FROM DIPLOMA TO DEGREE: EXPERIENCES, CHALLENGES AND OPPORTUNITIES

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Abstract. This paper explores some of the issues faced by the staff and students of the Australian Maritime College (AMC) as its seafaring qualifications program was changed from an Advanced Diploma program to a degree pathway. The work is based upon the recent experience of migrating this program as well as the feedback received from students, staff and the maritime administration.

For many years the Australian tertiary education system has been operated in two distinct sectors – the vocational education sector and the higher education sector. Seafaring qualifications are delivered and assessed either through the relevant maritime 'training package' or through an approved higher education pathway. The AMC had, since its formation in the 1980's, utilised the higher education route to its international seafaring qualifications. Following integration with the University of Tasmania in 2008, AMC conducted a review of its programs and determined to deliver the seafaring qualifications though a maritime degree program in preference to the Advanced Diploma used hitherto. The paper considers the Australian education environment with an emphasis on the different approaches to competency and the application of Bloom's taxonomy, which classifies learning objectives into cognitive, affective, and psychomotor domains, in a competence framework. The rationale for the change to a degree, in the context of Australian education is then explained.

Finally, the paper concludes by considering what this has meant for the student learning experience including the use of research/project-based approaches to parts of the syllabus and the enhanced role of simulators in a degree framework for both teaching and assessment. It also reports on the broader views of students and the marine administration.

Key words: MET degree, educational issues, training, qualifications

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1 INTRODUCTION

Up to the 1970s, maritime education and training (MET) for seafarers in Australia was primarily focused on helping them pass exams set independently by national or state marine administrations. During that decade some sea service remission was granted to students by the marine administration when they successfully completed approved courses and associated assessments. A further development gave successful students exemptions from some of the 'non-critical' certificate of competency exams. The advent of the Australian Maritime College (AMC) in 1980 brought further, more significant changes. Courses were now incorporated into the national higher education system, accredited as diplomas and approved by the marine administration. When a course was successfully completed, graduates with the requisite sea service were now only required to pass the marine administration's oral exam before gaining their certificate of competency. [1] This approach remained fundamentally unchanged until the AMC integrated with the University of Tasmania in 2008. It then conducted a review of its programs and determined to deliver the seafaring qualifications though maritime degree programs in preference to advanced diploma programs.

The Australian tertiary education system has two distinct sectors – the vocational education sector (VET) and the higher education (HE) sector. Programs leading to seafaring qualifications can be delivered and assessed through either sector. The VET sector utilises the national maritime training package approach whilst HE utilises the Australian Qualifications Framework (AQF) approach followed by universities. Programs in both sectors must include the competencies listed in the International Maritime Organisation's (IMO) Standards of Training, Certification and Watchkeeping (STCW). To ensure compliance the Australian Maritime Safety Authority (AMSA), the national maritime administration, approves educational institutions allowed to offer programs leading to seafaring qualifications.

In migrating seafarer programs from diplomas to degrees a number of educational challenges and opportunities arose.

2 EDUCATIONAL ISSUES

Two of the major challenges faced in migrating seafarer programs from diplomas to degrees were:

– Fitting the different approaches to competencies taken by STCW and national training packages to the requirements of AQF, and

– Taking advantage of changing education paradigms to improve program delivery

2.1 Competencies

STCW was first written in 1978 and has been revised seven times. The 2010 Manila Amendments attempted to update the convention but the last major revision was in 1995 some twenty years ago. It is a fact that shipboard practices and technology move far faster than the process of updating STCW thus some competencies remain obsolete, inappropriate, or inadequate to deal with modern technology and practices. Appendix 1 illustrates the form of competencies contained in STCW. [2]

STCW provides a framework that must be used to design education and training schemes to develop competent seafarers. Although STCW has some flexibility, interpretations tend to be conservative, consequently MET has been relatively slow to incorporate the learning and teaching changes which continue to sweep through education in general.

A different approach to describing competencies is taken in the national training packages which are developed by Australian Government funded Industry Skills Councils (ISCs). The website Training.gov.au has been developed for the VET sector and is the official source of information on training packages, qualifications, accredited courses, units of competency, skill sets and Registered Training Organisations (RTO). [3]

As an example, the Maritime Training Package for the Advanced Diploma of Maritime Operations (Master Unlimited) contains 26 units of competency; each unit contains a small number of Elements each having a number of performance criteria. [4] Appendix 2 illustrates the form of competencies contained in training packages.

The Australian Qualifications Framework (AQF), which is the national policy for regulated qualifications in Australian education and training takes yet another approach to describing competencies. [5]

"The organising framework for the AQF is a taxonomic structure of levels and qualification types each of which is defined by a taxonomy of learning outcomes.

… The AQF levels define the relative complexity and depth of achievement and the autonomy required of graduates to demonstrate that achievement. …

Each level/qualification type is defined by a descriptor expressed as learning outcomes. The learning outcomes are constructed as a taxonomy of what graduates are expected to know, understand and be able to do as a result of learning." [6] Appendix 3 illustrates the form of competencies contained in the Australian Qualifications Framework.

It is a significant challenge to incorporate the competencies of STCW, national training packages and the AQF into the design of a new degree program.

2.2 Changing educational paradigms

Significant changes to education and training include the move away from teacher centred to student centred learning, the rise of lifelong learning, the provision of courses on demand, the global market for education, and the technology juggernaut which has made information available on demand and provided the capability to deliver courses anywhere/anytime

Change creates challenges and opportunities for all education and training providers, including MET, but MET has been relatively slow to uptake technology advances for learning, teaching and assessment, and use the full range of delivery techniques such as distance education, blended delivery, E-learning etc. This is due to factors such as conservative attitudes and resistance to change, MET's traditional teacher centred approach to learning, and lack of on-board internet access. For example; in late 2013 the Australian internet usage penetration rate was 87% but only 12% of seafarers on cargo ships had freely available internet access and 65% had none at all. [7]

One of the ways to improve the learning experience and overcome some of the conservative attitudes has been to promote the greater use of Bloom's taxonomy. The taxonomy is a classification of the different learning objectives that educators set for students. It divides objectives into three domains: cognitive, affective, and psychomotor (sometimes loosely described as knowing/head, feeling/heart and doing/hands respectively). Within the domains, learning at the higher levels is dependent on having attained prerequisite knowledge and skills at lower levels. A goal of Bloom's taxonomy is to motivate educators to focus on all three domains to create a more holistic form of education. [8]

In the past, Certificates of competency were about knowing rather than doing, were valid for any ship anywhere and were assessed by written and oral exams. This is no longer the case. Competence is about doing (effectively, efficiently, and safely) all the time with an acceptable level of accuracy. Using variants of Bloom's taxonomy helps educators to properly describe and assess learning objectives (competencies).

3 THE IMPACT OF MIGRATING TO A DEGREE PATHWAY

In the move to an undergraduate route to the qualifications there were a number of important factors evaluated by the course team and discussed with both internal and external stakeholders. These factors are discussed in more detail below and included:

- The schedule of delivery of the units
- The delivery style of the units and in particular the classroom contact
- Assessment methodologies
- Recognition by the marine administration
- Compliance with AQF
- Impact on students

3.1 The schedule of delivery of the units

AMC has, since its inception, adopted a schedule of course delivery that reflects the perceived need of the industry stakeholders in preference to the usually less flexible academic calendar often demanded by universities and colleges. In particular this has meant delivery in short blocks with units delivered discretely
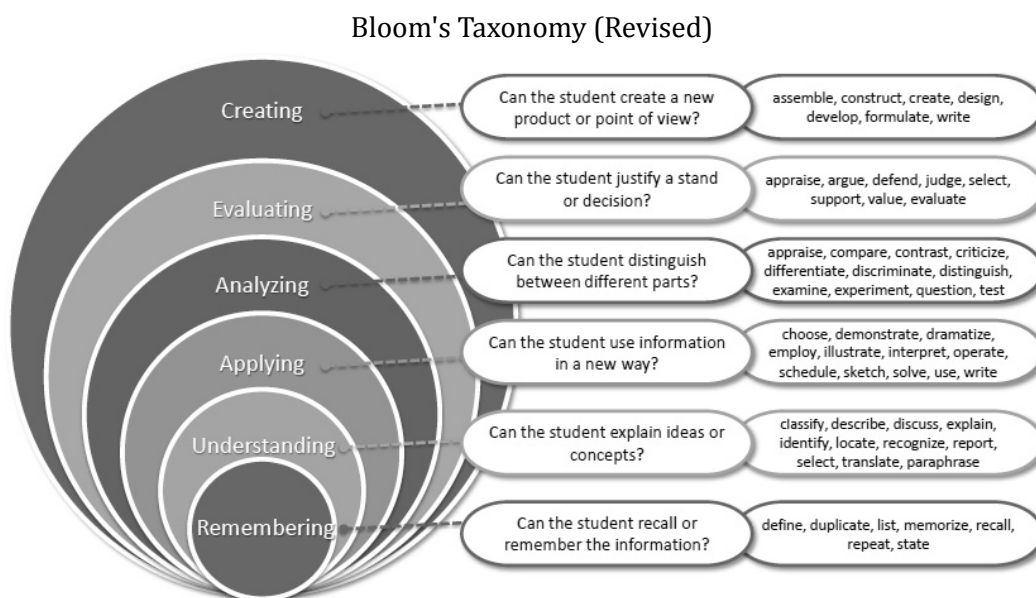
Bloom's Taxonomy (Revised)

Figure 1 One form of Bloom's taxonomy [9]

rather than longitudinally. Ensuring study in one area was not dependent upon success in a previous unit helps ensure maximum flexibility and accessibility for the students proceeding ashore from periods embarked their vessels.

Taking the Deck Watchkeeper diploma course as an example: prior to the inception of the degree, AMC delivered this course in three blocks of equal duration during the course of the year. Students were required to complete two blocks to cover all the units. Such an approach illustrated below allowed the students to enter at any of three entry points and they could complete their studies in one period of attendance or split their studies with a break (usually spent at sea).

The move to the degree program resulted in a comprehensive review of the contents of each unit and a careful evaluation of load. For both funding purposes and to match university policies an effort was made to align the content of each academic subject to the load required for a standard academic unit of study (one eighth of a year of study or 0.125 of a typical academic year). This review led the course team to re-align some content and the result was 12 units to cover the required syllabus. Finally the course team took this academic evaluation and in consultation with industry and regulators devised a rhythm of delivery shown below.

In fact the result was a course that offered greater flexibility of access to the students meeting both their needs and those of the sponsoring employer.

3.2 The delivery style of the units and in particular the classroom contact

One of the features of the diploma program, and indeed other professional or vocational subjects, is often a strong emphasis on the teacher being at the centre of the learning process and a desire on the part of all in the learning process that all relevant material should be covered in the four walls of the classroom.

Consistent with this approach, the AMC, like many other maritime training institutions hosted a typical time-tabled week of 30 hours per student – all of it in class or laboratories. This was felt to be inconsistent with the characteristics of a degree program and student centred learning, and work was undertaken to develop different delivery techniques. In particular the delivery team sought to make the student the centre of the learning process by:

- Better use of the University on-line learning platform 'MyLo'
- Greater use of directed reading
- Updating of the learner guides
- Greater use of tutorials for reviews, discussions and feedback
- Increased use of simulation and practical activities

3.3 Assessment methodologies

The assessment of candidates for competence and the underpinning knowledge required in support of that competence is particularly important. Students learn in a variety of ways often at a different pace to one another. But the assessment is one that must be undertaken by all and in a manner usually of the choosing of the lecturer. In a block of delivery a typical assessment profile of the Diploma program was a single assignment piece of work to be undertaken and then a final examination conducted under traditional closed book conditions.
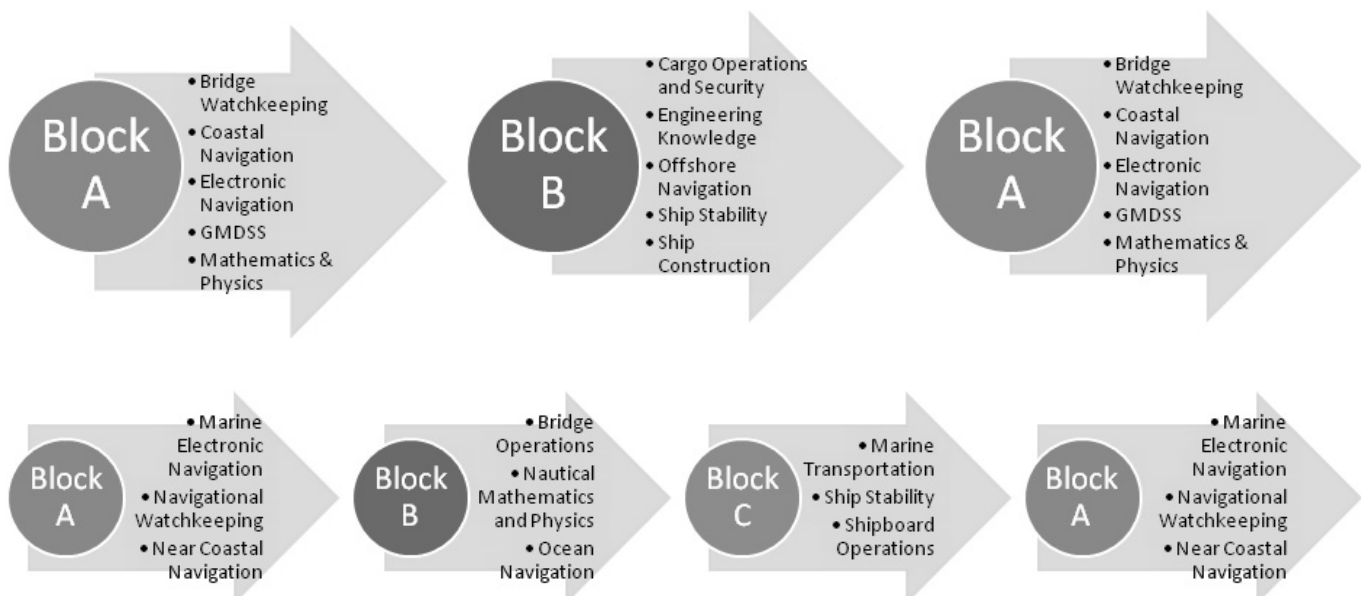
The move to the degree meant the course teams had to determine if such a regime would be appropriate for the future and whether or not it encouraged the graduate attributes expected by a university and met the expectations of a learning taxonomy and in turn the AQF. In most circumstances it was determined a modification to the assessments would be required. At the time of writing this is an area of ongoing improvement but the main aim has been to encourage the students to adopt those higher-order skills that reflect a *graduate* rather than a *diplomate*. They are expected to be more analytical in their response and to be more reflective of their own learning. This can be achieved by more incisive questioning in examinations, expecting more detailed responses to questions and also assessments requiring students to report back on their own learning during a particular activity.

3.4 Recognition by the marine administration

As part of the stakeholder engagement, AMC entered discussions with a number of companies but, perhaps more importantly ensured that the national regulator AMSA were fully engaged and consulted.

Recognising that the existing diploma programs have long-standing approvals AMSA sought re-assurance that the previously approved content was (as a minimum) covered in the revised delivery arrangements. At the same time it was recognised that Australia works in a complex regulatory framework and AMSA took the opportunity to require that AMC demonstrate compliance with both the latest amendments to the STCW Convention as well as the maritime training packages covering this area. This compliance exercise was conducted through a comprehensive mapping exercise in which all areas of the STCW code and the training package were checked against the learning content of the degree programs. The matrices developed though this exercise remain an important source of reference that helps ensure all areas are covered and that each is delivered at the appropriate level – Operational or Management.

Appendix 4 illustrates the form of matrix developed as a result of the mapping exercise.

3.5 Compliance with AQF

As identified earlier in the paper, the AQF establishes for each level the learning outcome criteria appropriate for the qualification award. A Bachelor degree is established as an AQF Level 7 award (See Appendix 3) and describes the requirements for the learning outcomes in terms of:

– Knowledge

– Skills

– Application of knowledge and skills

The development work and implementation of the degree criteria ensured that the course delivery and assessment would determine whether or not the candidate met these requirements.

A development matrix was established whereby the generic learning outcomes required by AQF were mapped to the course delivery. As an example:

Knowledge required by AQF:
Graduates at this level will have broad and coherent theoretical and technical knowledge with depth in one or more disciplines or areas of practice.

Subject Area: Navigation

In the field of navigation candidates are assessed in all three years if their studies.

In Year 1 the focus is on the fundamentals of navigation.

By Year 2 the work becomes more specialised looking at Electronic Navigation systems, Coastal Navigation and Ocean Navigation.

The theoretical and technical knowledge is developing each year and in Year 3 the candidate is able to demonstrate the "depth" through the Command Navigation module and the unit of Command Operations.

In each case a comprehensive mapping exercise determined the assessment methodology selected from:

– Formal examination

– Assignment

– Practical assessment

– Class test

The intensity or depth was usually determined by the year of delivery and reflected whether the responsibilities of the task lay at the Support; Operational or Management Level, with the management level requiring the deepest level of theoretical and technical knowledge.

4 THE IMPACT ON STUDENTS

History will judge whether the move to a degree pathway from the diploma was successful but for the moment this paper will conclude with some remarks on feedback from the students and whether or not such a significant change was important to them.

The feedback at the moment is mixed and trends along the lines of career expectations. In this sense the students can be grouped into three broad categories each of whom view the program changes in a different light. The groups are:

Traditional cadet and junior officers progressing through a 'deep-sea' career to a Class 1 Certificate of Competency. To these students the award of a degree is seen as a positive thing. It aligns a period of study with the award of a degree and makes their studies more rec-

ognisable when considered alongside their own genera-
tion of school-leavers. The perception is that when they
move to a second or subsequent career choice then be-
ing a graduate will stand them in better stead than hold-
ing just a Diploma.

The second group that values the changes are over-
seas students. Having been selected for a specialised
pathway of study the question that often vexed them
and their employers was how to make sure these pro-
fessionally qualified students were not disadvantaged
from their peer age group who may have studied for a
degree in their home country or overseas. Particularly
in the Middle East, the award of a degree is highly val-
ued and career opportunities may be limited to those
holding a lower qualification.

Finally there is a group of mariners, typically from a
coastal or fishing background seeking to upgrade their
professional qualification to allow service in foreign-
going ships engaged in the offshore oil and gas sector
particularly the North-West shelf of Australia. For this
group the award of a degree held little or no signifi-
cance. They are already embarked on a second or third
career and their principal interest is getting a senior
certificate of competency as quickly as possible.

Whilst the paper describes one recent initiative and
its associated challenges and opportunities, the future
is certain to provide many exciting opportunities for
MET. When will we see:

– the first massive open online MET course (MOOC)
  aimed at unlimited participation and open access
  via the internet?

– virtual reality apps which allow MET students to
  experience a wide range of shipboard tasks without
  actually stepping aboard ship?

– simulation used to assess the competence of seafar-
  ers and perhaps reduce sea service requirements?

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APPENDIX 1 IMO STCW COMPETENCIES

Example: *Table A-II/2*

Specification of minimum standard of competence for masters and chief mates on ships of 500 gross tonnage or more
Function: Controlling the operation of the ship and care for persons on board at the management level

Column 1	Column 2	Column 3	Column 4
Competence	**Knowledge, understanding and proficiency**	**Methods for demonstrating competence**	**Criteria for evaluating competence**
Control trim, stability and stress	Understanding of fundamental principles of ship construction and the theories and factors affecting trim and stability and measures necessary to preserve trim and stability Knowledge of the effect on trim and stability of a ship in the event of damage to and consequent flooding of a compartment and countermeasures to be taken Knowledge of IMO recommendations concerning ship stability	Examination and assessment of evidence obtained from one or more of the following: .1 approved in-service experience .2 approved training ship experience .3 approved simulator training, where appropriate	Stability and stress conditions are maintained within safe limits at all times

APPENDIX 2 NATIONAL TRAINING PACKAGES COMPETENCIES

Example: Advanced Diploma of Maritime Operations (Master Unlimited) 6 June 2013 (26 units of competency)

MARA6001A Unit Descriptor

This unit involves the skills and knowledge required to control trim, stability and stress within safe limits at all times on a vessel 500 gross tonnage or more.

Packaging Rules

Core units		
Field		
A Handling Cargo and Vessel Stability	MARA3001A	Contribute to safe cargo operations on liquefied gas tankers
	MARA3002A	Contribute to safe cargo operations on oil and chemical tankers
	MARA6001A	Manage stability of a vessel 500 gross tonnage or more

Elements and Performance Criteria

Elements describe the essential outcomes of a unit of competency	Performance criteria describe the required performance needed to demonstrate achievement of the element. Assessment of performance is to be consistent with the evidence guide.
1 Manage vessel trim under normal operating conditions	1.1 Stability analysis and weight distribution planning are conducted at a time frequency and scope appropriate to the proposed nature of the voyage and vessel operation
	1.2 Weight distribution is arranged to maintain vessel within acceptable stability limits for the anticipated operational situations likely to be experienced during the voyage
	1.3 ***Calculations*** are made to determine the draught and centre of gravity of vessel after adding, removing or shifting weight
	1.4 Factors affecting the stability and trim of vessel are identified and allowances are made in calculations
	1.5 Trim, draughts and list of vessel are controlled as required to ensure they are suitable to progress all anticipated vessel operations

Required Skills and Knowledge

Required Skills
• Apply IMO recommendations concerning vessel stability
• Determine stability and trim requirements for docking or slipping the vessel
• Determine the effect on trim and stability of vessel in the event of damage to and consequent flooding of a compartment, and countermeasures to be taken
Required Knowledge
• Causes and repercussions of a heeling vessel
• Effects of density of sea water on the draught and freeboard of a vessel
• Features of the load-line and draught marks of a vessel and procedures for carrying out related calculations
• Typical problems related to the control of trim and stability for vessels of 500 gross tonnage and more

APPENDIX 3 AQF COMPETENCIES COMPARISON OF AQF LEVEL 6 AND 7 CRITERIA

Criteria	Level 6	Level 7
Summary	Graduates at this level will have broad knowledge and skills for paraprofessional/highly skilled work and/or further learning	Graduates at this level will have broad and coherent knowledge and skills for professional work and/or further learning
Knowledge	Graduates at this level will have broad theoretical and technical knowledge of a specific area or a broad field of work and learning	Graduates at this level will have broad and coherent theoretical and technical knowledge with depth in one or more disciplines or areas of practice
Skills	Graduates at this level will have a broad range of cognitive, technical and communication skills to select and apply methods and technologies to: • analyse information to complete a range of activities • interpret and transmit solutions to unpredictable and sometimes complex problems • transmit information and skills to others	Graduates at this level will have well-developed cognitive, technical and communication skills to select and apply methods and technologies to: • analyse and evaluate information to complete a range of activities • analyse, generate and transmit solutions to unpredictable and sometimes complex problems • transmit knowledge, skills and ideas to others
Application	Graduates at this level will apply knowledge and skills to demonstrate autonomy, judgement and knowledge defined responsibility: and skills • in contexts that are subject to change • within broad parameters to provide specialist advice and functions	Graduates at this level will apply knowledge and skills to demonstrate autonomy, well-developed judgement of knowledge and responsibility and skills • in contexts that require self-directed work and learning • within broad parameters to provide specialist advice and functions

Specifications	Advanced Diploma	Bachelor Degree
Purpose	The Advanced Diploma qualifies individuals who apply specialised knowledge in a range of contexts to undertake advanced skilled or paraprofessional work and as a pathway for further learning	The Bachelor Degree qualifies individuals who apply a broad and coherent body of knowledge in a range of contexts to undertake professional work and as a pathway for further learning
Knowledge	Graduates of an Advanced Diploma will have specialised and integrated technical and theoretical knowledge with depth within one or more fields of work and learning	Graduates of a Bachelor Degree will have a broad and coherent body of knowledge, with depth in the underlying principles and concepts in one or more disciplines as a basis for independent lifelong learning
Skills	Graduates of an Advanced Diploma will have: • cognitive and communication skills to identify, analyse, synthesise and act on information from a range of sources • cognitive and communication skills to transfer knowledge and skills to others and to demonstrate understanding of specialised knowledge with depth in some areas • cognitive and communication skills to formulate responses to complex problems • wide-ranging specialised technical, creative or conceptual skills to express ideas and perspectives	Graduates of a Bachelor Degree will have: • cognitive skills to review critically, analyse, consolidate and synthesise knowledge • cognitive and technical skills to demonstrate a broad understanding of knowledge with depth in some areas • cognitive and creative skills to exercise critical thinking and judgement in identifying and solving problems with intellectual independence • communication skills to present a clear, coherent and independent exposition of knowledge and ideas
Application	Graduates of an Advanced Diploma will demonstrate the application of knowledge and skills: of knowledge • with depth in areas of specialisation, in contexts subject to change and skills • with initiative and judgment in planning, design, technical or management functions with some direction • to adapt a range of fundamental principles and complex techniques to known and unknown situations • across a broad range of technical or management functions with accountability for personal outputs and personal and team outcomes within broad parameters	Graduates of a Bachelor Degree will demonstrate the application of knowledge and skills: of knowledge • with initiative and judgement in planning, problem solving and decision making in professional practice and skills and/or scholarship • to adapt knowledge and skills in diverse contexts • with responsibility and accountability for own learning and professional practice and in collaboration with others within broad parameters
Learning volume	The volume of learning of an Advanced Diploma is typically 1.5 – 2 years	The volume of learning of a Bachelor Degree is typically 3 – 4 years

APPENDIX 4 AQF MAPPING EXERCISE MATRIX

Course Learning Outcomes			JND280 Marine Electronic Navigation				JND281 Navigational Watchkeeping				JND282 Near Coastal Navigation			
Demonstrate broad and coherent nautical knowledge by:	*Applying diverse navigation concepts to safely plan and conduct a voyage.*	ATs	T	A	P	E	T	A	P	E	T	A	P	E
			2		2	2	2	2	2	2	2	2		2
		TLAs	L	P	W	TT	L	P	W	TT	L	P	W	TT
			2	2		2	2	2			2			2
	Applying principles of cargo handling and storage on board a ship.	ATs	T	A	P	E	T	A	P	E	T	A	P	E
					2									
		TLAs	L	P	W	TT	L	P	W	TT	L	P	W	TT
Assess and solve nautical problems by:	*Analysing, interpreting and evaluating a range of available data as a basis for decision making in standard-operational and emergency related scenarios on a commercial ship.*	ATs	T	A	P	E	T	A	P	E	T	A	P	E
			2		2	2	2	2	2	2		2		2
		TLAs	L	P	W	TT	L	P	W	TT	L	P	W	TT
			2	2		2	2	2			2			2
	Implementing responses which acknowledge stakeholders expectations and needs.	ATs	T	A	P	E	T	A	P	E	T	A	P	E
			2		2	2	2	2	2	2		2		2
		TLAs	L	P	W	TT	L	P	W	TT	L	P	W	TT
			2	2		2	2	2			2			2
Practice effective leadership by:	*Applying Relevant management theories to control the operation of a ship and care for the persons on board.*	ATs	T	A	P	E	T	A	P	E	T	A	P	E
							2	2	2	2		2		2
		TLAs	L	P	W	TT	L	P	W	TT	L	P	W	TT
							2	2			2			2
	Exhibiting appropriate, communication, motivation, collaboration and decision making strategies which enables safe operation of a commercial ship.	ATs	T	A	P	E	T	A	P	E	T	A	P	E
					2		2	2	2	2		2		2
		TLAs	L	P	W	TT	L	P	W	TT	L	P	W	TT
			2	2		2	2	2			2			2
Demonstrate personal and professional stewardship through:	*Locating and adhering to regulatory frameworks and ethical codes relevant to ship operation in the international shipping industry.*	ATs	T	A	P	E	T	A	P	E	T	A	P	E
							2	2	2	2		2		2
		TLAs	L	P	W	TT	L	P	W	TT	L	P	W	TT
							2	2			2			
	Performing tasks in an ethical manner where the safety of persons and protection of the natural environment are of the greatest importance.	ATs	T	A	P	E	T	A	P	E	T	A	P	E
								2	2	2				2
		TLAs	L	P	W	TT	L	P	W	TT	L	P	W	TT
							2	2			2			

In this table the following abbreviations have been used:

AT – Assessment Tasks: T – Test; A – Assignment; P – Practical; E – Examination

TLA – Teaching and learning activities: L – Lecture; P- Practical; W – Workshop

The number 2 indicates the matter is delivered and assessed at the 'Support Level' whereas Management Level studies are more intense and have Level 3 intensity.