and knowledge, the young professionals went to sea starting at the bottom of the ladder. A crucial component of their professional development was undoubtedly the guidance received from their seniors. The shipboard operations were conducive for the mentor-mentee relationship to blossom and achieve the desired results. Thus far MET had proved its mettle.

Ship board operations have seen tremendous changes over the last several decades. Even though, mechanisation of systems, advanced communication and effective control systems have made ship board operations less dependent on human intervention, there will always be the need for a fundamentally competent and well groomed seafarer. However the vessels' turnaround time in ports has significantly shortened, compromising the ship staff's exposure to routine tasks. Further, with reduced contract times a large number of seafarers often do not get an opportunity to even witness a dry-docking. Similarly, the significantly increased time

period between overhaul of machineries also results in loss of opportunities for hands-on maintenance experience. Higher reliance on OEMS and workshops has deprived the seafarers of their share of learning. All of these have resulted in inadequate competency of the seafarers and thus increasing the risks of ship operations. Advancements in technology have compounded the problem further.

> ## "What the mind does not know the eyes will not see"
>
> *Our cadets are a captive audience for 3-4 years. This being the most precious time and the foundation of their learning curve, every moment should be well utilised as time lost cannot be regained. Further recognising that the youth are like sponges that will absorb quickly and effectively most of what is presented to them, the Institutes should maximise goal-oriented exposure during their sojourn in the campus.*

To add to all of this, the mentoring and structured training of the junior seafarers has come under pressure due to various reasons. The employment pattern saw a change from permanent employment and ownership management to a contractual engagement system and third party management. This led to change in mentor–mentee relationship as the connection between seafarer and shipping company was lost. Growing stringent rules of ship operations and the presence of multinational crew further contributed to this issue.

Time and again, it has been seen that the root cause analysis of incidents and accidents reveals some form of human error as opposed to machinery/equipment fault. In all likelihood it is inadequate competency and reduced mentoring that are the real root causes for unsafe ship operations.

These constraints are putting the onus on the maritime training institutes to shoulder a greater responsibility. Transfer of high quality education rests on three pillars, Academic Infrastructure, Faculty and Students. While the infrastructure inclu-

> **The employment pattern saw a change from permanent employment and ownership management to a contractual engagement system and third party management.**

sive of the curriculum must be upgraded to cater to the present day needs, it is equally important for the students to be exposed to the principles of the obsolete, which remain to be the foundation of the present day technology. This triggers the young mind to understand the need and benefits of development. The faculty must be given the liberty to develop relevant pedagogy for his/her course and devise methods to evaluate the effectiveness of the same. Undoubtedly the last few decades have produced technologically smarter student bodies; however, it is the attribute of unceasing curiosity and greater participative learning that will yield far superior professionals. Active engagement of the students with the faculty, in co-curricular and extra-curricular activities, will contribute to their confidence building and development into sound individuals. For both faculty and students, the system must be able to inculcate a sense of enquiry to promote applied research. This will enable MTIs to develop incubators and open avenues for young start-ups. The Industry, State and Administration should endorse such start-ups by adequate funding to encourage maritime entrepreneurs.

In MET, the initial year or so caters to defining and clarifying the basic principles on which the discipline is founded. Classroom teaching is ideal for this purpose. However going forward it is imperative to, at the earliest, intertwine theory with demonstration of real life equipment and the hands-on discovery of their intricacies. This is best achieved outside the classroom setting in laboratories and/or workshops. It is never too early to do so. Could we look at replacing at least 10-15% of classroom teaching by such systems as early as in the second semester? For more efficient transfer of knowledge in such settings, the trainer must indulge in all available audio-visual technologies. Further into the training an invaluable learning experience

K-SIM 310° Navigational Simulator
(Source: Kongsberg Simulators)

comes from one's own and other's mistakes. What better platform than simulators to make this possible? They can provide unlimited opportunities to carry out independent yet supervised tasks of different natures.

One cannot stress enough the concept of "Safety First" which can only exude in the presence of sound knowledge and situational awareness. Our cadets must be sensitised, from day one and throughout their MET, to be aware of their surroundings at all times. This would have them better prepared to deal with all situations at hand.

Needless to say, cadets must be empowered with sound fundamentals of science. Additionally to meet the ever-changing technology and skills sets, education and training has to be more experiential. The academic curriculum must incorporate learning by way of active projects, presentations, case studies and solving real life problems. The conventional hands-on approach needs a revamp. The active use of simulators, virtual/augmented reality tools and other such teaching aids will enhance practical training.

Assessments by way of written examinations are here to stay. The conventional "Sketch and Describe"

> **It is important that multiple knowledge verticals are available at all METs so that cadets achieve interdisciplinary proficiency.**

patterns are able to gauge memory and comprehension but fail to evaluate the candidate's ability to apply and analyse. It is often noticed in numerical courses that questions are only bringing out the mathematical solution but not its application or analysis. Tasks like interpret or demonstrate and distinguish, differentiate or compare have the potential to assess a candidates ability to apply and analyse respectively. The right and calculated usage of Seminars, Projects, Model making are ingenious ways of assessment.

It is important that multiple knowledge verticals are available at all METs so that cadets achieve interdisciplinary proficiency. The New Education Policy also rightly emphasises this. The faculty and staff at METs must remain current at all times. Their up-gradation can be achieved by structured continuous professional development programs in the form of industry seminars,

CONTEMPLATION

'Change is the only constant'; some constants will need to change while among these changes there could be some constants. Even while Elon Musk intends making human-being multi planetary, we can be sure that sea transport is here to stay.

Considering the limited crew members and resources on-board, ships will always need to be handled with utmost discipline, a sense of responsibility and uncompromised competency. These attributes need to be the constants in the curriculum. On the other hand, the rapid changes in technology and industry need to be accommodated in the curriculum on real time basis. An educational cell at the MTIs with subject area experts needs to observe, track and implement. In the final semester "Recent Advances" could be a multi-disciplinary subject which is updated annually and makes the graduating students aware of the recent developments. The accumulation of the recent

advances will be the basis of the changes in the syllabus at the next opportunity.

The world growth rate may be declining but its population for a while will surely continue to rise. Amidst this is the paradox that technological advances enable reduction in manpower across industries. Reskilling and retraining will be required to stay relevant. With an increasing student body, it is imperative that we use technology to our advantage to enable "more" delivery from "less" teachers for "more" students. Faculty will need to reorient, evolve as course content developers and remain engaged in continuous course improvement.

The quantum and dimensions of information in all areas of study have exploded over the last few decades and will continue to do so. This impacts strongly on how education is imparted. The bare minimum should be, transferring knowledge and skill. Over and above this, the goal must be to deliver a holistic education which

engages all aspects of the learner; mind, body and spirit. **The paradigm of education needs to recognise the inherent worth of all individuals and enable them to fully express their potential.** Further in this maze of information, no single individual can know everything. The ability to recognise one's limitations, the maturity to seek out what one doesn't know and the knowledge about where to look, are the key to continuous learning.

MET does not stop when a student graduates; it continues throughout his/her career path. The industry more often than not takes on this responsibility. Often companies worry about "Train Drain", however from a broader perspective, a well-trained seafarer is an asset to the community at large and keeps all in this community safe.

Evolving maritime education and training will pave the way for smooth transitions to the changing technology and for safer and cleaner seas.
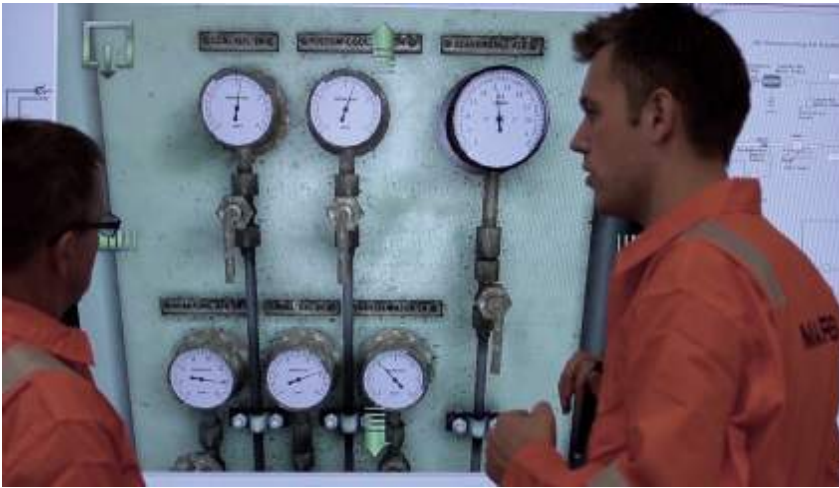
On-Board Mentoring
(Source: Marine Gyan)

Structured training will not yield the desired results until and unless the senior officers on-board play an active role in mentoring colleagues for their career development. Companies should have rigid systems in place to ensure compliance in the above.

Task oriented training has always been a critical part of a seafarers on-board professional development. While this will always remain to be so, the task elements themselves will be gradually transformed based on the concurrent technologies and require different competencies. Returning back to the classroom for continuous professional education at various points in their career can be argued to be an effective method to ensure that our seafarers are better positioned for a 'technological future'.

workshops, research & development, consultancy, higher education etc. The METs and the Industry are equal stake holders in creating human resources for safe and efficient shipping. The timely and appropriate technical inputs from the industry will keep the curriculum relevant always.

MET system so far has been very traditional in restricting the practical training to that of ships only. Technological changes of any kind are today best reflected in the shore based micro-small-medium enterprises (MSME). Local MSME tie-ups and frequent visits to these enterprises embolden and enhance the thought process of the cadets. They are able to better co-relate between applications and fundamental sciences.

An area found wanting, is the structured training for on-board management level positions. **The minimum competencies as defined in STCW 78 as amended for the management levels could be monitored by a suitable mechanism, possibly similar to the TAR book used for operational levels.** Such a standardised method of training across the "state" would achieve uniformity in the competency of seafarers as they go up the ranks.

Technologies, the likes of Virtual Reality, Augmented Reality etc. have found their place in the modern curriculum of professional courses across various domains. Researches world-wide are proving this tool to be an effective and acceptable method of training and education.

The conventional chalk and talk and the audio visual projections may appear to be losing their sheen, but they still have the desirable impact and are here to stay. Capitalising on the best of the traditional methods of teaching and the contemporary technologies, the path for "blended learning" has been paved.

The COVID-19 pandemic has taken an unimaginable toll on the human race and this can never be downplayed or forgotten. While undoubtedly scores of people suffered, COVID-19 put us on a technological trajectory that otherwise may not have happened for years to come. Advanced technology that was being put to use

Welding Training with Augmented Reality
(Source: Seabery 2021)

> " The fourth industrial revolution has blurred the boundaries between the physical, digital, and biological worlds. "

Marine Autonomous Surface Ships
(Source: Rolls-Royce plc 2016)

Hull Design development by IMU
(Image courtesy: IMU Chennai Campus)

CRV Design by IMU
(Image courtesy: IMU Chennai Campus)

Maritime Autonomous Surface Ships (MASS) includes vessels with different ranges of automation that will be operated independent of human interaction to varying degrees. While today's equipment/machineries are individually automated; the ships of the future will have automation and integration across the vessel. The level of automation and integration will determine the degree of human decision support required by the vessel and the extent to which it can be operated remotely from ashore. It is only a matter of time that autonomous ships will be routinely traversing the high seas. Appropriately qualified and experienced on-board or remote operators are required to safely operate such vessels with zero risks for environmental damages. **The curriculum at the MTIs must be gradually modified to meet the requirements of the ships of the future with special attention being given to cyber risk management of the systems and infrastructure.** All stake holders have a role to play in preparing for the challenges that lie ahead.

Professional excellence is not just about competency; it is also about the ability of an individual to successfully be a part of a diverse ecosystem and to manage human resources, when in a leadership role. Fortunately many administrations have recognised the role that community living plays on board ships. The residential pre-sea courses in India, give our students the opportunity to evolve in the company of others from different backgrounds and to develop as leaders. Advantage must be taken of this platform to instil a higher degree of professional camaraderie. Sharing of resources and structured frequent interactions by MTIs across the country are a few examples of how this could happen. All of this is further challenged by the fact that our seafarers will more often than not engage with professionals across geographical borders. One cannot help but wonder if in the future international students should become a part and parcel of our student body.

in pockets across the world, almost overnight became all pervasive. Education and Training would have taken a serious beating in the last one year and more, had it not been for the world already being on a technological brink. The system has been fortunate that faculty and students have quickly adapted to virtual classrooms, virtual labs, virtual seminars, virtual assessments and virtual co-curricular and extracurricular activities. The ability to control the learner may have been lost, however for those students who continue to remain involved, the faculty has been able to achieve often far greater than what was possible in the normal classroom setting. Admittedly, all of this can never replace an on-campus education and therefore we eagerly await some kind of normalisation. Or should we say the "new normal", in which we hold on to the best of both worlds.

The fourth industrial revolution has blurred the boundaries between the physical, digital, and biological worlds. It is a fusion of advances in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing, and other technologies. Unlike the previous three revolutions, Shipping is an integral part of the fourth industrial revolution.

About the Author

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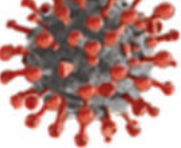
DIGITAL MARITIME TRAINING IN COVID-19 TIMES

■ **Tracy Plowman, Volker Bertram**
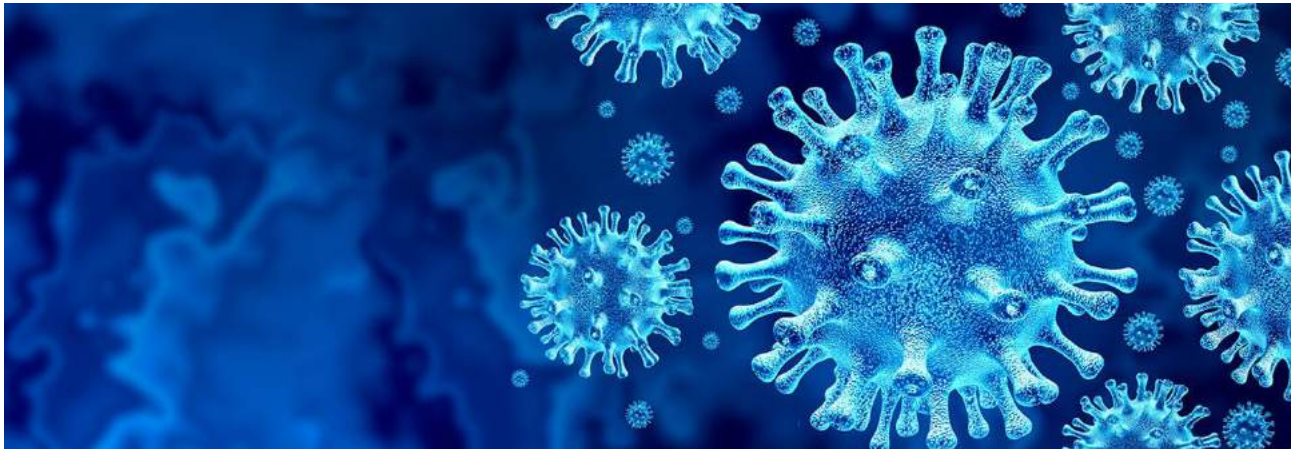
1. Introduction

COVID-19 has changed everything in our private and our business world. Teaching environments and approaches have also evolved in response. Like it or not, we have all had to embrace digital or remote forms of training very rapidly since last year. The first response was to employ ad-hoc measures such as delivering traditional classroom lectures as videoconferences. But, in parallel, a more fundamental discussion has started on how to provide high quality training if the pandemic stays with us for longer. Indeed, we are in the middle of a debate whether we should return to traditional classroom training if we could; or whether the experience with currently deployed remote methods indicates that an evolution towards more digital training methods is called for anyway.

Before the emergence of COVID-19, DNV's Competence and Learning unit had already employed a wide portfolio of options for digital training, *Bertram and Plowman (2017,2019)*. The various software solutions employed for live online teleconferencing (Microsoft Teams, Webex, Zoom, GoToTraining,etc.) have really taken off since the COVID-19 outbreak. We reviewed a variety of competing options for live online training, and now use both Microsoft Teams and Zoom for our online training, where the choice often depends on what the trainer is most familiar with and if Breakout rooms are needed. Improved software solutions for developing self-paced online training (we now favour Articulate's Rise over Storyline) have brought down the required production effort significantly, while at the same time improving trainee satisfaction with the "look and feel" of the end products. More and more of our training courses will employ a blend of live online training and self-paced online modules in future.

Self-paced online training is predominantly used for:

• Resource libraries with reading material (pdf files or hyperlinks) and videos, often referencing to publicly available sources

• Assessment, mainly in the form of multiple-choice tests

• Secondary topics, such as background knowledge or historical developments

Live online training or "virtual classrooms" are used for:

• Kick-off and closure of trainings

• Question & Answer sessions

• Group activities in virtual breakout rooms

• Material that needs live commentary from trainers and is most likely to spark interactivity such as questions from trainees with fast response from trainer

2. Traditional vs. Digital Training

Comparing traditional training with digital options, **Table I**, we have a digital equivalent for almost all modes of training: reading, frontal lectures, exercises, discussions and assessment. If a traditional training is well designed using visually stimulating material with interspersed activities for the trainees, the conversion to a digital equivalent is fairly straightforward. Only the

	Traditional	Digital
Reading	book, lecture notes	e-book, pdf, online reading
Frontal training	lecture, presentation	online lecture, webinar
Exercises	(group) exercises	(virtual) breakout rooms
Assessment	written exam	online test or quiz
Social networking	coffee breaks, etc.	social media

Table I: Traditional training elements with their closest digital equivalents

coffee breaks with real coffee and initial social bonding are vastly more satisfying in the real world.

3. Self-paced Online Training

These days, people generally think of self-paced, click-through (boring?) training when they hear terms like "e-learning" or "digital training solutions". Fortunately, this is just one of our tools. A key risk with self-paced learning is that the trainee does not really learn, and this may be true whether it is learning from an old-fashioned book or an e-learning course. Purely self-paced online courses generally have less impact than classroom courses where individual feedback is possible and where learners have a higher attention rate. A good web course should employ a wide range of task types to avoid boredom and fatigue. The training material employs techniques akin to PowerPoint presentations – text (sometimes animated), images, embedded videos. Short courses with typical durations of 5-10 minutes ("nano-learning") are often employed for quick once-off instructions, e.g. when a new app is rolled out inside a company or a short safety instruction is needed. In principle, all good advice for designing PowerPoint presentations for classroom training also applies to designing e-learning. Unlike PowerPoint, most e-learning authoring tools allow information on demand (e.g. mouse-over pop-up explanations, magnifying of images, links to websites or pdf documents), which helps in decluttering slides with faster progress for those who don't need information in so much detail.

Videos are frequently used in e-learning and range from short video clips to full recorded lectures which put high focus on the qualities of the speaker. Green-screen recordings of the speaker may be overlaid with slides (PowerPoint) while the trainer talks and moves through the slideshow as in traditional training. Alternatively, and at significantly lower cost, the expert may self-record with a webcam, using standard PowerPoint features, clicking through the slides and running a natural narrative. For special, usually promotional purposes, professional video production may be outsourced. Prices can range from 1000-3000 € per minute of video. Videos available on public websites are best hyperlinked. This avoids many legal issues and makes the final training material "light", i.e. reduces required bandwidth for acceptable response. Rather dry (technical or regulatory) material may be made more entertaining by using animated, cartoon-type videos using software like Vyond. As a rule of thumb, 1 minute of an animated videos costs 200-400 € to produce.

While e-learning courses should be strongly visual, there is usually textual information that needs to be transmitted. Our preference has moved towards "silent" reading options, based on the feedback from our multi-national, mostly non-native speaker customer-base. While not glamorous, pdf files and online reading text are often a good and cost-effective option, allowing people to learn at their own pace. **"**Sometimes
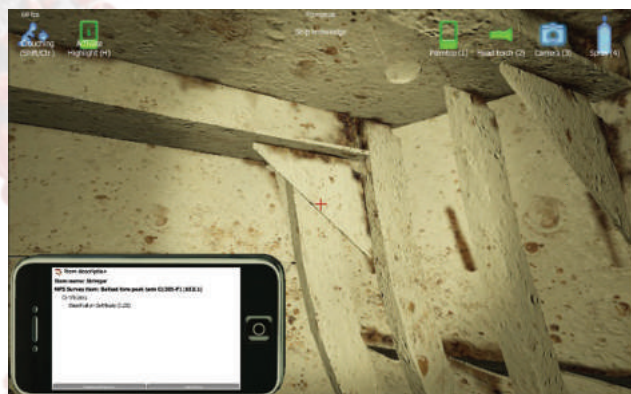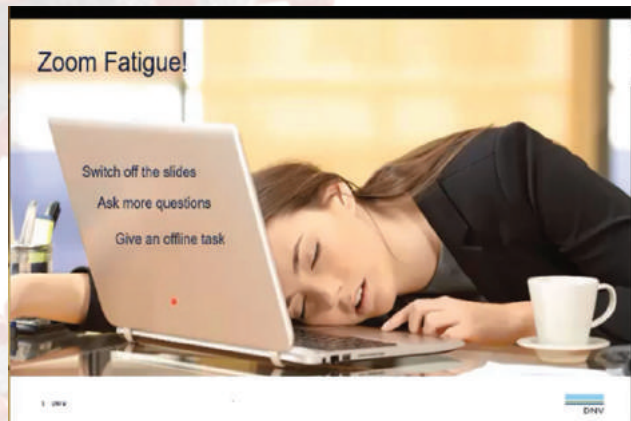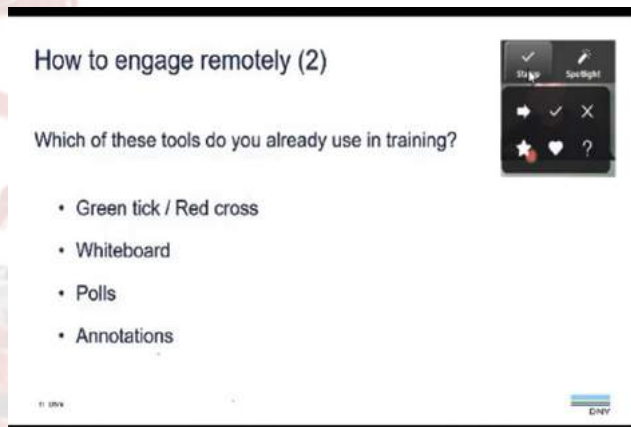
it makes more sense to deliver new training content in the form of a job aid. Don't stretch out a small amount of content in order to create an hour e-learning course," *Ferriman (2013)*. If you have little to say, put it on one page. A cardinal sin in training is 'slidumentation', the confusion of slides for presentation with documentation for reading. Much of our traditional training material contains reference knowledge. Nobody can seriously expect trainees to retain this amount of knowledge after a brief exposure. All the trainee should learn is where to find that documentation and how to work with it. Transferring classroom training to digital solutions, we often include links to pdf files or websites, where the reference knowledge is found, and focus on the learning goals "I know this resource exists", "I know where to find it" and "I know how to work with it". However, most participants feel a need for take-home reading material for later reference in their professional life. More or less extensive

lecture notes as pdf downloads from online training are popular and make pedagogical sense. The lecture notes can be updated frequently and cost effectively, much faster and cheaper than programming an e-learning.

Pdf files come with some inherent advantages. They can be downloaded and printed. We get a lot of reading done during our commuting to and from work. And we often prefer reading a paper version, where we can work with a pen or a highlighter, and where the strain of reading seems less after hours spent in front of computer screens. And the standard reader for pdf files comes with a search function, which is particularly useful in large documents.

Often a test at the end of a course is required to get the formal qualification. For such an assessment, there are various options, such as ungraded quiz, graded quiz, or human evaluation of free text. Mostly, graded multi-choice test questions are preferred as they can be integrated directly in the web course and graded and tracked in a Learning Management System.

4. Live Online Training

Overall, experience shows that live online training ("virtual classrooms") is more tiring, for both trainers and trainees, possibly due to reduced audio and visual resolution. We recommend reducing conventional full days in classrooms to half-days online while doubling the course duration in calendar days. PowerPoint presentation material generally needs reworking for online delivery, reducing text and making the teaching material strongly visual and interactive to keep the audience focused. While recordings can be offered after a broadcast, in our experience virtually nobody downloads these recordings. Some trainers feel overwhelmed by the multitasking required during online delivery and request a second person as support, e.g. for monitoring chats, handling technical issues, etc. This is definitely a good idea if your budget allows. Working with at least two monitors is really a must for the virtual trainer.

Short training units of 20-30 minutes are suitable for webinars. As with classroom/conference presentations, there are good ones and bad ones. Bad ones are of the format "you look at PowerPoint slides while the expert talks and talks". Participants then are likely to zone out and do other things like checking their emails, passively absorbing the audio and tuning back into the webinar occasionally. The good ones are relatively brief, focused on a single, tangible topic with a clear take-home message, and strong user interaction. In our line of training, we often have to respond rapidly to new developments, e.g. new regulations coming into force. We thought that webinars could be an attractive addition to our toolbox of training solutions in this respect. The problem is that we all get flooded with emails, and everyone is offering webinars today but no one has the time to attend them. As a simple self-defense, webinar invitations often land in the spam folder. In order to avoid this fate, best use a specific invitation from a known colleague/ manager and find an exciting title for your webinar that raises at least curiosity to join.

Some lessons learnt about live online training include:

- Live online training always comes with live audio. That makes them easy to prepare and generally livelier than e-learning but introduces a challenge: Listening to a voice from another nationality requires more concentration than listening to someone speaking your own language. The first few minutes our brain tunes into to a different accent; native English speakers are often the hardest to understand for non-native speakers. Keywords should be put on the screen to help the listeners. Also, simple vocabulary helps, where in the maritime industry most technical terms are considered as simple by a maritime audience.

- Presentations can be broadcast with or without webcam video of the speaker. Having an inserted window showing the speaker makes a webinar more personal. Lip reading also helps with comprehension; it is good to have a close-up of the speaker for that purpose.

- The Chat feature is good for trainees to write down immediate questions and comments, but can be disruptive for the trainer. Regular breaks need to be planned for the trainer to review questions and respond to them. Responses may be live or via the Chat or email.

- Live online training software allows tracking of user behaviour and exporting statistics e.g. to Excel files. Information gathered includes trainee registration information, time of joining, time of leaving, attention rate (percentage of time when window with webinar was active), questions asked, what was answered in polls. Both for training and marketing purposes, such statistics can be very interesting.

5. Virtual Reality for Training

Gamification of teaching using video game technology has attracted a lot of attention in recent years. Virtual Reality (VR) is not only fascinating and fun, it is also a powerful tool for training, especially when it comes to visual assessment and human interaction, e.g. judging when to initiate action in manoeuvring, crane operation, etc., *Plowman (2017). Bertram and Plowman (2018).* However, the price of developing VR-based training is high. Import/export from CAD systems or other models is never as straightforward as hoped for or promised by vendors. Having a ship modelled over several decks, along with equipment, interactivity, training tasks and solutions, assessment, etc. may cost from 100,000 to 1,000,000 €. Such an investment needs either subsidising from R&D projects, opportunistic recycling of available, suitable models or a mass market willing to pay premium fees for training in high-risk situ-

ations, such as firefighting. Besides the cost issue, there are other aspects to consider with VR-based training, such as cyber-sickness from use of the headset, with symptoms akin to motion sickness and loss of trainee group coherence due to varying levels of IT savviness. VR-based training does not seem suitable for self-paced learning without support.

Several years ago DNV developed SuSi (Survey Simulator), a VR-based training solution for our ship surveyors and inspectors, *Bertram et al. (2020)*. SuSi provides realistic and cost-efficient 3D training software for survey inspections, using Virtual Reality technology and highly detailed models of ships and offshore structures. The virtual inspection gets trainees exposed to deficiencies that it would normally take years to experience working onboard real ships. An inspection run can be recorded and discussed in a debriefing with an experienced supervisor/trainer, pointing out oversights and errors made by the trainee. A pragmatic approach where the trainer guides the class collectively through the ship (e.g. with a single PC and a data projector, or a shared screen) and trainees interrupt when they spot a deficiency has been well received by participants from industry across a wide range of nationalities (cultures), educational backgrounds, management levels and age groups.

6. Social Media

Training and learning, whether at school, at university or in the workplace, always has a social aspect, making friends, networking and building long-standing relationships. To overlook this aspect and focus only on "we want them to answer these questions correctly" would be a huge mistake. In response to an invitation to attend a training event webinar, we received the following reply: "I shall not register for the webinar, whatever the topic, for the simple reason that I do not see the point… no networking, no coffee, no time out of the office." This echoes a widely shared feeling: people miss the exchange of experience, the maritime gossip, the networking. Social media options can only provide a pale substitute for real human interaction. This, too, has been a learning moment in COVID-19 times in our training community.

6. Conclusions - Combine and Conquer

You can achieve "Death by PowerPoint", i.e. boring training based purely on PowerPoint slides. But trainees may die many deaths. Irrespective of the training platform, training can still be boring: in the classroom presenting, using pinboards and flipcharts, talking in videoconferences or accumulating a multitude of videos.

The creed for digital training is the same as for classroom training: Make it relevant, make it short, make it fun. No media is per se evil, and no media is per se perfect. Most of the time, variety is the key element, it makes training fun and helps us to achieve our objectives. Combine (training options) and conquer (the hearts of the trainees).

The COVID-19 situation forced us to adopt digital training solutions, whether we wanted it or not. Not all options worked well, but some things worked surprisingly well; one trainer even perceived more audience focus while online than during his traditional classroom training. We learnt many lessons and, for sure, we are not at the end of our exploration of the digital universe of teaching. So we know that after COVID-19, we will not simply return to the previous modus operandi. The virus has changed our private world, our business world, and also our training world forever. And no doubt yours as well!
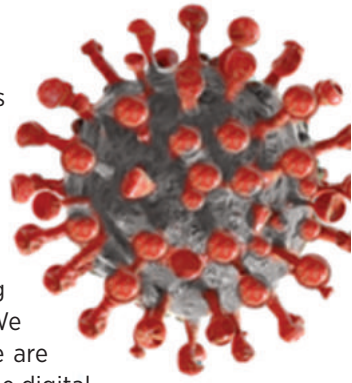
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Approaches to Teamwork and Leadership Training in METIs:
AN ANALYTICAL OVERVIEW OF SEAFARERS' PERSPECTIVES ACROSS DIFFERENT REGIONS

■ **Kirtan S. Vakil**

Shipping is a global industry and the most international of the world's greatest industries. It is one of the most essential components for continuous sustainable economic improvement at a global level (IMO, 2019a). The safety and security of the life at sea and more than 90% of the global trade depends on the expertise and competency of the seafarers (IMO, 2019b).

Over time, the number of ships have increased and the modern vessels have become bigger and are equipped with modern technology. However, despite the technological breakthroughs, statistics have indicated that shipping is still a very high-risk industry (Grabowski & Sanborn, 2002; Borch et al., 2012; Acejo et al., 2018).

The number of maritime accidents has been fluctuating since 1979. It declined from a peak of 3152 in 1979 to 959 in 2001. However, since 2002, it increased again and reached a peak of around 2100 in 2008. The average number of deaths per year from 1978- 2013 was 1777 (Leo & Shin, 2019). According to another source, around 2000 seafarers, on average, lose their lives every year (George, 2015).

In most of the cases, the safety of the ship is closely associated with the *human element*. While automation helps in reducing the workload of humans operating complex systems on board a vessel, it can also broaden the risks of human errors, which can be destructive to system control prompting mishaps at sea (Hanzu-Pazara, Barsan, Arsenie, Chiotoroiu, & Raicu, 2008). Around 80% of marine causalities are said to arise from human factors and human failures in managing different activities on board a ship (El Ashmawy, 2012). A study by Allianz Global Corporate & Specialty (2018) esti-

mates 75% to 96% of marine accidents may be attributed to human error.

From the above statistics, its apparent that the human element might be one of the prevailing sources for accident initiation. Accordingly, all the major stakeholders have recognised that addressing the human element is highly imperative.

Taking into consideration the importance of the human element, the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended (STCW) went through another substantive revision in 2010 called 'The Manila Amendments', focused on updating the convention and addressing issues which were anticipated in the near future.

One of the integral changes included new requirements for **teamwork and leadership** training. This amendment required seafarers to undergo mandatory training in leadership and team working skills at operational level and leadership and management skills at management level. Since then, a number of Maritime Education and Training Institutions (METIs) across different regions of the world have started training its seafarers to inculcate these skills.

The role and influence of human factors on the safety of life at sea has been one of the most significant issues in the maritime industry. One of the most important element of these is Teamwork and Leadership. Teamwork and leadership skills play a crucial role for all the activities on-board a vessel.

There have been many accidents attributed (at least in part) to less than optimal leadership and teamwork

in high risk industries (Manuel, 2011). One of the most famous incidents is that of Costa Concordia, which ran aground and capsized, leading to the loss of 32 lives (gCaptain, 2013). According to the report, the accident was a prime example of how bad leadership or wrong leadership decisions in synergy with less-than-optimal teamwork can cause a disaster. The captain of the ship, Francesco Schettino, ordered his crew to conduct a risky unofficial manoeuvre, which resulted in the ship hitting the rocks and risking the lives of 3229 passengers, injuring 157 passengers and killing 32 passengers (MIT, 2013).

The collision of Bulk carrier Capri with tanker Brightoil Legend is another classic case of communication errors and incompetent teamwork that led to a devastating situation in Singapore in July 2015. The Marine Safety Investigation Unit (MSIU), Malta, in their investigation reported that "ineffective teamwork between the crew members on the bridge and the pilot" resulted in the collision and heavy damage of both the vessels (World Maritime News, 2016).

On June 17, 2017, a collision occurred just off the coast of Japan between USS Fitzgerald and MV ACX Crystal, which lead to 7 fatalities and many more injured. In a statement released by Chief of Naval Operations, Adm. John Richardson of the United States Navy, he had said that the accidents could have been prevented if there had been good teamwork and communication amongst the crew members (Seck, 2017). The accident report also focussed on the bad leadership of the commanding officer and stated that "Many of the decisions made that led to this incident were the result of poor judgment and decision making of the commanding officer" (Schmitt, Gibbons-Neff, & Cooper, 2017).

The importance of Teamwork and Leadership is not stressed upon enough. Leadership and teamwork skills, despite being so important, have not seen much research carried out to analyse the different approaches to team-work and leadership training for trainee seafarers. Most studies have focused on a top-down approach to team-work and leadership (Surugiu & Dragomir, 2010; Saeed, Bury, Bonsall, & Riahi, 2016; Wake, 2004; Röttger, Vetter, & Kowalski, 2016).

There exists a gap in the research literature when it comes to how the seafarers themselves view teamwork and leadership. Similarly, there is not much research analysing teamwork and leadership training or the issue of generational shift relating to the notions of leadership from the perspective of the seafarer trainees in what may be called a bottom-up approach. The Team work and leadership training has to focus on the Gen- Z Candi-dates (people born after 2000).

Teamwork and leadership skills contribute immensely to the overall understanding of the ship safety concept. IMO realised the importance of such skills and in the 2010 Manila Amendments to STCW Convention, introduced mandatory competence standards for teamwork and leadership skills at management and operational level. The general vision for the introduction of these standard was the need for all the seafarers to be trained in team-work and leadership as these skills would be required in all the activities on board a vessel, from leading their own team to working in a team with crews from various nationalities and different levels of competencies.

The UK Maritime and Coastguard Agency (MCA) has subsequently approved **Human Element Leadership and Management** (HELM) courses which are conducted

According to the report, the accident was a prime example of how bad leadership or wrong leadership decisions in synergy with less-than-optimal teamwork can cause a disaster.
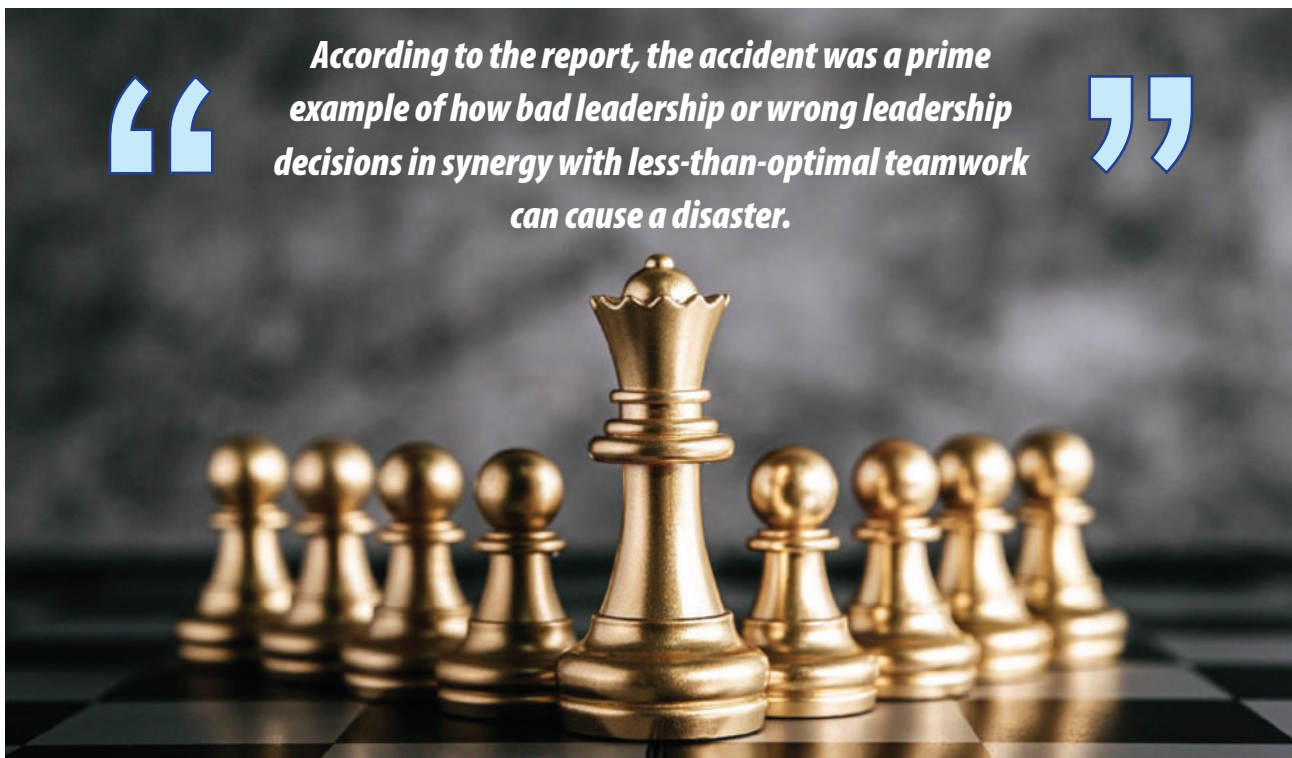
by various METIs to train the seafarers to develop these skills. The HELM course provided by HIMT Offshore trains the seafarers at operational and management level to develop cognitive skills and social skills which. Various other METIs conduct multiple academic programs, distance learning courses, and skill development programs to help the seafarers inculcate these skills.

The challenges in teamwork and leadership training lies in the training provided at METIs for the trainee seafarers. The biggest challenge is that the training for the skills are not standardised across METIs nor do they take into account the generation shift and the perceptions of the trainees towards leadership and teamwork. Further, the Training Institutes appear not to take into consideration the trainee seafarer's perception of teamwork and leadership.

Various METIs across different regions train the trainee seafarers differently to inculcate the skills. However, there have been multiple arguments that the institutions fall short in developing their leadership and teamwork curricula to ready trainees for the future (Coll & Weiss, 2016; Drew G., 2010). Researchers Au-Yong-Oliveira, Gonçalves, Martins, & Branco (2018) argued that a new generation of students want to be taught and trained for authentic leadership over traditional styles of leadership like Autocratic Leadership. They further suggested that the new generation of trainees prefer practical training over theoretical classes and that they desire the lectures to be as realistically applicable as possible. There is an apparent need for METIs to understand the perceptions of the new generation of seafarers and develop their curriculum in such a way that it accomodates the needs of the students and the industry - present and future.

According to experts, teamwork plays a vital role in all the activities on board a vessel. Although every individual member of a team may have a unique variety of styles and characteristics, team-members are interdependent and require from each other experiences and strengths to be more effective (Driver, Brousseau, & Hunsaker, 1998). Working together as a team, the team can achieve extraordinary results and they can push things together to heights of excellence (Karvelas, 1998). During Pandemic, the HELM courses for operational level and management level are being conducted online through virtual platforms. Breakout rooms in zoom help in dividing the teams in various rooms and the instructor monitors the discussions in each room.

It is often inferred that leadership is eminent and complex. A number of studies have focussed on the importance of leaders in influencing the safety and attitude of the employees in a workplace (Kelloway, Mullen,

Figure 1 Leadership Styles

& Francis, 2006). A study by Clarke & Taylor (2018) discusses the importance of leaders and their right decision-making skills in improving the safety culture at a workplace. Another study by DeArmond, Bass, Cigularov, Chen, & Moore (2018) also stresses on the positive relationship between leadership and safety performance and the goal commitment of the subordinates.

The synergistic relationship between leadership and teamwork cannot be overstated. An effective leader will be able to identify the potential of every member in the team and use it to achieve excellence. Effective leaders are the individuals who are able to attain the reciprocity of other individuals and to achieve their goals by harnessing the resources provided (Rosser, Johnsrud, & Heck, 2003).

There are various leadership styles (**Figure 1**) with their own characteristics.

Authentic Leadership: Individuals enacting their true selves in their duties as a leader are considered as authentic leaders (Leroy, Anseel, Gardner, & Sels, 2015). Authentic leaders are the ones who are aware of their drawbacks and continuously try to overcome them. They empower their subordinates, and create and drive a positive change.

Autocratic Leadership: This style of leadership is usually considered as the classical approach (Khan, et al., 2015). In this leadership style, maximum power and decision-making authority is retained by the leader.

Bureaucratic Leadership: This is a leadership style where the leader follows the book of rules and procedures and makes their followers follow these rules. According to Amanchukwu, Stanley, & Ololube (2015), this leadership style is appropriate for high risk jobs.

Democratic Leadership: It is defined as the effectiveness of 3 elements: distribution of responsibilities among the members, empowerment of all the group members, and supporting in the decision making process for the group (Gastil, 1994).

Laissez-faire Leadership: According to Robbins, Decenzo & Coulter (as cited in Long & Thean, 2011), a Laissez-faire leadership style is a passive leadership style where the leader gives his/her subordinates full flexibility to make decisions or to complete tasks in whichever way they think is appropriate.

Servant Leadership: Greenleaf (2002) defined SL as a kind of leadership where the servant leader ensures that the subordinate's 'greatest' needs are met and therefore becoming "healthier, wiser, freer, more autonomous, more likely themselves to become servants".
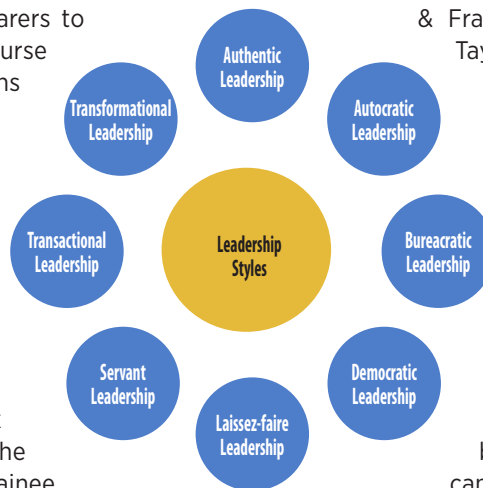
Transactional Leadership: According to Burns (as cited in Bass & Stogdill, 1990), transformational and transactional leadership are at "opposite ends of a continuum". Burns (as cited in Macit, 2003, p.425) notes, in regards to Transactional Leadership, that such leadership is the reciprocal process of mobilising, by persons with certain motives and values, various economic, political, and other resources, in a context of competition and conflict, in order to realise goals independently or mutually held by leaders and followers. The nature of those goals is crucial. They could be separated but related; that is, two persons may exchange goods or services or other things in order to realise independent objectives. This is transactional leadership. The point of this style of leadership is exchange. The transactional leaders expect certain behaviours from subordinates, which when evident are then compensated with monetary or non-monetary rewards. With the help of these exchanges, the leaders can meet the objectives, get tasks done and avoid unnecessary risks.

Transformational Leadership: "Transformational leaders are those who stimulate and inspire followers to both achieve extraordinary outcomes and, in the process, develop their own leadership capacity" (Riggo & Bass, 2006). They are the leaders who are open minded to new ideas of the subordinates, and they empower their subordinates to help them to achieve their goals, and in the process develop themselves into better leaders. This type of leadership is all about initiating and driving a change.

It is eminent to discuss the Maritime implications of different leadership styles.

Autocratic Leadership style is highly suitable in a maritime operation when there is limited time for decision making and a quick decision must be taken. Bureaucratic leadership style is favourable when working in a high risk environment like handling and working with high risk machinery and dangerous cargo.

Charismatic Leadership style is desired in situations when new seafarers get on board a vessel. The charismatic leaders would be role models for the junior cadets and would be able to guide them in the right direction. It is very important, therefore, that leaders having Charismatic Leadership characteristics set a right example for the juniors to follow.

Democratic Leadership style is preferable when various solutions and opinions are needed to address a particular problem on board a vessel. This leadership style will help the seafarers feel involved and will increase the probability of achieving an optimum solution.

Laissez-faire leadership style of leadership is not very preferable in a maritime context as the juniors have no direction and have freedom to do what they want, which is highly unfavourable in the maritime industry. Servant style of leadership is arguably unfavourable in maritime operations as the captain should focus on getting the tasks done and safe operations of a vessel over meeting the needs of the team on the vessel.

Given the above, it can be argued that leaders in an operational maritime context (on-board ships) should adapt to the situation and use the most appropriate style of leadership to complete a task safely.

Transformational style of leadership is highly favourable on board a vessel because of its 4 I's components. They encourage, motivate, and inspire the subordinates to work better. This leadership style is also highly suitable when junior seafarers come on board a vessel.

Transactional Leadership style is favourable in a situation where the leader wants particular tasks done. Rewards or punishments are offered based on the completion of the tasks. This leadership style has some drawbacks when displayed on board a vessel as when

> **"Transformational leaders are those who stimulate and inspire followers to both achieve extraordinary outcomes and, in the process, develop their own leadership capacity"**

punished, the subordinates might go through emotional damage and fatigue.

The study explored various leadership and teamwork practices and identifies the notions of effective leadership and teamwork skills from the perspective of the seafarers. The objectives to achieve the aim were to find out how seafarers perceive and approach teamwork and leadership skills, to investigate the various attributes of teamwork and models of leadership, to find out how METIs train seafarers to develop the teamwork and leadership skills required in the seafaring profession, to find out if the seafarers are aware of the teamwork and leadership training provided to them and the research recommended effective methods to further develop teamwork and leadership skills in the seafaring profession.

There are many learning theories today and academic staff at METIs need to adopt a learning theory which best suits the context in which they are teaching. Every learning theory has its merits and demerits and the teachers need to use the learning theory which is the most effective for the delivery of a particular element of teamwork and leadership training, so that it results in an

effective learning, developing and acquisition of these skills.

Learning theories provide a framework to understand how individuals learn and how learning can be explained, described, analysed and predicted. The 4 main theories of learning are behaviorism, social cognitive, existentialism and constructivism. Pavlov proposed the Classical Conditioning Theory which discussed that learning would occur during a repetitive association of an individual's action and its impulse from the environment. This approach was termed as *behaviourism.* Albert Bandura extended his Social Learning Theory and developed the Social Cognitive Theory which emphasised that learning would occur through observation of others. J. Lave and Wenger proposed the Situated Learning Theory which discussed that learning occurs through collaboration and social interaction. Carl Rogers proposed Existentialism theory which expressed that every individual has an

essential impulse to learn, and a teacher facilitates the learning process. Further, this theory suggests that the learner's threat is kept to a minimum, distinct concepts are simplified, and learning is not merely just an accumulation of information (Kitada, 2019). The sociocultural theory was developed by Vygotsky which discussed the development of critical thinking skills by social interactions and cultural exposure (Kozulin et al., 2003).

Approaches to the Study

The research primarily used a qualitative methodological approach aided by questionnaires and interviews and a degree of quantitative data collection and analysis. The qualitative approach was chosen as the primary approach as it helps the researcher gain a deeper understanding of the various elements of leadership and teamwork.

The target sample of trainee and experienced seafarers from various METIs across different regions of the world /globe was determined in order to collect data relating to teamwork and leadership attributes. Categories to be found in the target sample were determined based on the categories used in The Manpower Report of 2015 from BIMCO and ICS (BIMCO & ICS, 2015).

The online questionnaire was aimed to determine the various notions of teamwork and leadership from the perspectives of seafarer trainees and experienced seafarers across different regions. A general overview of semi-structured interviews is projected below:

- A brief discussion about how the teamwork and leadership training is provided to the students at their METI.

- Their perceptions of the importance of teamwork and leadership training is for the seafarers

- The view of the interviewees of how the student's perceptions of teamwork and leadership are changing.

A total of 90 valid responses were received from seafarers and trainee seafarers from different regions across the globe as categorised in the Manpower Report 2015. A total of 60 responses were obtained from the Far East and Indian sub-continent regions, followed by 26 responses from the Africa/Latin America region. However, only 4 responses were obtained from the OECD region and no responses were obtained from the East European region. Given that there were only 4 responses from the OECD region (no external validity of the study to that population), an in-depth analysis was done only for the responses from the Africa/Latin American, Far East, and Indian subcontinent regions.

Results and Inferences

In answer to the research questions, the research and its analysis indicated the following:

1. Trainee and experienced seafarers across different regions perceive and approach various elements of teamwork and leadership differently, but a majority of the seafarers across all the regions find the characteristics of Transformational Leadership more desirable for shipboard operations.

2. Since there are no well-defined guidelines for METIs to train the trainee seafarers to develop their teamwork and leadership skills, most of the METIs train their trainees in different ways which include lectures, sports activities, group events and role-play.

3. From the findings and analysis discussed in the previous section, a conclusion can be drawn that over 96% of the trainee and experienced seafarers were aware that they were being trained to inculcate these skills.

4. From the findings, it is also evident that METIs can do more to make teamwork and leadership training more effective.

Recommendations

To make teamwork and leadership training more effective, and to prepare the future seafarers and to ensure safety of life at sea, the METIs need to realise that incul-

cating these skills into seafarers is a slow and continuous process which cannot be effectively conducted by just giving lectures or group activities. There is the need to blend different learning theories, techniques and activities to make the training more effective. For a METI to provide more effective teamwork and leadership training, the following are recommended:

1. Integrate **teamwork and leadership training modules** into the **curriculum**. By doing so, the trainees will be trained to inculcate these skills, just like learning the other subjects in the curriculum. The syllabus for the training modules can be adapted from IMO Model Course 1.39.

2. The academic staff can develop effective classroom sessions to train the seafarer trainees develop teamwork and leadership skills by using **different learning theories** like cognitive and social constructivism theory.

3. The staff training the students for these skills should provide recent **real world examples** of collisions, near misses and other accidents that have occurred because of less than optimal leadership and teamwork skills.

4. METIs should **invite the alumnus**/past /passed out students to share their experience with the seafarer trainees about the importance of teamwork and leadership on board a vessel.

> a majority of the seafarers across all the regions find the characteristics of Transformational Leadership more desirable for shipboard operations

5. METIs should also organise **guest lectures by seafarers** with rich sea experience to share their experience, motivate the students and explain the importance of teamwork and leadership skills.

6. The theory section of the leadership training should include the **positives and negatives** of each **leadership style** and which leadership style is more appropriate in which scenario.

7. To achieve the practical aspects of teamwork and leadership training, the METIs should organise regular **scenario role plays** and increase the time on **simulators**.

8. METIs and their staff should encourage the trainees to **think critically** about the importance of teamwork and leadership skills to achieve safe operation of vessels and ensure safety of life at sea.

About the Author

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'TEACHING POTENTIAL' AS A KEY PERFORMANCE INDICATOR IN MARITIME EDUCATION & TRAINING

■ **Dr. Brijendra K. Saxena**

Introduction

A commercial ship is a complex equipment and a large investment by the ship owner who is obviously looking for a decent return on his investment. The complement on the ship, the crew, take care of the ship and contribute in ensuring that the owner gets what he aims to get. The competence of the crew, and especially their dedication and commitment is therefore imperative for this objective.

Indian seafarers, especially the nautical and engineering officers are preferred globally and are known for their quality. Various maritime education and training institutes (MTIs) therefore become integral to the Indian maritime industry and it is necessary that this sector is abreast with the constant changes and continue to strive to produce quality seafarers.

After the 1995 amendments to the STCW Convention wherein under Regulation I/8, the concept of quality systems was recognised, the Maritime Education & Training (MET) sector has been more conscious towards quality. Today all institutes, big or small, comply with these requirements and have their quality management systems certified by different agencies. This, while complying with the requirements, did not always truly demonstrated to the other interested parties the serious understanding and appreciation of the word quality in true sense. Obviously some maritime education & training institutes (MTIs) moved ahead in the quality ladder and started work towards the Total Quality Management (TQM).

This issue was the crux of the author's PhD dissertation titled, 'Application of TQM in Maritime Education'. Besides other issues, a parallel was drawn between the MET sector and ISM compliant tanker industry. Charterers in oil transportation sector had realised that in spite of the compliance with the requirements of ISM Code, certain gaps remained between what the Code desired from the tanker operators and what was being achieved. To bridge this gap and to achieve a system for continual improvement, OCIMF developed the Tanker Management and Self-Assessment (TMSA) system.

These prescribed guidelines that are clear, provide a system of key performance indicators (KPIs), and allow a method of self-assessment by the tanker owners. Realising the need for improving the quality consciousness in MET operations, MEMSA (Maritime Education Management & Self-Assessment), a TMSA version for MET institutes was developed. This required maintenance of certain KPIs for the processes and sub-processes in a MET institution and aimed at an honest and sincere look on its operations and provide a mechanism for continual improvement.[1]

Various processes and sub-processes are used in MTIs. However, this paper focuses the critical issue of the quality of a teacher and his/ her potential, and also such potential of the MTI. MET covers both the foundation building pre-sea part, as well as very focused post-sea part. The paper mostly aims at the pre-sea sector, the principles as well as the tool developed can also be used in post-sea part.

Potential of a Teacher

MET is vocational and very industry specific. The approach of the MTI is therefore different from a traditional educational or training institution. The teaching community has personnel with seafaring backgrounds as well as academic teachers from different disciplines like mechanical/ electrical engineering, mathematics, computers, humanities etc. This brings in an additional challenge for the academic administrators. Availability of quality teachers has also been an issue.

It is pertinent that any professional trying to get into the teaching or training activities assesses his/ her attitude towards teaching by answering some straight and at times, painful questions:

Will I make a 'good' teacher?

Can and how do I become a 'good' teacher?

What kind of potential should I have or have I developed before finally entering this profession?

Unfortunately, on the other hand, it is the institutes or their management ask:

How do you get 'high quality' teachers?

What kind of competence setting must a 'high quality' teacher develop during his/her teacher education and training?

It is further important that after entering the profession how a teacher continues to do what he or she had ideally thought of. The decision of a young person to become a teacher, is a real challenge and a complicated one. Furthermore, who knows, how heartily committed to teaching is someone after 10 or 15 years of teaching? Also does the environment in the MTI support or block the development of the potential for high quality teaching? Importantly how far MTIs are able to transform and to adapt to the pressing needs of the industry relies to a large extent on the availability and effectiveness of the teaching workforce.

Various studies have been carried out by developing diagnostic tools to help the college management identify and explore fundamental attitudes towards the teaching profession. These included involvement in leadership and group dynamics training that looked to encourage group discussion and decision-making, the trainers and researchers collected and analysed detailed observations and recordings of group activities.

Nakazawa suggested that many factors must be considered for assessing the teaching potential of the teachers and also of the institute. Some of these could be the qualifications and experience of all teachers.[2] This concept was used in the PhD dissertation referred earlier.

Tool for establishing the teaching potential of a MTI

In any educational institution, including MTI, the teachers will have both teaching and industrial experience and also at times shipboard experience. Thus both academic and professional careers

> **The decision of a young person to become a teacher, is a real challenge and a complicated one**

influence the style of teaching and both are necessary to provide a perfect blend of theoretical knowledge and practical experience. Similarly, besides the academic qualifications the teachers may have obtained Certificates of Competency (CoC).

A good teacher must always be upgrading his/ her knowledge. This can be based on self-study of information available from different sources. Attending conferences, seminars, and workshops, both nationally and internationally, can also enhance the knowledge base and also make the teacher current with various technological developments. It is a well-established fact that publishing and presenting papers in quality journals and conferences respectively, confirms and acknowledges the academic up-gradation of a teacher. Such up-gradation measures enhance the quality of teachers and reflect in the quality of teaching.

Considering the above referred factors, a tool is developed to identify the potential of a teacher individually and also to arrive at the collective faculty potential of the academic institution/ MTI. The criteria used in the tool are as follows:

1. Academic qualifications including CoC for marine faculty.

2. Teaching experience

3. Industrial experience

4. Up-gradation initiatives, which includes papers published and presented and also various seminars, conferences etc., attended in a specific year, both nationally and internationally.

Each teacher can be awarded points on a scale of 1 to 4 on the above four aspects as shown in **Table 1.**

Academic Qualification	Under Graduate	Graduate	Post Graduate	Doctorate
Certificate of Competency	Class IV / II Mate	Class II / I Mate	Class I / Master	Combined CoC/ Extra Chief/ Extra Master
Teaching Experience	≤ 1 yr.	≤ 3 yrs.	≤ 6 yrs.	> 6 yrs.
Industrial Experience	≤ 1 yr.	≤ 2 yrs.	≤ 4 yrs.	> 4 yrs.
Up-gradation Initiatives	Seminar/ Conference attended	Paper Published	Published & presented (National level)	Published / Presented (International level)
Points	1	2	3	4

Table 1 Teacher Evaluation

INVITING APPLICATIONS FOR THE POST OF ACADEMIC CHAIR AT IMU

The Institute of Marine Engineers (India) is dedicated to spreading learning in Marine Engineering. The IMU, with campuses across 6 cities, is poised to play a key role in the development of trained human resources for the maritime sector. The IME(I) and IMU have agreed in principle to set up an IME(I) sponsored 'Academic Chair' at the IMU. This is the first position of its kind at IMU and the IME(I) is honoured to partner in this venture.

The President, on behalf of the Governing Council, invites applicants for the position of the Chair, which is expected to be installed in the current year, 2021. IMEI Chair is a position at IMU, supported by IMEI funding or sources external to the University. It is being created in order to engage professionals from Industry who have demonstrated excellence in professional contribution at a level that brings external recognition to the University. This position is intended to be an interface for a wider interaction with industry.

This position will be governed by the applicable policies of IMU. The Chair shall be located in one of the Campuses of the University and shall be provided academic, administrative and logistic support extended to Professors of the school/university. Additional facilities that may become necessary shall be provided with the approval of Vice Chancellor on the recommendation of Campus Director.

The ideal candidate will have a strong academic background and good connections within the Maritime Industry and Shipping circles. The candidate would be required to interact with the Academic Council of the IMU and Industry at large, guide soft research projects at the IMU relevant to Industry and influence the Academic Council of the IMU to tailor the syllabus to Industry needs.

Interested candidates may apply in confidence, with their CV and enclosing a brief presentation on why they consider themselves to be the ideal candidate for this prestigious post, latest by 31 August 2021.

The President, IME(I)

email: president@imare.in marking a copy to: uday.purohit@gmail.com

Let us consider a marine engineering faculty member who holds a Bachelor's degree; Class I CoC; has two years teaching and eight years sailing experience. He attended some conferences during the current year. From the table above, following points emerge:

Academic qualification: 2 points; as Class I CoC holder: 3 points; Teaching experience: 2 points; Industrial experience: 4 points; and Up gradation initiatives: 1 point.

The ideal situation would be when the score is 4.0 for all the four aspects, but that is extremely ambitious and not easily achievable.

A quadrilateral can be drawn for the selected faculty member. The ratio of the area of this quadrilateral with the ideal data quadrilateral (all aspects having a score of 4) gives the 'Teaching Potential' of that particular teacher as 37.5%. It is important to understand that this can be used for arriving at an individual KPI and chart out what is to be planned, targeted and achieved as an improvement in this. This can be done continuously, year by year.

The above calculation is considered for all teachers in a fictitious MTI. The mean value of the collected data under each would be the value for the MTI. The exemplar numbers for the institute are,

Academic Qualification: 3.0; Teaching Experience: 2.9; Industrial Experience: 3.1; and Up-gradation Initiative: 1.8. (Teaching potential calculated as mentioned is 44.8%).

> **Fundamentally, action research is about teachers striving to understand and to improve their practice**

Similar information is collected after two years and the numbers are,

Academic Qualification: 3.0; Teaching Experience: 3.2; Industrial Experience: 3.1; and Up-gradation Initiative: 2.7. (Teaching potential is 56.2%).

It can be observed that in two years the specific MTI and its faculty members have taken initiative of improving the up-gradation score by increased participation in conferences and seminars and also by publishing papers in reputed journals. This has an effect of increasing the overall 'Teaching Potential' of the MTI from 44.8% to 56.2%.

This data can be plotted on a graph for better presentation (**Figure 1**).

Discussion

It is acknowledged that the transfer of knowledge is a complex process and it would be difficult, and at times

stupid to rely on just one criteria or KPI. Some of the further discussions will cement that point. Nevertheless, assessment of the individual as well as the MTI 'teaching potential' could be an interesting and unique mechanism.

It is important to remember that the arrived figure, just like any other KPI, is just a figure and that too it reflects the historical position. This data must be used in the future planning of the MTI and action points must emerge. After few years, a trend would be visible and an upward movement will obviously reflect improvement.

As compared to its earlier version ISO 9001:2008, the later version of 9001:2015 is more focused and the changes can be very useful in any production, as well as in a service industry. The suggested KPI of 'teaching potential' will be able to demonstrate some compliance with many elements of this Standard. Some of these are,

Quality objectives (6.2.1);

Organisational knowledge (7.1.7);

Competence (7.2);

Control of production and service provision (8.5.1);

Control of changes (8.5.6);

Continual improvement (10.3), etc.[3]

If teachers and their teaching is acknowledged as the core of the education and training system, and that their performance has a large impact on the performance of the students, it becomes imperative that systems are in place to monitor, assess, correct, develop, and reward the activities and the key players. It is therefore appropriate for education authorities and practitioners to consider suitable appraisals seriously. It is further important a sound teacher professional development mechanism is in place.[4]

In a nation-wide study conducted in England, teachers' professional learning practices and perspectives were researched. This was on the basis of three criteria, benefits and effectiveness; organisation; and access to CPD (Continuous Professional Development).

The result and the analysis concluded that teachers' professional learning in England is generally not very effective and there existed a large scope for developing the potential of teachers' professional learning, which could enhance the quality of classroom teaching. It therefore establishes that a very focused and well-executed CPD system is essential to obtain the desired result.[5]

The issue of achieving effectiveness in teaching is global, and teachers and the administrators (Academic) world over, try to find a workable solution. The academia in USA calls this as '**action research**' and it aims to find solution by making a teacher understand his/her practice better, including the factors that affect the process. Obviously this has to be person driven and motivated.

Action research therefore has two aspects. The starting point is to sort out a problem or issue in prac-
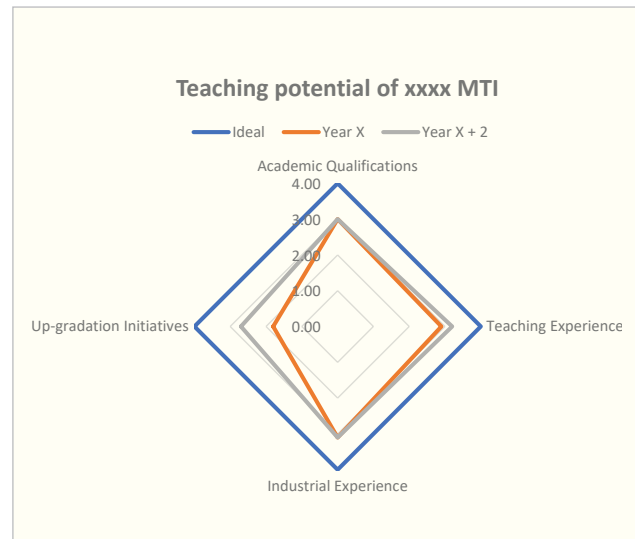
Figure 1 Teaching Potential: Exemplar Radar Chart

tice; to this extent an action researcher seeks a solution. But the process can also be used as a deliberate attempt to understand practice better – a traditional research attitude. Both these approaches require the teacher to be open, honest and rigorous. Fundamentally, action research is about teachers striving to understand and to improve their practice. In USA extensive work has been done on this topic and many papers and dissertations have been published. In spite of the idea being excellent and useful, in practice there are many limitations. Some of these being biased approach, free and active participation, collection of meaningful data, possibility of generalising the outcomes as practices of two individuals may be different, etc. It therefore establishes that teaching/ learning is a complex activity and just one or few criteria for assessment may be a mistake.[6]

Conclusion

The assessment tool developed and discussed above addresses four aspects. Out of these, the academic qualifications, industrial experience and the teaching experience are little less in the control of a MTI, unless it establishes and thereafter adheres to very strict selection standards. However, the last aspect, i.e., up-gradation initiatives, is completely under the control of the MTI. It must establish a clear policy on the issue and provide adequate budgetary allocation for the same. In fact, the percentage of such budget out of the tuition fees collected can be yet another KPI. Furthermore, it is imperative that conducive environment is created for further studies by the interested faculty members.

It is true that the teaching quality is not always in direct proportion to the teaching experience. Also the conferences/ seminars attended by the teachers may not necessarily be subject specific to the teacher's area of teaching. In spite of these issues, this mechanism definitely provides some measurable assessment of the potential of teachers in a maritime education and training institution.

> It is true that the teaching quality is not always in direct proportion to the teaching experience

Singapore, as a progressive service providing nation is also influenced by contemporary trends in education. Accountability pressure is constant, given the high social and economic stakes.

The government has adopted policies that promote innovation in processes. Besides other initiatives, action research has been in vogue in Singapore for many years. This has led to the recognition of the need for innovations and improvements in the education system so that the product is ready to meet the future economic needs of the country. Singapore strives to be a leader in educational excellence, with attention to lessons learned from other countries and with extensive efforts at its own innovations.[7]

Globally, in the education sector, many papers have been published on the issue of development of the teaching learning experience and its effectiveness. The importance of research, including publishing of quality papers emerge as a significant component. Similar initiatives are also being regularly taken in the MET sector in many reputed centres of maritime education and training in many countries.

India is a major supplier of well trained and educated manpower, as well as womanpower to the global industry. It is imperative that 'management of change' remains a priority for the MTIs in the country and sufficient work is done in improving the quality of the teaching learning process. It is further encouraging that MET sector has been given importance in the Maritime Vision 2030 document and it is recognised that India should be the preferred destination of the global industry for quality maritime personnel. Using the suggested tool can be one of the methods in achieving that objective.

About the Author

Dr. Brijendra K. Saxena, *is an alumnus of DMET. After his sailing years and management positions with SCI, he has been an ardent Academic. In his long academic career, he had served as the Founder-Principal of Tolani Maritime Institute, Induri, Pune. He obtained his M.Sc. from World Maritime University, Sweden and M.S. from BITS, Pilani. He has a Ph.D. from Symbiosis International (Deemed University). He is currently the Chairman of the Norattam Morarjee Institute of Shipping.*

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IME(I) Branch News MUMBAI

MERI BIDS ADIEU TO 4TH YEAR B. TECH (MARINE ENGINEERING) CADETS

Indian Maritime University (IMU) Mumbai Port campus organised a "Farewell cum Prize Distribution Function" for 4th Year B. Tech (Marine Engineering Cadets) 2017-21 at Hay Bunder Road campus on 5th July 2021 at 11:30 hrs.

With a brief gathering and by following all COVID Protocols, the Guests of Honour were IME(I) Mumbai Branch Secretary, Cmde. Bhupesh Tater and the Student Sub-Committee Chair, Shri. Rajesh Doshi.

Speaking on the occasion, Shri. Doshi highlighted the various phases of one's career at sea making the life of a marine engineer a challenging one. He urged the passing out batch to put in their best at sea in order to make a mark for themselves in years to come. Cmde. Bhupesh Tater highlighted the role of IMU in transforming young cadets to capable marine engineers and wished the passing out batch many memorable milestones in life.

– IME(I) Mumbai Branch has been regularly involved in the activities at this campus for Mentorship and Soft-skills development programmes and Membership drive. In this instance, IME(I)- Mumbai Branch sponsored the Prizes and Mementos for the MERI event: "Navacharitam-21" organised at the IMU Mumbai Port Campus, covering Technical Paper Presentation and the Marine Quiz competitions. The farewell event was a befitting occasion to award the prize winners of 'Navacharitam-21' and who better than their mentor and Chair of the Student Sub-Committee to do the honours. Each of the following prize winners had a piece of advice personally given to them by Shri. Doshi during the prize ceremony:

Technical Papers

Chief Guest: Shri Sanjay Bhavnani

Judges: Cdr. Gaurav Agarwal IN(Retd.), Shri. Sandeep Kumar, Shri. Rajesh Doshi

Winners:-

I Prize   (Topic: 'Enhancing the Transparency in Shipping Industry by Advancing the RFID Sensor Technology')
Prepared & presented by Cdt. Anuj Singh and Cdt. Prakarsh Jha.

II Prize   (Topic: 'Modern Port Management and Technology')
Prepared & presented by Cdt. Shreekrishna Prabhu, Cdt. Utkarsh Jaiswal and Cdt. Sourav Patra.

III Prize   (Topic: 'Alternate Fuels and Methods for CO_2 Reduction in The Present Maritime Scenario')
Prepared & presented by Cdt. Anuj Chouhan, Cdt. Vidit Tiwari and Cdt. Manish Kumar.

Marine Quiz Competition

Winners:-

I Prize   Cdt. Hrishabh Jain & Cdt. Kaushal Jeena

II Prize   Cdt. Divit Singh & Cdt. P.S. Jyotish

III Prize   Cdt. Sumit Rajput & Cdt. Ashish Upadhyay

Judges: Shri. Hare Ram Hare, Shri. P.K. Gopalakrishna, Shri. P.K. Ramrakhiani

A well conducted event thus came to an emotional end with a promising path ahead for future marine engineers and a strengthening bond between IMU and IME(I).

CLASS ACTION / INDUSTRY MOVES

Compilation: ■ **Rashmi Tiwari**

SHIPPING MATTERS

DNV AND NAKILAT JDP WORKS TO IMPROVE VESSEL SOFTWARE RELIABILITY AND QUALITY

Nakilat, a global leader in energy transportation, Classification Society DNV, and a group of leading yards and system suppliers have teamed up on a joint development project (JDP) to elevate software reliability and maintenance during operations. The JDP, which was initiated in 2020 by Nakilat, has resulted in the launch of a new DNV Recommended Practice (DNV-RP-0582), published in June 2021.

For more information, please visit:
www.dnv.com/maritime

DESMI'S EASIER AND CHEAPER ON-BOARD HELICOPTER REFUELLING AT NAVAL STANDARDS

DESMI introduces a new ship-based helicopter fuelling system where Navies and coast guards of the world now have the possibility to get a ship-based helicopter fuelling system with several advantages that not only make it better, but cheaper, too. These advantages include a new, modular design for lower overall cost and faster maintenance, lighter weight, an improved user interface that makes it easier to operate, and an integrated logistics system. All of this is in a proven design at NATO STANAG standards. This includes options for both on-deck or Helicopter In-Flight Refuelling (HIFR).

For more information, please visit:
https://www.desmi.com/segments/defence-fuel/helicopter-refueling-systems/

INDIAN REGISTER OF SHIPPING (IRCLASS) OFFERS EEXI AND CII SERVICES

Indian Register of Shipping (IRClass) will be offering two new services Energy Efficiency Existing Ships Index (EEXI) and Carbon Intensity Indicator (CII). Through these new services IRClass will assist ship-owners and managers in assessing the EEXI and CII of their vessels and determine compliance. Vessels will have to demonstrate compliance by the annual, intermediate or renewal IAPP survey whichever comes first on or after 1 January 2023, by preparing a comprehensive EEXI Technical File including calculations on Attained EEXI which must be equal to or less than the required EEXI value set for that specific ship type and size as outlined by IMO.

For more information, please visit:
http://www.irclass.org

ABS CERTIFIES BLOOM FUEL CELL TECHNOLOGY

Fuel cell technology from Bloom Energy Corporation has been awarded a Concept Verified Statement of Maturity by ABS, a key step on the path to commercial application. ABS engineers have reviewed Bloom Energy's technology and verified its potential application as an alternative fuel source for vessels, part of the ABS New Technology Qualification (NTQ). The NTQ offers guidance on early adoption and efficient implementation of new technologies – demonstrating their level of maturity – and that potential risks have been systematically reviewed.

For more information, please visit:
https://www.csi-newsonline.com/news/article/abs-certifies-bloom-fuel-cell-technology.html

BOL BADA SAAB BOL

(This section is for quick QA and easy read on marine engineering matters)

Relevant important classification rules on Windlass

Windlass and Chain Stoppers

General

1. Windlass of sufficient power and suitable for the size of chain cable is to be fitted. Where wire ropes are proposed and approved in lieu of chain cables, suitable winches capable of controlling wire rope at all times are to be fitted.

2. Windlass is to have one cable lifter for each anchor required to be kept ready for use. The cable lifter is normally to be connected to the driving shaft by release coupling and provided with brake.

3. For each chain cable, a chain stopper is normally to be arranged between the windlass and hawse pipe. The chain cables are to reach the hawse pipe through the cable lifter only.

4. Electrically driven windlasses are to have a torque limiting device (slip clutch). Electric motors are to comply with the requirements of Pt.4, Ch.8.

5. The windlass is to be capable of exerting, for a period of 30 minutes, a continuous duty-pull corresponding to the grade of chain cable, as follows:-

   $36.8\ d_c$ for grade CC1

   $41.7\ d_c$ for grade CC

   $46.6\ d_c$ for grade CC3

   Where d_c is the chain diameter [mm]. The mean hoisting speed is not to be less than 9 [m]/min.

   The windlass is to be also capable of exerting, for a period of not less than 2 minutes, a pull of not less than 1.5 times the continuous duty pull. The speed in this period can be lower. The above criteria do not require both anchors to be raised or lowered simultaneously on windlass fitted with two cable lifters.

6. The capacity of the windlass brake is to be sufficient for safe stopping of

Picture & Words: CE Ramesh Subramanian
Octogenarian Chief Engineer A.K. Ramanujan concludes his Anchor talks. And CE Ramesh throws light on modern equipment. All sketches have been done by CE Ramesh Subramanian.

anchor and chain cable when paying out. The windlass, with brakes engaged and release coupling also engaged should be able to withstand a static pull of 45% of the tabular breaking strength of the chain, without any permanent deformation of the stressed parts and without the brake slip.

If a chain stopper is not fitted, the windlass is to be able to withstand a static pull of 80 % of the tabular breaking strength of the chain without any permanent deformation of the stressed parts and without brake slip.

The chain stoppers and their attachments are to withstand a pull of 80 % of the tabular breaking strength of the chain without any permanent deformation of the stressed parts. The chain stoppers are to be so designed that additional bending of the individual link does not occur and the links are evenly supported.
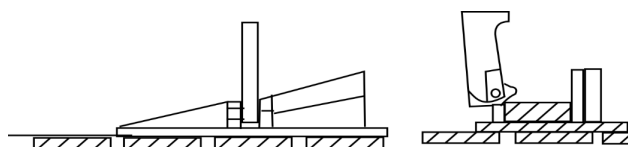
Details of chain stoper

7. Attention is to be paid to stress concentrations in keyways and other stress raisers and also to dynamic effects due to sudden starting or stopping of the prime mover or anchor chain.

Mooring winch operation:

When a ship arrives at the berth or pier, it is placed parallel to the pier or jetty and engines stopped. The ship has to be bodily hauled in by the mooring ropes forward and aft. The mooring ropes ends formed into spliced nooses are slipped on the pier bollards and the mooring ropes on the ship are wound by two or three turns on the mooring winch cones both at forward and aft. When the cones are rotated by the mooring winch the tension created on both the forward and aft ropes pulls the ship bodily towards the jetty. The ship moves inwards and comes to rest when the ship makes contact with the jetty fenders.

The question usually asked is why is the mooring rope drum conical in shape and **how is the large tension created in the rope capable of pulling the ship towards the pier**.

The answer is as follows:

The Able seaman or boat swain holding the slack end of the rope puts his body weight on the rope and this body weight produces a tension on the rope at the other end of a high magnitude caused by

friction between rope and cone surface. This resultant high force is based on the rope or belt Drive formula derived in Applied mechanics and is given by the formula

$T1/T2 = e^{\mu\Theta}$,

Where T 1 is the tension on the tight side and

T 2 is the tension on the slack side.

e is the natural number approximately 2.3

μ is the coefficient of friction between rope and steel and is approximately 0.3, Θ is the angle of overlap which in this case is 3 turns or approximately 19 radians. The body weight of a normal person is about 70 Kgs. The tension on the tight side therefore increases to 70 x 2.3 $^{(0.3 \times 19)}$ ~ 8000-10080 kgs weight...= 98.88 KNs which is the high tension.

The reason for having a conical shape is for ease of slipping the rope out by one or two turns. This high tension on the tight side is needed to create a momentum to advance, if maintained it will break the rope with fatal consequences. The broken rope can spring back with a high rebound hitting the able seaman or boatswain holding the rope. There have been many instances of persons losing their lives on such occasions.

A competent seaman will instantly reduce the turns when the ship starts moving so that the rope does not break by the high tension created and the conical shape provides for this convenience.

The wire rope drum provided is to connect the wire rope mooring called a back spring. This additional mooring is used only in jetties along the riverside where currents are strong and additional mooring is required. This wire rope mooring is also called an insurance wire.

Anchoring tests:

After the ship returns to the ship yard sea front after completing the speed and endurance tests, the anchoring test is done.

The anchor will be dropped and the chain will be paid out for about 5 shackles amounting to a length of 450 feet. The captain may give an astern movement for the catenary to form easily without taking the aid of the tide. When the ship is stationary, the anchor will be hauled in by the windlass and the time taken to bring the anchor just above the water noted in the stop watch. The rate of hauling in should not be less than 9 meters per minute, as per the classification rules. However, if the construction contract or MOU states a higher rate, then that rate has to be complied since the owners may have asked for a higher capacity windlass.

Points to Ponder/Data to Dig

1. Explain the situations when anchor chain has to be released from the bitter end.

2. Explain why chain stopping arrangements are made.

3. Describe the chain stopper arrangement on board your ship.

◆

EXPLOSION OF HYDROGEN GAS RELEASED FROM CARGO

■ **Dr. Gopinath Chandroth**

(Dr. Chandroth was the inspector in-charge of this Marine Accident Investigation Branch (MAIB) investigation.)

The Accident

At 1447 on 13 January 2017, the dry cargo vessel *Nortrader* suffered two explosions in quick succession while anchored in Plymouth Sound, England. The first explosion was in the forecastle store and the second in the cargo hold. The chief engineer, who was inside the forecastle store at the time, suffered second degree burns and was airlifted to a nearby hospital. He was repatriated home after 12 days and was unfit for duty for a period of 4 months.

The explosions dislodged and distorted all nine of the vessel's steel hatch covers, breaking all but one of the 66 hatch cleats in the process. Some of the hatch covers dropped into the cargo hold and were found resting on top of the cargo. The cargo hold coaming bar was also damaged in several locations and the cargo ventilation trunking tower flaps were deformed. The vessel was out of service for over 4 months **(Figure 1)**.

The cargo

Nortrader was loaded with a cargo of 2333 tonnes(t) of unprocessed incinerator bottom ash (IBA), the ash accumulated at the bottom of the furnace when waste material is incinerated. The MAIB investigation estab-

Figure 1 *Nortrader* **immediately after the explosion in the cargo hold**

lished that the explosions were caused by the ignition of hydrogen gas released from the cargo. The cargo of unprocessed IBA loaded onto *Nortrader* was generated at the incinerator plant owned and operated by MVV Environment Devonport Limited (MVVD), Plymouth. MVVD handled approximately 250,000t of non-recyclable waste in a year. At the time of the accident, there

Figure 2 Unprocessed incinerator bottom ash cargo

were 32 operational municipal waste incineration plants in the UK. The heat energy produced by the incineration was recovered in combined heat and power plants. Samples of cargo collected by the MAIB were tested to reveal an estimated total metal content of 10.6%, of which the non-ferrous content was 2.6%.

On 10 January, the master of *Nortrader* had received instructions from the charterer to load a full cargo of unprocessed IBA at Plymouth. He and the chief officer referred to the International Maritime Solid Bulk Cargoes Code (IMSBC Code) which listed all solid cargoes permitted to be shipped in bulk and provided a schedule of requirements for the safe handling and carriage for each cargo. Unprocessed IBA was not listed in the IMSBC Code but the master, nevertheless, decided to load as instructed by the charterer.

Release of hydrogen

The cargo on *Nortrader* was typical of the unprocessed IBA from the MVVD facility and included items such as unburnt paper, domestic gas cylinders and wheels from motor vehicles **(Figure 2)**. Hydrogen gas is released from the IBA during the ageing process as aluminium reacts with calcium hydroxide and water to form aluminium hydroxide.

The cargo of 2333t of unprocessed IBA had been loaded in heavy and persistent rain over a 9-hour period and the vessel had anchored in the Plymouth Sound 30 minutes after departure from port. The cargo hold was sealed after loading and remained unventilated for nearly 19 hours before the accident. Studies carried out after the accident established that more than 171 m^3 of hydrogen gas was present in the cargo hold at the time of the explosion.

Events leading up to the explosion

On the afternoon of 13 January, the chief engineer visited the forecastle store and started the emergency fire pump to supply water to the deck wash line. From the sound of its operation, he suspected that the pump was running dry and so returned to the forecastle and opened a fire hydrant, to confirm that no water was being pumped. He then returned to the store and stopped the emergency fire pump using the stop button on the starter panel.

As he activated the stop button, there were two loud explosions in quick succession. The fire detection system registered this event at 1447. The first explosion threw the chief engineer onto the emergency fire pump starter panel. The second explosion pushed him violently backwards and he fell on the deck under the starter panel.

How did hydrogen enter the forecastle store?

There were two cargo lamps at the forward end of the hold. The access to the starboard lamp was from within the forecastle store. The access plate for this was found loosely fitted using two of ten bolts, and the sealing
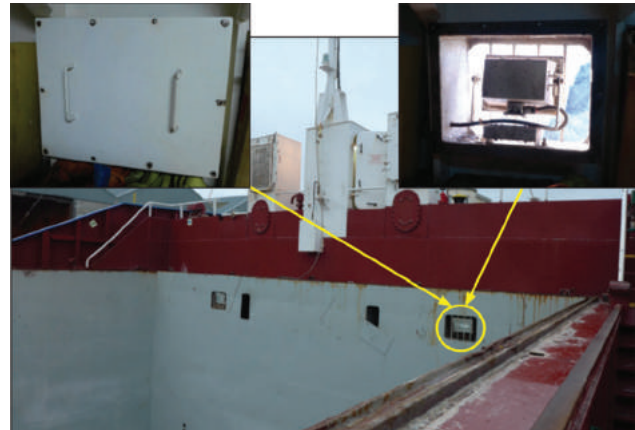
Figure 3 Cargo hold lamp access
(Insets: views from forecastle store with maintenance hatch closed and removed)

gasket was missing, thereby breaching the gas tight integrity of the cargo hold **(Figure 3)**. One of the lugs on the starter panel for the emergency fire pump was broken preventing the panel door from being fully closed.

Hydrogen generated by the cargo entered the forecastle store through the loosely fitted lamp access hatch and into the emergency fire pump starter panel through its poorly sealed door. A colourless, odourless gas, hydrogen is 14 times lighter than air. It is highly volatile and burns easily in air at concentrations between 4% and 75%. Compared to other flammable gases, hydrogen has the lowest minimum ignition energy. The ignition source for the hydrogen air mixture was most likely to have been electrical arcing between the contactors in the switch gear in the emergency fire pump starter panel.

Lessons Learnt

1. It is not permitted to carry cargo not listed in the IMSBC Code. All the crew on a ship would benefit immensely from having an awareness of the cargoes carried on board and the potential risk they present.

2. Gas tight integrity of all spaces on board must be strictly maintained and any deviation promptly corrected.

3. For purposes of transportation in bulk by sea, the release of any quantity of flammable gas should be considered dangerous.

For the complete report, see *Gas explosions on general cargo ship Nortrader with 1 person injured - GOV.UK (www.gov.uk)*

About the Author

Dr. Gopinath Chandroth, *CEng (UK); FIMarEST; FIMarE is an alumnus of DMET (1974-78). He holds a Master's degree in Software Engineering and a Doctorate in Machinery reliability and Artificial Intelligence. He is currently with Marine Accident Investigation Branch (MAIB) of UK as an Inspector of Marine Accidents.*

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PROBLEM-SOLVING SKILLS IN COMPETENCY BASED TRAINING: AN INSTRUCTIONAL DESIGN MODEL

■ Kian Chuan, Lim

Institut Teknologi Petronas, Malaysia

Abstract

This concept paper is about the learners' problem-solving and critical thinking skills. The aim of this assignment is to conceptualise and develop a suitable instructional model that can be used for planning and designing instruction. A well-established instructional model is very useful in competency based training (CBT) and learning activities that address issues of critical thinking skills and challenging problem situations. A 70:20:10 model is proposed to address the experiential, social and formal learning. To achieve this, learners are provided with training opportunities at integrated live plant and application of virtual reality system. The analysis of design is based on backward instructional design model. This concept paper is important in proposing an instructional design for marine electrical competency based training to produce workforce and cater to the rapidly growing economy of Malaysia.

Keywords: problem-solving, critical thinking, instructional model, instructional design, competency based training

there are four objectives in training and development: social, functional, organisation and individual

1.0 Introduction

Education is one of the main components of Malaysia's transformation into a high-income nation by 2024. National Key Economy Area (NKEA) undertakes initiatives to develop the range of education in Malaysia, from early childcare education to professional skill training (ETP, 2014) like maritime education. Under the Prime Minister's department, it was aimed to enhance Malaysia's international reputation as an education hub. To achieve the vision 2024, it is extremely important to reform higher education structure to meet the international quality standards. Thus, the human capital enhancement is crucial to achieve goal of Economic Transformation Program. Higher education institutions, which can provide the skilled profession, are needed to fulfil national requirements (ILO, 2000; ILO, 2010; Wildavsky et al., 2012).

Manpower demand of competent technicians in the developing countries (for industries) is rising day by day. However, the scale of the problem of shortage of skilled workers amongst available applicants, who do not possess relevant qualifications for specific jobs, is serious and needs to be addressed. This issue is even more pronounced in three major age groups such as young semi-skilled and skilled technicians, successful applicants who have been contracted but are not yet fit for the job, and experienced technicians who are looking for promotion in carrying out complex jobs (GIZ, 2013).

In an organisation, the training and development is an on-going enhancement activity that promotes performance of employees. With this program, employees will be able to gain knowledge and skills which lead to efficiency and effectiveness of work (Kulkarni, 2013). According to Kulkarni (2013), there are four objectives in training and development: social, functional, organisation and individual. Thus, the main objectives of CBT are to promote learners' full potential and lifelong learning, develop learners with quality transferable skills, and merge the education with industry (Anane, 2013).

Therefore, in the fast growing society, it is essential for competent workers to acquire the skills of critical thinking and problem-solving. They must be able to respond to open-ended problems creatively, fast and flawless under the uncertain and pressured conditions. This study aimed at understanding learners' response on lack of problem-solving and thinking skills. Later, determines an appropriate instructional goal, assessment, and strategies.

2.0 Literature Review

Mayer and Wittrock (2006) defined problem-solving in four elements namely cognitive, process, directed and

personal. Problem-solving is a cognitive process which transforms an unknown entity or current state into desired future situation or goal state by the solver based on his knowledge and skills. Problem solving involves critical thinking, reasoning and decision making. Halpern (2013) defined critical thinking as ability which applied cognitive processing to obtain the required result. It is a high-level thinking capability to analyse, establish and evaluate information to solve problem.

The cognitive process in problem solving can be divided into four stages like problem representation, planning for solution, execution of plan and regulate to evaluate (Mayer and Wittrock, 2006). Mayer and Wittrock (2006) argued that a good solver must acquire five types of knowledge which can be applied for each stage of the cognitive process.

1. Problem representation requires *facts* and *concepts*,
2. Planning need *strategies*,
3. *Procedures* are used for execution and,
4. *Beliefs* are essential for regulation.

Training methods affect the abilities and development of learners in terms of communication, critical thinking and interpersonal skills. Deductive traditional teaching methods are used to promote performance, knowledge retention, and cognitive learning (Oermann, 1990; Prince & Felder, 2006). Trainers deliver a subject first with theories and later progress to application. Learners accept the knowledge passively by memorising it (McCarthy

& Anderson, 2000). Finally, examination is conducted to assess learners' ability. Thus, in traditional teaching methods, trainers do most of the information delivery and seldom involve learners in conversation to engage active learning and it limits learners' learning experience (Broughton et al., 1994; Kuzu, 2008; Smit, 2009; Kahl & Venette, 2010).

It is worth noting that trainer-centred approach is preferred in hard sciences like medicine, engineering and physical science. Unfortunately, this training method produced graduates with limited exposure to real world problems and lacked improvements in critical thinking skills. Also the shortage of real life experiences to solve the problem, interpret and analyse data was another area found wanting.

Othman et al. (2008) argued that strong academic results are insufficient to secure an employment. Current teaching and learning are focused on memorisation and lead to deficiency in problem-solving and critical thinking skills. Thus, it is crucial for educators to introduce methods after trying to analyse and synthesise cognitive learning among learners to increase the capability to solve complicated and open-ended problems (Shakir, 2009).

Yusof (2010) reported that Malaysian polytechnics prepared their learners with problem solving and critical skills which were required by the employers. However, those skills are still lacking and learners are unable to achieve the higher level of cognitive capability. According to Yusof (2010), due to the spoon-feeding culture in

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ELECTION NOTIFICATION

IME(I) GOVERNING COUNCIL, BRANCH & CHAPTER COMMITTEE ELECTIONS 2021-2023

Voting for the Governing Council, Branches & the Executive Committee closed on 01st Aug, 2021.

Counting of votes:

1. The counting of votes will happen on **Tuesday, 24 August 2021** in the auditorium at IMEI House, Plot no. 94, Sector 19, Nerul East, Navi Mumbai 400 706.

2. The counting will begin at 1000 hrs with the postal ballots followed by the collation of votes received electronically.

3. The Election officer, Mr V K Chandrasekharan, will preside over the count.

4. Those who wish to witness the counting are requested to inform the Election Officer, of their intent to attend, at least one week prior to the date i.e. no later than **Tuesday, 17 August, 2021**.

Election Officer, (**electionofficer@imare.in**)

The Institute of Marine Engineers (India)

IMEI House, Plot no. 94, Sector 19, Nerul East, Navi Mumbai 400 706

education, learners lack in independent thinking. Other than that, learners also lack in communication skills, creative thinking skills, interpersonal skills and decision making skills.

Abdul Kadar (2013) also presented that many Malaysian graduates are unemployed because they are unable to meet the requirements of potential workforce and not efficient at workplace. They lacked in soft skills which include problem-solving and critical thinking skills. Purcell et al. (2012) described that advanced technology has changed the meaning of learning. Internet is a quick source of information but it has brought negative impact to the learners especially in research. With internet as a source of information, Learners obtained solution to a problem without putting efforts in analysing and interpreting the information. Learners seldom explore beyond the limits (Schoenfeld, 2010). Subsequently, learners are unable to think critically and creatively when solving problems.

> " With internet as a source of information, Learners obtained solution to a problem without putting efforts in analysing and interpreting the information "

In the recent years, there has been a major paradigm shift in technical training from deductive traditional teaching approach to inductive alternative teaching approach (Prince & Felder, 2006). Alternating teaching and learning involved various methods like problem-based, project-based, discovery and case-based. In technical training, the inductive alternative teaching methods exposed the learners to real world problems. Learners acquired real life experiences and critical thinking skills to solve the problem, interpret and analyse data. These teaching methods are learner-centred and characterised as constructivist learning. Fosnot (1989) described the constructivist learning as a meaningful learning comprising of adapt new changes, building new ideas and rethinking to replace the old ideas. Constructivism is not considered to be accumulation of facts but creating novel approach to solve problems. A constructivist, learner-centred classroom consists of competent trainer who facilitate the active learning by providing opportunities and motivating leaner to think critically and creatively. Active learning such as simulations, problem-solving and peer discussion frequently take place in cooperative and collaborative manners. Training is a unique and complex effort that required dedication. Factors which may influence effective training are the trainer-learner relationship and learner motivation (Tomcho & Foels, 2008). Trigwell et al. (1999) explain that the diversity in

classroom created variation in learning. Thus, it is crucial to determine the effective training strategies to enable surface and deep learning. The factors that influenced selection of training methods are principles and perceptions. The effective training methods not only provide deep approaches in learning and high quality of learning outcome but also motivate and inspire learners' to be more ready for their future professional development.
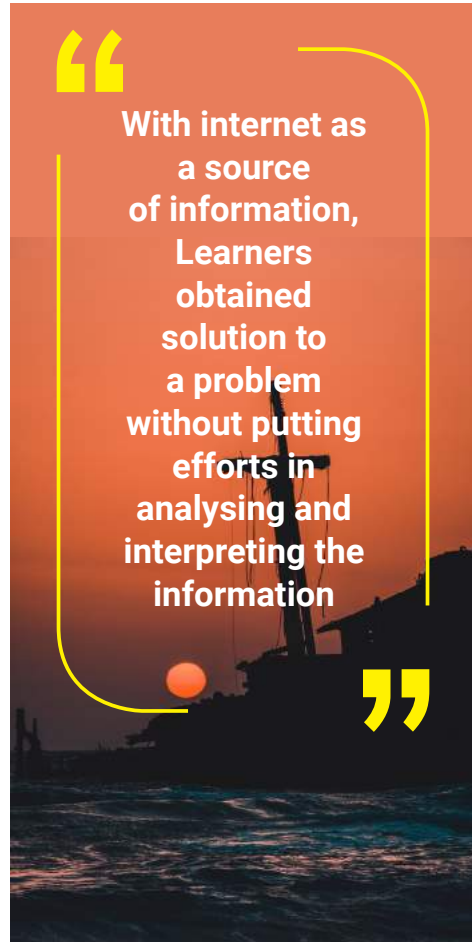
3.0 Study Approaches

Context and Analysis of Responses from Target Population

A discussion on the text of interviews conducted is provided in later sections. The details of interviewees are discussed in the order given in this manuscript. The learners' characteristics are analysed based on entry skills, prior knowledge, attitudes, motivation, learning preference and ability levels.

Four learners graduated from TVET (technical and vocational education and training) institutions were interviewed for this study. All learners commented that to improve the learning is good to incorporate the knowledge and practical together instead of delivering them one by one. They have also pointed out that the lack of facilities, equipment and tools jeopardised the process of learning. The competent training is to prepare the students with knowledge, skills and right attitude. Thus, it is crucial to have adequate facilities, tools and equipment for quality leaning. This is in line with the work of Abdullahi (2003) that sufficient workshop facilities and support will enable trainers to deliver the training effectively and productively.

They also highlighted their struggle to locate financial support for final project and meet their teammates to complete the project due to the busy class schedules and personal behaviour. The learners found that teaching using power point presentation slides is boring and dull. From the interviewees' response and observation results, it showed that learners prefer to have more hands on skills rather than traditional theoretical class. They also preferred experienced trainers in terms of knowledge and young trainers for innovative thinking.

According to Gurney (2007), the more the trainers were involved in the learning process and knowledge is shared, the learning environment gets more effective.

He also pointed out that there are few main factors in good teaching: knowledge, enthusiasm, assessment, feedback, respect and environment which stimulate learning.

Teaching approaches and techniques applied in classroom need to be transformed from classroom theory to virtual reality for example. Virtual reality is a potential aid used to learn complex and abstract concepts. Career-focused learning in technical is rising fast in developing countries and the learners with specified skills get easily hired. Thus, the virtual reality is an essential tool to train the learners in difficult and dangerous experience in real life at safe condition (Pantelidis, 2009). Fry et al. (2009) reported that adult learners responded well towards new challenging learning experiences, excitement and freedom. Thus, it is crucial to avoid the development of learners in isolation and in a controlled situation.

Majority of the interviewees agreed that they faced problem in English language proficiency. This is probably due to the early school training. During the tertiary education, the classes were delivered in English language but Malay language was used to assist students to overcome their shortcoming in English language. Furthermore, learners were uneasy to communicate in English language and choose to speak in native language. These are the causes for lack of English language proficiency (Musa, et al., 2012).

However, Murray and Christison (2010) reported that many learners (students with English language as an academic subject in school) are unable to view its impact for their future employment with national or multinational companies where English is used for communication, report writing, and etc.

The four students agreed with competency training. The training which designed with focus on knowledge, skill and attitude to measure students' achievement by referring to the evidence collected and it must meet the standard. Their founding is matched with the research by Sattler & Peters (2012). They reported that skills or job oriented learning and training will help the students shift into the workforce with high adoptability. This type of learning also helps to grow workforce skills and become the pre-screening of a potential candidate for the employer.

The current curriculum is overloaded with theory classes, lack of practical training, and absence of integration between basic knowledge with electrical subjects. This passive teaching-learning approach led to lack of problem-solving and critical thinking skills among
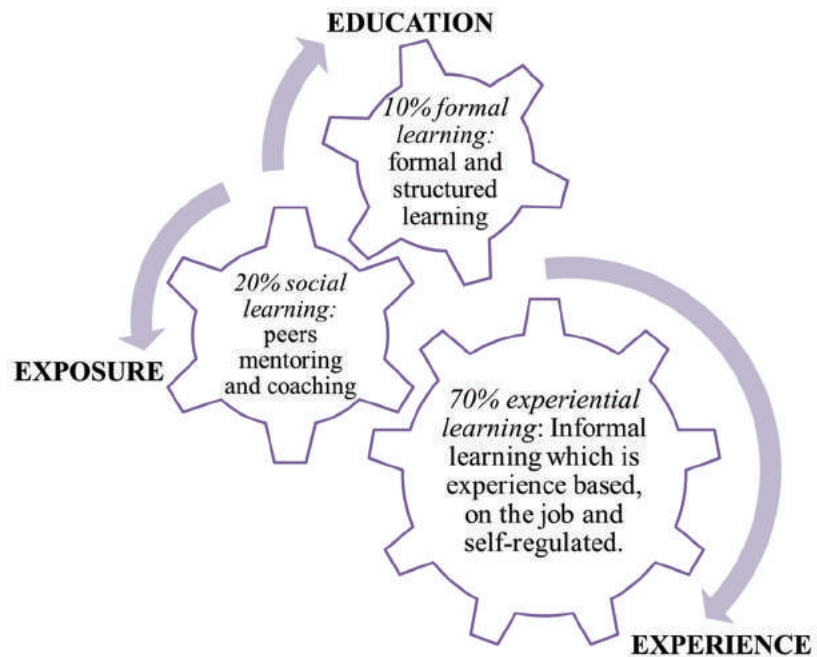
Figure 1 The 70:20:10 task based training model

learners (Annamalai et al., 2015). Learners memorised for final examination and learning was not taking place in full. This finding matched with Murphy (2009) which the disadvantages of final examination such as it is only for testing memory instead of understanding; it is only a surface learning not a complete performance and feedback after examination is not available.

Instructional goal, analysis, entry behaviours and performance objectives

In order to stay competitive at workplace in this day and age, problem-solving skills are essential for competent technicians to carry out non-routine analytical and interpersonal tasks. They are required to handle uncertain situations with systematic steps, monitor the consequences, adjust emerging situations and evaluate accordingly (OECD, 2012). In real life, to participate actively at workplace, it is crucial for a competent technician to familiarise surrounding conditions, engage and convert the knowledge learnt through the life into action with enthusiasm. Thus, training systems play an important role to promote metacognition and self-regulated lifelong learning.

This study is about instructional design for a pre-employment training course. It is aimed to prepare the learners as the first step into the employment, progress and development along their career.

The 70:20:10 Model

Blended learning, a combination of formal and work-based learning creates great challenges and opportunities in skill and task based training. Training can happen not solely at formal setup, it can also be carried out informally. OECD (2005) classified the formal training as

qualified learning at a recognised educational institution and the informal training as learning obtained from daily work-related activities. Tough (2002) reported that 80% of learning happened outside the educational institution and 20% of learning came from trainer. The 80% is further described as 73% if self-regulated learning, 3% learned from family and friends, and the remaining 4% gained through peers' group. Cross (2007) also described that 80% of lifelong learning happened informally through leader and only 20% learning is formal. Thus, implementation of 70:20:10 task based training model is designed. The main elements of the training are opportunities to practice, new experience challenges, reflect on feedback and involvement in discussion and exchange ideas (Jennings, 2013). The details of 70:20:10 model is shown in **Figure 1** (Kajewski & Madsen, 2012; Jennings, 2013).

Instructional Design Model

The backward instructional design model for this study is illustrated in **Figure 2** (McTighe & Wiggins, 2012; Clark, 2015). In this training model, it aimed to ensure that as competent technicians, they are required to have skills in reasoning, able to regulate the problem-solving process and be motivated rather than acquiring expert knowledge to solve problems (OECD, 2012). This is a pre-employment training program. Thus, learners have basic academic qualification/background such as diploma from TVET institutions with appropriate level of

knowledge, skills and attitude in lifelong learning. In this training program, learners are required to perform task according to standard procedures and stated assessment criteria. Learners must acquire the problem-solving and critical thinking skills when handling the open-ended or uncertain situation.

Assessment methods and instructional strategies to achieve the goal

Integrating the competency based training requires a complex and tedious process. A holistic approach is needed to match every element in the system to produce an initiative which makes all the learners to be eligible from every level of workforce (Hodge, 2007; Kodiappan, 2011). Thus, for this initiative, steps were taken to eliminate the problem inherited from the previous system and encouraged proficiency and mastery of tasks with opportunities provided.

The instructional model is designed to provide a student with knowledge and skills needed as the first step into their employment. Thus, it is a job related qualification which will develop the students' understanding, knowledge and skills in performing the service and maintenance according to procedures and safety guidelines. The assessment focused on measuring the learners' comprehension of work related skills and provides confidence needed for performing the task (Jones, 2005).
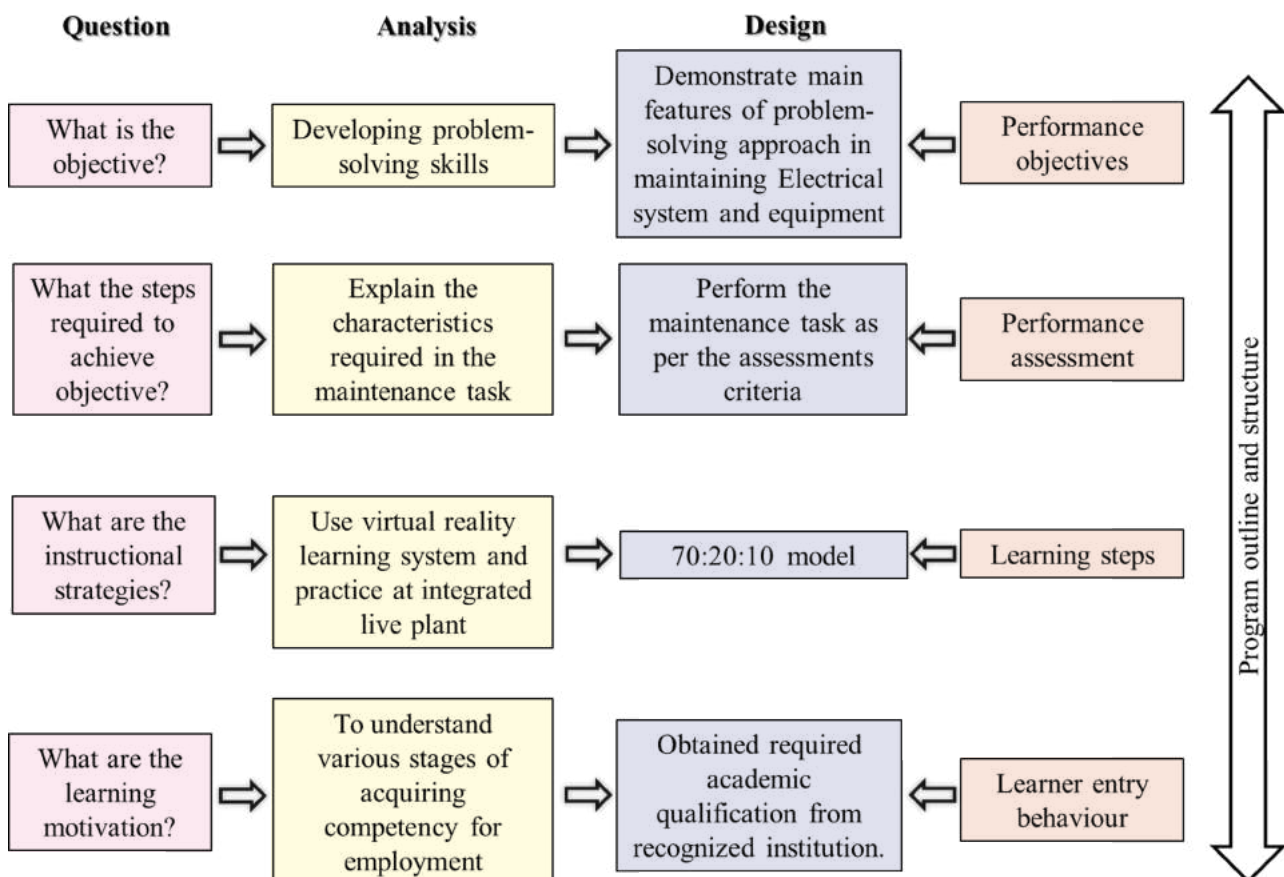

Figure 2 Backward instructional design model

In the competitive global market, industries prefer to have job ready graduates who have both knowledge and skills in specified area. Thus, the assessment methods introduced must consist of task based assessments and recording of evidences from the task performed. The learners are not required to sit for the final examination but they are assessed to be competent in performing the tasks. According to this method, each learner is given a fixed number of chances to perform the tasks and awarded with NOT YET COMPETENT or COMPETENT status. The assessment areas are:

(i) risk and safety

(ii) preparation of equipment and work area before maintenance

(iii) positive working attitude

(iv) interpret technical information

(v) test the electrical equipment and system

(vi) maintain and monitor the electrical equipment and system

(vii) troubleshoot and corrective maintenance in equipment and electrical system. This is important to ensure the students become more proactive, effective and their abilities are recognised. (GIZ, 2013).

These new instructional strategies involve learners' experiences working in an integrated live operation training plant equipped with numerous state-of-art facilities including simulator, manufacturing plant, process plant and workshop. This is to provide learners with real-industry hands-on experience and enables them to attain competencies via structured self-learning activities in production-technological learning environment. It is vital to produce competent technicians who have skills in problem-solving and able to continuously improve the manufacturing process. This is in line with Tisch et al., (2013) finding that with the rapid advancement of technology, reformation of current training is needed by adding scientific-founded approach. Based on their study, it is crucial for the employer to catch up with the rapidly changing of social, economy and technology in order to move forward to the future oriented-production and compete with others in global market.

Constructivist Approaches

The current trend in education is characterised as individualised, personalised, self-determined education with three components which are connections, creator and constructivist (Gerstein, 2014; Twyman, 2014). The teaching and learning are multidirectional which is cross-institutional; cross-cultural and cross educational (Keats & Schmidt, 2007). According to Twyman (2014), personalised learning is associated with pace of instruction, different instructional methods and learner's experi-

> **In the competitive global market, industries prefer to have job ready graduates who have both knowledge and skills in specified area**

ences. On the other hand, the drivers for self-determined and interest based learning are innovation and creativity (Gerstein, 2014). Thus, the learning environment which is open, free and broader where learners are allowed to determine, create and generate the content of learning with the collaboration from others at anytime, anywhere (Keats & Schmidt, 2007) is preferred. This can be achieved with the integration of technology and digital support in learning i.e. virtual reality system allowed learners to have the flexibilities to facilitate their continual learning and development of capability. The advantages of virtual reality system are that it is a potential aid used to learn complex, abstract concepts and dangerous experience in real life at real time, real avatar and safe condition. (Pantelidis, 2009). It also encourages the active engagement and active participation at different scenarios and consequently leaves positive impact on the self-esteem. This will produce human capital with innovative problem-solving skills and entrepreneurship (Rahmat & Osman, 2012).

6.0 Conclusion

Indeed, there is a demand of work force which possessed the right attitude of lifelong learning and critical thinking skills employed in problem solving. Learners are encouraged to possess those skills to address and adopt in maintaining electrical equipment and system therefore increasing employability. The stated instructional model enables learners to learn and develop through experience at integrated live plant and virtual reality system which lead to experiential learning. The application of advanced technology enables the interoperability, collaboration and re-usability. Thus, this provides a communicative channel for knowledge and information exchange among peers which is known as social learning. The function of trainer is now becoming coordinator who manages, observes and deploys the teaching resources. Thus, the face-to-face time is shorter and formal learning is minimised to necessary level.

(The samples of survey forms can be provided on demand.)

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LUBE MATTERS 2

WHAT MY UOA RESULTS ARE TELLING ME ■ **Sanjiv Wazir**

COLUMNS

Introduction

The lubricating oil for any machinery needs a variety of properties. The selection of the type and grade of lubricant to be used should be based on the relevant machine operating and service conditions. In addition to its main job of lubrication, the lubricant may be required to keep engine components clean, neutralize acids, transfer heat, fight rust and corrosion.

Since lubricating oil condition can be impacted by operating stresses and contamination, monitoring the oil quality is important. Used Oil Analysis (UOA) comprises tests carried out on a sample of the oil to monitor the physical and chemical changes and ingress of contaminants that the oil may be undergoing.

These tests are usually carried out in specialised laboratories using automated equipment. Only a small volume of oil is needed (LUKOIL Marine typically requires 120ml) for a full Routine Used Oil Analysis. This makes routine UOA quick, easy and economical.

Normally the test method used will be according to ISO or ASTM standards specified by the OEM. The lab test report signals the condition of the oil. What those signals mean, what may have caused the change and how the change may impact the machinery is described below. The standard test methods used by LUKOIL Marine are also mentioned.

VISCOSITY DECREASE	
POSSIBLE CAUSES	POSSIBLE EFFECTS
-Wrong grade used/topped up	-Poor lubrication
-Fuel dilution	-Reduction in oil film thickness
-Shear of VII additives	-Reduction in load carrying ability
	-Metal to metal contact
	-Engine overheating
ASTM D445-18	

WATER CONTAMINATION	
POSSIBLE CAUSES	POSSIBLE EFFECTS
-Coolant leak	-Loss of lubricating properties
-Internal leakage (jacket)	-Loss of bearing life
-Condensation	-Corrosion
-Low Load operation	-Emulsion formation
-Rainwater ingress	-Increased viscosity
	-Foaming
ASTM E2412; ASTM D630416e1; ASTM D9513(2018)	

ABNORMAL DECREASE IN BN	
POSSIBLE CAUSES	POSSIBLE EFFECTS
-High sulphur fuel	-Increased acid number (AN)
-Low oil consumption/top-up	-Oil degradation
-Extended oil drain interval	-Increased wear rate
-Top-up with low BN oil grade	-Acid build-up in oil
-Low load operation	
-Low cylinder liner temperature	
-Poor combustion	
-Excess blow-past	
-Water ingress (condensed water with scavenge air)	
-Other water contamination (purifier, cooler, etc.) leading to wash-out of additive	
-Raw fuel contamination/ dilution of lube oil	
ASTM D2896-15 Procedure B	

POSSIBLE CAUSES	POSSIBLE EFFECTS
-Top up with high BN oil grade	-Additive deposits
-Contamination by cylinder scrape down oil (2-S Engine)	-increase in insoluble/soot
	-difficulty in centrifuging
	-foaming
ASTM D2896-15 Procedure B	

INCREASE IN AN	
POSSIBLE CAUSES	POSSIBLE EFFECTS
-High sulphur fuel	-Corrosion
-Ingress of acidic combustion products	-Leaching
-Overheating	-Reduced oil life
-Excessive blow-by	
-Additive depletion	
-Oxidation by-products	
-Extended oil drain intervals	
ASTM D664-18e2 Method A	

DECREASE IN FLASH POINT	
POSSIBLE CAUSES	POSSIBLE EFFECTS
-Contamination by fuel	-Increased flammability
-Oil degradation	-Hazard of crankcase explosion
	-Viscosity drops
	-Lubricity decline
FP @ 200 °C ASTM D3828-16a Method A; ASTM D3828-16a Method B; ASTM D9218	

VISCOSITY DECREASE	
POSSIBLE CAUSES	POSSIBLE EFFECTS
-Wrong grade used/topped up	-Engine overheating
-Contamination by soot/insoluble/dirt	-Bearings overheating
-Oxidation	-Oil filter bypass
-Nitration (mainly gas engines)	-Increased fuel consumption
-High temperature degradation	-Increased operating coats
-Extended oil drain interval	-Oil flow issues
-Fuel Contamination (Residual fuel)	-Sludge/deposit formation
-Water contamination	-Air entrainment and foaming
-Coolant contamination	
-Contamination by waste cylinder oil (2S Eng.)	
-Low oil top-up	
ASTM D445-18	

INCREASE IN SOOT	
POSSIBLE CAUSES	POSSIBLE EFFECTS
-Improper injector adjustment	-Poor engine performance
-Defective spray pattern	-Poor fuel economy
-Improper air/fuel ratio	-Harmful deposits or sludge
-Poor fuel quality	-Increased wear
-Incomplete combustion	-Carbon deposits
-Low compression	-Clogged filters, reduced filter life
-Worn engine parts/rings	-Increase Viscosity/oil thickening
-Low load operation	-Oil gelling
-Leaky or dirty filters/poor centrifuging	
-Insufficient capacity of filter/ centrifuge	
ASTM D7899-13;ASTM D893-14(2018); ASTM E2412	

INCREASE IN INSOLUBLES	
POSSIBLE CAUSES	POSSIBLE EFFECTS
-Wear debris	-Filter plugging
-Oxidation by-products	-Poor lubrication
-Environmental debris	-Deposits
-Wear debris	-Formation of sludge
-Leaking or dirty filters/poor centrifuging	-Accelerated wear
-Fuel soot	-Decreased oil flow
-Additive drop-out	-Foaming
-Extended oil drain intervals	-Shorter equipment life
-Insufficient capacity of filter/ centrifuge	
ASTM D7899-13; ASTM D893-14 (2018) ; ASTM E2412	

Details about ELEMENTAL ANALYSIS, PARTICLE COUNT, and FTIR will be in later articles.

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IN THE WAKE

■ Rajoo Balaji

Corona Crusades & Chronicles

Index Singapore is improving... more crew changing... traversing the global oceans...

Tokyo titbit: The Olympic Games got pushed into 2021 (postponed due to pandemic).

Now, OG 2020 is on (the 2020 tag is retained though happening in 2021);

To avoid physical contact/intimacies (veto the virus), TOG features Anti-sex beds in athletes' accommodation...

How can that be?

Beds are made of cardboard (engineered to carry only one person's weight) so as to 'avoid situations beyond sports'. The premise: It takes two to tango (or at least more than one).

But, Life will find a way and Necessity is the mother of invention...

(floors, floor mats... might be easy options...)

BTW, TOG will still issue contraceptives as in any OG. But they have to be carried back (to home country) and create awareness about AIDS/HIV. [! #*!].

We may believe: No naïveté here.

Shipping Matters

Another shipping subsidy in sight...

What does it offer?

– An incentive to bid for global tenders competitively (For GoI imports).

How is it to be done?

Quote low/win the bid/import; some portion [5-15%] will be made up by the GoI.

The catch: Register and flag vessels in India.

What is the idea?

To boost Indian tonnage as also Shipper sentiment (& profits?); To offset the cost disadvantage.

Any bonus?

– A quick registration for Indian flagging of vessels

– A quicker crew change (change to Indian crew)

Will it work?

Somewhat, say the sceptics. With the intention being clear to favour Indian Shippers, global ship-owners might keep away. With the absence of foreign interest, the lowest bid might not become apparent. Then, how to find the quantum of subsidy?

One solution:

India's major imports are processed petroleum products, steel, coal ...Can we use some data mining on imports from past and predict figures? Use modern tools on data crunching and get answers...?

Bills to Berth

The Inland Vessels Bill, 2021; The Marine Aids to Navigation Bill, 2021... these are moving to LS...RS (Lok Sabha/Rajya Sabha).

A Bill which could be on LS (left side) or RS (right side) before going through LS/RS is the Indian Ports Bill 2021. The draft is being deliberated upon in a States vs Centre style.

States: Erosion of power and federalism; can do as good as Centre in developing Ports; so, let it be.

The other side: Development of Minor ports (deepening drafts; increasing number of ships, freight; improve infrastructure... road/rail connectivity etc.) need Central funding support; States cannot invest heavily. Also, pollution, port safety/security can be managed better centrally (Really?).

Non-functional ports (about 100+) have to be energised (possible only with traction from big projects like Sagarmala).

Whatever the outcome be, how about hubs based on Centre-State handshake models?

Crowding Containers

The box freight rates have gone North (US$13K/40' Container).

Smiles: Carriers; stock market. Frowns: Exporters (Indians included).

What is the problem?

Boxes are stuck all over from Los Angeles to Yantian (add any major container port in the list).

Prognosis: Logjam will continue; if a third wave rises... could get worse (or stay as bad?).

Industry watchers say the high box rates could reach a new elevated normal.

Are we looking at a post-pandemic (or through pandemic) inflation?

Tech Talks: Eliminating Emissions & Enhancing Efficiencies

Two stroke improvements are back on the agenda.... Some thoughts from recent webinars...

WinGD flexes its muscles with 2nd generation (iCER) RT Flex version burning gas.

– Otto Cycle adaptation and lean burning (Gas gets in at a low pressure @ 13bar)

– Methane slip taken care of (iCER: intelligent Control by Exhaust Recycling technology works well to capture the methane and get it back in to be burnt; experience so far showing promise)

– The cylinder lubrication problems: another issue also appears to be resolved.

(Cylinder lubricants used for Diesel engines do not perform well in Otto cycle. New formulations and extra cylinder cooling seems to have worked).

Will have to await operational performance of the Gen 2 Flex.

And MAN B&W engines are ready to drink Methanol (with water).

Base conventional Diesel engine costs, the capex is less as compared to LNG burning engines.

And Methanol flame has least visual radiation as compared to many other fuels... reduced emissions??

But the associated equipment and other needs look like more work for the ship board engineers with Methanol... (heating... mixing... pressures... Nitrogen generators etc.).

Wait and watch as always...

BTW, MAN B&W's ME-C engines are 'future ready' to burn LNG, Methanol and Ammonia.

There are sporadic discussions by sailing marine engineers on these in some forums. Wish they can appear here...

About August

This month has, I guess, a variety of Days that are thought provoking.

Withstanding the importance of Indian Independence (15 Aug) and the Quit India movement (8 Aug) that gave the impetus... there is:

A World Elephant Day (12 Aug) and a World Mosquito Day (20 Aug).

More in focus should be on the National Sports Day (29 Aug) ... and on our teams in Tokyo.

Wish we get golden, silvery and bronzy brown this month.

THE END VIEW

Oh, God, The Pirate Boat is almost Here. WHY the HELL, the Security Guards are NOT FIRING !!

Capt, I guess the Chief Officer has STRICTLY INSTRUCTED them not to FIRE Till they get the HOT WORK PERMIT

Idea, Words & Drawing:
■ Ramesh Subramanian

THE INSTITUTE OF MARINE ENGINEERS (INDIA)

DIESEL ENGINE GAS COMBUSTION SIMULATOR COURSE
FOR MEO CLASS I - 3 DAYS

ABOUT THE COURSE

Our ARI , DNV-GL Certified Simulator, simulates the MAN 6S 60 MC main engine for a Tanker, which meets the STCW and DGS requirements for Simulator training.

OBJECTIVE

⇨ To facilitate the practical simulator-based training to students preparing for their Certificate of Competency.

⇨ This course fulfils the simulator training requirement for Chief Engineer Officers at the Management Level, specified in Table A-III/2 of the STCW Code as amended, to provide knowledge and skills related to optimisation of fuel consumption, supervising and monitoring the combustion parameters, for safe and efficient operation and control of ship's machinery.

⇨ To provide an opportunity for the learner to apply theoretical knowledge.

⇨ To enhance operational safety and efficiency.

COURSE FEE	:	Rs. 12000/- (Including 18% GST)
PERSON IN CHARGE	:	Ms. Anukampa Mallick
PHONE NO.	:	022 2770 1663 / 2771 1664
MOBILE NO.	:	9773363542 / 9967875995
REGISTRATION	:	https://docs.google.com / forms/d/e/1FAIpQLScoODFV36h9NWM8ZDG emBP9E3eRbSx BSiO_fw8YScjubymHDw / viewform
PAYMENT	:	http://imare.in/buy-online.aspx
LOCATION	:	The Institute of Marine Engineers(India) "IMEI House", Plot No. 94, Sector-19, Nerul, Navi Mumbai - 400 706

*After registration and payment, please email the details of the receipt to: **training.imare.in***

To know the exact date of course please click below link;
https://imare.in/navi-mumbai-news/course-offered-by-ime(i),-nerul.aspx

IME(I) House, Nerul, Navi Mumbai