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Shipboard training of marine engineers : promoting experiential learning through on-the-job training

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WORLD MARITIME UNIVERSITY
MALMO, SWEDEN

SHIPBOARD TRAINING OF MARINE ENGINEERS: PROMOTING EXPERIENTIAL LEARNING THROUGH ON-THE-JOB TRAINING

by

ZAINORIN BIN MOHAMAD
MALAYSIA

A dissertation submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of,

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I certify that all material in this dissertation which is not my work has been identified and that no material is included for which a degree has been previously conferred upon me.

The contents of this dissertation reflect my personal view and are not necessarily endorsed by the University.

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In the Name of Allah,
The Beneficent, The Merciful

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ABSTRACT

The availability of modern training equipment and methods like computer-based training and simulator training cannot replace the entire training onboard actual ships.

This study deals with the shipboard training of marine engineers, particularly, for their continuing training after they have completed the initial education and training in maritime colleges ashore.

The developments of maritime education and training in response to the ever-changing shipping industry is first discussed. The prevailing state and future trend of maritime education and training are also considered.

In addressing the lack of seafarers' competence, the elements essential for achieving competence are identified. The importance and advantages of promoting shipboard experiential learning through on-the-job training are highlighted.

Using the systematic approach, a structure of the on-the-job training programme is proposed with important considerations in developing, implementing and evaluating the programme pointed out. Models of experiential learning are used to highlight the need for reflection and other learning packages to support experiential learning. The study is concluded by drawing attention to the review of the STCW 1978 convention and giving recommendations for the on-the-job training of marine engineers in Malaysia.

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INTRODUCTION

1.1 BACKGROUND TO THE PROBLEM.

Continued decolonisation, industrialisation and developments of many countries during this century have generated a tremendous flow of trade worldwide. Shipping has grown increasingly competitive to remain as the major mode of transport facilitating world trade. New concepts of ship management, operation and designs have emerged. The spectrum of technologies employed onboard ships has correspondingly increased in sophistication attempting to achieve higher operational efficiencies. Nevertheless, the task to improve the safety of life at sea and the protection of the marine environment and property through the establishment of the International Maritime Organization (IMO), has become a major global concern.

Today, ships can be constructed by various ship-yards for a shipping company or individual owners. These ships will then be managed by the shipping company or a management company which will hire the crew, usually made up of different nationalities, to operate the ships. In spite of the capabilities of the shipbuilders and the credibility of the shipping or shipmanagement companies, it will ultimately be the competency of the ships' crew that would determine the level of safety and environmental protection achieved. Are today's seafarers, in particular the marine engineers, adequately educated, trained and competent to cope with the technological advances to operate modern ships efficiently and safely?

The only major IMO instrument presently addressing this issue is the 1978 Convention on the Standards of Training, Certification and Watchkeeping for Seafarers (STCW). This convention lays the minimum standards as required by the shipping industry during the 1970's. However, the developments and technological progress experienced since then has had direct implications on these minimum standards. Correspondingly, these standards have not been upgraded to ensure their congruence with the current needs of the industry. A radical rethinking of the education and training of marine engineers and other seafarers is required if the developments and new technologies are to maintain safety at sea while preserving the marine environment.

1.2 STATEMENT OF THE PROBLEM.

Since the establishment of maritime schools, colleges or academies, seafarers education and training has been increasingly shifted and concentrated ashore. Greater commercial inclinations and the growing demand for seafarers have made the traditionally slow process of educating and training seafarers onboard ships unsuitable and uneconomical. Most merchant ships, today, are purely 'places of work' for seafarers, except for cadets and trainees. Learning and the knowledge gained throughout their sea experience are mainly dependent on the individual's interests and efforts. Training vessels have been used by some maritime colleges to conduct the sea training, but they too, have been restricted to the training of cadets and trainees. Training vessels could, however, accommodate more training berths than commercially operated ships.

From the day the engineer cadets receive their diploma or degree award upon the completion of initial education and training, they are almost entirely left on their own to learn and face the challenges that await them as they progress through their career at sea. This lack of support and guidance to encourage learning from the sea experience gathered throughout their career, is the problem that this study attempts to address.

1.3 PURPOSE OF THE STUDY.

In March 1993, the Standards of Training and Watchkeeping(STW) sub-committee of IMO, at its 24th session, began to undertake a comprehensive review of the STCW 1978 convention[1]. This review could not have come at a more crucial time. In line with this review, it is the purpose of this study to highlight the importance and the benefits of shipboard training and its role in enhancing the continuing education and training of marine engineers.

However, shipboard training cannot be a substitute for the already established shore-based education and training of seafarers. Both are essential towards achieving a true 'total training concept'. This concept caters for the entire education and training required from entry to the highest seagoing qualification.

This study also possess the following objectives:

1. to establish the need to encourage learning throughout shipboard service periods;

2. to identify the teaching methods and aids that could be adopted for shipboard training;

3. to define the functions of senior engineers as trainers onboard ships;

4. to enable effective shipboard training programmes to be developed, implemented and monitored;

5. to provide maritime educators and trainers new insights into shipboard training; and

6. to show that on-the-job training (OJT) conducted onboard ships would help produce competent seafarers.

1.4 IMPORTANCE OF THE STUDY.

In many developing countries, including Malaysia, national maritime colleges or training centres had put great emphasis on the conduct of initial education and training and certificate of competency preparatory courses. Their concern was mainly to provide an adequate supply of qualified seafarers for their national fleets. This study will focus on providing marine engineers with the necessary continuous learning while serving onboard ships to ensure that they are not only qualified or certified but are actually competent to carry out their duties and responsibilities.

The costs of training ashore has been escalating too, due to the need for well-equipped modern laboratories, workshops and other facilities. This study looks at on-the-job training onboard ships playing a larger role towards achieving an economical and effective solution. OJT can be provided whilst the marine engineers are productively employed onboard to create a close relationship between the training and the operational tasks to be carried out.

Like other seafarers, marine engineers have to spend a number of years at sea acquiring the necessary sea service to fulfill certification requirements. This study is also concerned with making such a sea-going period a more attractive, relevant and satisfying experience.

1.5 METHODOLOGY OF THE STUDY.

The approach to this study was to undertake a literature review followed by gathering information and data from shipping companies. Observations and discussion notes made during field trips and visits to various maritime institutions were also a major source of information. In particular, the relevant seminars and lectures attended at the university were referred to.

Having gone through a shore-based education and training system of marine engineers, worked as a ship engineer and as a lecturer in a maritime academy, the writer had attempted to reflect on these experiences throughout the study. Finally, the information and data acquired were analyzed to formulate the recommendations.

1.6 SCOPE AND LIMITATIONS OF THE STUDY .

The study deals specifically with the shipboard training of marine engineers after they have completed their initial education and training. It covers the continuing training that is needed by marine engineers during their periods of sea service.

CHAPTER 2 examines how the shipping industry has evolved and its effect on the education and training of seafarers. The present shortcomings and future trends of maritime education and training are also discussed.

In **CHAPTER 3**, the elements involved in achieving competence are identified and the need for an effective OJT programme to promote shipboard experiential learning argued.

In **CHAPTER 4**, the approach and important aspects of developing OJT programmes are discussed. The process of implementing OJT onboard ships and its evaluation are also discussed. A proposed structure of the OJT programme for marine engineers is given.

CHAPTER 5 points out the importance of reflection in experiential learning and considers the use of debriefing and writing. The use of correspondence courses and computer-based learning packages to enhance experiential learning are also noted.

CHAPTER 6 conveys the conclusion of the study with recommendations on the use of OJT onboard ships for achieving agreed standards of seafarers competence .

Notes

1. A group of students from the World Maritime University which include the writer attended this session of the STW sub-committee as observers.

CHAPTER 2

THE DEVELOPMENTS OF MARITIME EDUCATION AND TRAINING

2.1 FROM SEA-BASED TO SHORE-BASED.

Vocational training began in the earliest civilization when parents gave job instruction to their children. Apprenticeship can be traced to ancient times. Today, various crafts are still being learned under the scheme of apprenticeship.

Being one of the oldest vocations, seafaring has been traditionally acquired by apprentices learning on-the-job under the guidance of a master over many years at sea. This lengthy process was necessary as:

> "Life at sea is so different from his natural mode of living that it has always took years of practical experience on board ships to master the practical arts and special skills which make a real seaman." (ILO, 1967)[1]

During the period when shipping was dominated by wooden sailing ships, young men began their seafaring career as a crew member or as an apprentice officer. With determination and training supervised by the ship's master he will " come-up through the hawse pipe" step by step to become a ship's officer and eventually a ship's captain.

At the end of the 18th century, the introduction of steam propulsion created a new breed of seafarers, the marine engineer. Like their predecessor in the deck department, they were also required to work their way-up step by step. Beginning as wipers, they worked alongside experienced engineers in the engineroom sharpening their aptitude, knowledge, skills and experience. Their achievements in each rating determined their subsequent promotion until they attained the rank of chief engineer.

The advent of screw propellers and iron ships around the mid 19th century provided greater impetus to the use of steam propulsion. Since then, remarkable progress in engine designs had been achieved. By the mid 20th century, ships propulsion had undergone a number of revolutionary innovations. Notably, among these innovations are the replacement of early steam reciprocating engines by high pressure steam turbines and the more recent substitution of the steam turbines by the fuel efficient diesel engines.

The last few decades also witnessed enormous increase in the sizes of ships, greater diversification in the types of ships and the developments of special purpose ships. The modern merchant ship has become a sophisticated transport unit which requires improvements of ship's design, construction, equipment, manning and operational procedures to maintain their safety and efficiency.

Consequently, the traditional way of training seafarers on-the-job onboard ships could no longer be relied on solely. As the time available for onboard training is reduced while the technology becomes more complex, formal education and training ashore was needed to augment the sea training. Today, the education and training of seafarers has been largely concentrated ashore so that "the acquisition of maritime skills has come to be regarded as primarily a shore-based process." (King, 1982)[2]

Most maritime countries have now establish their own maritime training institutions to educate and train their seafarers. Various types of programmes have been developed. However, entry into most of the officers programmes requires the completion of 10 to 12 years of general school education. Some of the major types and concepts adopted for such marine programmes will now be examined.

2.2 SANDWICHED VERSUS FRONT-ENDED PROGRAMMES.

When pioneer maritime nations like the United Kingdom and other European countries first established their seamen training schools ashore, it was mainly to provide short supplementary courses to compensate the decreasing emphasis given to training onboard ships. This arrangement later led to the introduction of study periods in between spells of working periods onboard ships. The courses offered during the study periods were also expanded to provide both theory and practical training which resulted in a further reduction of ship-board service. This type of education and training is referred to as a **sandwiched** type programme.

The entire programme from entry up to the highest qualification of a Master or Chief engineer may span over 8 to 10 years. The programme starts with a course to provide the education and training required for the role of a Junior Officer. It is usually administered fully by the training institutions and spreads over a period of 3 to 5 years. The succeeding stages include acquiring the necessary sea experience, attending upgrading courses and sitting for the appropriate examinations.

Sandwiched type programmes had been widely adopted and are still being offered in many developing countries such as Singapore, Philippines, Thailand, Pakistan, Bangladesh and India. A chart demonstrating the education and training programme for marine engineers in Singapore is shown in figure 2.1. Students that have completed 10 years of general education qualify for admission into the programme. When accepted, the students start with a 3.5-year course at the Singapore Polytechnic. Those who successfully complete the course receive a Diploma and a Class 5 Engineer certificate of competency. A series of sea services, upgrading courses and examinations follows to complete the programme with a Class 1 Engineer certificate of competency. Upon obtaining the Class 2 and Class 1 Engineer certificates of competency, they are qualified to hold the position of Second and Chief Engineers respectively.

As an alternative to the traditional unstructured training onboard, sandwiched type programmes possess the following merits:

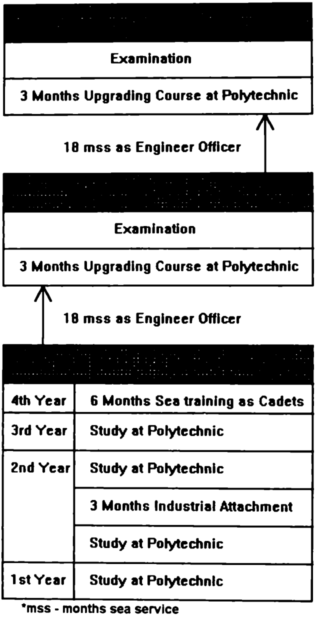

Figure 2.1 The Sandwiched Type Programme of Education and Training of Marine Engineers in Singapore.

Source: Sarma D S and Sidin J "Officer Training at Singapore Polytechnic", presented at the 2nd International Manning and Training Conference, October 1992.

1. the total time required to qualify for the highest position is reasonably shortened;

2. training institutions are able to provide more breadth and depth of knowledge to students;

3. they facilitate positive blending between the theoretical studies and practical training provided at the marine colleges and the practical experience gained onboard ships; and

4. students are more prepared to assimilate the knowledge related to higher qualifications that are being introduced later in the programme.

However, sandwiched programmes are linked to the following limitations:

1. it is more difficult to administer the entire programme comprising a number of separate basic and upgrading courses;

2. the disruption of studies caused by the sea practice affects students learning abilities resulting in some repetition or overlapping of subjects; and

3. the recognition of sea practice and upgrading courses for academic award purposes is complicated.

Despite their merits and limitations sandwiched type programmes demand high commitment and co-operation from shipowners to ensure that students are not delayed for subsequent courses. Ship officers are also expected to play an important role by transferring their knowledge and experience to cadets and junior engineers.

However, due to the need to meet the demands of increasing competition in shipping, it was necessary to overcome the weaknesses of and the difficulties faced with sandwiched type pro-grammes. The **front-ended** type programmes which would provide the entire scope of theoretical studies needed at the beginning of the programme were developed.

Students enrolled into these front-ended programmes will undergo a course of 3 to 5 years covering the complete studies required for their highest sea-going qualification. At the end of these programmes, students will normally receive an academic award and a certificate of competency. The higher levels of certificates are usually obtained by acquiring only the necessary period of sea experience for each level but in some cases an examination is also included.

Countries that offer front-ended type programmes include Japan, Australia, Portugal, Russia, Sweden, United States of America and Poland. The front-ended type programme for the education and training of marine engineers in Japan is illustrated by the chart in figure 2.2. The programme starts with a 4-year course which can be taken at a mercantile marine university. There are two such universities; one in Tokyo and the other in Kobe. Students who have completed 12 years general education are required to pass an entrance examination to gain admission into the universities.

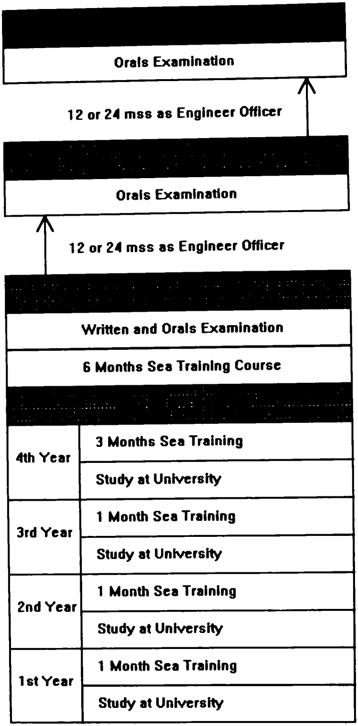

Figure 2.2 The Front-ended Type Programme of Education and Training of Marine Engineers in Japan.
Source: Lecture Notes, "MET in Japan" by K.Ishida, WMU.

The course includes 6 months of sea training which is taken in four parts. The graduates of the course are awarded a Bachelor's degree and are required to undertake an additional 6 months of sea training. They will then sit for the written and orals examination to qualify for the Third Grade Maritime Officer (Engineering) licence. In order to qualify for the First Grade licence, further periods of prescribed sea experience must be completed and the appropriate examinations taken.

Generally, the influence of front-ended type programmes is to increase the reliance on training ashore and to diminish further the attention given to shipboard training. They also have the following disadvantages:

1. the integration of theoretical college studies with practical sea experience is weakened; and

2. students may not be ready to assimilate the knowledge related to higher levels.

2.3 THE MONOVALENT AND POLYVALENT CONCEPTS.

The sandwiched and front-ended type programmes described earlier are based on a clear distinction between the functions of the deck and engine departments. Officers of both departments undergo totally separate education and training programmes to suit different roles onboard. The officers of such programmes are considered to be educated and trained under the **monovalent** officers concept.

During the 1960's the introduction of automation and bridge control in ship operations prompted the first attempt to review the relevance of separating the roles of deck and engine officers. During the same period, more shore employment opportunities were generated and the seafaring career became less attractive.

The world was then hit by a major oil crisis in 1973 forcing shipping companies to take cost cutting measures. In order to compete with the low labour costs available in developing countries, shipowners in developed countries had to resort to buying highly automated ships which could operate with reduced crew. A new education and training concept for the officers of these ships was required. The two deck and engine departments were merged into one and the dual-purpose or **polyvalent** officer concept emerged.

In 1967, France introduced their polyvalent officer programme. Since then, other countries have developed their own programmes for the dual-purpose officer. They include Germany, Netherlands, Japan and United Kingdom. A chart illustrating the programme of the French polyvalent First Class Masters is shown in figure 2.3. Only students who have completed 12 years of general education and the Baccalaureate C are eligible for this programme. They have to sit for a competitive examination before being accepted to begin a 5-year course at a national school for the merchant marine. Upon the completion of the course, students receive a Diploma of Higher Merchant Marine Studies which enable them to serve as a polyvalent officer. The necessary sea service as an officer is then required to qualify for the First Class Master certificate.

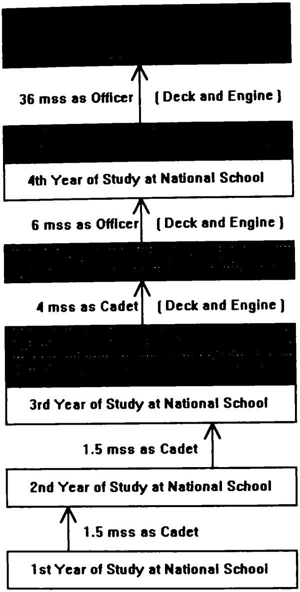

Figure 2.3 The Education and Training of Polyvalent Officers in France.

Source: Lecture Notes, "MET in France", G. Zade, WMU.

The advantages claimed by the polyvalent officers programme are:

1. it provides greater mobility to all ship officers in the maritime labour market ashore;

2. it instills higher confidence for the Master who could fully understand engineroom problems;

3. shipowners have the possibility of reducing crew costs by operating with less officers and keeping less officers on stand-by. Watchkeeping officers have the flexibility of assuming either roles on deck or in the engineroom;

4. officers with a wider understanding of the ship could give the higher level of cooperation between bridge and engineroom needed onboard modern ships.

2.4 THE EDUCATION AND TRAINING OF MARINE ENGINEERS IN MALAYSIA.

There are 3 institutions providing marine engineering education and training in Malaysia, namely, the Akademi Laut Malaysia (ALAM), the Politeknik Ungku Omar (PUO) and the Universiti Teknologi Malaysia (UTM). The courses offered are not only catering for the needs of the maritime industry but also for the growing shore industries.

Since 1972, PUO has been offering a 4-year course in marine engineering. The course includes a sea training period of one year and leads to a diploma award. UTM conducts a 3-year diploma and a 5-year degree course in marine technology. Although the courses offered at UTM are mainly aimed at supplying marine technologists and naval architects for shore-based maritime industry, some of the graduates have been employed as sea-going marine engineers.

As a monotechnic, ALAM has been conducting various courses for seafarers including certificate of competency upgrading courses for marine engineers. In June 1992, the marine engineer cadet course was introduced at ALAM to overcome the shortage of marine engineers for the country's maritime industry[3]. The cadet course forms part of the whole sandwiched type education and training programme of marine engineers. A chart showing the programme is provided in figure 2.4. Students who have completed 11 years of general education are eligible for enrollment. The course has a duration of 4 years and leads to a diploma award. Upon completion of the course graduates can also take the oral examination for the Class 4 Engineer certificate of competency. The graduates can then proceed to sea as Junior Engineers to acquire the necessary sea experience for higher certificates of competency. Upgrading courses and examinations both written and orals are required for each subsequent level of certificates[4].

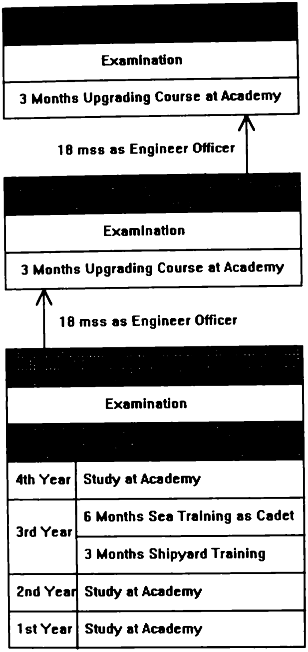

Figure 2.4 The Education and Training of Marine Engineers in Malaysia.

Source: Marine Engineering Section, Akademi Laut Malaysia.

2.5 THE STCW 1978 CONVENTION.

The increasing number of national fleets on a worldwide scale had an injurious impact on maritime safety. The occurrences of catastrophic accidents with loss of life and damage to property and the marine environment that followed, raised intense political and public pressures. Disasters such as that of the TORREY CANYON in 1967 and the AMOCO CADIZ in 1978 raised the need for stricter maritime safety standards to be adopted and regulated internationally. At the heart of maritime safety, the education and training of seafarers quickly gained international concern.

A number of conventions relating to maritime safety has already been adopted by IMO since its establishment in 1958. Concerned with the need to control standards for seafarers education and training, IMO in association with the International Labour Organisation (ILO) convened an International Conference on Training and Certification of Seafarers in 1978 where the STCW 1978 convention was adopted. The convention came into force from April 1984 providing for the first time, minimum standards for the training and certification of seafarers.

According to IMO[5], there are 96 signatories to the STCW 1978 convention as at January 1993. They represent more than 85% of the world's tonnage.

The main aim of the STCW 1978 Convention is to ensure that merchant ships will operate safely and efficiently with maximum protection of the environment against pollution. It is also directed at helping the less experienced maritime nations to develop their seafarers education, training and certification that will satisfy acceptable minimum standards.

The convention specifies mandatory minimum requirements relating to theoretical and practical knowledge, understanding and experience contributing to seafarers' competence. In particular, Regulations III/2, III/3 and III/4 of the convention deals with the certification of marine engineer officers.

It can be claimed that most countries are now able to satisfy the mandatory requirements and that many have far exceeded them. In fact many countries have modified and improved their education and training programmes to such an extent that the standards of the convention are no longer acceptable.

Appreciating the tremendous developments that have been experienced by the shipping industry, IMO had initiated efforts to review the STCW 1978 convention. In March 1993, the STW sub-committee started work on the comprehensive review of the convention. The convention revision is expected to be completed by 1995 with adoption following in 1996.

2.6 THE CURRENT STATE OF MARITIME EDUCATION AND TRAINING.

There are currently many approaches to seafarers education and training. The education and training programmes which have been examined are only few of the options available. Some programmes, like the French polyvalent officer programme, employs a combination of the sandwiched and front-ended concepts. They can also vary widely from country to country. Even in the same country, there could be a number of differing alternatives. Coupled with differences in infrastructures, management, administration and teaching resources, MET is at present exposed to very diverse possibilities. The effects of this situation are disturbing inconsistencies in standards of seafarers education and training.

The STCW 1978 convention has become outdated as a result of changes in ship operation and management that have taken place since its adoption. Therefore, programmes which are only designed to meet the minimum requirements of the convention would not be able to produce manning suitable for the present needs of the industry. The convention has put greater emphasis on the education and training ashore but not on the training that should be done onboard ships.

A worldwide study which was carried out by the Institute for Employment Research, University of Warwick in 1990[6] concluded that:

- There is a shortage of about 50,000 officers in 1990.
- The number of ships is assumed to increase by 33% over the next 10 years resulting in an increase in demand of some 90,000 officers.
- Taking into account the assumed losses of seafarers due to wastage of 10% per annum, about 350,000 officers will be needed over the next 10 years.

- The requirement of around 35,000 new officers per annum is three times the estimated output from current level of training activity.

MET is also being confronted by an increasing reluctance of young people to choose a seafaring career. This is true not only in developed countries but also in some developing countries like Singapore and Hong Kong. Seafaring in such countries has lost its attractiveness and is presently viewed more as a job rather than a career. It is usually considered as a medium term job which may last for a period of between 5 to 12 years (Anselmo, 1989)[7]. It is also possible nowadays for a person to command a comparatively good salary ashore, unlike those days when the sea career drew a much better salary.

An analysis of major casualties suggests that human error is by far the largest single cause of disasters. According to a recent report published by the UK Protection and Imdemnity Club covering their experience in the period 1987-1991, 60% of all claims by number are due to some form of human error,[8] the classic being lack of knowledge and/or lack of experience. This fearsome situation has incited the urgent need to upgrade the present level of seafarers education and training.

2.7 THE FUTURE TRENDS OF MARITIME EDUCATION AND TRAINING.

The technological developments together with the social, economical, and environmental pressures experienced by the shipping industry have and will continue to influence the way in which countries manage and implement their MET. Generally, the trend is to place seafarers education and training under the mainstream of education to gain accreditation for a degree award. It is also a common trait to provide a broader base of education and training instead of limiting to a seafarer's job. The polyvalent officers concept will be increasingly adopted particularly in countries where labour costs are rising and shortage of seafarers is experienced. Already there are moves by developing countries, such as Singapore, to integrate the lower stages of the education and training programme.

The areas for improvement that will be adopted in 1996 as a result of STCW 1978 convention review will certainly influence the direction of future education and training of seafarers. The review has indicated that the use of modern training methods such as simulator training and computer aided instruction will be fully expedited. In fact, the use of marine simulators are being considered for replacing part of the required sea experience and also as a tool for assessing seafarers competency. Inconsistencies in the range of a seafarers seagoing experience has prompted the need for a more accurate assessment of seafarers competency. The functional or skills-based or competency-based approach to education and training recommended by Australia and United Kingdom will have a considerable impact on the shape of future MET. The need for higher quality seafarers will require maritime training institutions to be closely monitored to ensure that programmes offered exceed the minimum requirements of the convention and correspond to some form of quality assurance.

Short (1993)[9] in his vision of MET into the 21st century asserts that the following developments can also be expected:

1. distance learning by seafarers onboard ships using satellite and interactive telecommunications technology and distance learning methodologies;

2. more effective shore-based learning for all students of maritime matters making greater use of the realism of computerised simulation; and

3. a global network of maritime educational institutions whereby a large number of primary training centres are linked with high budget key centres for advanced work and research and development.

Despite of all the developments that has taken place and the future improvements that are expected in MET, the original idea of learning on-the-job could not be discarded. This is reflected through the realisation of the importance of the required sea experience. The sea experience has and will remain as an indispensable component of seafarers competence.

Therefore the efforts being taken by IMO in its review of the STCW 1978 convention should also be directed towards improving the sea experience component. Particularly, for Malaysia and other developing countries where a moderate level of automation and crew size is appreciated onboard ships, ample opportunities still exists onboard for the enhancement of seafarers competence.

Notes and References

1. ILO, Report on Seafarers Vocational Training, 1967.
2. King, J "The Design of Computer-aided Maritime Training Packages", Conference on Training and Distance Learning Onboard Ships, March 1982.
3. See ALAM's News No.3 :1992.
4. Merchant Shipping Ordinance 1952, Merchant Shipping Examination for Certificate of Competency (Marine Engineer Officer) Rules 1992.
5. IMO, "Status of IMO Convention on 1 January 1993", IMO News, No.1:1993.
6. The study was on The Worldwide Demand for and Supply of Seafarers and was funded by BIMCO and ISF.
7. Anselmo, J (1989) An Extended Maritime Education and Training Concept as a Necessary Response to Changes in the Shipping Industry and Social Environment, (Unpublished M.Sc.thesis, World Maritime University).
8. See article "Standards for the New Millennium", Lloyds Ship Manager, January 1992.
9. Short, R F "Maritime Education and Training into the 21st Century", Focus, Australian Maritime College, No.10:1993.

CHAPTER 3

ACHIEVING COMPETENCE

Early seafarers acquired their competence by learning on-the-job. They had to demonstrate the appropriate level of competence to get a promotion. During the last century, national regulations were introduced to certify the competence of seafarers. Certification required the completion of minimum periods of sea experience and the passing of written and orals examinations. The sea experience was expected to provide the necessary on-the-job training. An increase in the number of maritime colleges soon followed as the acquisition of competence became more dependent on shore-based training.

The STCW 1978 convention did not go much further than expanding the certification requirements that already existed, except that they had been made globally 'acceptable'. Underwood (1992)[1] argues that the methods of certifying the competence of seafarers as required by the convention has been based on the premise "that competence is **inferred** from what the candidates **appears** to know".

As the shipping industry continued to develop, the competence of seafarers were increasingly queried. In order to ensure that seafarers competence are compatible with the current demands of a highly sophisticated and competitive industry, the process of reviewing the STCW 1978 convention was started. New strategies of education, training and examination to certify seafarers competence have been proposed and are being discussed. It is therefore important to understand the meaning of "competence" and identify the elements involve in achieving it.

3.1 THE COMPETENCY TETRAHEDRON.

"Competence" is defined in Webster's[2] as,

> "the quality or state of being functionally adequate or of having sufficient knowledge, judgement, skill, or strength (as for a particular duty or in a particular respect)".

Short (1985)[3] identified four concepts to clarify the meaning of "competence":

1. "competence as behavior or performance";
2. "competence as command of knowledge or skills";
3. "competence as degree or level of capability deemed sufficient"; and
4. "competence conceived as a quality of a person or as a state of being".

The above definition and concepts indicate that competence can be quite a complex quality to assess. However, if correct mechanisms for achieving competence can be provided, appropriate assessment methods would be revealed or exposed.

A tetrahedron, a solid figure with four triangular faces has been chosen to describe the elements essential for achieving competence. Figure 3.1 shows the intact tetrahedron and its exploded view.

The essential elements are represented by the four faces of the tetrahedron. They are education, training, experience and learning. There is no intention to differentiate education and training as they are closely interrelated. The following is only intended to identify the roles that each can play:

> " training can expedite the acquisition of specific job-related knowledge, skills and attitudes. Education ..... can equip individuals with the intellectual perspectives and the tools of analysis ..... experience can integrate and act as the vital catalyst and 'test bed' for the skills, techniques, ideas, etc acquired in formal training and educational settings. " (Buckley and Caple, 1990)[4]

Since learning is the process whereby individuals acquire knowledge, skills and attitudes through experience, reflection, study or instruction, it is therefore the key element which will transform education, training and experience into competence. In other words, to achieve competence, learning must result from all the other three elements of education, training and experience.

The tetrahedron illustrates that learning plays an important role in education, training and experience. The learning face forms the base of the tetrahedron that keeps the other three faces bound together.

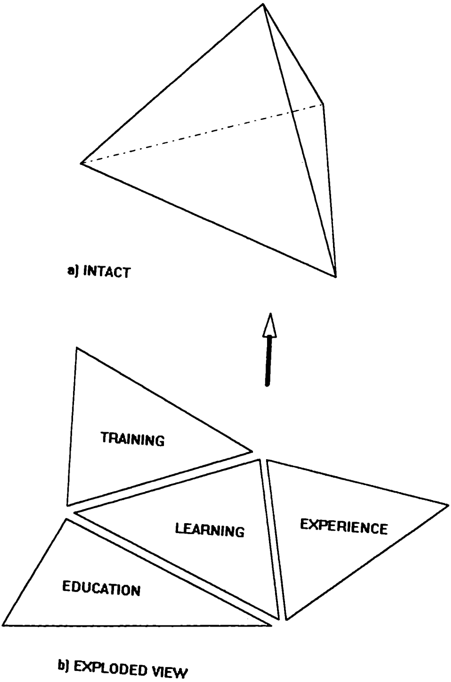

Figure 3.1 The Competency Tetrahedron.

3.2 THE ELUSIVE EXPERIENTIAL LEARNING.

A superficial examination of current MET programmes, seems to indicate they possess all the four essential elements of the competency tetrahedron. However, a more searching study reveals that learning as a result of direct experience commonly referred to as **experiential learning** is often lacking onboard ships. The contribution of the sea experience to learning has not been readily appreciated. Although education and training ashore can be immediately linked to learning, the attitude towards shipboard experiential learning leaves much to be desired. It is common for a cadet to undergo some form of shipboard training but beyond this stage, learning at sea has received little attention.

One of the main reason for this deficiency is related to the STCW 1978 convention itself. The acceptance of knowledge-oriented examinations conducted ashore for certification purposes (Holder, 1991)[5] decreased the incentive to learn during the sea experience. Also, use of the term "sea-going service" which is only specified by the period required, does not reflect the need for any associated learning. It may also be attributed to "the methods of employment in shipping" which do not encourage learning "unless the company develops a sensible approach to learning"(Parker, 1992)[6].

Today, seafarers competence is more demanding. Shipboard experiential learning cannot continue to be neglected. It has to be given its proper place in seafarers education and training; as an integral component of equal importance to achieve competence.

3.3 COMPETENCY-BASED TRAINING.

As mentioned earlier the STCW 1978 convention is being reviewed. At the STW sub-committee 24th session, it was agreed that one of the principles underlying the revised convention is that it should provide for a functional approach to training. This approach (which is similar to skills-based and competency-based training) should ensure that the required standards of competence can be attained. It has been recommended by United Kingdom and Australia based on their experience in restructuring their vocational education and training. The ISF has also given a strong support to this approach of training.

Australia has restructured their vocational education and training by introducing the competency-based approach to training. Their working party on the implementation of competency-based training[7] describes competency-based training as:

> "training that places primary emphasis on what a person can actually do as a result of training (the outcome), and as such represents a significant shift away from an emphasis on the process involved in the training (the inputs)."

Australia has since then adopted the skills-based approach for educating and training their seafarers. In their recommendation to IMO[8], they have outlined the following steps to achieve skills-based training:

1. Identification of essential core skills and additional specialist skills and the necessary

standard essential for safe and efficient ship operation;

2. Linking or grouping of the identified skills to allow for the development of learning and training activities designed to achieve the skills standards;

3. Establishing an agreed assessment scheme including procedures to assess theoretical, practical and on-the-job elements; and

4. Completion of a suitable programme which should be dependent on the achievement of competencies leading to certification.

In United Kingdom, the education and training of seafarers will also move towards competency-based. The functional approach which they have recommended involves the setting of appropriate standards and grouping them into units of broad functional areas. The units are then grouped again to give levels of competence which allow an individual to perform certain task functions. It also requires the assessment of competencies which are needed to meet the standards.

The competency-based training and the functional approach may be suitable for certification purposes but their application to the entire education and training programme should be carefully considered. Their usage may contradict with the need to provide a broad base education and training. Competency-based training can however be suitable for the work-based or on-the-job training(OJT) and assessment.

3.4 SIMULATOR-BASED TRAINING.

Another area being discussed in the STCW review is the use of simulator-based training. The value of simulators as a training and assessment tool has been increasingly appreciated. The review is expected to give its usage favourable considerations. It is likely that part of the sea-service required for certificates of competency will be waived in-lieu of simulator training. This has already been the practice in countries like France, USA and Norway. With the use of simulators, the sea service required in the future may be shortened further.

The advent of computer technology has boosted the development of marine simulators. Today, there are numerous categories and levels of simulators available for the training of seafarers. For the training of marine engineers, they can range from a simple computer-based simulator to a full-mission simulator which combines real control room instrument consoles with mimic panels interface and sound effects to increase realism.

The biggest advantage of simulator-based training is that it is possible to simulate a variety of abnormal or emergency situations without putting lives or equipment at risk. It is therefore very useful in training seafarers to deal with such circumstances. Modern engine room simulators are also capable of providing marine engineers training in monitoring skills and operational procedures. Simulator-based training certainly has the potential of forming part of competency-based training and improving training standards. But no matter how high is the realism achieved in modern simulators, the training provided is still not in the actual sea environment and the question of transfer of training still needs to be addressed. Considering also the high costs of simulator-based training, the requirements for its usage should be carefully weighed.

There is little doubt that the inclusion of simulators and competency-based training into the revised convention will contribute to the enhancement of shore-based education and training of seafarers as well as for the assessment of competence. But despite their value, they cannot disregard the need to learn onboard during the entire required period of sea experience in order to achieve competence.

3.5 SEA SERVICE AS ON-THE-JOB TRAINING.

The establishment of shore-based education and training for seafarers was initiated by the need for an alternative to the unaffordable long process of training onboard. The courses developed by maritime colleges have replaced a major portion of the training leaving a much shorter sea service requirement. This sea service or experience has been recognized and will remain as an indispensable element of achieving competence. Therefore this remaining period of sea service must be fully utilized for the meaningful learning and development of the seafarer. Promoting shipboard experiential learning by programming the required sea service not just as an experience but as OJT can achieve this end.

According to the Dictionary of Instructional Technology[9], OJT is:

" The supervision and other supportive instruction that is given to a trainee or beginner in a particular job or position within the actual factory, plant etc. at which he/she works "

OJT allows trainees to "learn new skills and behaviours through observation and guided practice while working 'on-the-job' "(Craig, 1987)[10]. It can forge a close link between training and the work actually to be performed. The biggest advantage of OJT is its potential of maximizing learning as it uses "the direct experience of 'Doing the real thing' "(Sheal, 1989)[11]. The modified Edgar Dale's well-known Cone of Experience shown in Figure 3.2 illustrates the relationship between learning, the type of activity and the level of participant involvement. Some other advantages of OJT includes:

1. Exact procedures and techniques are taught and correct work habits are built through performance during training;

2. The desire of trainee to learn is greater as the need for training is more readily seen;

3. Training at the work place provides an opportunity to give the best kind of safety training. Safe practices and methods are taught and safety habits are formed as part of the job;

4. No transferability of training is required as it is done in the real work situation; and

5. There is no 'off-the-job' cost involved.

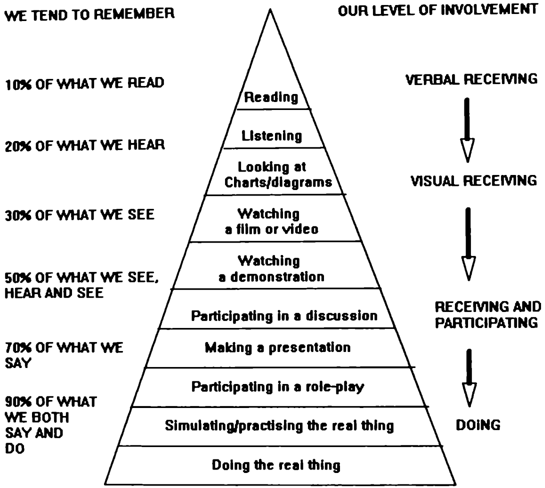

FIGURE 3.2 The Modified Edgar Dale's Cone of Experience showing the links between Activity, Involvement and Learning.

Source: Sheal, P R (1989) <u>How to Develop and Present Staff Training Courses</u>, London: Kogan Page, pp.25.

OJT also has its own possible disadvantages and limitations. They include:

1. Time taken for training may interfere with operations;

2. There may be high wastage of materials and damage to tools and equipment by trainees;

3. Supervisors or part-time instructors may lack skill in training; and

4. Noise and other activities present in the work place sometimes make a bad teaching environment.

The amount of learning resources already available onboard ship are bountiful. They include the ship machineries and equipment, spares and tools, operation and maintenance manuals/reports, experience of senior officers, television and video recorders, usually a library and nowadays computers too. Furthermore, King(1982)[12] stresses that:

> "There are very few operational activities performed at sea that do not have some training content, even though this is not always directly and explicitly recognised. For example when someone consults an equipment manual in order to find out how to repair a fault, he is going through a learning process in order to achieve an operational end."

OJT moves away from the trap of 'Training for Activity' and subscribes fully to 'Training for Impact'. In 'Training for Activity', the end result is often thought of in terms of increased skills or knowledge; in 'Training for Impact', the business results that will occur because of increased skills or knowledge are identified (Robinson and Robinson, 1989)[13]. The concept of Training for Impact can be summarized by this formula:

LEARNING X WORK ENVIRONMENT = IMPROVED WORK PERFORMANCE

Finally, it would be feasible to undertake the most reliable method of determining seafarers' competency by assessing their performance on-the-job with an effective OJT.

Notes and References

1. Underwood, T D "Training for Competency Afloat and Ashore - Time for Reappraisal", Safety at Sea and Marine Electronics Exhibition and Conference, 1992.
2. Webster's Third International Dictionary (1981), Chicago: Encyclopedia Brittanica Inc.
3. Parry, A K "Competency-based Vocational Education for Seafarers" IMLA 5th International Conference on Maritime Education and Training, Sydney, Nova Scotia, Canada, September 1988.
4. Buckley, R and Caple, J (1990) The Theory and Practice of Training, London: Kogan Page, pp.13-16.
5. See Australia's Vocational Education, Employment and Training Advisory Committee draft guidelines on Assessment of Performance under a Competency-based System and the Administration of Competency-based Training, 1992.
6. See IMO STW sub-committee 24th session document submitted by Australia, "Incorporation of Modern Training and Certification Arrangements in the STCW Convention", STW 24/18, 3December 1992.

7. Holder, L A (1991) Training Onboard, London: Videotel Marine International.

8. Parker, C J "Should the STCW Convention be Scrapped?", Seaways, November 1992.

9. Dictionary of Instructional Technology compiled by Henry Ellington and Duncan Harris, 1986.

10. Craig, R L (1987) Training and Development Handbook, 3rd ed., New York: McGraw Hill.

11. Sheal, P R (1989) How to Develop and Present Staff Training Courses, London: Kogan Page.

12. King, J "The Design of Computer-aided Maritime Training Packages",Conference on Training and Distance Learning, March 1982.

13. Robinson, D G and Robinson, J C (1989) Training for Impact, San Francisco: Jossey Bass.

CHAPTER 4

PLANNED ON-THE-JOB TRAINING OF MARINE ENGINEERS

OJT has to be well-structured and planned to be effective. Planned OJT is a systematic, organized form of training designed to meet the requirements of a definite objective, as opposed to incidental, haphazard training or training given for its own sake. It is not merely "sitting next to Nellie" but takes place in a personal supervisor or instructor-learner situation.The vehicle of instruction is the task to be performed together with the tools and equipment necessary for the performance of the task. However, it should be done in such a manner that the ship operations will not be interrupted.

4.1 DEVELOPING THE OJT PROGRAMME.

4.1.1 A SYSTEMATIC APPROACH.

Therefore, a systematic approach should be adopted for developing the OJT programme. A model of the systematic approach to training suggested by Buckley and Caple (1990)[1] is shown in figure 4.1. However, it should only be used as a working tool to draw-up a more suitable model for this particular situation or need. The

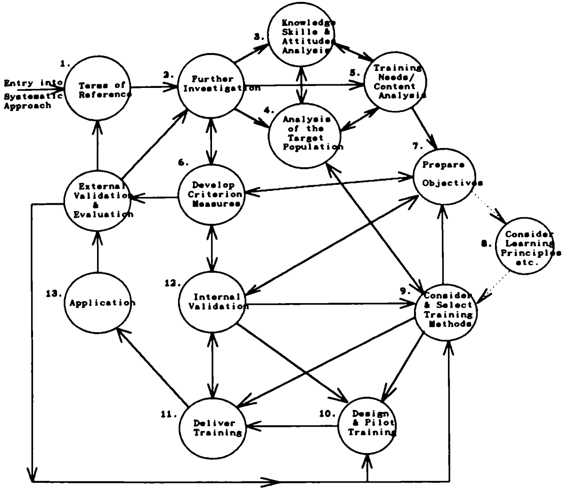

Figure 4.1 A Systematic Approach To Training

Source: Buckley, R and Caple, J (1990) The Theory and Practice of Training, London: Kogan Page, P.27

model comprise 14 stages which provide a practical guide for developing an effective OJT programme and describe the process to be followed.

Stage 1: Determine Terms of Reference

It is important that the terms of reference are determined before any work to develop the training starts. What has to be done must be specified and agreed indicating a commitment to the work. This requires the time, cost, manpower resources, physical constraints etc. to be clarified at the outset so that expectations can be seen in a realistic perspective. A reporting system and an action plan can be drawn at this stage.

Stage 2: Further Investigation

Early investigations on training needs may not have generated sufficient information to proceed to subsequent stages. A further study of the training requirements may be carried out using a number of analyses.

Job analysis is a process of examining a job in detail in order to identify its component tasks. It involves collecting information about the jobs or positions being examined followed by a detailed analysis of the information. A variety of sources and methods may be used to collect the information. They include observation, interviews, questionnaires, group discussions, examination of documents and materials used on-the -job. The information is then analysed to identify the main objectives of the job, the conditions under which it is performed, responsibilities, main and sub-tasks, difficulties involved etc. The information gathered during this analysis is used to draw up a job description. In addition to the job analysis, a close examination of data provided by reviews or previous training programmes may also be carried out.

Stage 3: Knowledge, Skills and Attitudes Analysis

The job description can then be extended further into a job specification using the information from the job analysis. The knowledge, skills and attitudes associated with each task that makes up the job is analysed. This analysis is essential to determine the nature and type of training that may be required. Other forms of analysis such as task analysis, fault analysis and skills analysis which reveal more details or identify critical features of the job may be undertaken at this stage. The extent and scope of the analysis will depend upon the job being examined and how much further information is required to determine the extent of the training requirement.

Stage 4: Analysis of Target Population

In conjunction to the analyses of the job there is a need to assess the capabilities and determine other features of those whom the training is to be designed for. this might include an examination of the other training and development programmes undertaken by them and the effectiveness of such programmes. At this stage, some preliminary thoughts to strategies which might be appropriate to match the characteristics of the target population may be considered. The characteristics would include age, experience, previous training and attainment.

Stage 5: Training Needs and Content Analysis

The various forms of analysis undertaken would provide a substantial amount of data about jobs and tasks and the people who perform them. This should reveal an actual or potential gap which could be the basis for identifying the training need and the training content. In most cases it will not be possible to everything and often it is not desirable to do so. There needs to be an identification of the 'need to know' and the 'nice to know' aspects of the job. This, in turn, would have to be balanced against the constraints which were identified earlier while establishing the terms of reference. This stage is important in ensuring that the best possible training content is determined.

Stage 6: Develop Criterion Measures

The content of a job is of no real value by itself. The standard or level of performance expected of a competent job holder has to be clarified to ensure that training can be designed to achieve that level.

These criteria are likely to be considered during the early stages of the investigation and the data should be incorporated in the objectives before any training strategies can be considered. Contributions by the job holder, supervisors or immediate managers give the most reliable data to establish the performance criteria for the job.

Stage 7: Preparing Training Objectives

Training objectives describe exactly what trainees are expected to be able to do as a result of their learning experience. They must be written clearly and are usually presented in three parts. The first part states the performance which is expected to show that the skills and knowledge which make up the content of the job have been acquired. The second part describes the conditions in which the performance is carried out and includes details of equipment, job aids, environment etc. The third part lays down the standards or performance which are expected to be achieved by the end of the training.

Written objectives should be derived from the analyses of knowledge, skills and attitudes and from the criterion measures which have been established. They are the key to the design of good training and are essential to assessing its effectiveness.

Stage 8: Consider Principles of Learning and Motivation

A suitable environment should be created to ensure that the training objectives can be achieved. The methodology, physical arrangements, time of day, resources etc. forms part of the training environment. However, consideration must also be given to the principles of learning and motivation such as knowledge of results, reinforcement, rehearsal, practice etc. that may need to be embedded in the training environment.

Recognition and the application of these principles form a rational link between writing objectives and the consideration and selection of training methods. The different ways in which people learn also need to be considered to identify their learning styles. The training environment often can be modified and adjusted to take account of such styles.

Stage 9: Consider and Select Training Methods

There can be various options when it comes to selecting the most appropriate form of training. Some direction on methodology may have been obtained from previous stages. However, it is important to keep an open mind and not to be biased towards one particular method from the outset. Close attention must be given to constraints, target population, objectives and sometimes 'political' implications when deciding on the options.

Stage 10: Design and Pilot Training

The design of training involves the translation of objectives and strategies into a balanced programme of instruction and learning. This does not necessarily mean a course; it could be a learning package, a video, computer based training etc., or it may be a combination of different methods and strategies.

Consideration has to be given to the nature of the content, the principles of learning and learning styles. Piloting training should be carried out whenever possible and every aspect of the training programme including administration should be planned and executed.

Stage 11: Deliver the Training

In order to achieve success, training programmes have to delivered properly. Having technically competent supervisors or instructors to present the training can be useful. However, the skills required to present the training must not be overlooked.Technical competence is not sufficient in itself. Instructors themselves must be trained to use a range of teaching techniques, particularly, those involved in one-to-one training. A common misbelief has been that by simply observing an expert doing the job, learning will occur by some form of psychological osmosis.

The use of various forms of open learning which might include computer-based training, video and learning packages also need the support of a trained instructor or supervisor. It is not sufficient merely to supply the trainees with material resources and leave them to manage their own learning.

Stage 12: Internal Validation

Internal validation is the process of measuring trainees' performance to see if they have achieved the objectives of the training. Information to make this assessment needs to be obtained in two ways. First, a series of tests, exercises and assessment instruments should be designed and used to examine objectively or to check on the progress of trainees. Second, instructors need to seek the views of trainees on their training programmes including such factors as the performance of their instructors, the learning materials and the environment.

Information from these two sources together with the instructor's end-of-training review should assist with the identification of areas of success and failure and suggest changes and modifications to the existing programme.

Stage 13: Application

Once the training has been delivered and learning has taken place, the trainees should be able to apply their knowledge and skills to the job. When the former trainees have had sufficient opportunity to put into practice what they have learned during their training, the process of external monitoring should be introduced.

Stage 14: External Validation and Evaluation

External validation is the assessment of whether the objectives of the training have met the needs of the trainees so that they are able to perform specific tasks or the total job, to previously identified and acceptable standards. A follow-up study should be undertaken in the job environment to establish whether the training was designed with the job requirements clearly in mind. If it was, then all things being equal, job performance after training should be satisfactory. On the other hand, information gathered from such a study could lead to modifications being made to training content or methodology.

Evaluation is the assessment of the total value of the training. It differs from validation as it attempts to measure the overall cost benefit of the training and not just the achievement of specified objectives. In other words, it attempts to measure cost benefits, social and individual benefits as well as the operational effectiveness of training.

4.1.2 SOME IMPORTANT ASPECTS OF OJT

It can be seen that the elements of competency-based training are also incorporated in the systematic approach. Based on the fourteen stages of the systematic approach, appropriate steps should be taken to develop the OJT programme. However, it must also be realised that the approach suitable for one shipping company may not necessarily be appropriate for another shipping company. This may be due to their differences in size, types of ships they own, shipboard manning structures and employment terms and conditions of the shipboard personnel. Each company must develop their own OJT programme which will best suit their needs and at the same time satisfy IMO requirements.

It must be stressed again that OJT is only meant to supplement existing shore-based education and training provided by marine colleges and institutions. The availability of modern training tools such as simulators and computers to improve further the shore-based education and training should also be taken into account when developing the OJT programme. In addition, it is important to ensure that the time available for training onboard modern ships is properly utilised. Therefore, only specific training requirements which can be effectively dealt by OJT should be incorporated to avoid overloading the programme.

Specific Content of the OJT Programme

The job and task analysis would determine the knowledge and skills requirements for a particular job. This information should then be used to identify those areas which need or can be effectively provided by OJT. Waters (1988)[3] suggests that knowledge and basic skills can be learned with no or little sea experience whereas higher level skills can only be acquired after considerable experience. Since education and training ashore has been entrusted to provide ships officers the knowledge and basic skills requirements, OJT should focus on developing their higher level skills.

Generally, the higher level skills required by marine engineers to carry out their shipboard functions can be categorised into the following:

1. Watchkeeping
2. Machinery operation
3. Machinery maintenance
4. Machinery management
5. Shipboard management
6. Safety and emergency operation

These skills should therefore be analysed further to select those skills that will be covered by OJT.

Essentially, this process should be conducted by a group of people which represents the marine college, the shipping company, the regulating or certification authority and the seafarers themselves. The group will therefore consists of educators, senior ship officers, ship superintendents, company training managers and officers from regulating bodies. Existing relevant documents such as the company's standing instructions, ships operating instructions, job descriptions, and various machineries operation and maintenance manuals should be consulted when conducting the analyses.

OJT Methodology

It is customary to find numerous manuals onboard ships. They provide valuable information on the tasks of operating and maintaining the ships machineries and equipment. The first step in any OJT should therefore be the reading of the relevant manuals. As an example, training on the task of overhauling a pump should start with reading the maintenance manual of the particular pump. By reading the manual, the engineer (trainee) obtains information on the procedures to be followed, the tools and spares needed, the important measurements to be taken and the precautions to be observed when overhauling the pump. This gives him a preview of the task to be performed and at the same time, any uncertainties or lack of understanding in the task can be clarified with the supervisor or a more experienced engineer.

One of the major features of OJT is the transfer of information from those with skills and expertise to those who need to acquire it. In order to ensure that the skills and expertise of senior engineers available onboard gets passed on to the less experienced engineers, coaching should then be used for OJT. The coaching method requires the supervisor or a responsible engineer to demonstrate, explain and guide the trainee through the activities and procedures which make up the task to be performed. One of the advantage of coaching as an OJT method is that there is a constant interaction between the supervisor and the trainee. This allows the supervisors to continuously appraise the trainees providing them constant feedback. Coaching can also be paced according to the needs of individual trainees and creates opportunities to clear any other doubts about the task.

Onboard ships it is not always possible to perform the same tasks over and over again to demonstrate and explain them to the trainees. Tasks like overhauling a pump is not done on a daily or weekly basis. It follows a planned maintenance schedule and is actually harmful to the pump to perform it more frequently. Although it may not be possible to dismantle the pump, supervisors can still explain and show to the trainees how the task is done by using the actual pump, tools and spares as training aids.

The final stage of OJT is to put the trainees on their own. They need to get the feel of the task and confidence by doing the task themselves. Again this may not be always possible, then the trainees should at least be given the opportunity to assist the engineer who has been assigned to perform the task. The trainees should however be able to describe the entire task, make the necessary preparations, take all the precautions and identify the key points of the tasks.

In summarising, the methods to be used for OJT should as far as possible include:

1. reading of the relevant manuals;
2. coaching by supervisors; and
3. doing the tasks personally.

OJT Supervisors or Instructors and their Training

Since good supervision includes the training of sub-ordinates, OJT should be the responsibility of the two most senior and experienced engineers onboard, that is, the Second and Chief Engineers. However, they must possess the necessary training skills before they can conduct the OJT programme. They should have sufficient training in the methods and techniques of instruction and assessment of performance. Ability to perform a job does not imply ability to train someone else to perform the job. The supervisors should thus be trained to train and assess effectively.

The IMO model course[3] for Chief and Second Engineers includes a module on Personnel Management, Organization and Training. The module has a duration of 31 hours of which 12 hours is spent on the subject of

Training on Board Ships covering the following areas:

1. Training methods
2. Training in safety
3. Emergency drills
4. Training in ship operations
5. Training in maintenance

In order to train the senior engineers to conduct the OJT programme effectively more time should be devoted for the subject, perhaps even having a separate module for it. More exercises and training practices should be incorporated to develop training skills. The subject coverage should also include the area on assessment of performance.

Documentation of OJT

Documentation of OJT helps to ensure that the training objectives are met. The documentation could be in the form of an OJT log for each trainee. The OJT log should contain all the information for the engineer to undertake and for the supervisor to conduct the OJT programme. In addition, the contents of the programme, a training chart and the supervisor's report should also be incorporated. The training chart helps in the planning, scheduling and determining the progress of the OJT. The supervisor's report states the trainee's achievements in all the tasks or skills covered by the OJT.

The amendments to Chapter III of the 1974 Safety Of Life At Sea (SOLAS) convention enacted in 1986 requires that training manuals for on-board training and instruction in the use of life-saving appliances be easily understood. The same philosophy should be applied when preparing the OJT logs.

The OJT log would provide a means of monitoring the training and the achievements of each engineer by shore-based managers. It could also be used to show evidence of training for validation purposes by national and international bodies.

4.2 IMPLEMENTING THE OJT PROGRAMME.

The commitment of all the engineers (trainees and supervisors) onboard and the concerned managers ashore is essential if the OJT programme is to be successfully implemented. Efforts must be taken to ensure that the objectives, contents, responsibilities and procedures of OJT are clearly understood by everyone involved.

Upon signing-on a ship, each engineer (trainee) should discuss his OJT with his supervisor at the earliest opportunity. Together, they should draw up a provisional OJT plan according to ship's voyage schedule, planned maintenance and continuous survey programmes. Due to irregularities of the ship operation schedules, the OJT plan must be flexible. It may be necessary to plan OJT for each voyage so that they can be more readily followed.

As far as possible the OJT should be conducted during non-critical periods of ship operation such as during calm weather and normal operating conditions. Priority must always be given to safe ship operations. Each engineer must always give full attention to his or her primary job duties and responsibilities. Therefore, the engineer should not undertake any OJT while keeping a watch which he or she is responsible for. The trainees should be prepared to undertake the training as an addition to their normal duties and responsibilities.

Fitzpatrick (1992)[4] discusses a number of adult learning theories and their application in the education and training of ships licensed officers. Based on his views, OJT of ships officers onboard ships can be considered as an adult learning activity at sea. In order to ensure that OJT will be successful, the factors that promote adult learning needs to be appreciated and applied. Sheal (1989)[5] puts forward ten factors that can improve adult learning. He points out that adults learn better:

1. In an informal non-threatening learning environment.
2. When they want or need to learn something.
3. When their individual learning needs and learning styles are catered for.
4. When their previous knowledge and experience are valued and used.
5. Where there's an opportunity for them to have some control over the learning content and activities.
6. Through active mental and physical participation in the learning activities.
7. When sufficient time is provided for the assimilation of new information, practice of new skills or development of new attitudes.
8. When they have opportunities successfully to practise or apply what they have learnt.

9. When there is a focus on relevant and realistic problems and the practical application of learning.
10. When there is guidance and some measure of performance so that they have a sense of progress towards their goals.

4.3 EVALUATING THE OJT PROGRAMME.

Evaluation is an integral part of the total process of developing and implementing the OJT programme. It is an assessment of the worth or value of the programme. Evaluations provide feedback which can serve the purpose of determining the extent to which the OJT has resulted in improved performance and obtaining data which will be of value in improving the programme.

The methods of evaluation to be used depends on the levels of evaluation. IMO model course[6] describes four levels of evaluation; the reaction level, the learning level, the job behaviour level and the functioning level.

At the reaction level, reactions to the OJT can be obtained from the engineers by questionnaires or interviews. These reactions should reflect their opinions on the OJT contents, methods, supervisors etc. A questionnaire could easily be incorporated also into the OJT log provided to each trainee. This will ensure that at the end of the training, the questionnaire will have to be completed.

At the learning level, the learning or acquisition of skills can be assessed by a practical test, project or exercise. Though there could be a number of problems to set-up such tests onboard, they should have been identified and catered for when the training objectives are being drawn. In addition, the engine room simulator could be used to assess the acquisition of certain skills ashore. The simulators are particularly suitable for testing the skills in fault diagnosis and trouble-shooting of the ship's machineries and equipment. They should not however be the sole means of assessing all the various skills learnt by the engineer.

At the job behavior level, the effect of OJT on the engineer's performance is measured. This should be done by the engineer's superior or supervisor using well designed performance appraisal forms and by direct observation.

The functioning level of evaluation attempts to measure the effect of the training on the overall functioning of the organization. Staff morale, turnover, grievances, safety records, ship running and maintenance costs etc. need to be analysed at this level.

4.4 A PROPOSED STRUCTURE OF THE OJT PROGRAMME

This proposed structure has been mainly based on the common practices of shipping companies in Malaysia engaged in the international trade.

Generally, the marine engineers employed on foreign-going ships of these companies are designated the ranks of:

1. Chief Engineer
2. Second Engineer
3. Third Engineer
4. Fourth Engineer
5. Fifth or Junior Engineer and
6. Cadet Engineer

The figure 4.2 shows how the engineer would progress through the ranks. After completing the initial shore-based education and training of about 4 years which includes a sea training period as Cadet Engineers, they are usually employed as Junior Engineers. Their promotion to the positions of Fourth and Third Engineers is determined by their performance at the previous position. However, most of them would be holding the position of Fourth Engineer by the time they have completed 18 months sea service. It is then necessary for them to attend a preparatory course and sit for an examination to obtain the Second Engineer's certificate of competency. Having qualified for the position of Second engineer, they are normally appointed as Third Engineers before gaining promotion to Second Engineer. After acquiring another 18 months sea service they will undergo the preparatory course and examination to obtain the Chief Engineer's certificate of competency. Upon obtaining the Chief Engineer's certificate, they are usually employed as a Second Engineer again before finally given the responsibilities of a Chief Engineer.

Base on this practice, it becomes evident that there is no coordination between the marine engineers job skills level and their eligibility to qualify for a Second or Chief Engineer's certificate of competency. Figure 4.2 suggests that they are not required to have

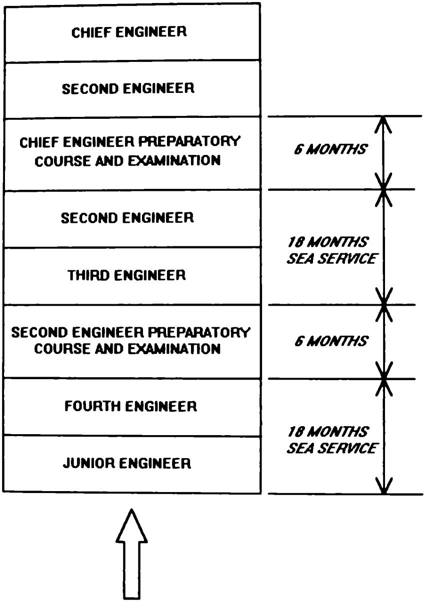

Figure 4.2 The Career Progress of Marine Engineers.

the necessary level of job skills of a Second Engineer to qualify for a Second Engineer's certificate of competency. Similarly, this same situation occur at the Chief Engineer's level. Apart from completing the required minimum period of sea service, there is nothing to stop the engineer from attending the preparatory course and make an attempt at the Second or Chief Engineer examination. Since job skills are not tested, it is possible that an engineer holding a STCW certificate has the knowledge but not the competence to perform all his shipboard duties. The purpose of OJT is therefore to fill this 'gap' and ensure that the engineers are equipped with the necessary skills to progress up the ranks and possess the required level of competence to perform when they qualify for the higher certificates of competency.

In practice the shipping companies do not usually promote the engineers immediately when they obtain the higher certificates. In doing this they try to bring up the engineers skills to the required level. However, without the efforts to ensure proper learning and assessment of skills onboard, it is a rather doubtful attempt.

In order to meet this challenge, OJT must be given to all engineers from the ranks of Junior Engineer to Second Engineer. Hence, a suitable structure for the OJT programme is a rank-oriented modular structure. The whole programme will comprise a series of OJT modules, each aimed at preparing the engineer for his subsequent position. As an example, a Junior Engineer will be provided with the Fourth Engineer's Module, a Fourth Engineer will undergo the Third Engineer's Module and so on. Their achievements in the modules would be a measure of their suitability for promotion and certification .

An important aspect in the structure of the OJT programme is the time allocation of each OJT module. It is only possible to make a rough estimate of the duration of each module by matching the OJT programme to the period of sea service required for certification. However, this would only be the minimum duration of each module. The individual's capabilities and efforts in learning the skills during the sea experience will be a major influence on the duration of the modules. Figure 4.3 illustrates how OJT of marine engineers can be structured.

The OJT module for a particular rank or position will be divided into units according to the functions performed at that position. Each unit is then subdivided into tasks, which are in turn, broken down into smaller sub-tasks.

As an example:

Rank: Fourth Engineer

OJT Module: Third Engineer Module

Unit: Maintenance of Main Diesel Engine

Sub-units: 1. Overhaul Fuel Injectors
2. Inspect Crankcase
3. Check Crankshaft Deflections

POSITION	OJT MODULE	DURATION	SUPERVISOR
Chief Engineer			
Chief Engineer Preparatory Course and Examination		6 Months	
Second Engineer	Chief Engineer	18 Months	Chief Engineer
Second Engineer Preparatory Course and Examination		6 Months	
Third Engineer	Second Engineer	6 Months	Second Engineer
Fourth Engineer	Third Engineer	6 Months	Second Engineer
Junior Engineer	Fourth Engineer	6 Months	Second Engineer

Figure 4.3 A Proposed Structure of Marine Engineers OJT Programme.

Notes and References

1. Buckley, R and Caple, J (1990) The Theory and Practice of Training, London: Kogan Page.
2. Waters, D M "The Education and Training of Shipboard Personnel: Policy Objectives and Practical Considerations, IMLA 5th International Conference on Maritime Education and Training, Sydney, Nova Scotia, Canada, September 1988.
3. See IMO Model Course 7.02, Chief and Second Engineer Officer (Motor Ships), London: IMO, pp.563-588.
4. Fitzpatrick, J J "Adult Education Methods for the Training of Licensed Officers", IMLA 7th International Conference on Maritime Education and Training, Kings Point, New York, July 1992.
5. Sheal, P R (1989) How to Develop and Present Staff Training Courses, London: Kogan Page.
6. See IMO Model Course 6.09, Training Course for Instructors, Vol.1, London: IMO, pp.75-81.

CHAPTER 5

SUPPORTING EXPERIENTIAL LEARNING

> "It has been said that knowledge is power. In truth power lies in the ability to assimilate, comprehend, understand, retain, recall, communicate and the consequent ability to create new knowledge from your extent multi-dimensional mental encyclopedia. The key to this power is learning how to learn."
>
> Tony Buzan (1988, pp.108)[1]

5.1 THE IMPORTANCE OF REFLECTION

In learning how to learn, the use of experiential learning should be encouraged. A simple model of experiential learning adopted by Dennison and Kirk (1990)[2] is a cycle which consists of four stages: Do, Review, Learn and Apply. Figure 5.1 portrays the model.

The cycle starts with the Do stage where an experience is organised to provide the opportunity of doing something. Before the process of learning and application can take place, it is essential that the experience of doing something is followed by its review.

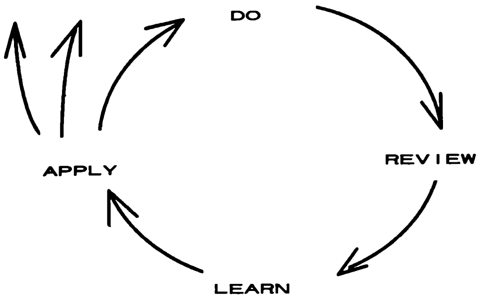

Figure 5.1 An Experiential Learning Model.

Source: Dennison, B and Kirk, R (1990) Do, Review, Learn, Apply: A Simple Guide to Experiential Learning, Oxford: Basil Blackwell.

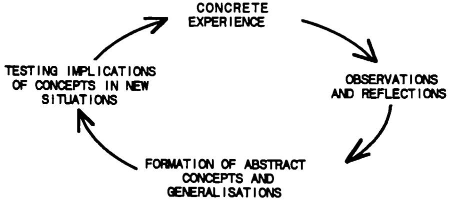

Figure 5.2 Kolb's Experiential Learning Model.

Source: Kolb, D A (1983) Experiential Learning: Experience as a Source of Learning and Development, New Jersey: Prentice Hall.

The better-known model of experiential learning described by Kolb (1983)[3] is shown in figure 5.2. Kolb argues that learners, if they are to be effective, require four different kinds of abilities which correspond to the four stages of his learning cycle: concrete experience abilities, reflective observation abilities, abstract conceptualization abilities and active experimentation abilities.

The OJT programme that is developed for marine engineers provides the experience of doing the real thing. It has the potential of maximising learning but experience alone is not the key to learning. So what is it that turns experience into learning? How can they apply their experience in new contexts? Why some learners appear to benefit more than others? In addressing these questions, Boud et al (1985)[4] identified the importance of the activity of reflection.

Simply to experience is not enough. Often we are so deeply involved in the experience itself that we are unable, or do not have the opportunity to step back and reflect upon what we are doing in any critical way. Therefore, it is necessary to support the OJT of marine engineers with activities that would encourage them to reflect upon what they have experienced.

One way to achieve this is by having a debriefing after experiencing or doing the tasks. Debriefing provides the opportunity for structured reflection and can occur either immediately after an experience or sometimes later[5]. However, to accomplish debriefing successfully there must be a strong commitment from everyone involved and sufficient time allocation. This can be accommodated in training ashore and debriefing has cer tainly given great emphasis in simulator-based training ashore[6]. Onboard ships it may not always be possible and it is not fair to expect supervisors or instructors to conduct a debriefing session for every OJT experience of the engineer. It should be used when time permits and particularly, every effort should be made for a debriefing after the occurrences of faults and troubles in the engineroom. It helps to establish to what degree the engineer has learnt from the experience and whether appropriate actions and procedures have been taken. In addition to the commitment and time required for an effective debriefing, the supervisor should also have the necessary skills to undertake the debriefing. The training of the OJT supervisors or instructors should therefore include the skills of debriefing.

Another activity to encourage reflection and which may be more suitable for OJT onboard ships is writing. In order to write down what has been learnt the trainee has to reflect back on the experience. The trainees should not however, record everything that they have done but more on what they have gained or learnt, their weaknesses and difficulties etc. Robinson (1988)[7] confirms the value of this record to the reinforcement of learning. He also believes that it helps to assess the trainee's progress and furnishes the trainee with a useful reference for the future. The OJT log which will be provided to the trainees can also be used for this purpose. When designing the OJT log, the space for this writing should be provided and with some guidelines on what the writing should concentrate on.

Other forms of activities that can enhance experiential learning onboard ships should also be considered. With today's technology, there is a wide variety of learning methods and media available for learning onboard ships as for distance learning. Although they may be used as entirely separate learning packages, but carefully selected and programmed they can encourage trainees to review or reflect on their OJT experiences too. Some of these learning packages will now be discussed.

5.2 CORRESPONDENCE COURSES

In order to be a useful means of reviewing the OJT experience, the correspondence course should contain materials which are relevant to the OJT module that the engineer is undertaking. The course may also contain the theoretical and practical knowledge necessary for the development of skills that OJT attempts to achieve. This will enable the trainees to relate the knowledge that they have gained in marine colleges ashore to the jobs onboard.

Correspondence courses has been used at sea for quite sometime now. Their usefulness has been rather unconvincing. In Malaysia, they have been mainly provided to cadets during their sea training and will probably be the only one throughout their entire sea career. As cadets have very little experience it will not be possible for them to learn everything about their future jobs during this period as a cadet. Correspondence courses structured according to the OJT programme (rank-oriented modular structure) would be more meaningful.

cording to their level of knowledge. The computer finally assesses their performance and provides feedback to learners on their level of accomplishment.

2. **Simulation**
   The computer's 'internal clock, permits simulations of various kinds to be produced, allowing maximum opportunity for learner interaction.

3. **Game format**
   Programmes can be produced in interactive game format permitting the learner to benefit from an additional motivating factor, that of enjoyment and amusement.

4. **Working models**
   Training programmes are being produced that utilise a mathematical model as an essential feature of the subject matter. These 'models' can be used to teach the novice who has little or no knowledge, provide random problems for the learner who has grasped the basic techniques but requires more practice, or provide a working model that the learner can use to solve 'real' problems onboard.

The use of suitable programmes are essential for any computer-based learning to be effective. The main advantage of computer-based learning packages is that they are interactive. Onboard ships, engineers can work on these packages at their own pace. In order to use them for the review of the engineers OJT experiences should also be programmed and structured according to the OJT modules.

Besides correspondence courses and computer-based learning packages, there are also other distance learning techniques that can use satellite communication, CD-I(Compact Disc Interactive) and interactive-video. They should also be considered when selecting learning packages to enhance shipboard experiential learning. The use of the books(library) and video programmes that are provided onboard should also be considered.

Notes and References

1. Buzan, T (1988) Speed Reading, London: David and Charles, pp.108
2. Dennison, B and Kirk, R (1990) Do, Review, Learn, Apply : A Simple Guide to Experiential Learning, Oxford: Blackwell.
3. Kolb, D A (1983) Experiential Learning : Experience as the Source of Learning and Development, New Jersey: Prentice Hall.
4. Boud, D et al (eds.) (1985) Reflection : Turning Experience into Learning, London: Kogan Page, pp.69-90.
5. Ibid., pp.52-68.
6. See paper by Meurn R J entitled "Ship Simulator Bridge and Control Station Requirements From an Instructor's Point of View" presented at the International Conference on Marine Simulation and Ship Manoeuvrability, St. John's, Newfoudland, Canada, Sept. 26-Oct.2 1993.
7. Robinson, K R (1988) A Handbook of Training Management, London: Kogan Page.
8. Anderson, S P "The TOPCAT System of Onboard Training : An Operational Perspective", Conference on Training and Distance Learning Onboard Ships, March 1982.

CHAPTER 6

CONCLUSION AND RECOMMENDATION

The importance of the national shipping industry in facilitating international trade and the economic growth of a country has been recognised. In order to enable the country to capitalise on this circumstance, there must be firm commitment to engage in international shipping that is both cyclical and highly competitive. National merchant fleets and ports together with the necessary administrative structure, supporting organisations and industries and human resources are needed to promote safe and efficient transportation of trade by sea. It has also been realised that central to the success of ship operations is the availability of qualified and competent seafarers.

During the next two years or so, until 1996, considerable efforts and attention will be directed towards the task of reviewing the STCW 1978 convention. Very important decisions will be made to determine the future standards of education, training and certification of seafarers worldwide. Besides having to address the problem of largely varying standards of seafarers competence, the review also needs to take into account the current and expected future shortage of seafarers and the reluctance of young people in an increasing number of countries to take-up the sea career.

New strategies and technology are already being considered for introduction into the revised convention. Amongst them are the functional approach to certification, skills-based or competency-based training, simulator training, computer-based training, modern distance learning and Compact Disc-Interactive. Despite all the advantages these can offer, the review of the convention must not start with the view that if there is a training problem, it can be solved by new technology. This would be a case of the technology in search of a problem. A systematic approach to training would ensure that current training needs are analysed, training objectives clearly set, and the most effective training methods for achieving those objectives, determined and used.

The revised STCW convention should not only ensure that countries will be doing MET right (efficiently) but also to ensure that countries will be doing the right MET right (effectively and efficiently).

In 1978, the STCW convention had agreed on the minimum knowledge required for certification of various grades or position (eg. Watchkeeping Engineer, Chief and Second Engineer) of seafarers. They had been useful for developing education and training ashore to achieve the knowledge requirements. What is needed now is to agree on the minimum skills requirements so that the best method of training to achieve them can be chosen. The sea experience has the potential of providing continuing training that can develop skills. Therefore, the sea experience must be defined further in terms of the skills that are expected to be acquired for a particular grade or position and not just the minimum period of sea time.

Safety training onboard ships is crucial if proper actions and procedures are to be taken during emergencies. Shipboard training of the day-to-day tasks of the crew is equally important if human-caused emergency situations are to be prevented. Shipboard training can be in many forms, but to achieve competence, the experience at sea must promote the learning of essential skills. The vehicle to promote this shipboard experiential learning is on-the-job training. The value of creating a learning environment onboard ships is tremendous and in today's shipping can give a shipping company the leading edge. It is believed that the loyalty and commitment of people to organisations is largely increased when learning is seen as part of an integrated human and organisational development plan. This has worked very well for Japanese organisations and there is no reason why it cannot work in Malaysian organisations, even shipping companies.

This study also makes the following recommendations for the introduction of OJT of marine engineers in Malaysia:

1. A working group should be formed to analyse and develop the OJT programme required for marine engineers of a particular shipping company. The programme should aim to supplement the shore-based education and training received and provide the necessary continuing training onboard.

2. As a pilot OJT programme, the Chief Engineer module should be implemented first. The reason for this is that the Second Engineers who undertake this OJT module will be able to supervise

and support the programme better when they are holding the Chief Engineer position. The duration of the Chief Engineer OJT module is also sufficiently long (18 months) and suitable to allow for any changes and improvements of the programme.

3. Training should be given to Second and Chief Engineers to instruct or supervise OJT onboard. A course to provide the necessary knowledge and skills on shipboard training should be developed.

4. Shipping companies should be fully committed to provide full support and invest in the OJT programme. Additional learning packages should be considered and supplied onboard ships. Marine engineers should be aware that in addition to the positions or ranks that they hold onboard, they are also trainees for the next position until they become Chief Engineer.

Finally, if the quality and competence of seafarers are to be assured future requirements for certification purposes should include the assessment of both the required knowledge and essential skills to perform shipboard duties. Through OJT, an accurate and reliable assessment of the seafarers skills can be obtained. OJT should therefore be considered as part of the STCW certification requirements.

BIBLIOGRAPHY

Abella, K T (1986) Building Successful Training Programs New York: Addison-Wesley.

Bigge, M L (1982) Learning Theories for Teachers, 4th ed, New York: Harper and Row.

Boud, D et al (eds.) (1985) Reflection : Turning experience into learning, London: Kogan Page.

Buckley, R and Caple, J (1990) The Theory and Practice of Training, London: Kogan Page.

Cervero, R M (1988) Effective Continuing Education for Professionals, San Francisco and London: Jossey-Bass.

Conference on Education and Training for Seafarers: What Policy for the 1990's?, jointly organised by the Nautical Institute and Institute of Marine Engineers, London, February 1984.

Craig, R L (1987) Training and Development Handbook, 3rd ed, New York: McGraw-Hill.

Farmer, B et al (eds.) (1990) Making Learning Systems Work, Association for Educational and Training Technology 23rd Annual Conference, London: Kogan Page.

Fish, D (1989) Learning through Practice in Initial Teacher Training: A Challenge for the Partners, London: Kogan Page.

First International Conference on Engine Room Simulators convened by IMLA in cooperation with the World Maritime University, ENMM Nantes, France, June 1993.

Holder, L A (1991) Training Onboard, London: Videotel Marine International Ltd.

ILO Information, Vocational Training: Pitfalls to avoid, Vol.28, No.3, August 1992.

IMO, (1978) International Convention on Training and Certification of Seafarers,1978, London: IMO.

IMO, (1986) International Convention for the Safety Of Life At Sea, London: IMO.

IMO Model Course 3.12, Examination and Certification of Seafarers, Vol.1, London: IMO.

Kolb, D A (1983) Experiential Learning : Experience as the Source of Learning and Development, New Jersey: Prentice-Hall.

Linklater, P (ed.) (1985) Education and the World of Work: Positive Partnerships, Milton Keynes: Open Univ.

Marine Engineers Review, The Safe Ship, May 1993, pp.12-17.

Proceedings of the Workshop on the Integrated Training of Deck and Marine Engineer Officers, organised by IMLA, March 1990.

Rae, L (1983) The Skills of Training: A Guide for Managers and Practitioners, Hampshire: Wildwood House.

Ramsden, P (ed.) (1988) Improving Learning : New Perspectives, London: Kogan Page.

Rinman, T and Brodefors, R (1983) The Commercial History of Shipping, Gothenburg: Rinman & Linden

Robinson, D G and Robinson, J C (1989) Training for Impact, San Francisco: Jossey Bass.

Robinson, K R (1988) A Handbook of Training Management, Rev 2nd ed, London: Kogan Page.

Romiszowski A J (ed.) (1970) A Systems Approach to Education and Training, London: Kogan Page.

Rushby, N (ed.) (1987) Technology Based Learning : Selected Readings, London: Kogan Page.

Sheal P R (1989) How to Develop and Present Staff Training Courses, London: Kogan Page.

Various Lectures on Maritime Education and Training, by P. Muirhead, World Maritime University, Malmo, Sweden.