

On a Lookout Beyond STCW: Seeking Standards and Context for the Authentic Assessment of Seafarers

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The Standards of Training, Certification and Watchkeeping Convention (STCW) amendments in 1995 intended to improve the knowledge-based training mandate established in STCW'78 by making it outcome-based. This required seafarer students undertake competence assessment (or outcome of training received) to demonstrate their capacity to perform tasks listed in the STCW Code. This necessitates that students direct their learning efforts to the attainment of clearly stated expectations that, typically, are represented by learning outcomes based on the STCW competencies. Maritime Education and Training (MET) providers working under the directives of the National Maritime Regulators interpret the STCW requirements to develop the seafarer training curriculum and the resulting learning outcomes, to assure that students attain the minimum standards of competence established by the STCW. This paper will review and argue that different ideas as to 'outcomes' has been confusing the interpretation of STCW and, therefore, how seafarer students are being assessed. Critically, a review of specific excerpts from the STCW Code will be used to show that the Code largely fails to provide a 'standard' that can assure assessment of seafarers to one of the most critical outcomes: the performance expected at a level of work in the industry. A short review of the inherent characteristics of authentic assessment is provided in justification of its use as an alternate and optimal solution to improve current assessment practices and respond to stakeholder needs. The paper will point to an evidence-based way forward where future research will empirically investigate how authentic assessment can improve the STCW and the resulting training outcomes.

Keywords: STCW, Outcomes, Criteria, Standards, Context, Authentic Assessment

1. Introduction

The International Maritime Organization (IMO) established the Standards of Training, Certification and Watchkeeping (STCW) Convention in 1978 (referred to as STCW'78) to provide global, minimum standards of competence for seafarers. Prior to STCW'78, individual countries established their own standards. However, STCW'78 did not prove to be as effective as expected due to criticisms from stakeholders that complained of vague and unclear standards left to the individual interpretations by maritime nations [16], which posed the risk of variation in the standards of competence development amongst international seafarers. To address these concerns and improve upon the training mandate, the STCW Code was revised with significant amendments in 1995 (referred to as STCW'95). Through the 1995 amendments, IMO intended to fundamentally improve the training mandate by making it outcome-based. This would require seafarers to demonstrate their competence in the tasks outlined in the STCW Code rather than just show they had acquired knowledge (as in STCW'78). Over the years STCW has been updated with various amendments (1997, 1998, 2004, 2006, Manila amendments 2010) to provide training and assessment guidelines to Maritime Education and Training (MET) providers and other stakeholders with an interest in developing the competence seafarers require at the workplace.

The STCW Convention developed the STCW Code which provides guidelines on what the seafarer student should know and demonstrate before being awarded with the Certificate of Competence (CoC). The CoC opens job opportunities and based on competence, becomes the basis for their recruitment, reward and promotions. The Code promotes specific assessment methods to collate evidence of demonstrated competence for the tasks listed in it. However, both competence demonstration and student assessments require explicitly stated 'intended outcomes' be achieved. The intention being to allow students to direct their learning efforts towards 'outcome' attainment and to

guide assessors on what they are supposed to measure via assessments. The Code provides guidelines for MET providers working under the directives of the National Maritime Regulators to interpret the STCW Code requirements and develop the seafarer training curriculum (with the intended outcomes) to assure that students can demonstrate the attainment of the minimum standards of competence established by the STCW Code.

This paper argues that the STCW Code fails to provide explicit guidelines and instead lays down vague statements which can encourage individual interpretations as to what benchmarks should guide competence assessment. If the benchmark falls short in the measure of essential, minimum, and required competence, graduating seafarers may lack the required competence to perform in a consistent manner in the workplace. This can be dangerous for the shipping industry where any regional weakness in assessment against the STCW Code has profound ramifications as it is an international industry where employees are sourced globally. The perceived oversight of the STCW Code continues into the lack of essential ‘criteria and gradations for the quality of performance’, and ‘context’, which can describe the student performance and contextualise the evidence of competence produced. Sub-standard evidence diminishes the value of the resulting CoC creating dissatisfaction among the concerned stakeholders, such as the employers [5, 6, 21, 23]. Supported by specific examples from the Code, basis will be laid to highlight the need for a review and improvement to the STCW Code as a standard with unambiguous, assessable outcomes. Additionally, a review of literature in the area of authentic assessment will be used to provide theoretical arguments in support of its use to address the inherent flaws in the STCW Code and improve upon the resulting training outcome.

2. Structure of the STCW Code for ‘standards’ for competence assessment

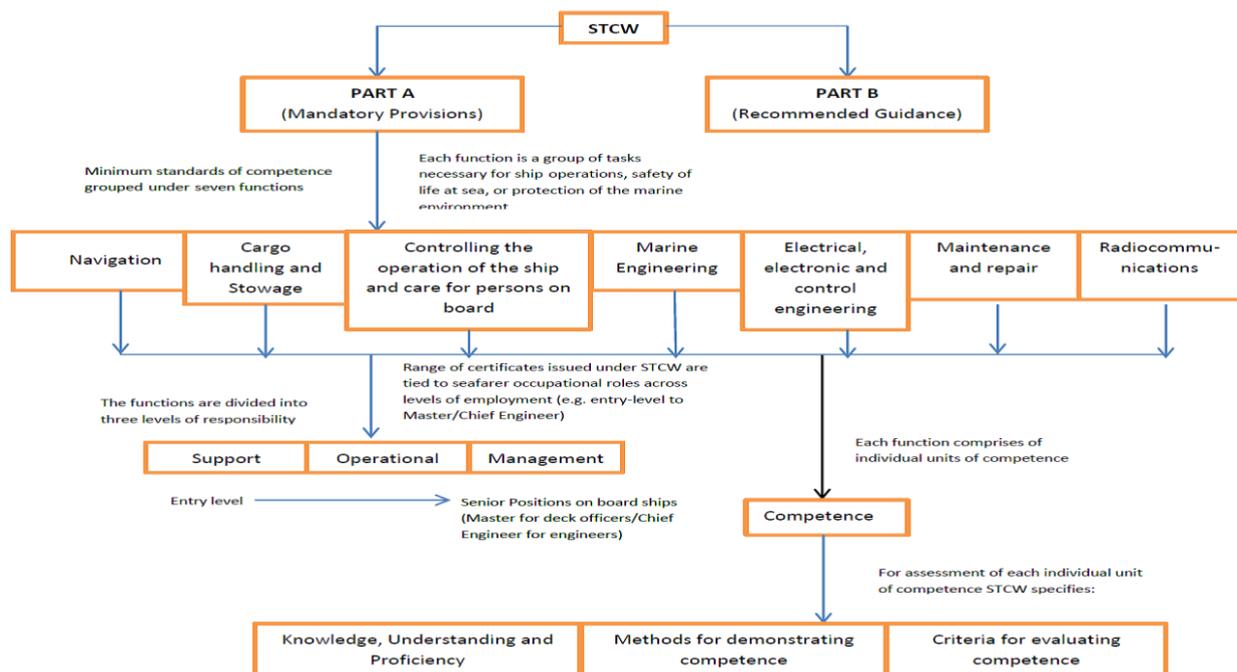


Figure 1: Standards of Competence and Assessment as laid out in the STCW Code

Figure 1 provides a snapshot of how the STCW Code is currently structured in providing ‘standards’ for competence assessment. As can be seen in the figure, the ‘standards’ are grouped under seven functions for the three levels of responsibility. Table 1 shows that under these seven functions, the competence for every individual task (or unit of competence), the Code specifies the minimum knowledge, understanding, and proficiency. The evidence of having achieved the required standard of competence is provided with the methods for demonstrating competence and the criteria for evaluating competence.

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Carriage of dangerous goods	<p>International regulations, standards, codes and recommendations on the carriage of dangerous cargoes, including the International Maritime Dangerous Goods (IMDG) Code and the International Maritime Solid Bulk Cargoes (IMSBC) Code</p> <p>Carriage of dangerous, hazardous and harmful cargoes; precautions during loading and unloading and care during the voyage</p>	<p>Examination and assessment of evidence obtained from one or more of the following:</p> <ol style="list-style-type: none"> .1 approved in-service experience .2 approved simulator training, where appropriate .3 approved specialist training 	<p>Planned distribution of cargo is based on reliable information and is in accordance with established guidelines and legislative requirements</p> <p>Information on dangers, hazards and special requirements is recorded in a format suitable for easy reference in the event of an incident</p>

Table 1: Example within the STCW Code stipulating the minimum standards of competence for assessment [24]

3. STCW lacks explicit guidelines for ‘outcome’ development

Assessment is a significant component of education along with learning and teaching as it provides feedback about a student’s progress and achievements, the effectiveness of the teaching and instruction methods, and the course outcomes [25] while supporting the overall goal of improving student learning [20]. One of the functions of assessment is also to gauge whether the student has achieved the desired outcomes that the learning tasks and teaching processes intended. These outcomes or more correctly ‘learning outcomes’, define what the students should be able to do at the end of a learning period [8]. The learning outcomes thus guide the teaching and instruction towards the assessable outcome. Hence, outcome statements should always precede assessments [29]. The outcomes should be explicitly stated to ensure that the appropriate assessment methods are adopted to produce the required evidence of outcomes achievement. For example, if the intended outcome is to develop a student’s professional competence to fight fires, then the evidence of such competence will be more credible and valid via practical demonstration and not just rely on written examinations. On the reverse side, if the outcome to be achieved was a students’ ability to recall the theory behind the cause of fires, written and oral examinations may be more appropriate than practical drills and exercises.

Although, the STCW Code is not a curricula or a source of learning outcomes, the ‘standards’ provided in its Code guide the MET providers (working under the regulatory bodies) to develop curricula with learning outcomes. However, Table 2 provides an example of how at times the ‘standard’ in the STCW Code can only be a ‘standard’ of what the students should know in terms of content with some suggested indicators of competence instead of providing ‘standards’ of demonstrated performance. This makes the STCW an input-based [4] standard, which is in direct contradiction to the ‘outcome-based’ objective of the STCW’95.

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Respond to a distress signal at sea	Search and Rescue Knowledge of the contents of the International Aeronautical and Maritime Search and Rescue (IAMSAR) Manual	Examination and assessment of	The distress or emergency signal

Lack of descriptive verbs

Lack of focus on ‘outcomes’ (e.g. standard of demonstrated performance) and more focus on ‘inputs’ (e.g. content coverage)

Lack of essential knowledge, skills and underlying competencies

Table 2: Extract from the STCW Code for the function of navigation at the operational level [24]

The word ‘respond’ represents an action word that provides some indication of what the students should be able to do but does not provide the reader with a ‘standard’ of how well they must do it. The task should be described with a verb that provides qualitative and/or quantitative descriptions of specific ‘performance standards’ expected from the students. Descriptive verbs can accurately describe the ‘action’ outcome expected during student assessments and ensure that the teaching and instruction process for students follow accordingly allowing them to learn and practice the required skills.

The ‘standard’ for demonstrated performance in the STCW Code should ideally also identify some of the essential knowledge, skills, and behavioural attributes required to perform the task at a professional level. It is because developing the professional competence to perform the task necessitates both cognitive ability to recall information (knowledge) and apply it (skills) based on analytical and critical thinking [19]. Underlying it are the principles, values, and attitudes (behavioural attributes) that are non-cognitive skills developed by the profession through historical experience that promote reflection and shape thought and prompt responses across a range of contexts [18]. However, Table 2 reveals that the STCW Code fails to identify such essential elements.

Lack of descriptive verbs that provide specific and measurable performance standards as well as a lack of essential knowledge, skills and behavioural attributes leave it to the discretion of the National Maritime Regulators and MET providers to develop them. This creates a risk of individual interpretation which in some cases may lead to subversion by low standards and expectations [29]. If MET providers set low expectations for their students that do not reflect workplace standards, the seafarer may hold a CoC but lack the required level of competence. This can prove dangerous for employers that trust such seafarers with ships worth millions of dollars putting the lives of other seafarers and passengers sailing on these ships and the marine environment at risk.

4. STCW lacks explicit ‘Criteria’ and ‘Standards for Criteria’

Driscoll and Wood [8] describe criteria as the essential qualities expected from a student’s performance that allows them to demonstrate and provide evidence of the achievement of learning outcomes. For example, in Table 3, the ‘criteria’ column identifies that an essential criteria for the ‘prevention, control and fighting of fires’ is the identification of the type and scale of the emergency.

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Prevent, control and fight fires on board	Fire prevention and fire-fighting appliances Ability to organize fire drills Knowledge of classes and chemistry of fire.....	Assessment of evidence obtained from approved fire-fighting training and experience.....	The type and scale of the problem is promptly identified..... Evacuation, emergency shutdown and isolation procedures are appropriate to the nature of the emergency.....

All the essential criteria for this task not identified and outlined

How soon is 'promptly'?

What does 'appropriate' mean and how can we measure it?

Table 3: Extract from the STCW Code for the function of controlling the operation of the ship and care for persons on board at the operational level (Master and deck department) [24]

However, Table 3 can also be used as an example to show that the STCW Code may overlook some of the other essential and necessary criteria required for performing the tasks listed. For example, the essential and mandatory criteria for donning and operating personal protective equipment for fighting fires are essentially missing from the 'criteria' column. Additionally, the column may also lack in providing a definitional glossary defining key words that shape assessment for the essential criteria. For example, the use of the words 'promptly' and 'appropriate' do not explain how 'quickly' or 'accurately' the task is to be performed. What is the measure that indicates competence as per workplace standards? Lack of measures may lead to vagueness for students and assessors on what is to be expected from the performance. The criteria should describe such words in measurable terms across a range of cultural and performance contexts, e.g. timeframes.

This would not mean that students who are unable to perform the task in the stated timeframe will be deemed incompetent. The criteria should be explained by a range of performance levels that provide a gradation of the quality of performance [1] or an accurate description of the current competence of the student in performing the task. For example, to perform the task identified as an essential criteria in Table 3 ('type and scale of the problem is promptly identified...') the gradation of the quality of performance could be written as,

Criteria	Standard 1 (Deemed insufficient to be declared competent at any level)	Standard 2 (Minimum required to be deemed competent at support level)	Standard 3 (Minimum required to be deemed competent at operational level)	Standard 4 (Minimum required to be deemed competent at management level)
Identify the type and scale of the problem	Type and scale of the problem identified in less than minutes of observation or when made aware of	Type and scale of the problem identified in less than minutes of observation or when made aware of	Type and scale of the problem identified in less than minutes of observation or when made aware of	Type and scale of the problem identified in less than minutes of observation or when made aware of

Table 4: Example of how the STCW Code could define the gradations for the quality of student performance

Explicit 'criteria' and 'gradations of the quality of performance' expected from students are essentially missing from most of the tasks described in the STCW Code.

5. STCW lacks explicit ‘Contexts’

Forneris and Peden-McAlpine [9] define context as the foundation upon which a learner’s knowledge is constructed in an environment that includes culture, underlying assumptions, previous knowledge, facts, rules and principles. Statement about students’ performance made in the specific context in which the assessment was carried out, may inform stakeholders whether competence developed can be directly transferable to workplace or not. For example, the competence to plot a ship’s position on a hydrographic chart using GPS data in a classroom may be directly transferable to the workplace (termed as transferable skills), whereas the competence to manoeuvre a vessel which was developed in a simulator may not (termed as non-transferable skills).

Table 5 shows that the STCW Code provides the ‘methods for demonstrating competence’ but does not explain the contexts in which such demonstration should be carried out. For example, in the case of ‘approved in-service experience’, should the evidence of competence be collated when the vessel is at sea, at anchor or alongside a port? Should the watchkeeping be done alone or under observation of an onboard assessor? Similarly, the Code does not explain what kind of simulations the simulator should create to obtain reliable evidence of competence. Should the simulated scenarios comprise of other ships to assess the students’ competence to apply the relevant theoretical knowledge?

Lack of context in suggested assessment methods			
Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Establish watchkeeping arrangements and procedures	Thorough knowledge of content, application and intent of the International Regulations for Preventing Collisions at Sea.....	Examination and assessment of evidence obtained from one or more of the following: .1 approved in-service experience .2 approved simulator training, where appropriate	Watchkeeping arrangements and procedures are established and maintained in compliance with international regulations.....

Table 5: Extract from the STCW Code for the function of navigation at the management level [24]

In an ideal world, educational institutes would exactly replicate workplace situations as the skills developed could then be directly transferred to the professional world. However, due to the complex nature of the ship as a workplace, it may be difficult for MET providers to recreate exact workplace settings. In such cases, assessments should be designed to contextually resemble situations likely to be faced by students in the real world, thus making it apparently ‘real’ rather than apparently artificial [7]. For example, to demonstrate their ability to manoeuvre ships, seafarer students may find simulators more ‘real’ than a decontextualized environment of a classroom. However, the context in which the assessment is carried out should be clearly defined. Although, the evidence produced from such assessments will not be an accurate reflection of professional competence, it will provide a contextual evidence of competence. Such evidence informs the concerned stakeholders (e.g. employers) about the gaps in the knowledge and skills between those that have been covered and assessed through learning outcomes and transferred to the workplace, and those that can only be truly acquired in the employers’ context.

Certainty as to expectations and the actual standard of performance for a graduating student is essential. The STCW Code should explicitly describe the contexts, under which the students’ ability to perform the tasks should be assessed. A lack of descriptive contexts may lead to assessors using their individual interpretation in creating contexts for assessments. Different contextual scenarios and varied contextual evidence will complicate matters for the employers and training providers intending to fill the gap. Individual training needs would have to be determined for the employees, which in

some cases, may lead to extra training costs and loss of time. Costs of additional training are often borne by the employer [13]. Although employers have training obligations for preparing their employees for specific types of vessels, costs borne for aimless training should be avoided as it can cause a significant impact on the employers' budgets and timelines.

6. Why the STCW needs 'Authentic Assessment'

Although it is imperative that the attention of the IMO is drawn to the inherent flaws of the STCW Code to enable its revision, such processes cannot be expedited. The IMO provides a critical 'safety net' and has a well-established process whereby revisions occur due to the global nature of seafaring. Nevertheless, revisions are required. However, the current focus should be on addressing the issue of the STCW Code failing to provide explicit guidelines to the MET providers and the regulatory bodies for developing learning outcomes that is standardized globally. Interpretation of vague guidelines left to the discretion of the individual parties may cause teaching, learning, and assessment process to vary widely on a global scale leading to inconsistencies in the development of competence level of seafarers. One solution that can be explored to address this problem is the use of authentic assessment methods.

The examples of excerpts from the STCW Code provided in this paper suggest that the Code lacks guidelines for the development of outcomes that can enable students to develop the necessary skills to perform to workplace standards. Authentic assessment tasks are uniquely characterised by tasks contextual to the workplace situations [14] that will replicate the complexities and challenges students will confront in the real world [10]. Performing tasks with strong figurative contexts and fidelity to ship-based scenarios will develop the necessary transferable skills to a higher level of reliability and validity than completely decontextualized scenarios, which may be currently permitted by the STCW Code. Due to the complexity in exactly recreating a ship-based environment, authentic assessment tasks used in seafarer education may only have contextual resemblance to workplace scenarios. Hence, some of the skills developed may not be directly transferable to the real world. However, authentic assessments provide opportunities for students to frequently reflect [15] on their work to recognize gaps in their knowledge and grasp cues for enhancing transfer of context free transferable skills and domain specific non-transferable skills [28].

Students cannot develop workplace skills by a one-off performance in authentic assessments. To perform to workplace expectations and develop the skills, students should be provided with prior opportunity to practice the skills under guided instruction and teaching. Authentic assessments have been characterised to not only guide the assessment process but also be designed to be a continuous process integral with the learning and teaching, which will allow students to practice skills till they reach the required level of competence [2]. Gulikers, Bastiaens, and Kirschner [11, 12] suggested a five-dimensional framework (the assessment task, the physical context, the social context, the assessment result or form, and the assessment criteria) for designing authentic assessment with pertinent questions being framed to consider different dimensions. The framework requires the 'task' that represents professional practices be explicitly defined. It compels assessors to think about the outcome and the required evidence that has to 'result' from or 'form' the basis for the assessments. Such a framework for authentic assessment that requires explicit description of the task to be performed by the student, and the evidence that reflects the level to which it was performed, may provide the contextual evidence that is not currently promoted by the STCW Code.

The framework also requires description of contexts (physical and social) under which the task is to be performed. Explicit descriptions of contexts under which student assessments should take place are essentially missing from the STCW Code. Physical and social context description for authentic tasks should ideally reflect how closely the assessment resembles the professional world [11]. For example, students should not only have access to resources normally available to them on ships during tasks but the resources should be applied to reflect the way knowledge, skills, and underlying competencies will be used in the real world. Students' are then assessed on their ability to integrate different competencies that may develop their critical thinking and higher order cognitive skills [26]. Such

assessments are a move away from examinations that only require memorized responses to questions. Ability to memorize is a lower level cognition which is not sufficient for performing in workplaces such as ships, where a higher level of cognition is required to assimilate, analyse, and structure [27] information for decision making and problem solving. Seafarers who are trained to rely on memory and not to assimilate and analyse the available information to deal with routine or novel situations in the context of the work environment, may suffer from memory failure leading to human errors [22].

Finally, the framework designed by Gulikers et al. [11] focuses on designing the assessment criteria. 'Criteria' in this case refers to the basis on which the evidence of student work produced from the assessments, is judged. Setting the assessment criteria may also guide the learning process as the seafarer students will have a clear understanding of what is expected during the learning process and during their assessments. In authentic assessments, students have access to the performance criterion (reflecting workplace requirements) beforehand [17] for them to aim for the desired level of performance, ensuring that they possess at least the minimum competence level essential for the workplace at a particular level of responsibility. Designing the assessment criteria will require identification and outlining of essential qualities (or underlying competencies) expected from a student during the task performance. Additionally, it will also require describing levels that can define the different gradations of quality of performance. Such requirements are currently lacking and not promoted by the STCW Code.

7. Conclusion and the Way Forward

The STCW Convention led to the development of the STCW Code to provide global, minimum standards of competence for seafarers. The 'standards' were expected to act as guidelines for regulatory bodies and MET providers worldwide to develop consistent and uniform training outcomes. However, the paper argues that the STCW Code is too vague and this may lead to individual interpretation in adopting learning and assessment processes towards competence development, which creates the risk of seafarers graduating with CoCs but lacking the required competence for workplace operations. The seafaring industry sources its employees globally and cannot afford to operate under such risks. Based on the review of the selected excerpts, the STCW Code gives the impression of being an input-based education system and not an outcome-based as it was originally intended to be. An input-based system may prove to be regressive for the seafaring industry due to its focus on curriculum and content coverage and not on the appropriateness, learning and assessment, or the attainment of the desired competence outcomes by the student. Graduates may be assessed as competent but lack the necessary attributes making it a point of risk for employers and governments relying on MET providers to deliver seafarers that meet the required standard.

Based on a brief review of some of the past literature on authentic assessment, this paper suggests it as one of the possible solutions to address the discussed weaknesses of the STCW Code. Although the review is not comprehensive of all the literature, the paper discusses the ideas of major authors on authentic assessments, such as Wiggins [28], Gulikers, Bastiaens and Kirschner [11, 12] and Herrington, Reeves and Oliver [15]. Based on their ideas, it is suggested that assessment tasks that contextually resemble real world situations may not only engage students in learning but also assist in the development of skills which may be directly transferred from MET environment to workplace settings. For non-transferable skills, it is suggested that authentic assessment may allow assessors to contextualise the competencies of the seafarers. This would allow stakeholders to identify the gaps, if any, between competence developed in educational settings and those required at the workplace, to be filled with additional training. In the absence of such contextual evidence, any additional training provided to employees is a 'risk accepting' behaviour that is more about 'hope' than assurance that a standard of performance has been obtained. However, further investigations requiring collection of empirical data is needed to substantiate theoretical claims stating that authentic assessment may improve the STCW training outcomes and the resulting training mandate.

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