

TIME Model
or
How to Integrate New Technology on Maritime Education and Training

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ABSTRACT

Why It is well known that the conventional educational system, which has been employed for a long time, needs to be involved. According to the exigent of 21st century, we intend to present an improving higher learning model using the Technology as facilitator of quality maritime education.

What The TIME model (*Technology In Maritime Education*) includes the idea that Technology contains basic equipment operations and concepts, resources and tools for information literacy and content areas. The goal of this model is to work with teachers and trainers, on a side, and pre-service and in-service seafarers, on the other side, to improve various competency categories through the integration of Technology on maritime education. An assessment of present situation and a project for the future are also advanced. Technology is considerate like art and science, like skill and competence in order to support effectively the system-outcomes of maritime learners, the decision – making process, the leading of different economics departments, especially in maritime background.

How To develop this project it is necessary to identify the behavior of our maritime educational environment, in fact to define the straights and the weaknesses of the system. So, the first needs analysis determine what is common and what is unique in maritime education, in higher education context. From this start point we can define our mission, our strategy. The main TIME strategic directions are the components of the model: Principles of learning, applying and researching; Information processing; Content standards; Teacher knowledge and competence; Technology. In fact, Technology encompasses and permeates all the components of the TIME model that involve the interaction between its elements.

1. Introduction

The globalization of the world economy and commerce determine economical and political changes and the opening of international markets. These have made it possible to establish closer economic, industrial and business relationships between countries. In this context, maritime

economy, however an international sector developed this dimension. It is often pointed out that the international shipping market is one of the most open markets of all the industries. International companies currently recruit foreign national able to practice their profession on the international level. Maritime academic institutions must respond to this trend by preparing their graduates according with the needs of maritime society. The role of maritime universities must be a leading one in this increasingly global market.

The term “technology” defines many things, but usually people understand technology as something related to hardware and software, to computers and communication, to Internet. In fact, they refer to Information Technology. Generally, “technology” defines the innovation, change or modification of the natural environment to satisfy perceived human needs and wants. These actions involve the generation of knowledge and processes to develop systems that solve problems and extend human capabilities.

In our acceptance, Technology is used as a powerful tool to facilitate and improve quality education. Technology can be used to develop information processing skills and dispositions. Databases, simulations and access to the Internet can provide rich experiences and information as students acquire the skills and knowledge represented by the content standards (Switzer, 1999).

In order to give a response for the necessity of integrated technology into maritime education, we build a model which improves both learning and teaching. So, the TIME model (*Technology In Maritime Education*) promotes the idea that Technology contains basic equipment operations and concepts, resources and tools for information literacy and content areas. The goal of this model is to work with teachers and trainers, on a side, and pre-service and in-service seafarers, on the other side, to improve various competency categories through the integration of Technology on maritime education.

Our research proved that the access to any of the following actions determines more competences in according with the actual demands:

- computer assisted instruction
- integrated learning systems technology
- simulations of real maritime situations
- necessary access to technology
- collaborative works.

2. Maritime Education and Romanian Context

While the broad technological progress, which has taken place over recent years, has caused a great need for technology education, the existing educational structures have not developed at the same rate.

Under the 1995 Amendments to the STCW Convention, all candidates for certification as deck or engineering officers are required to complete what is described as “approved education and training” and meet the standard of competence specified in the relevant section of the part A of the STCW Code.

Since the adoption of STCW Convention and other requirements from maritime industry, the maritime universities tried to find the best solutions. It is known that the level required by the revised STCW 95 Convention is minimum. In a historical and traditional perspective, the scope of MET is to educate people for ships' officers in order to obtain the Certificate of Competency issued by authorized organizations. On the other side, the maritime universities have to comply different national accreditation requirements, to develop their educational level suitable for a university, not for training center.

The mission of maritime institutions shall define its distinctive character, shall address the needs of maritime society and identify the students it seeks to serve, and also reflect both the institution's traditions and its vision for the future.

The maritime education can be defined as a set of interdependent processes such as teaching, learning, researching and resources including human, material and information that function harmoniously to achieve specified educational objectives. This content can be analyzed in four categories: knowledge, know-how, wisdom and the character (Bloom, 1996).

Knowledge enables the people to understand what they learn in relation to what they already know. Knowledge is both practical and theoretical. Know-how differs significantly from knowledge and enables people to put knowledge to work. Wisdom is the ability to distinguish what is important from what is not. Wisdom enables people to set priorities on how to use resources of time, energy and emotion. Character is a combination of knowledge, know-how and wisdom coupled with motivation. It is up each educational organization to identify what to include in each of these four categories. It appears that in maritime higher education, attention is given only to the first of the four categories, with the last two not even given lip service (Bloom, 1996).

In maritime higher education, the lecturers often believe that at the university level their sole duty is to develop knowledge and pass it on to the next generation. The list of knowledge that the students are expected to acquire is usually a composite of what is required for accreditation and what the faculty decides itself.

In the last years, the sophisticated environment of ship operation and new technologies required high standards of seafarer. Therefore, MET institutions tried to attract good applicants. In the same time, taking into account the world economic conditions, in order to meet the new expectations most of maritime universities have developed advanced educational programs, which provide subjects according not only to STCW Convention, but also professional mobility from ship to shore.

In this context, Constanta Maritime University seeks academically qualified and motivated students interested in earning a bachelor's degree in Navigation and Maritime Transport, Naval Electromechanics and General Electrotechnics. *Navigation and Naval Transport Faculty* includes full time higher education 5 years of study. Graduates are awarded both Engineer Diploma (BSc) and Third Deck Officer Certificate. *Electromechanic Faculty* includes two specializations: Naval Electromechanics and General Electrotechnics, both of them full time higher education 5 years of study. Graduates are awarded both Engineer Diploma (BSc) and Third Engineer Officer Certificate.

To be eligible for the Bachelor of Science Degree from Constanta Maritime University, a student must complete all courses of the major program. In addition, they must demonstrate one year's sea time for the Third Mate's license and 6 months for the Third Engineer license. Each student must submit a cadet Shipping Report, that must comprise the Ship's Officer Evaluation Report and evidence of the sea time. Many students find this experience to be a major advantage in finding employment following graduation.

In March 2003, our university was certified ISO 9001/2000 for the Quality Management by Bureau Veritas. Constanta Maritime University also becomes Center for International Relations and focuses its activity on the cooperation with other maritime universities.

In order to be a permanent maritime education center it is developing a postgraduate academic program consisting in master's courses for higher-education graduates, in a related field of studies. *Maritime Law, Maritime and Multimodal Transport Management, Maritime Safety, Maritime and Port Management* are only few courses which offer an opportunity to further the education by studying some of the most modern issues on today's transport and operations in international trade and port activities.

3. TIME Model

Our model proposes to use technology developing interactions between its main TIME strategic components:

- Teacher's knowledge and competence;
- Content standards;
- Principles of learning, applying and researching;
- Technology.

In fact, Technology encompasses and permeates all the components of the TIME model that involve the interaction between its elements.

3.1 Teacher's Knowledge and Competence

A main component of TIME model is *introducing technology into teacher preparation*.

The maritime business demands that our schools prepare educated workers for maritime industry all over the world, who can use technology effectively in the global labor market.

New skills needed in the workplace are catalysts that spur technology use in university. So, computer to student ratios have increased steadily from 1/40 in 1998 to 1/10 in 2003 affecting traditional courses and local curricula. In this direction it is a paradox that the teachers' competence in using technology is not so advance, some of them considering that skill in the use of technology has not been necessary.

The teaching staff of Constanta Maritime University consists of 85 academics, with the following ranks: 12 Professors, 13 Associate Professors, 46 Lecturers, 8 Assistant Lecturers, and 6 Tutors. 80 per cent from them have IT competence, but only 20 per cent used effectively IT in their teaching process.

First, we must define “what teachers must be able to do” in order to take advantage of technology for instruction and student learning. In the spirit of our model, we present what propose teachers’ adapting to new educational technology environment.

New Understandings

Teachers need to understand the deep impact technology is having on society as a whole and special on maritime business world: how technology has changed the nature of work, of communications and others.

New Approaches

Teachers must recognize that information is available from sources that go well beyond textbooks and teachers themselves, and make use of many ways in which they can gain access to information. Teachers must employ a wide range of technological tools and software as part of their own didactical repertoire.

New Roles

Teachers should help students for their proper formation. Technology will be used to find, organize and interpret information and skills.

New Forms of Professional Development

Teachers must participate in formal and informal courses not only in traditional ways. So, they must become part of e-learning communities, use Internet for their own train, etc.

According with these items, we propose to develop a modern teacher technology education program. This fact supposes the changing of many factors:

- An appropriate infrastructure that allows powerful applications of technology to occur. To encourage the long distance learning, the technical infrastructure must include intranet networks, web-teams with others universities or employments which work all over the world.
- Incentives for faculty in terms of release time for professional development, new course development and recognition for experimental teaching.
- Continuing relationships with corporations and foundations for funds to support innovations in teachers’ education.

3.2 Content Standards and Curriculum Development

The educators involved in the development of modern curricula in maritime education tend to characterize the curriculum as the complementary relationship of a syllabus and its related teaching and learning processes (Chandler, 1992). Moreover, they have recognized that the teaching/learning process is a highly dynamic one.

We must point out that the curriculum process in maritime education is extremely complex and particular, with many components and interactions. It demands the involvement in naval course programme and syllabus development of those who possess an intimate knowledge of both maritime and educational processes. It is essential that curricula comply not only with actual and future maritime sector needs, but also with possible changes on the labor market regarding job requirements.

Content standards define only the core elements of education that should apply to all students from a faculty. National standards elaborated by the Ministry of Education have been articulated with IMO international standards and allowed the access to international brevet.

Content standards can accomplish three primary goals:

- Give students and teachers a clear and challenging target.
- Help focus energy and resources on the bottom line: student achievement
- Give a tool for judging how well the students are learning and how well the university is performing.

Therefore, in designing modern curricula special care should be taken to ensure that essential qualities and knowledge are included in all courses to form a modern professional profile adapting for the international requests. The curricula in maritime education must include:

- Technical knowledge and skills;
- Intellectual skills;
- Excellence in computer proficiency and in the application of computers;
- Attitudes;
- International standard of practice;
- International business practice;
- International cultural background;
- International maritime law background;
- Foreign language proficiency.

The local maritime curriculum is recording with modern maritime needs and covers a large number of subjects:

- *Maritime Law*, a master course that successfully makes for the obvious gap in juridical studies, related to the maritime field. Courses cover a wide range of subjects, from International Conventions and European Community Directives to Maritime Insurance and Maritime English.
- *Maritime and Multimodal Transport Management* is an opportunity to study one of the most modern issues on today's transport and operations in international trade. This course is intended for those who will work in the field of shipping, trade and international transport and also for those interested in the legal aspects of the international transport.
- *Maritime Safety* is a course which responds to the latest requirements of the International Maritime Organization regarding the safety at sea and the prevention of pollution, these being the most important issues imposed by the Convention for Standards of Training Certification and Watchkeeping for Seafarers, 1995.

- *Maritime and Port Management* is a master course which has as target population all the people involved in the management of port activities as well as those working in a variety of maritime related fields, such as economy, marketing, shipping and transport.
- *Advanced Concepts of Marine Engineering* is a master course already traditional, attendants being mostly naval and mechanical engineers. Naval Hydrodynamics, Naval Electromechanical Systems, Modern Technologies of Maritime Depollution, Experimental Research on Naval Machines, etc. are only a few of the subjects dealt with.

3.3 Principles of Learning, Applying and Researching

In order to attain desired capabilities, it's necessary to apply proper pedagogical methodologies. Learning by example, based on observations of real examples, could be considered as the first stage. Learning by experience seems to be an appropriate learning method as the final stage. Meantime, learning by experience uses different methods: laboratory-class, role-playing, simulation, on board training. It's important to point out that simulation could be also used for different learning objectives, not only as usually for specific tasks (navigation, engine room).

It is already known that students retain only 10% of what they read and only 20% of what they hear. On the other side, if a problem is simulated, then up to 90% of the lessons learned may be retained. The main consequence of these results is the shift of teaching – learning ratio. Learning is an active process of investigation and creation based on the learner's interest, curiosity and experience and should result in expanded insights, knowledge and skills. So, seems to be necessary to focus university education on the principles of active learning (learning to learn):

- the learner is not a “receptacle” of knowledge, but rather creates his learning actively and uniquely
- direct experience decisively shapes individual understanding
- beyond stimulation, learning requires reflection.

In fact, learning must determines a new active environment with technological insertions.

Table 1: Traditional Learning – New Learning

Traditional learning environment	New learning environment
Teacher – centered instruction	Student – centered learning
Single – sense stimulation	Multisensory stimulation
Single – path progression	Multipath progression
Single media	Multimedia
Isolated work	Collaborative work
Information delivery	Information exchange
Passive – learning	Active/exploratory learning
Reactive response	Proactive/planned action
Isolated, artificial context	Real – world context
Technical & professional skills (knowing how)	Entrepreneurial & managerial skills (knowing why)

Technology is the main tool in creating this new learning environment. The advent of the Internet (39 per cent of students users in 1998, 95 per cent of students users in 2003) and growth of computer per student ratio increase the subjects who use technology in teaching (from 15 per cent in 1998 to 45 per cent in 2003), respectively in learning (from 25 per cent in 1998 to 75 per cent in 2003).

According with technology evolving throughout the maritime industry, new planning tools are required. Maritime university curriculum must keep up with technology change, from interactive curriculum support systems to increasingly sophisticated simulators. That involves a new paradigm: Project – organized education versus Subject – based education. The aim of the project work is *learning by doing* or *action learning*.

Because simulator training has over the last years proved to be an effective training method, now in our university is currently used the Engine Room Simulator (ERS). The best way to acquire practical experience is to learn from real life in a real engine room, but today the efficiency requirements do not allow for this kind of onboard education, hence the training has to be carried out on a simulator. Practicing decision making in a simulator environment where decisions and their effects are monitored, opens a unique possibility to evaluate the effect of the decisions.

Research in maritime universities has been changed very much in recent years. Maritime research is now mainly based either on specific maritime issues or on pedagogical research (educational courses, training materials, distance learning packages). Using eventually a SWOT analysis, identifying the actual research requirements, both internally and externally, maritime institutions have to develop realistic research strategy (Pourzanjani, 2001).

Constanta Maritime University, as a member of International Association of Maritime Universities, activates in the direction of European Integration and has got as result the participation in:

- Tempus project: Retaining Program by Open and Distance Teaching for Underwater Technologies (Galati University, coordinator)
- Leonard project: Triaina (Piraeus University, coordinator)
- Socrates project: Master's Degree for Maritime Safety (coordinator).

Starting with 1994, our university developed several international cooperation with overseas universities such as: Maritime Faculty of Istanbul Technical University, Maine Maritime Academy, Arab Academy for Science and Technology, etc. These relationships between maritime universities would be the beginning of a maritime educational network.

4. Conclusion

Our model uses the Technology as facilitator of quality maritime education. Effectively used, technology can contribute to create conditions that optimize teaching and learning. Databases, simulations and full access to Internet can provide rich experience and information as students acquire the skills and knowledge represented by the content standards (Switzer, 1999).

Technology provides tools to enhance learning and gives students and teachers more opportunities for feedback, reflection and revision.

The achievement of most important educational goals involves expensive technologies. Unfortunately, many times economic reasons slow down this process. Therefore, the proposed model is not an algorithmic one with very concrete steps, but it provides a framework for thinking more holistically about the maritime education process. It incorporates the best what we know about learning, teaching and curriculum. In the model, technology has an intrinsic role, like an infrastructure what permits the development of the future maritime educational profile.

MET institutions have to establish new educational program with highly efficient teaching tools according to the requirements of maritime industry and international standards.

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