

DISTANCE TEACHING STANDARD

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ABSTRACT

The Manila Amendment of STCW opens the door to distance delivery of courses to mariners that are required for advancement in certification level. The Marine Institute of Memorial University of Newfoundland has been working on preparing distance courses for deck officers and marine engineers which would prepare them for writing the Transport Canada challenge examinations as part of their certificate advancement.

With an eye to developing these courses, the authors have developed a distance delivery standard which is applied to their online course development. It is anticipated that the standard would allow courses to be developed in such a way that certifying authorities would find the courses and all evaluations delivered by the institution acceptable.

This paper describes the content of this new distance delivery standard to include the broad categories of:

- Delivery Infrastructure
- Receiving Technology
- Content Format
- Learner Management System (LMS)
- Instructor Standards

The standard will cover aspects of the delivery ranging from required bandwidth and minimum standards of computers and devices to be able to participate in a course to minimum expectations of students to be able to receive a response to a communication with the course facilitator while taking a course.

Much of the standard has been developed based on the authors experience in delivering online and blended delivery courses and is based on current course delivery methods employed at the Marine Institute.

Keywords: *Distance Education, Standards, Educational Technology.*

1. INTRODUCTION

While the concept of distance delivery is not new and has existed formally since 1753, the variety of new technologies available, coupled with the instantaneous communications allowed by the internet, has transformed distance education into a sophisticated and effective tool. The new technologies mean that educators can effectively engage with learners with different learning styles and learning speeds (Tucker and Cross, 2013). The effectiveness of these new technologies was recognized by the International Maritime Organization who in the Manila Amendments to the STCW stated that distance education was an effective tool.

For over 10 years, the Marine Institute of Memorial University has been experimenting with distance education in several formats. It is now offering degrees through distance education, as well as using it to supplement the traditional classroom courses. However, with the new interest in distance education and its application to training mariners, the Marine Institute has started the development of courses that will prepare students to challenge the exams needed for shipboard personnel to advance in their careers. Current efforts include the development of a suite of distance courses designed to prepare course participants for Transport Canada administered certification examinations. At the present time, there is no one standard that is being used to govern distance education in Canada. Institutions are left to follow their own routines and guidelines. While the routines address a significant portion of how and

why, they are developed individually and very often independently. There is a need for a minimum standard that future institutions, and just as importantly current institutions, must adhere to.

This paper will look at the items that are necessary for the development of a standard based on the combined 15 years of experience that the authors have in developing distance education material. The standards have been organized into the following 5 broad categories to facilitate the logical organization of material:

- Delivery Infrastructure
- Receiving Technology
- Content Format
- Learner Management System (LMS)
- Instructor Standards

This paper identifies what should be considered in the development of standards for each category and also what the Marine Institute does in regards to some of the proposed standards.

2. DELIVERY INFRASTRUCTURE

At the core of most educational distance delivery systems is some form of electronic communications and in almost all cases the current communication system is the internet. This is expected to remain as the primary form of communications in the future; however, based on historic performance it is anticipated that the capacity will increase allowing better access and faster transmission of larger amounts of data at less cost.

While high speed internet access has become the norm for many places, ships still must use satellite communications while at sea, which makes internet access very expensive. Since the target audience for this distance education is the typical mariner, this cost is critical. As an example of cost, a company currently providing internet access to ships today sells what they call their standard package. The standard package costs \$129 a month for which you get 10 Mb¹ (Megabytes) of data downloaded. However, if you go over the 10 Mb allotment each additional Mb will cost \$13.99. There are other options available, for example a high end option costs \$1,969 a month for which you get 6 GB of data and then \$0.40 per Mb after that. However, compared to land lines which can be as inexpensive as \$0.10 per Gb (or \$0.0001 per Mb) sea access is still expensive (INMARSAT, 2013).

As with all technology we expect to see access increase and costs decrease in the future. INMARSAT is currently working on a system called Global Xpress which is expected to increase bandwidth considerably and within a year or two we can expect to see ships being able to afford multiple meg files. Nevertheless, currently we are stuck with prohibitively high costs and low transfer rates

Based on the above, as a standard we would recommend that two options be made available to the learners. The first would be similar to a current distance education program which would take place over a fixed connection. The high bandwidth of a fixed connection such as optic fibre allows fast communications and the exchange of large files. Even a relatively slow 56 kbps (56 kilo bits per second) would allow the download of a Mb size file in about 2 minutes. However, at sea the slow speed and high cost means that the transfer of multiple Mb sized files could be prohibitively expensive and time consuming. For these cases, other options must be available that would permit a learner to be fully engaged in the course, receive all course materials in an appropriate timing and order, and have adequate access to the course facilitator and fellow course participants for discussions and to be able to seek answers to questions. Such options might include delivery of material on a disk, or the delivery of material when in port and the ship is able to take advantage of a ground link supplemented by exercises to be done while at sea.

In addition to being aware of a ship's capability to receive data, an additional issue is the educational institute's ability to transmit data. As the demand for distance education grows for both marine related courses as well as more conventional educational courses, care must be taken to ensure that people are still able to receive their information in a timely fashion even at peak times. This is critical for a marine related course being taken on board a ship since, as mentioned above, access may be available for only brief periods while a ship is in port.

3. RECEIVING TECHNOLOGY

Receiving Technology means all the hardware and software associated with a learner. Technology of this nature has been advancing at a staggering rate and is probably the main reason that standards for delivery of distances courses using this technology are slow to develop. The old adage that it is hard to hit a moving target is very applicable. From 1995 to 2012 (the date of the most recent one), Microsoft has developed 10 major releases of their internet browser (Explorer) and within each release there are numerous updates. Firefox has had even faster change with 20 versions being released since it first appeared in 2004 and it is anticipated that in the interval between when this paper was written and when it is presented there will be an additional 4 versions released.

Of course that was just the web browser. We also have to deal with new versions of operating systems. Microsoft has stopped mainstream support of Windows Vista in 2012 and Windows 7 will not be supported after 2014 (although there is what is called extended support which must be bought but will extend support for a year or two). There are also changes to hardware, the most significant of which is the large numbers of tablets which are becoming common at this time (and of course tablets have other, different operating systems).

To begin to develop a standard it is useful to group the elements necessary for the receiving computer into the following categories:

- operating systems
- video and sound
- internet browsers

A standard for operating systems is going to be driven (to a large extent) by what the current system developers are supporting and what is commonly out there. For example, at the present time Microsoft will support Windows XP only through extended support however since 40% of the world's desktop computers are currently running XP it makes sense to still support it until Windows ends all support (NetMarketShare, 2013). Apple does not publish their operating system support criteria but appear to support the current version as well as the two previous versions. Nevertheless, it could lead to major problems trying to support a system that is no longer supported by the manufacturer. Thus it makes sense to link the minimum operating system standard to what is currently supported by the manufacturers. Relying on a manufacturer to dictate the change over dates may not be acceptable for all educational institutes, but in the absence of a better criteria it seems to be the best available.

Since the delivery of content relies on pictures and video and possibly sound, it is important to ensure that a learners computer is able to process what is required for the course. However, this is not a particularly restrictive condition since video card and sound card development have been driven by the video game industry and it is difficult to imagine online course content or applications that would have requirements exceeding those of the gaming industry. In fact, since about 1995 most computer manufactures have integrated sound cards with their motherboards. Likewise, video has progressed

¹ Note that byte is defined as consisting of 8 bits so a Megabyte (Mb) is 8 million megabits.)

significantly but the requirements for distance education are relatively simple and a resolution that all newer computers can meet and oldest ones can as well suffice. The video standard XGA would allow for 1024 x 768 resolution (the number of horizontal and vertical lines viewable on a monitor) and is sufficient for most purposes.

Where internet browsers are the most rapidly changing part of the receiving technology, they must be treated a little differently. New versions will have newer and different options so they must be evaluated as well as seeing if the older versions still work. Also, acceptable versions will depend to a certain extent on the software the institute is using to deliver educational material. Thus it makes sense to introduce a couple of categories for browsers. It is critical that a new browser is evaluated to make sure that it still supports the features required for the applications used for distance education. Consequently there must be an evaluation category

where new browsers are tested with current content. If no problems are found, then the browser can become part of the recommended category and be one of a number of suggested browsers for learners. Finally, there should be a maintenance category where older versions of browsers are listed. The maintenance category must ensure that as new versions of learner programs become available, the browsers are able to support the content and display it correctly. Keeping in mind the changes illustrated above, as hard as it is for an institute to keep up to date on software and driver versions and operating systems upgrades, it must be impossible for all but the most dedicated of learners. So it is critical to have an easy way for a user to check their system. Several organizations have adopted an automatic System Check that you can visit and which will check your system automatically. The one used at Memorial University is shown in Figure 1.

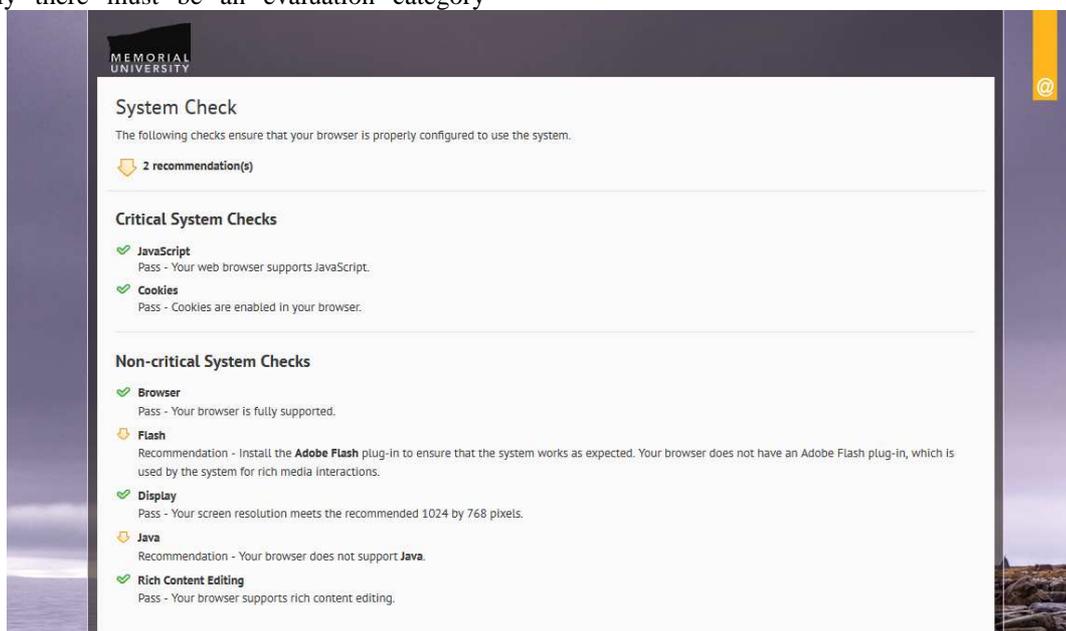


Figure 1 MUN System Check Website

By simply visiting a site the System Check is able to collect basic configuration information from a learner’s computer and then make recommendations about whether upgrades are needed or not.

4. CONTENT FORMAT

Content format refers to two different concepts. The first is the software that is used to develop the content; the second is the actual content that will be presented to learners.

In regards to the software, a distinction must be made between the Learning Management System (LMS) and the software used to create content. Some creation of content is possible using a LMS and this content then will by default adhere to the standards in the LMS. However there will be times when other material is necessary.

If the content is textual or image based, then the preferred standard would be to create it using any available tool, but then deliver it as a portable document format (commonly called a PDF). While still associated with the company Adobe, since 2008 the PDF has been an open standard published by the International Organization for Standards. It is well accepted, readily available and does not carry a cost for users who only wish to view files or produce simple PDF files. The authors have been using PDFs for 10 years and have found them to be flexible, of good quality and robust.

However, care must be taken with other software. While there is excellent learning software available, caution must be taken to ensure it is available to areas with limited bandwidth and if it contains any personal information (i.e. a student name or number or any student work) it must be secure.

The authors have made extensive use of MapleTA

to develop exercises and even tests and exams (Cross and Tucker, 2012). MapleTA does not require a great deal of bandwidth and there is an option in the case of assignments to print a hard copy of the assignment which the student can complete and then log back into the system and enter the solutions to the assignment. In addition, all work is done on the server so it is secure against unauthorized access or accidental loss.

It must also be noted that this is an interesting time in regards to trying to develop standards for the use of software. We are currently in the middle of a change in some fundamental ways content is displayed on the internet. At the present time there are two main programs used to display enhanced internet content: Flash by Adobe and HTML5 which is an open standard. They both do essentially the same thing (allow enhanced content such as video to be displayed on websites) but they do it in different ways. Currently Flash is used by the majority of program developers, but Apple does not support Flash and Microsoft has stated that they will no longer support Flash (the two companies produce 99% of the desktop operating systems). So the future appears to belong to HTML5, but keep in mind there are a large number of systems, machines and software that use Flash and older computer systems may not be able to use HTML5 but can use Flash. In fact, almost 40% of the world's desktop computers run Windows XP which can not by default support HTML5 (however it can be upgraded to show HTML5 based information). While this is a large number, it is not as daunting as it may seem since it is expected that this number will drop off fairly quickly now (Windows has stated that they will stop supporting XP next year). To summarize, Flash has been used extensively in the past but HTML5 seems to be the way to go for future development.

Probably the most important part of any distance education experience is the content of the course. This is especially so for training related to shipboard activities since all training must deliver content developed by IMO in addition to other requirements of the country and even the educational institute.

Obviously the initial content must present the information required by the certifying authority; however, there must be continuous checks done to ensure that the content is accurate and current. It is critical that there is a formal process in place to recommend and track changes in a course so people are always aware of what the current content is. In addition, there must be a mechanism to ensure that course changes are recommended by knowledgeable people and reviewed by some group not directly involved with those changes.

In the current information age, it is also critical to ensure that all source information for a course is identified and referenced. In general, this would require extensive documentation of information in an appropriately referenced format. Since we are discussing distance courses, electronic based resources are expected to form an important part of the required information.

Such sources should be linked to in a direct and easy to access format. It is also critical that these links are reviewed prior to the start of each course to ensure

that they still are valid links and direct the student to the correct information.

As well as web based resources, most courses will require more conventional references as well. Such references should be provided in a standard format (such as the American Psychiatric Association or APA format). Information that is based on an instructor's experience is appropriate and sometimes necessary content, but should clearly be indicated as such.

5. LEARNER MANAGEMENT SYSTEM

To facilitate distance education, the use of a Learner Management Systems (LMS) is recommended. Such a system provides a number of critical services that make the interaction between instructor and student more seamless.

One of the most important of these is security. Since there is personal information about students in the system (such as student contact information, grades and even medical information), such a system must be safeguarded against unauthorized access. Generally this means that only qualified people have access to the system and only the appropriate access for the function they perform. In addition, educational staff and faculty must ensure that the system remains secure. To ensure these only safe computers should be used for access, computerized student records should not be taken away from the educational site and there should be a policy of changing passwords on a regular basis.

Furthermore, appropriate backups must take place to ensure that curriculum material, as well as grades are not lost through a computer error (i.e. a computer crash) or an infrastructure failure (i.e. a fire at the institute). This is normally achieved through backup media being protected inside fireproof areas such as safes, but off site secure locations for storing backup data are becoming more common.

One of the advantages of distance education is that it can take place outside the regular educational institute timing. This is very beneficial to people who work on board ships since ship operations are completely removed from the educational timetable. Consequently, it is important for courses to be scheduled in a manner that is flexible enough to permit mariners to be able to start the course, fulfil all of the course requirements and finish the course given the wide and varied spectrum of schedules that mariners are subjected to. To be able to achieve this, course participants should be able to start the course within a flexible timeframe as opposed to an official course start date which is the norm. Similarly, participants should be able to complete all course evaluations and finish the course at times which would be dictated by their individual schedules and circumstances.

Another important aspect of a traditional education program is class attendance. While simple to do in a traditional class room setting it has been a problem for distance education – so much of a problem that most institutes just ignore it. However it is felt that attendance is an important metric so there should be some effort made to gauge student involvement and participation.

While systems can be established that monitor a student through things like fingerprint scanners or video monitoring, it is not recommended that this type of system be pursued. The cost of the technology involved, possible privacy issues and the fact that anyone with enough knowledge could work around the system makes this type of attendance problematic.

Instead it is recommended that the time that a student spends looking at a particular module or presentation be recorded and used to verify attendance. It is further recommended that presentations be created that require active participation from a learner at various points to ensure they are still watching. Such activity could be as simple as a click to progress type of response, or as sophisticated as asking a learner a material related question in order to gauge understanding as well as participation. Of course the ultimate gauge of attendance and involvement will take place when the student must write an exam.

6. INSTRUCTOR STANDARDS

In a way, instructor standards are one of the easiest categories to look at. After all educational institutes have been dealing with this issue ever since education was formalized. However, the introduction of the Manila Amendments (as well as providing guidance on distance education) has highlighted the importance of maintaining competency for seafarers through refresher training. This may require some additional requirements for officers

who keep watch as part of their instructional duties. In addition, as shipboard routines and technology changes, there will be a requirement for continual training of personnel. For example, ten years ago there was no course available dealing with Ship Board Security, but now it is a critical part of most Nautical Science programs.

At the core of any nautical education program are the ship officers who are experienced and able to communicate this experience to the learner. Thus it is critical for any program to have people who have worked extensively on ships. However, there may be others required as appropriate. For example, a Marine Engineering program can draw from professional engineers to teach some of the fundamental technical engineering course, or language majors for communications. All institutes have their own hiring process which should fulfil the above, but everyone involved in a program should also hold some teaching credential or equivalent experience dealing with students.

7. DEVELOPING A STANDARD

The above discussion has provided a description of what should be considered in a standard and the reason for its inclusion. However, it will be beneficial at this point to summarize items that would belong in a standard. This is done in Table 1, Standard Elements.

Table 1. Standard Elements

<i>Delivery Infrastructure</i>	Should take advantage of existing communications infrastructure (i.e. the Internet).
	Two options should be provided, one that is similar to traditional standards, the other that is oriented towards users with slow or intermittent connections.
<i>Receiving Technology</i>	Institutional support should be offered for computer operating systems that are still fully supported by the manufacturer.
	The user’s computer should be sound capable and have at a minimum XGA resolution.
	A system must be in place to monitor the changes to the web browsers used and identify older technology or systems that will not be supported.
	The information about the supported operating systems and web browser versions must be disseminated to the user in an easily understood manner. A site that automatically tests and makes recommendations regarding is ideal.

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<i>Content Format</i>	PDF files should be used where practical.
	Other software used should be robust and compatible with current versions of the hardware and software as discussed under receiving technology.
	Where programs are used for the delivery and evaluation of student work, such systems must be secure and robust.
	In order to support all users, content that is currently developed using Flash must also be capable of being developed using HTML5 and vice versa.
	Internet references should be checked for accuracy and relevance on an ongoing basis.
	Information not referenced from the internet should be referenced using an appropriate format such as APA.
<i>Learner Management System (LMS)</i>	A LMS should be used that provides a secure and convenient way to interact with students.
	Access is restricted to those who need it and only for the functions necessary to do their job. Passwords must be changed regularly and access from public computers be done with caution.
	A mechanism is available to track a student progress. Such progress would consist of the time spent viewing material as well as grading of information.
	A system is established that ensures backups are done on a regular basis (at least daily).
	Back up computer records are stored in a secure place that is reasonably safe from theft, fire or other incident.
	Course timing is flexible enough to allow people working at sea enough time to receive information and complete assignments.
<i>Instructor Standards</i>	Instructors must be experienced in their field of instruction.
	Instructors must have specific education or experience in the delivery of distance material.

8. THE MARINE INSTITUTE AND THE STANDARD

The Marine Institute has been involved with the development and delivery on distance material since 2000. A suite of online courses are being prepared for online delivery for ships officers that will permit them to advance in certification level with Transport Canada. The development and preparation of these courses incorporates the latest advances in online delivery methods and technology at the disposal of the MI, and the following highlights a sample of these elements intended to satisfy distance standard requirements.

8.1 Interactive Video Lectures

As outlined in their paper, Tucker and Cross (2013) employ online video lectures in Flash and HTML5 format as a means to present course material to students. When nested within an LMS, the video lecture will administer a quiz to students to ensure that they are

engaged and report to the LMS with learner performance.

It is intended that these form the foundation of the formal course delivery, but to permit learners to continue with their studies when internet access is limited or not available. It is the authors' intention to provide workbooks for study and practice examples that they can access which can be accessed using very limited internet bandwidth or printed for access when no internet connectivity is anticipated.

8.2 Desire 2 Learn (D2L)

The Marine Institute as part of Memorial University of Newfoundland uses an LMS entitled D2L as a primary resource in the delivery of all face to face, blended and online deliveries of courses administered at this university.

D2L is administered from a secure computer server and requires students to log into personal accounts to access any courses for which they are registered. Privacy

laws in Canada require that the highest levels of information security be maintained when personal data such as registration and individual course activity and performance are being recorded.

Such is the case in D2L where student activity such as communications and logs of accessing course material are recorded and saved. Computer servers housing such data are backed up to secure locations and protected from calamity such as fire or other damage.

Although recording attendance in a distance course delivery is not practicable, D2L does have a reporting facility where records of the details of student access to different course elements can be obtained. These details include which elements were accessed, the duration of access, total time accessing over multiple sessions and a variety of statistics analyzed over the course. From this reported data it is possible to extrapolate an index of student participation in the course and, subsequently, a rough correlation to the distance equivalent of attendance in a course.

8.3 Course Preparation

The preparation of material for a distance course is somewhat different than for a class delivered in a class room. As such, the Marine Institute has developed a set of guidelines that show what is to be expected in a distance course. This information is provided in a table in The Appendix and is relatively straight forward.

9. CONCLUSIONS

Standards are a common and necessary part of the marine industry. However there has not been much published on the development of standards that could apply to the delivery of distance education to the

mariner.

This paper has looked at the necessary elements that could go into forming a standard for the delivery of distance education for mariners. The actual elements that could form a standard are presented in Table 1. While the standards will change with country and institute it is felt that the above will serve as a solid starting point to build the required standard.

10. REFERENCES

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New Technological Alternatives for Enhancing Economic Efficiency

Appendix

The following checklist is used as a guideline in the creation of MI courses:

Online Course Element	Face-2-Face	Blended	Fully Online
Course Information			
• Intro & Welcome	✓	✓	✓
• Course Outline	✓	✓	✓
• Course Schedule (Class and online sessions - eLive)	✓	✓	✓
• Learning Objectives	✓	✓	✓
• Instructor (bio and contact information)	✓	✓	✓
• Office Hours (online or face-to-face)	✓	✓	✓
• Texts & Resources (required, recommended)	✓	✓	✓
• Evaluation (list and values)	✓	✓	✓
• Checklist of Activities & Assignments	✓	✓	✓
• System or Technical Requirements	✓	✓	✓
• Help and Technical Support (how to print, etc)	✓	✓	✓
• Link to the Library	✓	✓	✓
• Academic Integrity & Netiquette	Optional	✓	✓
• University Links: APA, Good Writing, Academic Dishonesty	Optional	✓	✓
Communications			
• Announcements	Optional	✓	✓
• Course Email	Optional	✓	✓
• Discussion Forums (for each Unit, Topic or Assignments)	Optional	✓	✓
• ELive! / Blackboard Collaborate	Optional	Optional	Optional
Student Feedback Opportunities			
• Course Evaluation Form	Optional	✓	✓
• Anonymous Discussion Forum	Optional	Optional	Optional
Content			
• For each Unit, Module, Chapter			
• Content organized by Unit, Module	✓	✓	✓
• Presentation Materials (PowerPoint with narration, ELive! Collaborate, etc.)	✓	✓	✓
• Instructor Notes (html, video, animations, etc)	Optional	Optional	✓
• Readings and Additional Resources (links)	Optional	Optional	✓
• Assignments	If applicable	If applicable	If applicable
• Self Assessment (Pre-Tests, post-Tests)	Optional	Optional	Optional
• Assignments, Labs, Quizzes, Exams			
• Assignments (description & instructions)	✓	✓	✓
• Assignment answer keys, general feedback	Optional	Optional	Optional
• Labs (description & instructions)	✓	✓	✓
• Lab answer keys & instructions	Optional	Optional	Optional
• Quizzes (list, dates, study details)	✓	✓	✓
• Quizzes offered online with feedback	Optional	Optional	✓
• Exams (list, dates, study details)	✓	✓	✓
• Exams offered online	Optional	Optional	Optional