

# Seamanship & Safety Training Through Hazard Simulation: Just like the Real Thing

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**Abstract:** Training plays a crucial role in furthering human learning and development. Training in the maritime industry is the key in producing competent seafarers. With most casualties resulting from a person's imperfect nature, there is a need to fill in the gap between the advanced technical standards and training methodology with the today's scenario. This paper discusses Hazard Simulation methods for teaching seamanship & safety training to the seafarers.

**Keywords:** Hazard simulation, Experiential learning, Safety Training, Causalities at Sea, Safety Attitude, Seamanship training.

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## I. INTRODUCTION

The Importance of Maritime Education & Training can't be overemphasized in furthering seafarers learning and development. Education & Training in the maritime industry plays a key role in preparing competent and safety minded seafarers. As majority of the casualties result from imperfect habit, there is a need to fill the gap due to the modern technical standards. It seems there is a better need to be more responsive towards safety-conscious management (Eriksson & Mejia, 2000.) Training activities conducted at Maritime Education and Training (MET) institutions are key elements in training of seafarers There are many maritime conventions and regulations which stipulate the training requirements for seafarers. The well-known pillars (regulations/conventions) which are focusing on safety & security at sea are Convention for the Prevention of Pollution from Ships,

**STCW** Standards of Training Certification and Watch-keeping,

**SOLAS** Safety of Life at Sea

**ISPS** International Ship and Port Facility Security Code

**ISM** International Safety Management Code

**MLC** Maritime Labour Convention.

### 1.1 CODE OF SAFE WORKING PRACTICES FOR MERCHANT SEAFARERS

Management of the high risks on-board ships, requires intensive training that primes seafarers to handle challenging situations with ease. The maritime industry has weathered decades of safety challenges using a rigorous curriculum-based safety training at Pre Sea training institutions and regulations-based bench mark safety training on board ships. The robust safety improvements can be owed to increased technology in ship building and high-tech equipment being used in ship's cargo and mooring operation.

The shipboard safety is further boosted by the higher standard of training being adopted by maritime nations. There is a need to set the objectives to boost the safety culture within the maritime sector. To a large extent this can be achieved through proper implementation of the ISM Code, which effectively requires companies to embrace a safety culture through a commitment to continuous improvement of their safety records.

Seafarers' education and training at pre sea training institutions certainly hold a strategic position in shaping future seafarer's professionalism

In all the education, training and development format, adoption of an efficient training method is important for building a robust and proactive safety culture among the trainee seafarers. Maritime training is more than a means to achieve regulatory compliance; it can take the training program over and above the requirements of minimum compliance. Crew safety can be compared to other high-stakes industries like aviation, the military, and nuclear power generation. In these industries, safety depends on the prevention of human errors.

It is a well-known fact that human factors contribute to safety incidents to prevent serious harm. Safety professionals & Safety trainers must concentrate on the near misses. There is a need to address Heinrich's pyramid through the prism of Significant Injury or Fatality (SIF) potential. Maritime trainers & shipboard personnel must focus on SIF potential near misses and incidents, rather than the flawed belief that reducing near misses overall will reduce serious injuries. SIF concept can be better understood & taught to the seafarers through the hazard simulation.

The utility of Hazards simulation in Maritime Training is certainly most interesting to consider in the context of seafarer's Training. The hazard simulation course developed jointly by NYK Ship Management Mumbai & Tolani Maritime Institute demonstrates the value of simulation for teaching safety and safe working practice This paper discusses the benefits of Hazard simulation as a pedagogical tool for teaching and training the young and experienced seafarer. The present Hazard simulations courses seems to be an expanded version of Baldauf et al., (2015) and presents enhanced results and the continuation of the research effort in the direction of maritime simulation for physical and electrical hazards and the pedagogic value the hazard simulation course affords.

## 1.2 IMPORTANCE OF SAFETY TRAINING

Workplace accidents can have several possible outcome & causes. Most common causes in human error occurring due to inadequate training of crew in the topic related to workplace occupational health and safety (Fung et al., 2012). Safety training of shipboard personal should be a priority for all stakeholder.

(Shang & Lu, 2009) emphasizing on the importance of training discovered that any time an occupational health and safety training is conducted there is a possibility in reduction of work-related accidents. Similarly, Khrais et al. (2012) discovered that training programs should be conducted immediately at the moment new workers are admitted, with an adequate plan being prepared based on the risks associated to the expected activities.

Safety instructions help in minimizing human error, since it is an excellent way to increase the workers' awareness skills and art of doing things (Lingard, 2002). The knowledge received during the training leads to increased awareness among workers who then seriously engage in respecting the safety rules and regulations (Huang et al., 2012). According to Siu et al. (2003), companies/ organization should pay special attention to unexperienced or less experienced workers. Training for Fresher's /younger crew is the best way to reduce unfortunate work-related accidents occurring due to lack of familiarization, and special care should be given to those methodologies which are more appealing to this type of workers and their job descriptions (Zierold et al., 2012).

If the training and development programs are well executed and done in a fairly good manner, they can have a significant impact on organizations' bottom line. Moreover, training & education has also been demonstrated to reduce life-threatening errors in high-risk environments like ships. Senders and Moray (1991) estimated that somewhere between 30% and 80% of serious accidents within human-machine settings can be attributed to human error; Safety Training and Educations are known to increase safety awareness, increase safety consciousness, changed in knowledge, skills and attitude would reduce errors and improve workplace health and safety.

## 1.3 RELEVANCE OF SIMULATION METHOD FOR TRAINING

Safety of ship's crew is an important concern in the high-risk seafaring profession. Maritime academician & ship board professionals approach training delivery for imparting safety training for personal safety /crew wellbeing. "Shipboard

Hazards Simulation & Situational Awareness Training” is an exemplary solution for addressing the dynamic shipboard workplace environment. Grounded in methodologies developed by the aviation industry, hazard simulation training exceeds traditional class room lectures and apprenticeship models in terms of speed of learning, amount of information retained through experiential learning, and capability for deliberate practice for simulating work place hazards. “Shipboard Hazards Simulation & Situational Awareness Training” remains an option in many MTI’s and continuing seamanship and safe work practices and for imparting curriculums-based safety education. Its use in training has shown to improve teaching methodology.

## II. AIM

In the Maritime Education & Training, it is imperative to develop more effective safety training methodology. Tolani Maritime institute with the Inputs from NYK company started to focus on the effectiveness of the instructional delivery method while teaching safety and safe working practice. The effectiveness pertains to level of understanding of safety instruction which could be enhanced through improving instructional delivery method, reflecting the hazard condition. This study aims to discuss the use of simulation technique i.e hazard simulation to bring both cognitive / kinesthetic impact for increasing safety awareness/ consciousness

Simulation of Hazards as a training method allow participants to experience a wide range of hazards and consequences of an unsafe act/ unsafe condition under the instructor supervised environment.

Safety First seems to be a well-known is frequently use buzz word used during all kind of ship board activities. Maritime safety has the most foregoing importance especially for activities carried out on ships of all safety concerns due to the nature of maritime transportation. Safety has different aspects in shipping such as safety for the ship and equipment, safety for the cargo, safety for personnel and safety for environment This paper primarily attempts to discuss certain module designed for teaching importance of personal safety covered in Shipboard Hazards Simulation & Situational Awareness Training conducted at Tolani Maritime Institute under NYK Flagship course NMC 73.

## III. ABOUT TOLANI MARITIME INSTITUTE

Tolani Maritime Institute (TMI) is dedicated to delivering high quality maritime education and training to prepare its students for rewarding careers in the shipping industry. TMI offers degree programs as well as a variety of short-term courses covering both the engineering and nautical disciplines.

### 3.1 ABOUT THE COURSE

The education and training requirements for seafarers are regulated by an internationally recognized convention by the name of Standards for Training, Certification and Watch keeping (STCW) Convention which was introduced in 1978. Shore based Maritime education and training institutes mostly cover the safety training as required by the industry. All seafaring personnel are required to receive basic safety education and training to work on board as part of STCW. Maritime training is more than a means to achieve regulatory compliance; it can take the training program over and above the requirements of minimum compliance. Keeping this in mind Tolani Maritime Institute along with NYK Ship Management designed a one-day course titled Hazard Simulation Situational Awareness Course

We tried to trace the origin & history of the hazard simulation course, it is believed that NYK–FIL Ship Management.INC was the first to design, develop the course named NMC 73 “Shipboard Hazards Simulation & Situational Awareness Training” at its Manila center. We came across that such course is also being conducted at Daiwa Steel Tube industries Co.ltd Japan.

### 3.2 SCOPE OF THE COURSE

The Hazard Simulation training is part of Tolani Maritime Institute continuous commitment to enhance the safety standard by increasing seafarers’ awareness on the topics related with safety and health and environment thereby contributing in reducing if not eliminating personal injury and even death onboard ships.

The Course which is aptly titled as “Shipboard Hazards Simulation & Situational Awareness Training” is mostly conducted in practical mode where each participant will have the chance to feel the hazard / experience real life danger. The Course is conducted in a controlled manner / environment) which would make every participant more safety minded. This course has no pre-requisites. It's designed for anyone who wants to get better on all aspects of basic safety at work place So the course

should be helpful to all seafarers at pre sea and post sea levels i.e cadets & rating (deck & engine) experienced crew & officers. The Course Training duration is one day only.

#### IV. METHODOLOGY

##### 4.1 Experiential Learning through Hazard Simulation

Hazard Simulation is a safety Training Technique adopted at Tolani Maritime Institute for developing a sense of safety among trainees while teaching seamanship and safe working practices. It is a technique (not a technology) where unsafe situation /conditions are used to give realistic experiences. With trainer's guided instructions, the training often becomes an "experiential learning". Hazard Simulation-based seamanship & safety training can be the way forward to develop seafaring professionals' knowledge, skills, and safety attitudes, whilst protecting trainees from unnecessary risks. Simulation-based seamanship safety education can be a platform in designing structured learning experiences, didactic instruction, to enhance safety performance, and possibly reduce human casualties at sea.

Confucius Once Said "Tell Me and I Forget, Show Me and I Remember." Safety Training through Hazard Simulation is Proven method to increase safety awareness. Simulation as a Training Method widely used for training Paramedics and Military Professionals.

The term "safety" is the degree of freedom from danger or harm. It is said that Safety can be achieved by doing right things, in right manner always & all ways. Therefore, this course of simulation hazard is based firstly demonstrating /showing unsafe condition/ unsafe act and consequences thereof. in the second phase the trainer discusses the best practice based on code of safe working practice or the procedure set out in the safety management system of the respective company.

Hazard simulation provide instructors and participants an eye to see the hazard, a sense of feeling the hazard and a tool for highlighting common human errors. The course help in visualizing the safe performance that can assist increased safety awareness /consciousness. Generally, employees always look at their work environment, the behavior of their colleagues and supervisors, and the way they observe them doing the things that form individual safe cognitive behavior. These patterns adjust their behavior in the workplace and thus have an impact on safety & security.

#### V. COURSE MODULES

This section elaborates on the design, development and delivery of training modules through simulation.

The Course has many modules, a few of them are listed below.

##### Modules

- Dangers associated with falling
- Proper use of helmet
- Proper use of safety shoes
- Demonstration of effect shock load on synthetic rope
- Dangers associated with the use of ladders, portable ladders, scaffoldings
- Dangers associated with hoisting heavy object using chain hoist
- Dangers associated with manual lifting
- Dangers associated with working on rotating machines / equipment
- Dangers associated with electricity
- Dangers associated with welding (electric welding) Fire due to improper grounding
- Health hazard due to inhalation of welding fumes or dust due to improper PPE's
- Dangers associated with handling steel plates & Pipes

## 5.1 SAMPLE SIMULATION NARRATION

A few hazard simulation exercises are discussed below

### 5.1.1 DANGERS ASSOCIATED WITH FALLING

This module discusses and demonstrate the falling hazard, the use of full body harness shock observer lanyard is explained and demonstrated Even if a person survives fall due to use of fall arrest equipment, yet there is risk of internal damage to the human body. Through Fall arrest equipment hanging simulation, participants can actually feel the load on their body by experiencing what it is like to be suspended.

### 5.1.2 PROPER USE OF HELMET

In this module the participants were made to understand the influence of the impact energy on head due to falling object. For this a weight was dropped on a dummy head Conditions on a ship can change on a daily, hourly, minutes, even on second basis. Always wear the helmet at workplace for that reason, all variables should be taken into account when performing a risk assessment and creating a prevention program

### 5.1.3 PROPER USE OF SAFETY SHOES

Foot injury is most common while working on board. In this module the participants were made to experience an impact of hit due to falling object /drop impact on a dummy foot. Participants can actually feel the burden on their body by wearing the full harness and dropping

### 5.1.4 DANGERS ASSOCIATED WITH THE USE OF LADDERS, & SCAFFOLDINGS

Slipping of scaffolding and ladder base (slide-out) is another common cause of falls associated with the use of specially extension ladders (Hsiao et al., 2008).

The likelihood of an extension ladder base slipping depends on factors such as, the angle of ladder inclination, the coefficient of friction between the ladder base and the supporting surface, and the magnitude and location of use and the static / dynamic loads on the ladder (Pesonen and Häkkinen, 1988).

In this module the participants were made to experience a “vertical ladder drop,” which is the main leading cause of accidents while working on ladders on board ships. Participants can actually feel the burden on their body by wearing the full harness and dropping.

### 5.1.5 DANGERS ASSOCIATED WITH CHAIN HOIST

Most common injury while using sling or while adjusting sling is the hand being caught between sling and the load.

Participants were made to experience a “palm injury. Through this module the participants can actually feel the punch on their palm/fingers when their hand was made to trapped and the Load was being hoisted in a controlled manner.

### 5.1.6 DANGERS ASSOCIATED WITH MANUAL LIFTING

When lifting a heavy load, a person may hurt his/her back if one tries to lift the load in the wrong posture. Participant can learn how to lift a load without straining with body. This was simulated using a working model what impact comes on backbone when load is lifted using correct posture /in incorrect posture.

### 5.1.7 DANGERS ASSOCIATED WITH WORKING ON ROTATING MACHINES

Working close to Machines or nearby rotating equipment is perhaps accident cause “entanglement”. In the “Caught in a Roller simulation,” you can experience the danger wherein your hands or body will be suddenly caught due to high-speed operation of a roller. In the “Shaft entanglement simulation,” you can experience the situation of shafts or protrusions dis

Simulating being caught in a V-belt. It is said that the strength of a human finger is about the same as a pair of disposable wooden chopsticks. By using chopsticks as fingers and getting them caught in the V-belt, you can experience the danger of fractures and amputations.

### 5.1.8 DANGERS ASSOCIATED WITH ELECTRICITY

Electricity is good master but a bad servant and many fire cases are reported occurring due to electrical faults or misuse of electrical appliances. Electrocution can also happen if proper PPE and Log out / Tag out is not followed.

Participants were made to experience an electric shock by applying a voltage to their fingertips. Participant could feel can also experience how easily electric current flows to the human body when you sweat or in wet condition.

### 5.1.9 HEALTH HAZARD DUE TO INHALATION OF WELDING FUMES

As per research study of the International Association for Research on Cancer (IARC) It is said that there is increased risk of lung cancer among welders or other workers exposed to welding fume. This was simulated to make the participant aware how lungs are affected due to welding fumes. Through this simulation, participants were also made to realize how smoking can be injurious to health (effects on lungs)

### 5.1.10 DANGERS ASSOCIATED WITH HANDLING STEEL PLATES & PIPES

Many Safeties Flash published by IMCA (International Marine Contractors Association.) and MARS/Seaways etc are evident that many serious accidents are occurring while handling/ storing steel plates and pipes

There is a risk of a slung load falling or getting crew fingers caught between the slinging wire and the plates/ pipes. Participants were made to feel the common mistakes made during handling steel plates and pipe. Use of pull and push hook was emphasized for adjusting the slings or sling angles besides the leather hand gloves

A number of reviews from the trainees were gathered during and after the completion of their course of which the data is represented below.

### 5.1.11 FEED BACK & TRAINING EVALUATION

The method employed in this study was mix method descriptive- survey, participant interview and behavioral observation during training. The study aims at focusing on the effectiveness of the hazard simulation training and its impact on the improvement of participants, The data used in the study were collected through questioners/interview. The statistical population consisted of 1600 participants which including 1294 cadets and 306 experience seafarers. The feedback questionnaires were distributed among participant on completion of the training. The questionnaires were designed on the bases of Likert (5) item scales

## VI. PROCEDURE FOR ANALYSIS OF DATA

Every item in the questionnaire was assigned a numerical value with the resulting data being both nominal and ordinal in nature. the survey data. In order to accurately reflect the true value of “No Opinion” (Neutral) as the middle value of the responses, the values of each response were placed on a five-point Likert-type scale. The values assigned were 5 for “Strongly Agree”; 4 for “Agree”; 3 for “No Opinion”; 2 for “Disagree”, and 1 for “Strongly Disagree”. The responses where participants failed to offer an answer on a particular question were categorized as “No Opinion” (Neutral) and assigned a value of 3.

Given below are the statements in the survey

1. Training has improved the knowledge of trainees.
2. Training was conducted according to course duration (Reaction\_
3. Instructor asks clear, coherent questions
4. Instructor encourages Trainees to express their views.
5. Instructor is open to Trainee views
6. Trainee’s interest throughout the session remains high
7. Discussion is well organized
8. Methods used for the training is interesting & effective.
9. I feel comfortable sharing my points of discussion
10. I have adequate opportunities to participate
11. House rules & safety measures are explained before the start of training.
12. Training areas is conducive for learning

13. Safety Posters and instructional charts are clear & understandable.
14. Training Equipment is sufficient & useful
15. My overall feeling about the course

## VII. MEASURING THE EFFECTIVENESS OF THE COURSE

We tried to measure the effectiveness of the hazard simulation with Kirkpatrick model of course evaluation. Training evaluation has traditionally focused on identifying immediate participant reactions to the overall training and on measuring the participant's level of learning upon completion of training. One of the famous models to measure effectiveness of training is perhaps the Kirkpatrick model (Kirkpatrick, 2006), which was developed in 1950. This model has four levels:

**Reaction:** How did the participants react to the training program?

**Learning:** To what extent did participants improve knowledge and skills?

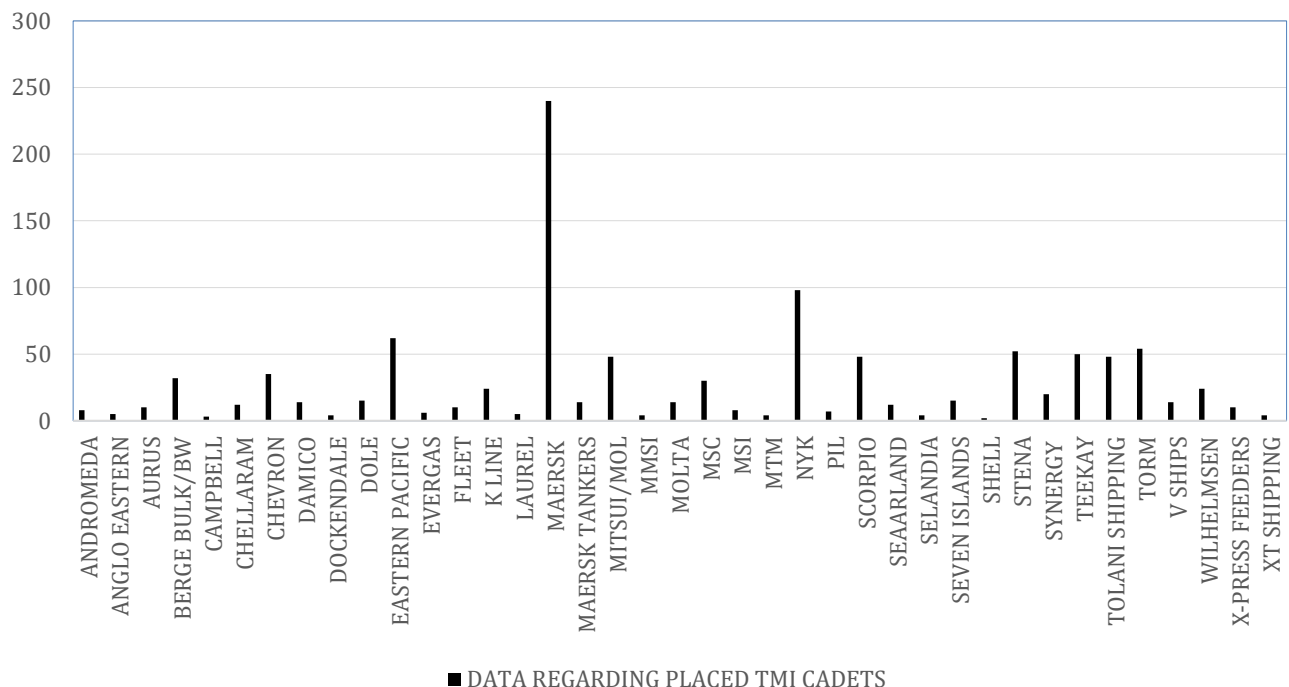
**Behavior:** Did behavior change as a result of the training?

**Results:** What benefits to the organization resulted from the training?

The first level of course evaluation was done immediately to determine the reaction of participants. This was achieved through end of the course 'feedback'.

Second level evaluation was done by observing the extent of interest and appreciation of the course by visiting delegates of various shipping companies. Many shipping companies had sent their junior officers and crew, was the proof of the popularity of the course.

The third level of evaluation pertained to practically observing the increase in situational awareness of the participants after becoming aware of the unsafe practices which they were following earlier. The participants raised 'freeze card' 'stop card' and pin pointed mistakes and thereafter suggested remedial safety control measures.



The fourth level of course evaluation was done by determining the overall impact of the training course by studying the no of accidents /incidence on board among the crew who have undergone hazard simulation and situational awareness course through feedback obtained from the Training Managers of the participating shipping companies.

Immediately after completion of the course, 99 % participants stated that they benefitted from the course. No participant claimed to have not benefitted from the course at all.

Though the course was primarily designed and developed for the training of NYK crew and for in-house safety training of cadets of Tolani Maritime Institute, but over time several companies have started sending their crew for this course namely EPS, MOL, DRS, Scorpio, BSM and Maersk. Thus, there is 5-fold increase in no of participating companies. Post sea course performance as received from the company feedback on LTI reports indicated that only one participant suffered minor finger injury post-course feedback about participants' safe behavior and their safe well-being at sea was obtained from company lost time injury records.

Student evaluations of teaching is the most widely spread method to conduct teacher evaluation at institutions for higher education (Arnold, 2009). Evaluation data were collected through feedback interviews and interactions with participants who had completed hazard simulation training

The focus of feedback to determine the training Evaluation was focused on the reaction of the participants to the hazard simulation course and to know their thoughts & Feeling about the hazard simulation training experience; We also were keen on knowing the participants' resulting learning and increase in knowledge from the training experience; participants' behavioral change and improvement after applying the skills on the job on board.

We acquired information from the shipping companies. The results indicated that the reaction of the participants was positive for training, secondly, post-course participants applied skills in risk assessment prior started work, use of freeze card, and knowledge that they had learned during training.

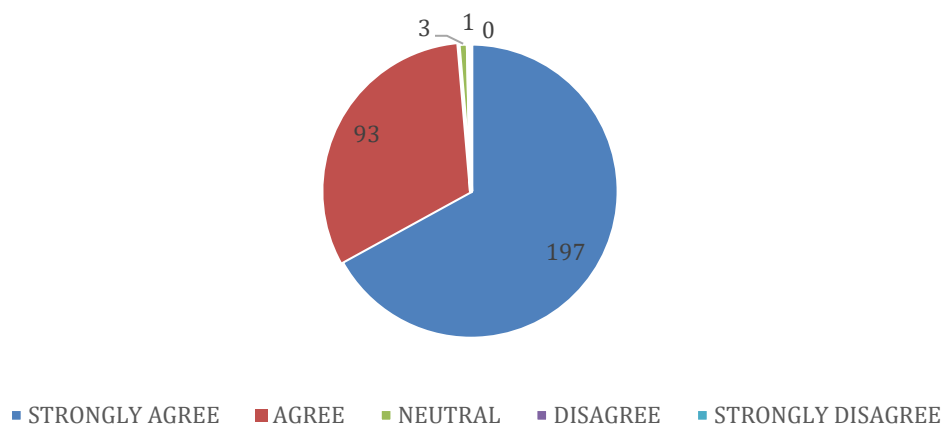
Toward the end of the training, the trainees started discussing how they thought more hazard simulation training modules were going to be developed in the future. While they mentioned traditional safety lecture methods need to be replaced with simulation, they also saw the potential for its future. They mentioned that training through simulation should be used more and more. In general, all participants felt like it was a unique educational tool that would get better in the near future. The main point that all the participants mentioned was realism and that it needed to become more realistic. They also stated that it gives a better experience like “Khatro Ke Khiladi” as some of the exercises like falling/sliding down a ladder and hanging on the harness, and touching the live electric wire were both realistic and challenging.

The course was primarily designed and developed for the training of NYK companies crew and for in-house safety training of cadets of Tolani maritime institute. but now several companies have started sending their crew for this course namely EPS, MOL, DRS, Scorpio, BSM Maersk, Teekey tankers and thus there is 5-fold increase in no of companies post-course performance as received from the company feedback on lost time injury (LTI) reports indicated that only one participant suffered a minor finger injury DUPLICATE

Quantitative feedback obtained from the participant through a questionnaire is presented in **figure 1 to 14**

## VIII. IMPACT OF TRAINING ON THE KNOWLEDGE OF TRAINEES

### IMPACT OF TRAINING ON THE KNOWLEDGE OF TRAINEES



The feedback clearly indicates the impact and effectiveness of the training on the trainees with the majority of trainees strongly agreeing with it.



Review:

*The instructor presents the material with expertise, humour and genuineness.*

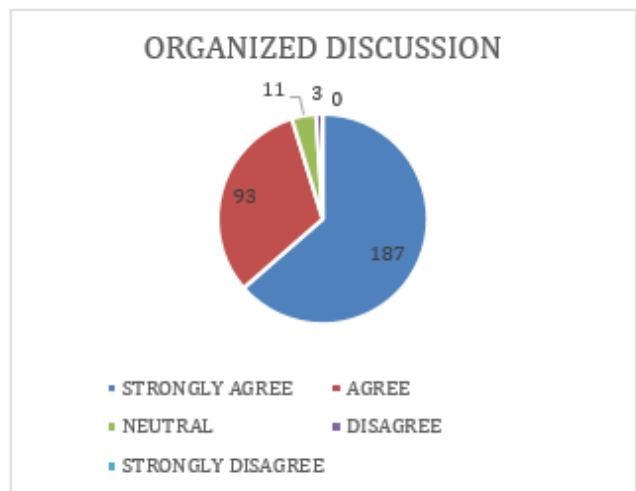
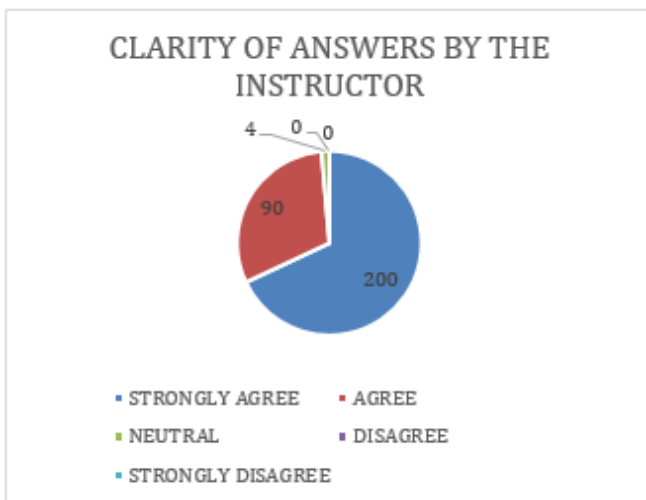
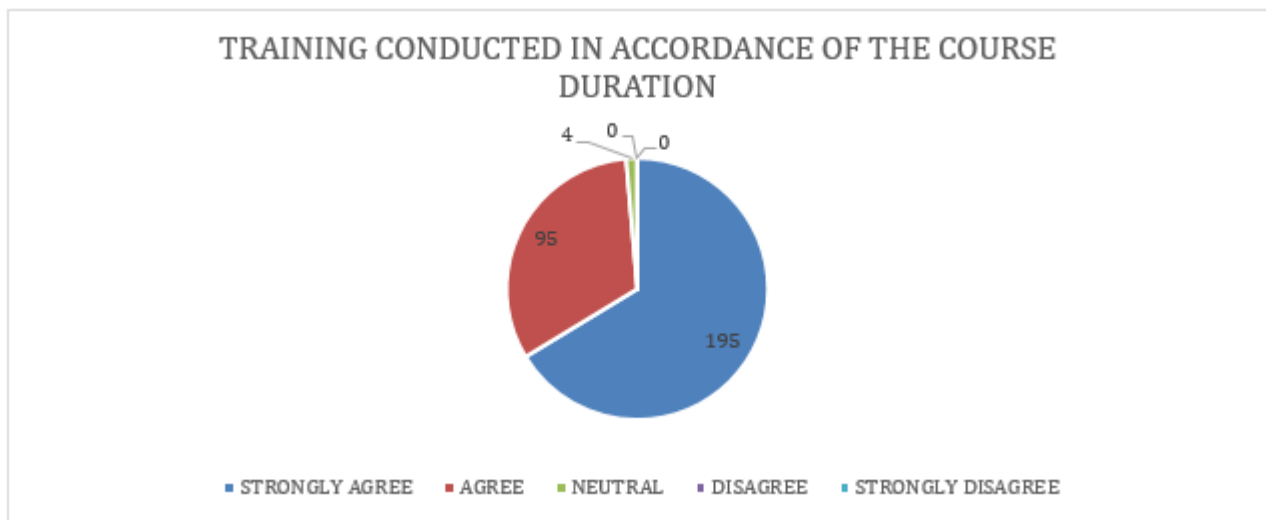
~ Trainee

*“The entire seamanship training was invigorating and a profound experience.”*

~ Company personnel

### 8.1 TRAINING CONDUCTED IN ACCORDANCE WITH THE COURSE DURATION

Majority of the trainees found the training schedule in apt with the course duration which allowed them to take their time to learn about the intricacies of safety related practices.



*“What a techniques and equipment have been evolved at TMI, Safety training through hazard simulations is going to be the obvious next step for seamanship & safety training. One can feel the real hazard at the same time it is an entertaining and enlightening safety training method*

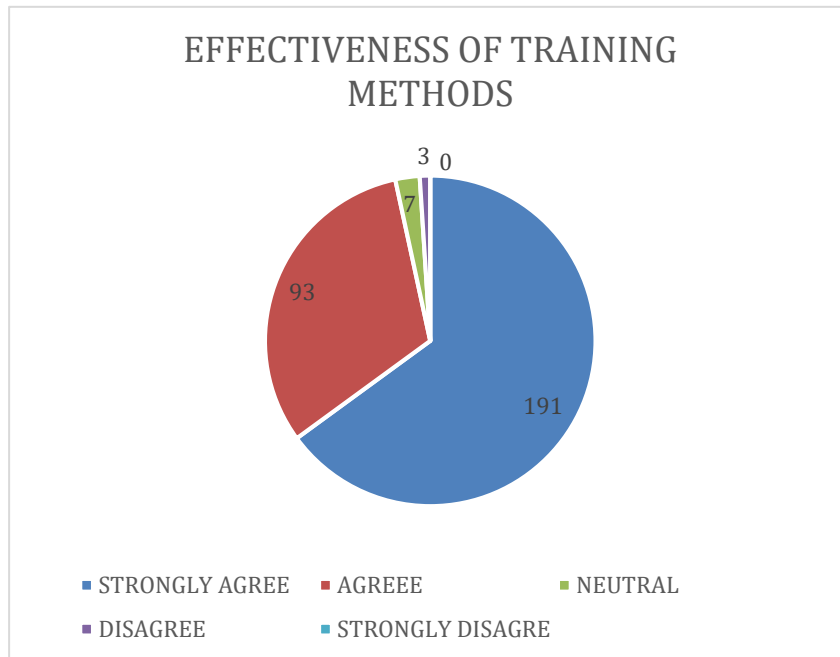
~ Trainee

### 8.2 CLARITY OF ANSWERS BY THE INSTRUCTOR

Each trainee was given adequate attention by the instructor leaving no scope of doubt in their minds related to the course. The instructors were able to tackle all the questions of the trainees clearing all their doubts regarding safety.

**8.3 ORGANIZED DISCUSSION**

The trainees were also made to be a part of an organized discussion where each and every one participated with great enthusiasm giving their points and views regarding the accidents and prevention of any kind of hazard on board.

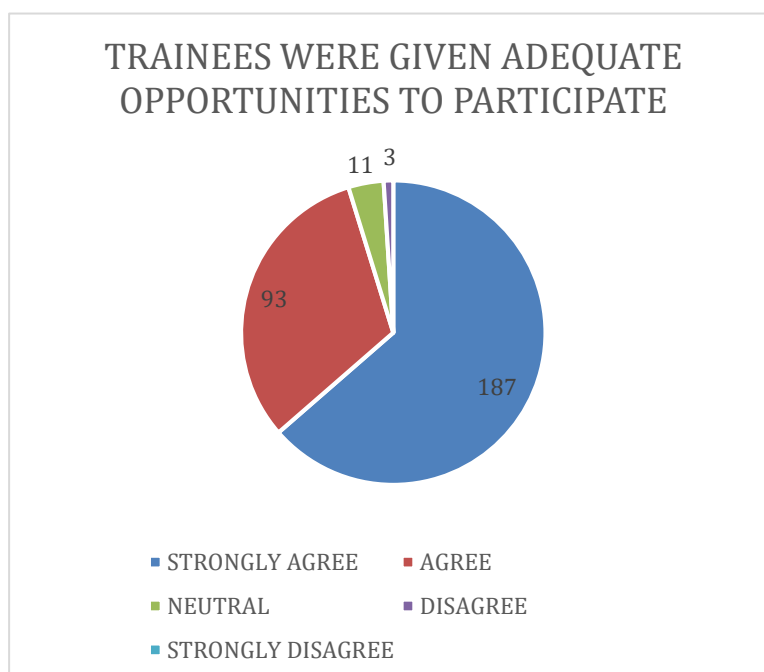


**8.4 EFFECTIVENESS OF TRAINING METHODS**

Almost all of the trainees agreed with the fact that the training methods in the Hazard simulation are effective and helpful on board a vessel helping them to tackle any kind of potential hazard with great care and confidence.

*“When a Safety module theory is backed by practical application of the knowledge, the ability to retain information is greatly enhanced, resulting in a more safety Consciousness Real hazard simulation introduces a new concept of teaching safety for boosting greater knowledge retention”*

~ (DRS)

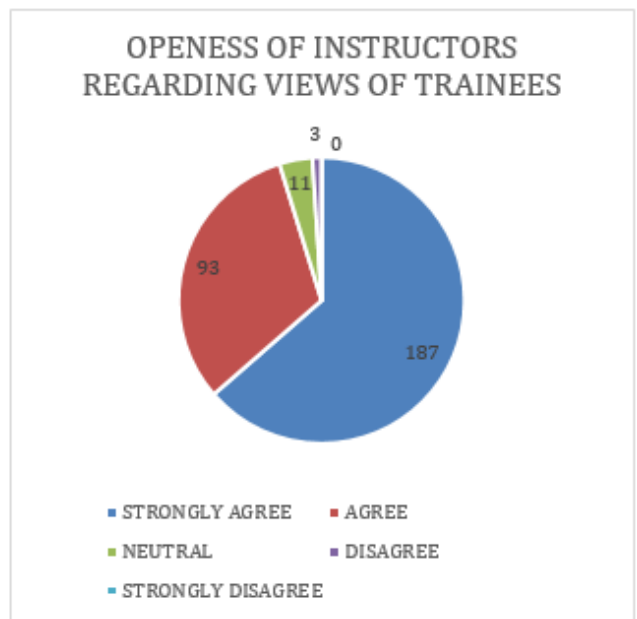
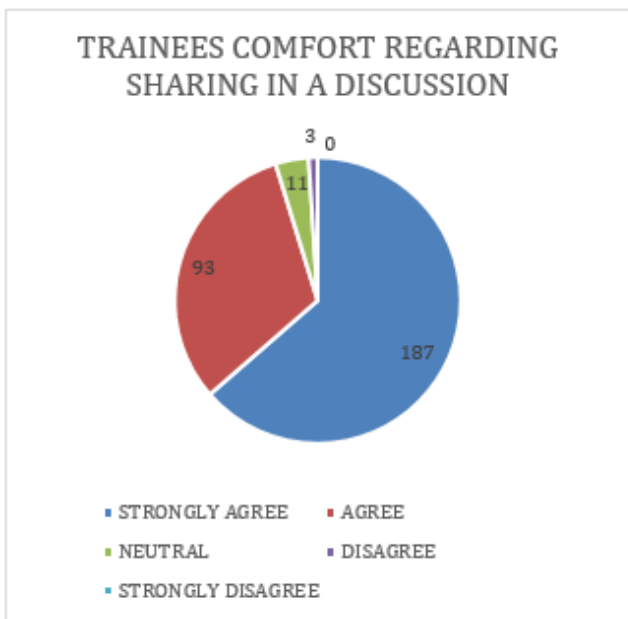
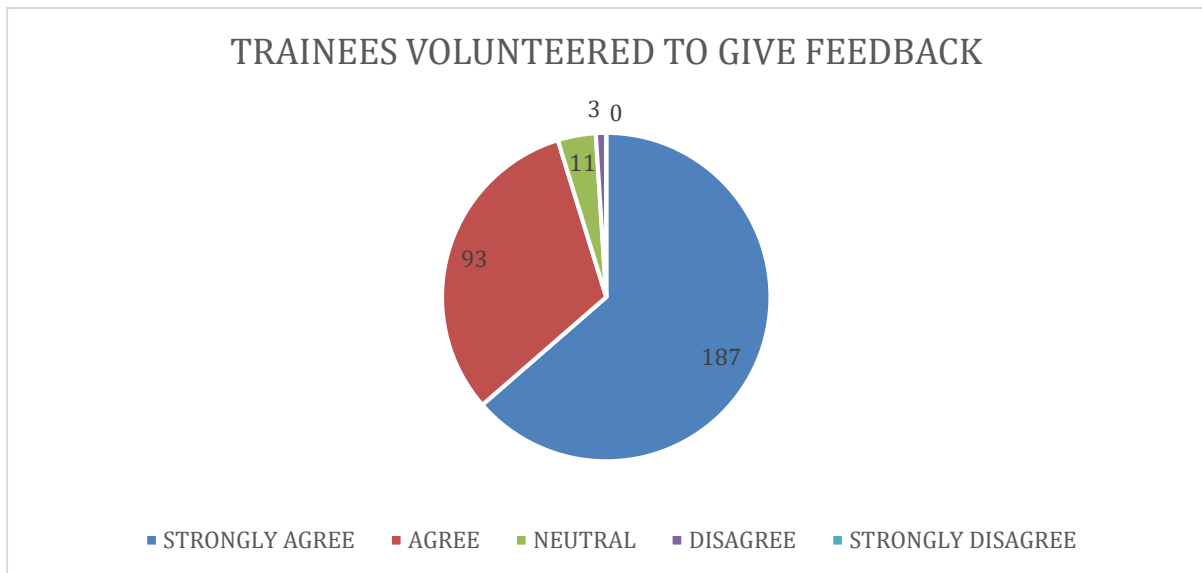


**8.5 TRAINEES WERE GIVEN ADEQUATE OPPORTUNITIES TO PARTICIPATE**

Each and every trainee was given adequate no of opportunities to participate in the training activities which helped them to inculcate safety related practices in them.

**8.6 OPENESS OF INSTRUCTORS REGARDING VIEWS OF TRAINEES**

The trainees felt comfortable in sharing their views regarding the training with the instructors. All of the suggestions were noted down and acted upon instantaneously.



**8.7 TRAINEES VOLUNTEERED TO GIVE FEEDBACK**

On the account of taking views and feedback from the trainees a very huge participation was observed. All of the feedback has been recorded and represented in this report.

**8.8 TRAINEES COMFORT REGARDING SHARING IN A DISCUSSION**

The trainees were comfortable in sharing their views during the discussion making it a success. The discussion helped the trainees in understanding the training module in a better sense.

### 8.9 SAFETY BRIEFING PRIOR TO THE TRAINING

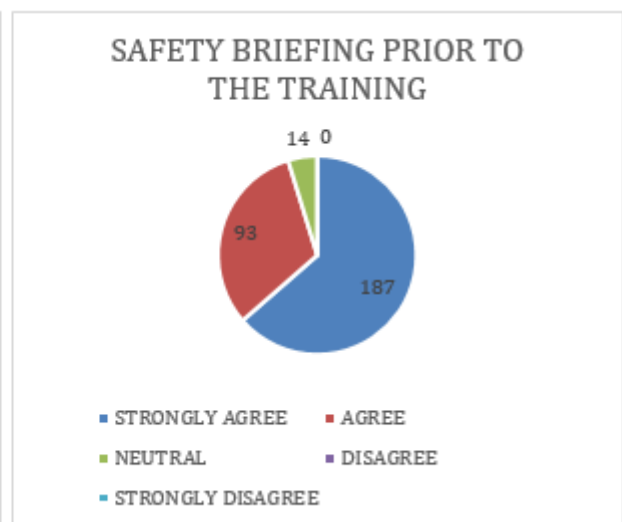
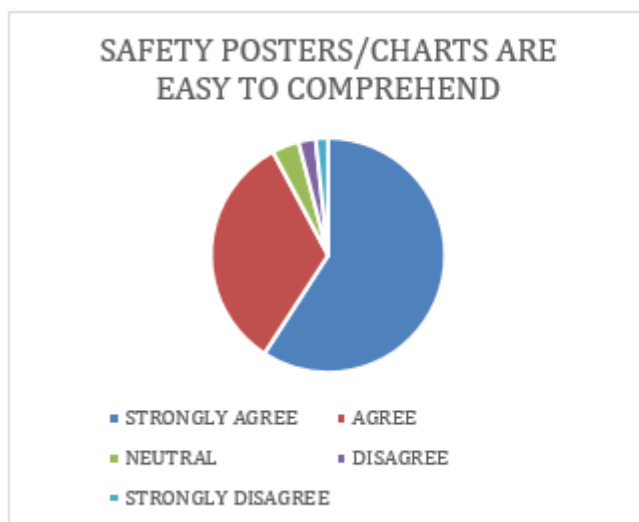
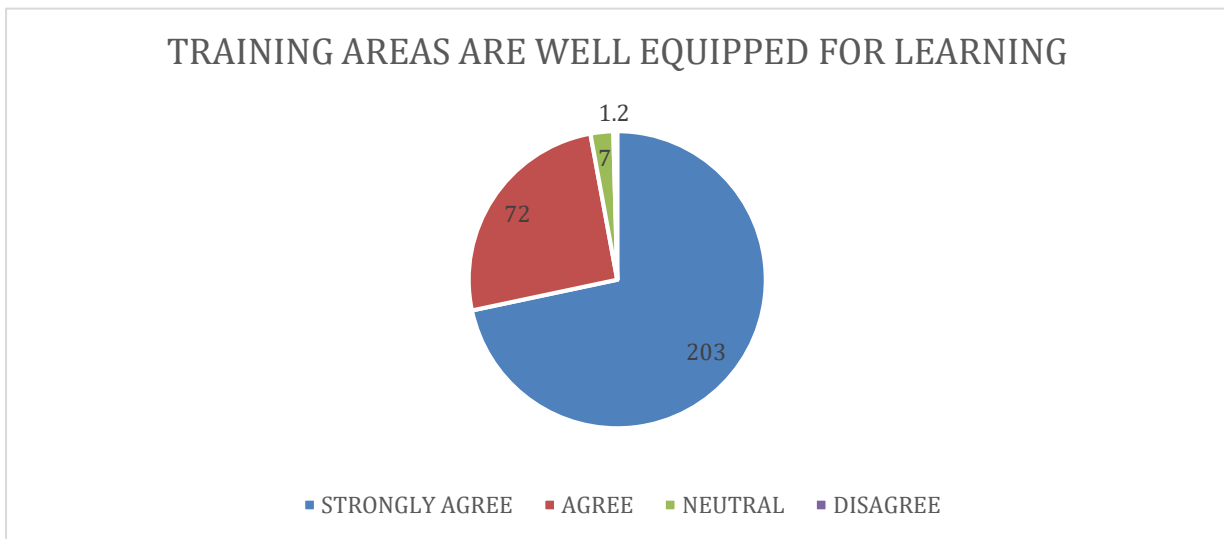
A proper briefing is conducted before the training which helps the trainees to understand the do's and dont's during the procedure. Majority of the trainees were benefited with the pre training briefing.

*Yes, during pre-course briefing the instructor explained the safety rules, overall, Hazard simulation training provided me necessary Knowledge and skills needed to do my work on board lot of emphasis was given on safety awareness and understanding of workplace hazards and how to identify, report, and control them.*

~Trainee

### 8.10 TRAINING AREAS ARE WELL EQUIPPED FOR LEARNING

The simulation is well equipped with all kind of learning aids which helps the trainees to inculcate a safety habit in them which in turn helps them to live an accident-free tenure throughout their sailing period.



*Yes, indeed the instructor was more effective than the traditional class room teaching to create realistic experience which was far more engaging that I thought of.*

~Trainee

### 8.11 SAFETY POSTERS/CHARTS ARE EASY TO COMPREHEND

The trainees were highly benefitted with the training aids that were used throughout the training period which also included interactive charts and posters.

## IX. DISCUSSION

Safety training through hazard simulation has a significantly positive relationship with personal compliance. The opinion of the participants indicated that this kind of safety training in maritime education institution would boost the safety awareness. Most of the participants who were experienced seafarers considered this kind of training to be made mandatory for all seafarers they felt the training was important that accidents could be prevented at work. Most of them also confirmed that they had been given sufficient training and exposure to safety issues, procedures and methods during the hazard simulation training. Hence, this indicates that the management of most of the shipping companies cater for crew safety. Company officers who most often send their crew for training emphasized that hazard simulation safety training will certainly inculcate a safe working culture among their crew on board.

Hazard simulation safety training contributes to the positive behavior of participants in preventing severe injuries. Frequent safety training forms a second habit of doing things right which creates a better occupational safety and health awareness among the new employee joining the ship and. They would be more aware of what needs to be done in an emergency. They would also know how to protect themselves from hazards and be familiar with the emergency evacuation procedure.

Lai, Liu and Ling (2010) in their research had revealed that employees found safety training as the most effective tool to minimize hazards since training helps to improve work skills as well as the ability to identify. A good safety knowledge and understanding the work at hand help minimize accidents. Workplace hazards are present in all industry including the shipping industry. It is crucial for management of maritime education institutions to provide more safety programs for their students in order to make them men of strong personal compliance towards safety. This practice would certainly help in achieving zero accident rates which will finally result in better organizational financial performance in the long run.

## X. CONCLUSION

Safety is a critical issue for the maritime industry. Literature argues that human error contributes to more than half of occupational incidents and could be directly impacted by effective training programs. Seafarers' safety and safety training continue to be the main issues in the Maritime industry. Inspired by NYK company safety initiatives, Tolani Maritime Institute with a focused aim to improve safety training, designed a one-day course called "Hazard Simulation & Situational Safety awareness course" which has received high appreciation from all stake holders.

This study has demonstrated the feasibility of Safety training through simulation of most common hazard occurring on board ships. The course was delivered by such an immersive environment. Participant perceived the training as impressive and attractive. The conception of setting up different safety modules to familiarize participants with the common shorts' cuts/ unsafe act and unsafe situations for raising their safety awareness/ safety consciousness.

The advancement in teaching methodology through hazard simulation techniques has provided an enormous convenience for educational purposes and leads to pedagogical innovation and creativity. Experiential learning enables participants to become critically safety minded. It is evident that an effective safety training through hazard simulations can improve participants' safety awareness and reduce the probability of injury, thereby contributing to a safer and more reliable working environment on board ships.

The hazard simulation & situational safety awareness course provides a reasonable level of fidelity along with well-developed instructional materials. While this type of training method appears to have a considerable capacity to develop safety knowledge, skills and attitude among the participants. The Course develops a sense for the perception and response towards hazards. The Course is cost effective, however, implementation on all modules to cover the entire curriculum seems a daunting task which demands high managerial will power. The underlying strategy employed in the hazard simulation course for hazard perception and avoidance training is very similar to the video-based activities / safety films. This suggests that video-based activities / safety films style strategies of video-based scenarios may be usefully applied for the module where hazard simulation is not possible.

Future simulation-based training and research needs to develop methods for measuring both the degree to which training translates into increased safety awareness and behavioral change to avoid short cuts to deter complacency.

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