Train the Trainer course for **Inland Navigation Simulator training**

Lifelong Learning Programme
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Preface

The use of Inland navigation simulators as learning platform forms an integral part of the Standards of Training and Certification for Inland Navigation Education and Training (STCIN). By means of a Train the Trainer course the knowledge and skills about the use of a simulator will be increased. This didactical manual in combination with the instructor guide, work book and familiarization exercise is designed to be used as a guidance to conduct the Train the Trainer course.

This course has been developed with support of the Leonardo Da Vinci funding programme. Various (associated) members of EDINNA and social partners joined force to develop this programme and related learning material.
From October 2013 till March 2016 the following consortium conducted the project to develop this Train the Trainer course under the Leonardo da Vinci Programme:

- STC-Group, Rotterdam, the Netherlands;
- Maritieme Academie Harlingen, the Netherlands;
- KTA Zwijndrecht, Antwerp, Belgium;
- Schiffer-Berufskolleg Rhein, Duisburg, Germany;
- European Transport Workers Federation, Brussel, Belgium;
- CERONAV, Constanta, Romania

In this book we present you the Didactical manual as well as the Instructor Guide, Work Book and Familiarization exercise.

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Definitions

In this manual, the following terms have the meanings set forth below:

Apprentice	A person learning in a practical training environment, under supervision, where professional hands-on experience is acquired.
Assessor	A person who evaluates the success of the learning process.
Candidate	A person undergoing an assessment.
Candidate trainer	A participant in the Train the Trainer course.
Examinee	A person undergoing an exam.
Examiner	A person who evaluates knowledge, reactions or qualifications and who administers examinations in schools, colleges or universities on behalf of an official institution (e.g., Chamber of Industry and Commerce).
Instructor	A person who instructs in a practical training environment, creating situations in which professional hands-on experience can be gained. Although often used as a synonym for 'teacher,' an instructor may have teaching aims and methods that are often quite different.
Operator	A person who operates a training vessel or simulation system in practical training environments.
Provider	A training or educational institution that offers simulator-based training courses. Providers are responsible for ensuring that content, organization, and implementation of a course comply with set standards. They also ensure that staff are well-qualified, i.e. suitable and experienced, based on standard criteria.
Student	A person who is enrolled in an educational institution.
Teacher	A person who teaches in an educational programme, and who is committed to providing a learning environment in which knowledge and competences can be acquired. Teachers enable students to transfer their knowledge to real-life-situations and to solve problems by relying on the knowledge gained.
Trainee	The collective term for an individual enrolled in an educational program. A trainee may be referred to as an apprentice, candidate, student, or examinee.
Trainer	The collective term for an individual who teaches in an educational programme and whose job entails assuming various roles, e.g., instructor, teacher, examiner, and assessor. Trainers must be qualified and experienced in both inland navigation and teaching, and must possess the specific knowledge and pedagogical skills to be responsible for different types and levels of training.

Introduction

This manual was designed for trainers who use simulators as a tool to facilitate the learning process. This manual aims to set European standards in the evaluation and assessment of training personnel in inland waterway transport using inland navigation simulators. This manual is to be used in a Train the Trainer course that makes use of an inland navigation simulator. The overall aim of the course is to increase the knowledge and skills of the trainer when using a simulator. The course has a number of objectives and attempts to answer a number of questions:

1 What makes a simulator such an effective tool for education and training?
2 What are the functions and limits of using a simulator?
3 What is the role of the instructor and assessor? What are the best practices?
4 How can we ensure that effective learning takes place?

The Train the Trainer course is competence-based and relies on an active learning approach. It includes a combination of didactical methods such as general instruction and presentations, simulator training, self-study, role-playing, and practical exercises.

Entry requirements

The Train the Trainer course is most effective when candidate trainers meet the stated entry requirements:

Requirements for a simulator instructor

The candidate should be

> qualified and experienced in the particular types and levels of training and examinations to be administered with regard to competence in inland navigation and/or use of simulators
> qualified and experienced in teaching
> familiar with the applicable simulator

Requirements for a simulator operator

The role of the simulator operator is:

> to operate the simulator in a safe and efficient way
> to perform the correct operation for each system function
> to recognize equipment faults and take appropriate action

The educational or training institute determines the suitability/competence of the staff based on standard professional criteria, e.g., licenses, certificates, work experience, work sample, on-the-job training with a senior instructor and pedagogical aptitude.

Learning objectives

The learning objectives of the Train the Trainer course are described in the Competence Table below:

Competence	Knowledge, understanding and proficiency	Methods for demonstrating competence	Criteria for evaluating competence
Develop a simulator module	Proper development of a set of scenarios to be used in a course - Create scenarios based on learning objectives - Test a scenario on a target group - Evaluate the effectiveness of the scenario	Examination and assessment of evidence obtained from a personal portfolio	The developed scenarios meet the learning objectives of the trainees
Execute the simulator exercise	Proper execution of the simulator exercise - Give an effective briefing in relation with the learning objectives - Execute the scenario with a target group - Give an effective debriefing in relation with the learning objectives	Examination and assessment of evidence obtained from an independently executed simulator exercise with professionals and/or other trainees	The simulator lesson meets all the criteria of an effective simulator exercise (chapter 5)
Evaluate and assess the learning outcomes	Proper development of evaluation tools that ensure validity, fluidity and objectivity of evaluation Understanding the functions of evaluation	Examination and assessment of evidence obtained from independently executed simulator assessment with professionals and/or other trainees	The simulator assessment meets all criteria of a valid assessment (chapter 8)

1. Simulation Training

For the effective education and training of inland waterway transport personnel, it is important that knowledge, skills and attitude should be incorporated in the learning programme. With the advancement of technology, industry is witnessing the increasing use of inland navigation simulators. Simulators provide a learning platform where all elements of learning can be integrated into a valuable learning experience.

Use of a simulator can, with correct assistance, produce positive results on a broad spectrum of attitudes, skills or cognition. This chapter will explain why simulators have a reputation for being so effective and how we can best use this knowledge to the benefit of both learners and trainers to create effective learning.

By the end of this manual, you will surely have gained an appreciation for the challenges presented to the participant when using a simulator. We will discuss the main functions and characteristics of simulators in general. We will also introduce the concept of pre-existing knowledge and the positive or negative effect it can have on the learning process. Participants join a course with pre-existing knowledge and skills that can influence their perception of events and information. This, in turn, can affect their ability to remember reason, acquire knowledge and even solve problems.

Trainers must be fully aware that different preconditions exist, consequently, they should always give trainees a solid introduction to the upcoming simulation, including familiarization, the objectives to be addressed, and their expectations.

In this manual, attention is drawn to regarding the participant as the subject and the simulator as a tool to aid in the transfer of knowledge, skill or attitude. Correct use of a simulator can greatly aid the learning process. The following are some general points concerning simulator functions and characteristics of simulators (see PLATINA[1] 2014, HINT[2] 2014 and CCNR[3] 2013)—presenting challenges for the participant.

Simulators can fulfil the following functions:

- present information as realistically as possible while being able to store, process and display information
- enhance the learning moment
- allow the learner to practice
- give the learner the ability to demonstrate the required attitude, skills and knowledge

1 PLATINA – Platform for the Implementation of NAIADES,
2 HINT – Harmonized Inland Navigation Transport through education and information technology
3 CCNR – Central Commission for the Navigation of the Rhine

Simulators have several characteristics:

- data storage and processing ability
- provide synthetic controls
- support learning at the intellectual and psychomotor level, whether the objectives are knowledge, skills or attitude
- display information in response to inputs either by learner or instructor
- represent a dynamic response as close as possible to realistic situations
- the instructor must be able to control the system
- the simulator can be used for groups or individuals

During the simulator run, challenges for the trainees are typically:

- spatial awareness
- ability to match outside view with traffic situation
- ability to interpret true wind and current
- ability to multi-task (listen to radio conversation while manoeuvring)
- ability to prioritize
- ability to understand the concept of relative motion
- ability to be pro-active

2. Basic Simulator Design and Simulator Types

A simulation is close to a replica of equipment, systems, phenomena and processes. It is normally a mathematical or algorithmic model that is combined with a set of initial conditions that allows prediction, visualization and control with change in time. The model allows easy manipulation of conditions and parameters. Simulation is used in many contexts such as simulation of technology for performance optimization, safety engineering, testing, training, education and video games. The use of simulators to demonstrate certain competences is one of the methods of evaluating performance.

The basic operational features in simulation that are applicable for training and assessment are

- representation of a real operational scene
- provision of control of the scene
- the calculated exclusion of some parts of the operational scene
- provision of recording and playback of the scene for assessment and debriefing purposes

Based on these features, the basic design of a simulator is made up of the following components:

1. an audio visual environment system
2. a mathematical model
3. equipment and user machine interface/controls
4. an instructor control system

These components contribute to four important characteristics of simulators: physical realism, behavioural realism, setting/controlling and monitoring the operating environment. These characteristics vary depending on the level of fidelity and accuracy of the components as well as on the number of modules or components. For instance, increasing detail in the graphic images to create the visual scene as well as more projectors will improve physical realism by displaying an all- round field view of a photographic scene. However such fidelity is not required for performing all the tasks necessary for a competence. Moreover the tasks and their complexity vary by level of responsibility. A range of simulators--from PC-based to full-mission simulators--are available for demonstrating competence in a specific function.

With such a variety available, simulators are generally classified as full-mission or part-task, or by creating a hierarchy within the different subject areas.

Critical components

The components of a simulator will fall under the following categories:

1. physical realism (equipment layout, 'Human Machine Interface and controls, etc.)
2. behavioural realism (mathematical model for different processes and systems)
3. operational environment (visual scene including objects, degree of view)
4. monitoring and evaluation

The layout of a simulator will have essential areas, for example: the server station, the trainee station and the instructor station.

Server station

- a visual scene generator, which generates terrains, vessels, objects, environmental elements and navigation areas
- a mathematical modeller, which calculates the characteristics and manipulations of the vessel, objects, current, tides, wind, interactions between vessels and environmental elements

Trainee station

- camera
- speakers
- indicators panel
- navigation equipment
- communication equipment
- steering control
- thruster controls
- visual systems (projectors or plasma)
- lights and shapes panel

Instructor station

- monitor
- speakers
- visual scene (visual database with areas of navigation)
- instructor monitoring controls

Fidelity

Simulation fidelity is defined as the degree to which a simulation is a close representation of the real equipment, system, process and environment. The closer the simulator is to representation of real systems, the better the fidelity.

Fidelity is determined subjectively; the higher the requirements on fidelity, the greater the cost and processing time of the simulation. High fidelity improves the training experience and learning; hence the need for selective fidelity, i.e. improving specific components of a simulator, to increase effectiveness in training and assessment of tasks. The level of fidelity required will therefore be determined by the training objectives. The underlying issue regarding fidelity is the transfer of specific knowledge and skill to the actual operational or job environment. Concretely, if trainees are learning how to apply a particular skill, then the simulated training environment must respond in a manner that is similar to what would occur in the real world. Otherwise the trainee will receive incorrect feedback and perhaps learn the wrong things. Equally important as physical realism ('Human Machine Interface, knots, buttons, hardware controls and consoles, etc.) is cognitive realism (behavioural and operational environmental realism). It is also worth noting that the level of fidelity may vary with the stage of learning, i.e. from simple tasks to complex tasks. A major technical consideration in the application of simulators and simulations is the need for consistently reproducible results from simulation exercises.

Validation

Validation is the process of determining the degree to which a simulation model and its associated data are an accurate representation of the real world from the perspective of the intended uses of the model. In the Platina Competence Tables (Platina, 2016, the criteria for evaluating competences and methods for demonstrating competences are defined.

For the validation of simulation training, there are two possibilities:

1. internal validation, i.e. finding out if a training activity has reached its objective
2. external validation, determining whether former trainees have applied what they have learned in training to the job context and were able to perform to the level expected of them after training.

The validation procedure should at least include approval and inspection of the content of the training programme, training methods, training facilities and environment, entry qualification of trainees, qualification and experience of trainers and the assessment system.
Validations include both objective and subjective elements. The elements of a simulation that require validation are the accuracy and fidelity of the following:

- image portrayal, including the content, quality, field and depth of view, and movement of the visual scene
- calculation and representation of the predicted parameters based on the relevant process
- characteristics of equipment, vessel, engine or system being simulated
- operational environment
- functional resemblance to the real systems
- physical resemblance to the Human Machine Interface and controls
- layout of the components of the simulators

3. The Scope of Simulation Training in Inland Navigation

Simulators are a suitable tool for training in the development of competence at different responsibility levels, from normal routine task performance training to complex task training to crisis management and emergencies. A simulator is a training tool that duplicates limited aspects of the real world and has to be integrated into a total training programme. The simulation process recognizes all the classic benefits such as avoidance of costs and dangers associated with operation of an actual system, avoidance of injury and damage, and rapid and repeatable exercises.

Each provider using a simulator for inland navigation has to ensure that the simulator used under certain conditions will at least fulfil the following minimum performance requirements:

- suitable for the training and/or examination tasks
- physical realism appropriate to training and/or examination objectives, including the capabilities, limitations, and possible errors of such equipment
- sufficient behavioural realism
- capable of producing a variety of conditions (operating environment)
- the trainee should be able to interact
- the trainer should be able to develop/control/monitor/record exercises

The standards of competence as laid down in the PLATINA Competence Tables (PLATINA 2014) with respect to navigation are grouped under three major functions:

- navigation
- controlling the operation of the vessel
- communication

The PLATINA Competence Tables also specify the following levels of responsibility:

- the operational level
- the management level

Functions and levels of responsibility are identified in the PLATINA Competence Tables as well as in other national and international legislations in this field.

The following pages discuss important aspects of implementing simulators under three headings:

- Training and examination/assessment
- Use of simulators
- Minimum standards of competences

Training and examination/assessment

All parties that are involved in Inland Navigation simulator-based training and examination/assessments must comply with the basic rules and requirements briefly outlined in this document. Moreover trainers must be suitably qualified and competent to carry out their tasks.

If the training is being conducted using a simulator, the trainer employed is expected to have received appropriate guidance in instructional techniques involving the use of simulators, and to have gained practical operational experience on the particular or a similar simulator used for the training. A trainer who serves as an instructor has to provide situations in which the trainees can acquire hands-on experience.

Serving as a teacher, the trainer has to provide a learning environment in which students can gain knowledge and competences. The trainer must also enable students to transfer their knowledge to real-life situations and to solve problems based on what they have learned.

Moreover when examination or assessment is performed by using simulators, the examiner/assessor is required to have gained practical examination/assessment experience on board an inland vessel or on a particular type of simulator. He should know the distinct differences between training in reality and training with a simulator.

Training and examination/assessments must be:

- structured in accordance with written and approved programmes, including methods and media of delivery, procedures, and course material (EDINNA[4], 2014) as are necessary to achieve the prescribed standard of competence (PLATINA, 2016)
- conducted, monitored, evaluated and supported by qualified persons

Qualifications of instructors and assessors

It is imperative that trainers be appropriately qualified and experienced--both in inland navigation and in teaching techniques. They must have qualifications and experience in the particular types and levels of training or examination/assessment they give.
Any person conducting inland navigation simulator training in order to qualify for a license or certification must:

- have a full understanding of the training programme and an understanding of the specific training objectives for the particular type of training being conducted
- be qualified in the task for which training is being conducted
- have received appropriate guidance in instructional techniques involving the use of simulators
- have the skills to organize a lesson and transfer knowledge and ideas to the trainees in simulator training
- have gained practical operational experience on the type of simulator being used

4 EDINNA – **Ed**ucation in **In**land **Na**vigation

Any person conducting examination/assessment as part of inland navigation simulator training in order to qualify for a license or certification must:

- have a sufficient level of knowledge and understanding of the competence to be examined/assessed
- be qualified in the task for which the examination/assessment is being made
- have received appropriate guidance in examination/assessment methods and practice
- have gained practical examination/assessment experience on the particular type of simulator under the supervision and to the satisfaction of an experienced examiner/assessor

Any person responsible for supervising the training of a boat master who wants to qualify for a license or certification must be sufficiently knowledgeable about instructional techniques, training methods, and practice. The person must also have a full understanding of the examination/assessment system, assessment methods and practices.

The provider of a course is responsible for the compliance of content, organization and implementation of a course as well as for the qualification of staff. The trainer determines the suitability and competence of the staff based on standard evaluation criteria (e.g. state examinations, licenses, certificates, etc.).

The content of training courses and examinations shall be laid down in written manuals. Following are the requirements and recommendations put forward by EDINNA (see e.g. the CMINET[5] project, LEONARDO DA VINCI, 2015).

The use of simulators for inland navigation

At present, there are neither formal legal regulations as such in either national legislation nor national and international regulations on the performance standards of simulators for inland navigation for the use of training, examination, and certification of boat masters. However, technical standards for IWT ship-handling simulators for the purpose of examination to promote career progression for IWT crew members and to reduce barriers to labour mobility was developed by the PLATINA 2 consortium, which includes the full range of professionals concerned. As soon as these technical standards are published, they will be discussed in this manual. In the meantime, simulators are expected to perform all functions necessary for the execution of a training or examination task as realistically as technically and economically feasible. This means that the features of the simulator should comply with equipment regulations as applied today. In sum, all simulated vessel behaviour should correspond closely to reality.

Approved simulators must meet specified performance standards and other provisions to be used for training and examination. Such simulators should be approved by the competent authorities or classification society.

5 CMINET – **C**ourse **M**anuals for **I**nland **N**avigation **E**ducation and **T**raining

According to CCNR (CESNI/QP (16) 8/January 2016) the simulator for inland navigation can be used in a number of capacities:

- as an initial training aid in training centres;
- as a test tool for confirming the acquisition of competences;
- as a tool for improving one's competences throughout one's life (lifelong learning), including for boar master's certificate or community certificate.

Standards covering the use of simulators

The PLATINA Competence Tables (PLATINA, 2016) demand that simulators show physical and behavioural realism appropriate to training and examination/assessments objectives. Capabilities and limitations of the original equipment along with possible errors should form part of the simulation. Simulators should be able to produce emergency, hazardous and unusual conditions to provide effective training. Above all simulators must provide the simulator instructor with control and monitoring facilities along with recording equipment to permit effective debriefing for trainees.

Simulator-based training should meet general performance standards. The simulator must:

- be suitable for the selected objectives and training tasks
- be capable of simulating the operating capabilities of shipboard equipment concerned, to a level of physical realism appropriate to training objectives and include the capabilities, limitations and possible errors of such equipment
- have sufficient behavioural realism to allow a trainee to acquire the skills appropriate to the training objectives
- provide a controlled operating environment, capable of producing a variety of conditions, which may include emergency, hazardous or unusual situations relevant to the training objectives
- provide an interface through which a trainee can interact with the equipment, the simulated environment and, as appropriate, the instructor
- permit an instructor to control, monitor and record exercises for the effective debriefing of trainees

Any simulator used for the examination/assessment of competence or for any demonstration of continued proficiency so required, must:

- be capable of satisfying the specified examination/assessment objectives
- be capable of simulating the operational capabilities of the shipboard equipment concerned to a level of physical realism appropriate to the examination/assessment objectives and include the capabilities, limitations and possible errors of such equipment
- have sufficient behavioural realism to allow a examinee/candidate to exhibit the skills appropriate to the examination/assessment objectives
- provide an interface through which a examinee/candidate can interact with the equipment and simulated environment
- provide a controlled operating environment, capable of producing a variety of conditions, which may include emergency, hazardous or unusual situations relevant to assessment objectives
- permit an examiner/assessor to control, monitor and record exercises for the effective examination/assessment of the performance of candidates

Additional performance standards are also necessary. In addition to the requirements set forth above, special simulation equipment (e.g. radar simulation) must meet the performance standards given in accordance with their specific type.

Example: radar simulation

Radar simulation equipment must be capable of simulating the operational capabilities of navigational radar equipment that meet all applicable performance standards. Radar simulation must be able to

- operate in relative motion head-up mode (inland navigation)
- model weather, tidal streams, current, shadow sectors, spurious echoes and other propagation effects
- generate shorelines and navigational buoys
- create a real-time operating environment incorporating at least two own ship stations with ability to change own ship's course and speed, and include parameters for target ships and appropriate communication facilities

Additional requirements are also necessary, i.e. that training and examination/assessment for simulator trainers should comply with a standard conduct of simulator-based training. Briefing, planning, familiarization, monitoring and debriefing should be part of any simulator-based exercise. Emphasis should be given to the importance of guidance and exercise stimuli by the instructor during monitoring and to peer assessment during debriefing. Simulator exercises (scenarios) must be designed and tested by the simulator instructor to ensure their suitability for a specific training objective.

Training procedures

All parties involved should ensure that the aims and objectives of simulator-based training are defined within an overall training programme and that specific training objectives and tasks are selected so as to relate as closely as possible to shipboard tasks and practices.
In conducting simulator-based training, trainers must ensure that:

- trainees are adequately briefed beforehand on the exercise objectives and tasks and are given sufficient planning time before the exercise starts
- trainees have adequate familiarization time on the simulator and with its equipment before any training or assessment exercise commences
- guidance given and exercise stimuli are appropriate to the selected exercise objectives and tasks and to the trainee's level of experience
- exercises are effectively monitored, supported by audio and visual observation of trainee activity and pre-and post exercise evaluation reports
- trainees are effectively debriefed to ensure that training objectives have been met and that operational skills demonstrated are of an approved standard
- the use of peer assessment during debriefing is encouraged
- simulator exercises are designed and tested so as to ensure their suitability for the specified training objectives

Examination/assessment procedures

When simulators are used to examine/assess the ability of candidates to demonstrate levels of competence, examiners/assessors must ensure that:

- performance criteria are identified clearly and explicitly and are valid and available to the candidate
- examination/assessment criteria are clearly established and explicit to ensure reliability and uniformity of examination/assessment and to optimise objective measurement and evaluation, so that subjective judgements are kept to the minimum
- candidates are briefed clearly on the tasks and/or skills to be examined/assessed and on the tasks and performance criteria by which their competence will be determined
- examination/assessment of performance takes into account normal operating procedures and any behavioural interaction with other candidates on the simulator or simulator staff
- scoring or grading methods to examine/assess performance are used with caution until they have been validated
- the prime criterion is that a candidate demonstrates the ability to carry out a task safely and effectively to the satisfaction of the examiner/assessor

Guidance regarding use of simulators

Existing course manuals are a good foundation on which to develop detailed guidelines on using simulators for training and examination/assessment purposes in inland navigation.
All parties involved should use common guidelines that describe in detail training and examination/assessment for specific competences (e.g. radar operation and observation).

Different types of training can easily be provided, namely:

- team training
- operator training
- decision-maker training
- procedure training
- maintenance training
- trouble shooting
- operation in suboptimal conditions
- emergency response

In more complex scenarios or simulations, these different aspects of training are generally incorporated into one simulation exercise. An extensive simulated task may require competence in operations, procedures, teamwork and decision-making.

These types of training can be described as follows:

- **Team training**
  A team is a group in which decisions are made based on evaluation of material in order to execute a particular operation. Team training is conducted to establish or strengthen a team with an aim to train decision-making.

- **Operator training**
  Operator training is required in order to train a person in proper equipment operation procedures.

- **Decision-maker training**
  This form of training aims to enable individuals make the right decisions based on evaluation of a given situation and to carry out the necessary action to reach a defined goal. In many situations, the decision-maker can communicate directly with the equipment rather than through an operator. The decision-maker thus becomes an operator.

- **Procedure training:**
  Procedure training aims to train a group of individuals the correct execution of a specific procedure.

- **Maintenance training:**
  This aims to train individuals in either technical or condition control maintenance.

- **Trouble shooting:**
  Trouble shooting seeks to teach individuals to tackle slight deviations from the normal operation.

- **Training in suboptimal conditions:**
  This is performed to train individuals in special operations such as navigating in restricted visibility.

- **Training in emergency response:**
  This aims to train individuals in circumstances where there is variation or deviation from the expected scenario or situation

Though important to understand these classifications, simulator exercises are made up of a combination of types.

Table 1 illustrates simulator application for the main function in inland navigation.

Table 1. Simulator Application for the Function 'Navigation/Control Position Operations'

No.	Simulator Application	Function: Navigation/Control Position Operations
1	Equipment Familiarization	Inland ECDIS/RADAR/Steering
2	Equipment Operation	All Navigational Aids
3	Equipment Integration	Navigational Aids/Steering/Main Engine (ME)
4	Systems Familiarization	Collision Avoidance
5	Basic Procedural Training	Operations (Ops: Berthing, Anchoring,
6	Basic Routine Regular Operations	Steering (S)/Handling/ Bridge Team Management (BTM)/ Bridge Resource Management (BRM)/Vessel Traffic Services (VTS)
7	Routine Operations with Faults Injection	Navigation Equipment Failure/Machinery Failure
8	Trouble shooting and Problem Solving	RADAR Fail
9	Complex Regular Operations Involving Multitasking	Arriving/Departure Ports
10	Non Regular Operations	Ice Navigation
11	Crisis Management/ Emergency Situations	Collision/Grounding
12	Specialized Operations/Area/ Machinery	Ship to Ship (STS: bilge oil boats, water police)
13	Case Studies/Incident Recreation	Ice/Pilotage
14	Feasibility Studies	Port design/bridge design/river design

Simulated systems can be used to train:

- vessel handling and manoeuvring
- navigation
- radio communications
- main and auxiliary machinery operation

It is important to note that all simulators used for training and examination/assessments must be described in detail.

In inland navigation, using so-called Full Mission Ship Handling Simulators is recommended. Their performance requirements must at least meet those for inland waterway vessels. Compared to simulators designed for limited tasks (e.g., radar operating), Full Mission Ship Handling Simulators are complex both in the equipment fitted and in the operations to be performed. This implies greater responsibility on the part of the instructor, who must be prepared to intervene in the design and conduct of training and assessment exercises when using these simulators.

In the PLATINA Competence Tables, competences for which a simulator can be used to demonstrate competence in inland navigation are listed.

The PLATINA Competence Tables enumerate multiple means to demonstrate each competence, one of which is simulator training; others are in-service experience and training ship experience. This parallel between real vessel training and simulator-based training places considerable responsibility on the instructor, who must ensure that simulator-based training is designed and conducted in such a way that it gives real-time experience to trainees. Simulator training must place the trainee in a nearly identical working environment, with similar mental scenarios eliciting the same level of physical stress as on board a real vessel.

In addition to performance standards, training procedures (briefing, familiarization, exercise stimuli, monitoring, debriefing, peer assessment) and examination/ assessment procedures (performance criteria, assessment criteria, briefing, grading methodology) must be defined to be adopted on simulators.

Standards for simulator-based training

It is required that simulators when used to demonstrate competence (e.g., an examination) for issuance of an official certificate or licence should first be approved by the relevant competent authority.

The rationale for this required standard is to ensure that simulations provided by the simulator include an appropriate level of physical and behavioural realism, as stated in approved training and examination/assessment objectives.

The main target group for such a standard is:

- a provider of a simulator that uses a simulator for examination
- a provider of a simulator that uses a simulator for simulator training

The standard should include criteria for simulated functions, equipment and the environment necessary for specified tasks in inland navigation operations. The standard should not prioritize the reliability of specific equipment or software used in the simulator, e.g. redundancy, environmental testing, nor maintenance. It is assumed that the simulator is built from parts of sufficient reliability.

It is also assumed that the simulator centre is to address the operation of the simulator (i.e. using the simulator for training and/or examination/assessment in a training programme) in a quality standard system. In such a system, the instructor's and examiner/assessor's qualifications shall be addressed and the course curriculum approved by the provider of the simulator.

It is further understood that the provider of a simulator is to ensure that the simulator complies with all additional mandatory requirements, e.g. electrical installation of such equipment, which are not covered in the proposed standard.

As mentioned, Full Mission Ship Handling Simulators are the highest grade scale for levels of performance capabilities of inland navigation simulators. It is a simulator designed to create realistic situations for Control Position Operations (Bridge Operations).

4. The Simulator Trainer

Today, simulators are widely recognized and accepted by the educational world to be an effective training tool. Simulators offer promising opportunities and an engaging arena for teaching and learning – through better presentation, engagement of senses and experiential learning. But one must not overlook the fact that however sophisticated and expensive a simulator system may be, the training results achieved are only as effective as how well the trainer uses it. The simulator can largely allure trainees through the multi-sensory approach of text, visual and audio effects in initial stages; but it is the trainer's presence that provides the vital link between the real world and virtual representation of that world.

The simulation experience provides for more meaningful and higher learning styles. Apart from the experiential approach -where trainees play a central role in their learning- the trainer provides an opportunity to learn through an inquiry approach, raising questions and working through complex concepts (with trainer and peers). The much talked about and often ignored aspect of learning and training, i.e. 'student motivation', can be meaningfully drawn and sustained out of constructive feedback, reinforcement from the trainer during the briefing, conduct, and debriefing of the exercises. The importance of the trainer's expectations of trainees is far less recognized but nevertheless a determining factor for the overall performance of the trainees on simulators. It goes without saying that trainers who have high expectations of their trainees are able to extract better performance from them.

With the advent of a new approach to training, the trainer's role has become increasingly critical. As learning has shifted from 'teacher-centred' to 'learner-centred', the trainer is no longer simply regarded as the sole voice of authority, but holds a number of roles.

4.1 Roles of the Trainer

Simulator-based training is placing trainers in new roles, which can be exciting as well as frustrating. Understanding the reasons for this change is as important as the instruction itself, and may help clarify the trainer's roles. The goal of using simulation technology is to allow trainers to facilitate learning using new techniques and simulated nautical situations. These techniques require trainees to participate in hands-on, real-time problem solving. Trainers utilize simulation for recurring instructions and processes, which allows trainees to practice and trainers to provide feedback.

The trainer's objective is to:

- facilitate the education and training of the trainees
- educate with an emphasis on conceptual knowledge, basic skills and an introduction to the actual work
- train with an emphasis on the actual tasks and the work to be performed in an authentic setting
- examine/assess performance and competence of both individual learners and teams

Therefore, the work of a trainer includes:

- learning more about trainees' learning styles
- training trainers how to train
- establishing strategic directions for the organization
- facilitating process improvement
- constantly being in touch with trainees and work processes and being aware of their skill needs
- knowing information technology and exploring the use of electronic training opportunities
- developing training programs
- facilitating problem-solving
- helping trainees to think over their jobs

With these goals in mind, the trainer must serve in the following capacities:

- **Assessor**
  As an assessor, the trainer attempts to measure the success with which trainees are learning. Assessments may also be made to obtain information on an organization or the implementation of a course. Assessments are internal investigations in which the trainee is judged without the involvement of examiners.

- **Examiner**
  As examiners, trainers evaluate knowledge, reactions and the qualifications of trainees or candidates/examinees, e.g., through questions or task assignments. They implement exams at school, in colleges and universities, and in training centres, following the requirements set down by the official institution/competent authority for trainees to be awarded certification.

- **Evaluator**
  As an evaluator, the trainer sets criteria and assesses performance so as to reinforce desirable learning. While offering encouragement, the trainer provides a yardstick by which trainees can measure their achievements. Evaluation is the process by which trainees evaluate their own learning.

- **Facilitator**
  The use of simulators does not obviate the need for the trainer, but undoubtedly forces a shift in the trainer's role from 'Sage on the Stage' to 'Guide on the Side'. As a facilitator, the trainer must know when to intervene and when to leave the trainee alone, providing as much experiential learning for trainees as possible.

- **Guide**
  The trainer guides trainees in understanding the nature of satisfactory performance, establishment of correct responses, and avoidance of habitual errors. These and other teaching objectives can be achieved through personal interaction and communication skills such as empathy, flexibility and adaptability.

- **Instructor**
  The instructor usually instructs apprentices and provides situations in which hands-on experience can be gained. The term 'instructor' and 'teacher' are often used synonymously; however, their aims and methods are often quite different.

  Learning strategist/organizer
  As a learning strategist/organizer, the trainer must sequence the information judiciously to facilitate learning.

- **Manager**
  The trainer should not merely repeat the same exercise, but manage (manipulate) materials and activities in such a way as to arouse interest. He must make learning more direct and relevant for the trainees.

  Motivator
  As a motivator, the trainer must give positive and constructive feedback and provide for individual differences.

- **Operator**
  The operator runs the simulation system. Although trainers generally do not operate a simulator, they may be required to do so in conjunction with their other roles.

- **Psychologist**
  When trainers use their knowledge of both the subject and the way trainees understand the subject, the use of the simulator has a more direct effect on trainee achievement. It is essential that trainers understand differences in learning styles accrued to experience, competence, culture, and personalities, and refrain from voicing harsh criticism.

- **Teacher**
  The trainer must realize that 'transfer of knowledge' is a process and not an event. 'One-off planning' is not sufficient; instead, the trainer should do substantial planning at each stage, without losing sight of the various factors involved: course objectives or the trainee's rank, number, background, etc. As teachers, trainers thus provide a learning environment in which knowledge and competences can be gained. Their objective is to enable students to transfer knowledge to real-life-situations and to solve problems based on what they have learned. Trainers must thus appraise methods, techniques, and resources so as to match and adapt their training to multiple learning styles, and thereby reach the common goals of the course.

Skills required of the trainer

As mentioned above, a highly sophisticated simulator system is wasted when in the hands of a poorly skilled instructor; a skilled instructor, on the other hand, can take even the most basic simulator and produce valid and effective training outcomes. This implies a need for pre-requisite qualifications and skill-sets for instructors engaged in simulator-based training. For the instructors to perform the activities their many roles require, four basic qualifications seem essential:

1 **Subject matter expertise**
Trainers need to possess the technical knowledge of the simulation system, i.e., job knowledge. They also need to be knowledgeable about the organization, the general rules, regulations and policies. Required job skills include the ability to operate various types of equipment and tools; the ability to select instructional methods to guide trainees and counsel them. Trainers must possess proven pedagogical skills and teaching experience. They must be able to organize a lesson, transfer knowledge and ideas, relate them through simulator training as is performed in training systems using other teaching tools.

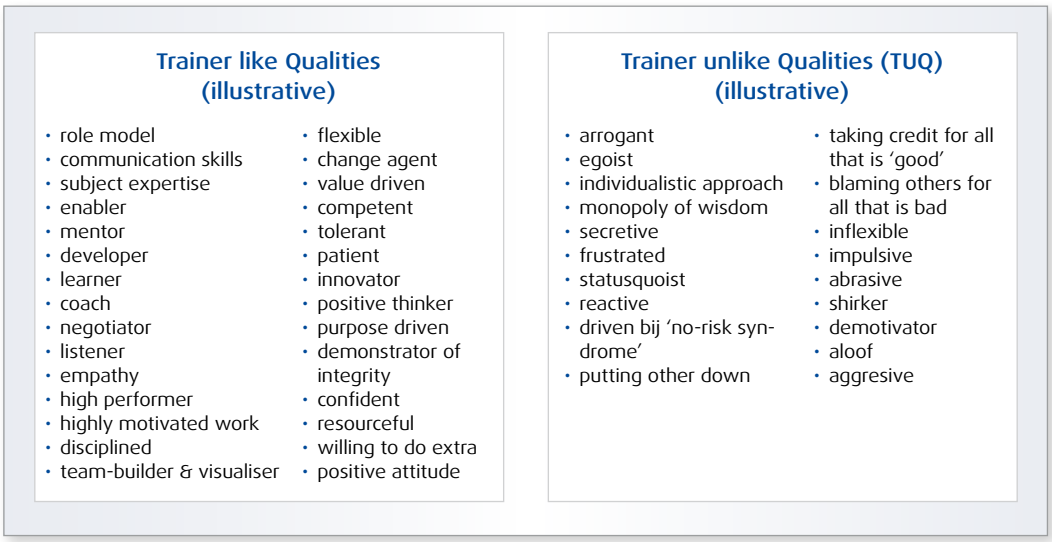
2 **Educational and andragogic knowledge and skills**
Trainers should possess formal qualifications coupled with an understanding of the principles of learning and motivation.

3 **Effective communication skills**
Possessing effective oral and written communication skills is an asset for any trainer. Asking questions, explaining, listening, demonstrating, and preparing training materials all require very high communication skills.

4 **Sought-after personality traits and qualities**
These include the ability to listen, negotiate, coach, solve problems, plan strategically, and facilitate group interaction, to name but a few.

Figure 1 shows trainer like and unlike qualities in brief.

Figure 1. Trainer Like and Unlike Qualities



Below are given some examples of specific behaviours that characterize a good trainer.

4.2. General Attitude towards Training

Trainers must be open to lifelong learning. Although trainers are not expected to have all the answers to questions that are put to them, they do lose credibility if they are unable to answer any of the questions at all. Therefore, keeping abreast of the latest developments and changes in all aspects of the actual job for which the simulation has been designed, including professional, technological and legal aspects, equips them with more comprehensive knowledge than their students. This is especially important when training senior and experienced students, i.e. when students are often eager to show off their knowledge. It is vital for the trainer not to feel daunted by the challenge of working with these students and to have the necessary information readily at hand.

4.2.1 Operational Experience/Familiarization

The ability to use specific computer skills – in particular those skills related to the type of hardware/software being used in the simulator. The ability to operate projectors, video players, etc.

4.2.2 Technical/Subject-Related Knowledge

Ideally, trainers have the same qualifications or competence as the trainees they are tasked to train. Technical knowledge will not only ensure confidence, but also prove essential to get the message across properly.

4.2.3 Pedagogy

It is essential for the simulator trainer to have background or experience in teaching or instructional techniques. This would aid the trainer to do the following:

- facilitate the various instructor-led and student-led interactions
- carry out briefing and debriefing in a safe learning environment
- monitor events and know when to intervene/leave alone
- show connections between operations and theory

4.2.4 Establishing Trust

One of the key elements of developing effective learning in trainees is establishing teacher-student trust. Considering the context in which the teaching and learning takes place on simulators, developing trust and building rapport are of paramount importance. The candidates entering the simulators bring along their knowledge and experience of working in real-life situations. This might give rise to a 'know-it-all' attitude or 'just-a-video-game' notion among students. Teaching may appear even more problematic if the instructor, who has undoubtedly spent a lot of time in planning and 'structuring' the exercises on simulators, fails to understand that there is still room for indeterminable and unpredictable events as the 'operational part' of the simulation exercise lies in the hands of the trainees. Thus, a candidate might display the capricious defensive behaviour when he cannot ace at a critical situation given to him. Learning from constructive feedback, reflecting on one's own performance honestly, and admitting one's mistakes all highlight the importance of good rapport between the trainer and trainee, one that is built upon trust and rapport.

Rapport formation – Building block for establishing trust

Establishing trust must start on day one and should continue to build throughout the programme. The trainer can make the trainees feel important and can strengthen their relationship with trainees by using the following guidelines. As trainees walk in the room, greet them with a smile; you do not have to engage them in a lengthy conversation, just a simple hello. This shows them that you recognize their presence and are glad to see them.

The introductory class can be used as an 'ice breaker' where the trainer can ask non-threatening questions. During breaks, or when you see trainees in the hallway, take a moment to ask how their day went or to ask what their plans are for the weekend. Try to find a balance between prying too much into their personal lives and being restrained and formal. You will need to see how comfortable each individual is and relate to him or her accordingly.

One of the surest ways to attract the attention of your trainees is to use them in your teaching. If you are giving an example of something, then use your trainees' names in the example. If you need some volunteers to demonstrate a concept, ask some of them to help you. This not only encourages trainees to become involved in the lesson, but also helps to involve the rest of the class as they are more attentive when they hear or see their peers perform.

5. Conceptualizing a Simulator-Training Programme

Simulators are valuable multifaceted tools for developing individual and team competence not only in performing skill-based tasks, but also in managing tasks, including handling emergency and crisis situations.

Simulators are an expensive resource in terms of value and time. Keeping this in mind, simulator manufacturers have designed simulators that can be used for different levels, from support to operation and management level. Moreover, there are different simulators available for training, from single task to multiple tasks to complex tasks, making it possible to integrate simulators based on functions or departments.

The use of simulators must therefore be optimized. Optimization is possible by conceptualizing simulator training judiciously and developing a progressive simulation programme.

Criteria of a simulator lesson

A simulator lesson is effective when the following criteria are met:

- The trainee is able to apply the knowledge learned
- The training objectives for each topic were identified and followed
- The curriculum content was organized and easy to follow
- The simulation exercise was pertinent to the learning objective
- The roles were appropriate to the exercise, and the briefing session was useful for the exercise
- The assessment criteria were clearly explained at the beginning of the exercise
- The conduct of the simulation exercise was realistic and achieved learning and assessment objectives
- The debriefing session achieved its objective, which was to summarize the lessons learned and reinforce learning objectives
- The simulation time was sufficient for developing skills outlined in the learning objectives
- The training aids and audio-visual aids were properly used
- Class participation and interaction were encouraged

5.1 Simulator-Based Learning Objectives

The PLATINA Competence Tables clearly specify 'Knowledge, Understanding and Proficiency', 'Methods for Demonstrating Competence,' and 'Criteria for Evaluating Competence' for each competence. Moreover, in column 3 of the Competence Tables, 'Methods for Demonstrating Competence', simulator training is listed as one of the methods. Each of these competences must first be identified and then matched with an appropriate simulator type.

ML 1. Navigation

The boat master chooses the most logical and economical sailing route to reach the loading and unloading destinations, taking into account the most efficient sailing time schedule according to actual circumstances.

1.2 The boat master sails and manoeuvres, ensuring safe operation of the vessel in all conditions on inland and maritime waterways. He is able to:

Column 1	Column 2	Column 3	Column 4
Competence	**Knowledge, understanding and proficiency**	**Methods for demonstrating competence**	**Criteria for evaluating competence**
5. Use modern electronic navigational aids, with specific knowledge of their operating principles, limitations, sources of error, detection of misrepresentation of information and methods of correction.	1. Knowledge of and ability to use nautical sensors and indicators providing navigation information. (D)GPS, position, heading, course, speed, distance, depth. Inland ECDIS, radar, compass, turn indicator, etc. 2. Knowledge of and ability to use River Information Services (RIS) and technologies. Inland AIS, Inland ECDIS, Electronic Reporting and Notices to Skipper, FIS (Fairway Information Services), TI (Traffic Information Services), TM (Traffic Management Services), CAS (Calamity Abatement Services), ITL (Information for Transport Logistics), ILE (Information for Law Enforcement), ST (Statistics), WCHD (Waterway Charges and Harbour Dues).	Assessment of evidence obtained from one or more of the following: - approved in-service experience - approved training ship experience - approved simulator training, where appropriate - approved laboratory equipment training Knowledge tests about technical details, operating principles, limitations, sources of error.	Setting and operating the navigation aids conform with accepted principles and procedures and to manufacturers' recommendations The frequency and extent monitoring of navigation equipment and systems conform to manufacturers' recommendations and accepted principles and procedures Errors are detected and their negative effects prevented by appropriate decisions and actions.

An example:
Function: Wheelhouse Operation–Navigation at the Management Level
Competences addressed by wheelhouse operation simulator for navigation at the management level

Competence	Full Mission Ship Handling Simulator [6]	Multitask Simulator	Limited Task Simulator
Plan and conduct a passage and determine position	X	X	
Manoeuvre and handle the vessel under all conditions	X		
Use external communication systems	X	X	
Use of RADAR to maintain safety of navigation	X	X	X
Operate Inland ECDIS and use different information for navigation (e.g. AIS data)	X	X	X

5.2 Detailing the Simulator Programme

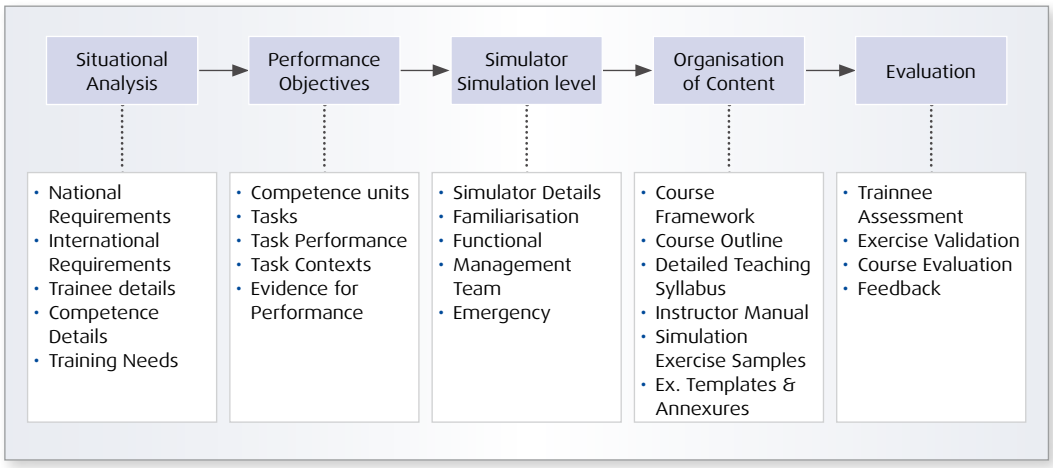
One can now refer to EDINNA Course Manuals (LEONARDO DA VINCI, 2015), in which a detailed teaching syllabus with learning objectives for the various functions and levels to be performed by candidates is outlined. From the learning objectives, task performances have to be drawn out so that the practical performances to be demonstrated by the candidates can be defined. This can be done by analysing the learning objectives for performance-related verbs such as demonstrates, plans, applies, identifies, calculates, etc, according to Bloom's taxonomy (Bloom 1956). Thus, it is from the learning objectives for each level that specific tasks can be discerned and it is from the list of tasks that performance elements specific to simulation activity can be set as performance objectives.

Once the learning objectives for a given simulation-based competence have been determined, then the simulator programme needs to be designed in detail. The process of designing a simulator-based training programme requires:

- situational analysis
- identifying the performance objectives
- selection of simulators and simulation exercises
- organizing and writing of content for a programme
- the evaluation mechanism

6 See also Standard for certification of maritime simulator systems (DNV 2011)

Figure 2. Detailing of Simulation Programme (IMO 2012)



5.3 Situational Analysis

A situational analysis involves establishing facts and figures on the trainees' level of responsibility, skills, cognitive abilities and traits as presented and to be developed. This is completed before developing the simulation programme. A situational analysis can be developed for the different units of competence for each function across different levels and categories. The PLATINA Competence Tables (PLATINA 2016) and EDINNA Course Manuals (LEONARDO DA VINCI 2015) shall be used as a guide. Instructors must begin the development of a simulation-training programme with a needs assessment related to the trainee, competence and context.

Trainees	Particulars
Number of Trainees per Course	
Number of Trainees per Simulator	
Qualification	
Experience	
Prior Relevant Courses	

Competence	Example
Tasks	
Task Context	
Experience	
Pre requisite Units	

5.4 Performance Objectives

Establishing standards of performance in terms of a set of outcomes is the next step. The set of outcomes relates to those tasks to be performed in order to achieve competence. More than one task may be combined for the performance. The range of contexts and conditions to which performance objectives apply must also be specified. A detailed example is given below. Note that the competence unit is broken down into specified tasks to be performed and that each performance criteria is described and evidence is recorded.

5.5 Example: 'Navigation on Inland Waterways'

The boat master sails and manoeuvres, ensuring safe operation of the vessel in all conditions on inland waterways.

5.5.1 Competence Tasks

Function & Level	Navigation at the management level
Unit of Competence	Navigate and manoeuvre using modern electronic navigational aids
Competence Tasks	
1	Inspect the modern electronic navigational aids, set and adjust turn indicator, RADAR, GPS, Inland AIS, Inland ECDIS before taking over the navigation of the vessel.
2	Take over the navigation of the vessel.
3	Use information generated by help of modern electronic navigational devices for manoeuvring the vessel.
4	Respond to changes in environmental conditions.
5	Information exchanges (Inland AIS / VHF radio) and consider for navigation.
6	The frequency and extent of monitoring of navigational equipment and aids conforms to manufacturers' recommendations and accepted principles and procedures, including principles to be observed in navigational procedures.

5.5.2 Task-Performance Objectives

Function & Level	Navigation at the management level
Unit of Competence	Navigate and manoeuvre using modern electronic navigational aids
Competence Task 1	Inspect, Setting and adjust turn indicator, RADAR, GPS, Inland AIS, Inland ECDIS
Supporting knowledge/ pre knowledge	Understanding of above mentioned systems
Performance Condition and context	Aboard vessel, shift changeover, having an inland navigation tank vessel (LOA = 110 m, B = 11,40 m), gasoil loaded, machinery of 750 kW, low Fog at port of Rotterdam, wants to go to Duisburg.
Performance Criteria	1 Switch on modern electronic navigational devices or determine status or condition of turn indicator, RADAR, GPS, Inland AIS, Inland ECDIS, control systems, indicating panels and communication systems. 2 Basic setting of the RADAR and Inland ECDIS (modus) according to the ambient conditions and the manufacturer's instructions. 3 Adjustment of range, measuring range of turn indicator and rudder angle and different filters (FTC, STC, ...) between RADAR and Inland ECDIS. 4 Enter travel-related data in the Inland AIS. 5 Check relevant information output of the modern electronic navigational aid and take it into consideration for the following manoeuvres.
Attitude	Inspect, set and adjust modern electronic navigational aids before using the devices for navigation.
Evaluation Criteria for Performance	1 Correctly determine status or condition of turn indicator, RADAR, GPS, Inland AIS, Inland ECDIS, control systems, indicating panels and communication systems. 2 Correct basic settings and adjustment of RADAR and Inland ECDIS (modus) according to the environmental conditions and the manufacturer's instructions. 3 Complete and correct entry of the travel-related data into Inland AIS. 4 Check and report relevant information output of the modern electronic navigational aid.
Evidence	1 Status or condition of turn indicator, RADAR, GPS, Inland AIS, Inland ECDIS, control systems, indicating panels and communication systems checked. 2 Basic settings and adjustment of RADAR and Inland ECDIS (modus) according to the ambient conditions and the manufacturer's instructions (Checklist) are correct. 3 Travel-related data are complete and accurate input to the Inland AIS. 4 All modern electronic navigational devices are running properly.

5.6 Setting the Level of Simulation

Simulation training shall be planned with increasing levels of complexity in familiarization, operational tasks, functional tasks and team building; then to high-level decision making and finally, high-level, high-stress, decision-making scenarios in emergency situations, etc.

A task is something an individual needs to do. It can be a simple activity such as taking a compass bearing of a terrestrial object or noting exhaust temperature of a main engine unit; or else, the task can be complex, such as determining position or troubleshooting causes of high exhaust temperature. This requires that such a task be broken into subtasks. The most complex tasks such as manoeuvring a vessel in a narrow channel or port will require that even subtasks be broken into still smaller tasks. Simulation tasks can be categorized as follows (PLATINA 2014):

1 **Familiarization**: The trainee is familiar with the equipment, layout, procedures, and routine tasks.
2 **Operational**: The task relates to the inputs/outputs and their relationships, and refers to the performance of a function; for example, the ability to operate the RADAR equipment, etc.
3 **Functional**: The task relates to the functions or activities performed by the system without reference to which of the elements of the system performs those functions; for example, use of RADAR for determining position or collision avoidance, etc.
4 **Management**: The task relates to the management of a combination of more than one system to perform a given job; for example, situational awareness or position determination after combining the RADAR outputs with the Inland ECDIS.
5 **Communication**: The task relates to effective communication between different human resources to report, get feedback or to execute a task.
6 **Emergency**: These tasks are performed in circumstances where there is variation or deviation from the expected scenario or situation.
7 **Crisis**: These tasks are performed when an emergency situation has developed into a non-controllable situation.

In addition to the above categories of tasks, certain tasks are team based and require honing of individual traits such as communication, personal relationships, team playing, influencing, negotiating, self-learning, establishing trust, managing and leading, etc.

Performance objectives need to be specified against a different range of contexts and circumstances; for example, from no wind to stormy wind, no current to high current, low water level to high water level, normal to heavy load conditions, etc.

Setting Level of Simulation						
Function & Level		Navigation at the management level				
Unit of Competence		Navigate and manoeuvre using modern electronic navigational aids				
No.	Competence Tasks	Level of Simulation				
		Familiarization & Operational	*Functional*	*Management*	*Communication*	*Crisis & Emergency*
1	Inspect the modern electronic navigational aids, set and adjust turn indicator, RADAR, GPS, Inland AIS, Inland ECDIS before taking over the navigation of the vessel.	✔	✔	✔		✔
2	Take over the navigation of the vessel.	✔	✔	✔	✔	
3	Use information generated by help of modern electronic navigational devices for manoeuvring the vessel.	✔	✔	✔	✔	✔
4	Respond to changes in environmental conditions.	✔	✔	✔	✔	✔
5	Information exchanges (Inland AIS / VHF radio) and consider for navigation.	✔	✔	✔		
6	The frequency and extent of monitoring of navigational equipment and aids conforms to manufacturers' recommendations and accepted principles and procedures, including principles to be observed in navigational procedures.	✔	✔	✔	✔	

5.7 Simulator Characteristics:

The simulator characteristics and specifications shall be such as to provide a training platform to produce functional and physical fidelity similar to the working environment on board vessel, and be able to meet the training objectives. The detailed technical specifications for inland navigation simulators are under construction. An example of brief specifications for a Full Mission Ship Handling Simulator is given below:

The simulator wheelhouse shall be equipped with the equipment and devices for monitoring and control of a real vessel engine and steering system, as well as the necessary modern electronic navigational devices to simulate the real operation environment on board (see European Parliament 2006). The subsystems shall be designed in such a way as to be operated by buttons and switches, PC-Keyboard/mouse, or touch screens on the local control panels in the simulated wheelhouse. The

simulation models in real-time mode shall be able to display various parameters at the monitors or control panels as well as the radar picture, Inland ECDIS, inland AIS-data and so on, similar to a real wheelhouse. The interfaces between the systems and interdependency shall be simulated. The simulator shall be able to simulate sounds in the environment. Therefore, all activities that are normally performed on board using modern electronic navigational aid should be possible in the simulator (see also chapter 3.2.2).

The following list is a compilation of the most important activities for navigating and manoeuvring using modern electronic navigational aids:

1. Safe navigating and manoeuvring should be possible in the wheelhouse of the simulator
2. The instructor should be able to alter parameter values to abnormal and alarm levels
3. All trainee events and activities should be watched and, if necessary, recorded. It should be possible to view these at the instructor station
4. Trainees should be able to check GPS data
5. It should be possible to change GPS accuracy, to simulate RADAR errors, radio communication failures, etc
6. Trainees should be able to enter and retrieve relevant data/information from the inland AIS
7. The instructor should be able to send text messages via inland AIS and to manipulate inland AIS data of traffic vessels
8. VHF Communication ship-ship and ship-shore must be possible
9. RADAR and Inland ECDIS have to work
10. RADAR overlay and Inland ECDIS must show the same area (also the sight system)
11. If the instructor changes the weather conditions, it must be possible to change the radar settings
12. It should be possible to operate the engine and the rudder in different modes
13 The main parameters of vessel manoeuvres (speed, rudder angle, rpm main engine, turning rate etc.) must be displayed

5.8 Organizing the Simulation Course Plan

The next step is to organize the simulation course plan in terms of:

- Course Framework
- Course Outline
- Detailed Teaching Syllabus
- Instructor Manual
- Simulation Exercise Samples
- Exercise Templates

5.8.1 Course Framework

The course framework shall contain the following:

- scope of the course
- course objectives
- entry standards
- duration
- group size
- course certificate
- course intake limitations
- staff requirements
- teaching facilities and equipment
- teaching aids
- references
- Textbooks and bibliography

5.8.2 Course Outline

The course outline shall summarily specify the subject areas and hours required for teaching each subject area.

5.8.3 Detailed Teaching Syllabus

The detailed teaching syllabus shall be written in learning objective format. It should specify what the student must do to demonstrate acquisition of specific knowledge or skills. The format shall also based on the PLATINA Competence Tables (version 2016) and EDINNA Course Manuals (LEONARDO DA VINCI 2015), along with a textbook, bibliography, teaching aids and simulators required to cover each learning objective.

5.9 Instructor Manual

The manual reflects the course designers' views on methodology and programme structure, i.e., what they consider relevant and important as guidance for the instructor. However, the instructors may use their own methods and ideas for the conduct of the course.

It is important that the simulation programme should cover the following areas:

1. Pre-session briefing
2. Simulator exercises
3. Designing exercises
4. Exercise scenarios
5. Conducting exercises
6. Monitoring exercises
7. Debriefing
8. Evaluation of the programme
9. Assessment of trainees and performance criteria

5.10 Designing the Simulation Exercise

Once the performance objectives have been determined, the instructor needs to design the simulation exercise. The exercises should not be so complicated that the students will have difficulty in carrying out their tasks and duties. The exercise should start with simple activities in which students can use simple elements. Step by step, they should proceed towards more complex activities. It is better to have two short exercises than to have one long one to ensure that the learning process is effective. The simulator is designed to provide training for normal to difficult operations. It is important for the students to achieve a satisfactory level of competence under normal conditions before proceeding to exercises in which faults have been introduced.

The proper designing and rehearsing of the exercise is important to ensure that the learning objectives are met and that the simulation provides situations and conditions similar to the ones actually faced on board vessels. The process of designing simulation exercises shall consist of:

1. Introduction
2. Choreographing the simulation in line with learning objectives
3. Duration of the exercise
4. Number of trainees
5. Rehearsing the simulation exercise
6. Writing the simulation exercise sheet

Sample simulation work sheets

The instructor must work from a written simulation worksheet to provide the necessary documentation of what the trainees are to be trained to do. Simulation work sheets may include the following elements:

1. Scenario type
2. Learning objectives
3. Simulator status
4. Condition of parameters
5. Instructions for the trainee
6. Instructions for the instructor
7. Trainee evaluation
8. Course feedback

The following work sheets provide examples:

First Sample Instructor Worksheet:

Sample Instructor Worksheet (No. 1)	
Exercise No.:	nn
Name	Taking over navigation of an inland navigation vessel
Function	Navigation at the management level
Competence Unit	Navigate and manoeuvre using modern electronic navigational aids
Task/Learning objective	Inspect the modern electronic navigational aids, set and adjust turn indicator, RADAR, GPS, Inland AIS, ECDIS before taking over the navigation of the vessel
Scenario topography	At the port of Rotterdam
Context	Normal routine navigating and manoeuvring, changing to bad weather conditions (fog, rain) and failures in the electronic navigational devices
Initial condition	All parameters normal, light fog
Duration	One and a half hour

Briefing	Brief the trainee about the competence unit, tasks, learning objectives, initial conditions, context and duration of the scenario.
	
	Make sure that the trainee is able to:
	- ensure that the persons in the wheelhouse appear to be fully capable of performing their duties effectively
	- understand the navigational aids and ensure that persons in the wheelhouse are able to operate and adjust the navigational devices including:
	  - the nature of all work being performed on machinery and systems, the personnel involved, and potential hazards
	  - the condition of each device of the navigational aid
	  - the condition of monitoring and operation console equipment and which equipment is manually operated
	- initiate relevant communication via VHF radio or Inland AIS and Inland ECDIS
	- understand the charts and other information given by radar and other navigational devices
	- understand effects on navigational devices and systems of potentially adverse conditions resulting from bad weather, bad GPS data, errors and failures
	- understand the motion of the vessel as a result of engine power and rudder effects under consideration of wind and current.

Action	Start the simulation and let the student - take a round view in the wheelhouse - switch on modern electronic navigational devices or determine status or condition of turn indicator, RADAR, GPS, Inland AIS, Inland ECDIS, control systems, indicating panels and communication systems - make the basic settings of the RADAR and Inland ECDIS (modus) according to the ambient conditions and the manufacturer's instructions - adjust range, measuring range of turn indicator and rudder angle and different filters (FTC, STC, etc.) between RADAR and Inland ECDIS. - enter travel-related data in the Inland AIS - check relevant information output of the modern electronic navigational aid and take them under consideration for the following manoeuvres - perform the manoeuvre For the second trainee: Call the trainee and inform him that the weather is going to worsen with increasing to heavy fog.
Debrief	Once the exercise has been carried out, the handling procedures for setting, adjustment and data entry, as well as the information output of the navigational devices and the resulting manoeuvre, must be checked. Any deviation from the normal operation must be discussed and investigated more closely. Evaluate with the trainee the results of the simulator run as related to the tasks and learning objectives, referring to the trainee evaluation sheet while considering different approaches.

Second Sample Instructor Worksheet:

Sample Instructor Worksheet (No. 2)				
Objective:	Familiarization with simulator and wheelhouse equipment			
Exercise Area:	Rhine River, km 765-795			
Exercise No.	Revision No.	Duration: 3 Hours	Issued by: Instructor (name)	Issue Date: DD/MM/YYYY

Start Information	Own Ship
Date:	Start Position:
Time:	Heading:
Visibility:	Speed:
Precipitation:	Working channels: for internal & external
Area:	Communication:
Tidal condition:	Charts & passage plan:
Special condition:	Checklist:
Special information:	Publications:
Special instructions:	Machinery status:

Wind	Current	Sea State
Direction:	Direction:	Direction:
Speed:	Speed:	Speed:

The Task

- Familiarize with vessel particulars
- Proceed on given heading
- Follow pre-planned track
- Try out hand steering and familiarize with different steering modes
- Try out main engine and thrusters
- Become familiar with all wheelhouse equipment
- Become familiar with virtual world
- Tick off familiarization checklist
- Doubts, if any, should be clarified in an open-minded manner

Performance Criteria

- familiarization with wheelhouse equipment
- familiarization with simulator and various buttons
- familiarization with virtual world
- trainee should have felt elements in the virtual world and thus experienced tele-presence.
- instructor should be able to change external environmental parameters from instructor station.
- instructor should be able to stop, start & pause exercise.

Third Sample Instructor Worksheet:

Sample Instructor Worksheet (No. 3)				
Objective:	Standard Manoeuvres			
Exercise Area:	Rhine River			
Exercise No.	Revision No.	Duration: 3 Hours	Issued by: Instructor (name)	Issue Date: DD/MM/YYYY

Start Information	Own Ship
Date:	Start Position:
Time:	Heading:
Visibility:	Speed:
Precipitation:	Working channels: for internal & external
Area:	Communication:
Tidal condition:	Charts & passage plan:
Special condition:	Checklist:
Special information:	Publications:
Special instructions:	Machinery status:

Wind	Current	Sea State
Direction:	Direction:	Direction:
Speed:	Speed:	Speed:

THE TASK

- Familiarize with the vessel particulars
- Carry out turning circle trial
- Describe how to carry out overtaking manoeuvre
- Carry out stop in loaded condition
- Repeat above manoeuvre in ballast condition
- Record time, position, heading and other relevant data
- Describe how trim affects the pivot point during turns

Performance Criteria

- Plot the manoeuvre from recorded data
- Compare loaded and ballast conditions
- Remember needed time and space of manoeuvres
- Information in the manoeuvring information booklet can be used when planning a manoeuvre
- The results among different groups are to be compared when using the same vessel

Sample RADAR Simulator Exercise:

EXERCISE	CREATED/UPDATED	BIJ
Use of radar for navigating in restricted visibility with traffic and arrival port	DD/MM/YYYY	Instructor (name)

Start Information	
Location: Rhine River, Krefeld, downstream	Date: DD/MM/YYYY Time: Day

OWN SHIP		
Type: ChemTanker Length over all: 110 m Breadth: 11.40 m Draft: 2.80 m	Starting position: km 770.0 Heading: downstream	Speed: 20.0 km/h full ahead

TARGET SHIPS
12 vessels of different types on pre-determined routes along the passage in both directions

WIND	CURRENT	SEA STATE
- Wind direction: S - Wind speed: Force 4	- Current direction: follows river - Current speed: 6.4 km/h	- Sea state: 0.5 m - Visibility: Reduced

TRAINING OBJECTIVES

- The trainee will use correct procedure for switching on the radar
- The trainee will set up the radar for the prevailing conditions
- The trainee will effectively use radar for navigating in restricted visibility
- The trainee will effectively take appropriate action for collision avoidance
- The trainee will carry out parallel indexing
- The trainee will correctly apply the rule for sailing by radar

THE TASK

- Make out a passage plan on paper
- Plan parallel indexing for legs where applicable
- Assess the clearing ranges for the passage
- Execute the passage
- At the start of the exercise, switch on the radar and adjust the controls for prevailing conditions
- Acquire targets
- Choose the appropriate range
- Carry out trial manoeuvre to assess for action
- Take appropriate actions for collision avoidance

INSTRUCTOR NOTES

- Brief the trainee about the exercise
- Discuss rules in detail and briefly refresh other rules applicable to the situation
- Select trainee for the exercise
- Check passage plan to ensure that normal requirements have been met
- Monitor discussion of passage plan, briefing team members on their roles
- Monitor preparations for approaching an area of restricted visibility
- Monitor the correct switching on procedure for radar and adjusting the controls
- Monitor communications
- Monitor actions of application of the rules
- Monitor full exploitation of the radar for safe passage

ASSESSMENT POINTS

- Correct switching on procedure
- Correct adjustment of radar controls
- Correct selection of range
- Correct sequence and selection of targets
- Correct application of rules
- Optimum tuning of radar for changing weather conditions
- Correct reporting and communications--internal information and reporting within the vessel, and external with AIS targets, traffic vessels, VTS, etc

Sample Trainee Evaluation Sheet

Trainee Evaluation Sheet		
Observation	Weight	Marks
Inspection	0-10	
Switches on all electronic navigational devices		
Makes the basic settings to all electronic navigational devices		
Inspects all electronic navigational devices, noting conditions and any deviation from normal		
Observation (observes, notes and, where necessary, checks)	0-8	
GPS data		
Information of the radar chart		
Information of the Inland ECDIS		
Inland AIS data of traffic vessels		
Reports	0-10	
Evaluates relevant information output of the modern electronic navigational aid, considers data for the following manoeuvres and reports the resulting manoeuvres directly to traffic vessels and VTS by VHF radio or inland AIS		
Records	0-10	
If satisfied with basic settings and the adjustment of the equipment, **accepts responsibility**, takes over navigation of the vessel and starts manoeuvring	8	
Total Marks	**100**	
Remarks and observations of assessor: - - - - -		

Sample Course Feedback Form

Course Feedback Form		Score Count					
Session/Topic	Question	1	2	3	4	5	Remarks
GENERAL							
Was the training of interest to you?							
Your role:							
CURRICULUM							
1 The training met my expectations							
2 I will be able to apply the knowledge learned							
3 The training objectives for each topic were identified and followed							
4 The curriculum content was organized and easy to follow							
5 The materials distributed were pertinent and useful							
SIMULATION							
1 The simulation exercise was pertinent to the learning objective							
2 The roles were appropriate to the exercise, and the pre-briefing session was useful for the exercise							
3 The assessment criteria were clearly explained at the beginning of the exercise							
4 The conduct of the simulation exercise was realistic and achieved the learning and assessment objectives							
5 The debriefing session achieved its objective to summarize the lessons learnt and reinforce the learning objectives							
6 The simulation time was sufficient for developing skills outlined in the learning objectives							
DEPARTMENT STAFF/INSTRUCTORS							
The Instructors were knowledgeable							
The quality of instruction was good							
The presentations were interesting and practical							
The instructors met the training objectives							
Good training aids and audio-visual aids were used							
Class participation and interaction were encouraged							
Adequate time was provided for attendee questions							
Staff were interested and addressed attendees' concerns							
TRAINING: SPECIFIC QUESTIONS							
How do you rate the training overall?							
The training will help me do my job better							
This training is worthwhile and should be conducted on a regular basis							
PROCEDURES AND INFORMATION							
Did you receive timely, advance training information?							
Was adequate time allowed for breaks and meals?							
Totals							

6. Effective Interpersonal and Communication Skills

6.1 Introduction

Effective instruction is very much a matter of effective communication. Even if you are very knowledgeable about inland navigation, instructing it to others can be very difficult if you are unable to communicate effectively. Effective instruction can only take place in a situation in which the student and the instructor feel safe. Effective instruction depends on mutual respect and mutual expectance. This chapter provides information about these topics.

6.2 Definition

When providing instruction to students, effective communication is very important. In this manual, we define 'communication' as the activity of conveying information through the exchange of ideas, feelings, intentions, attitudes, expectations, perceptions or commands, as by speech, gestures, writings and behaviour. In other words, it is the meaningful exchange of information between two or more participants.

6.3 Behavioural Guidance to Effective Communication

Literature provides guidance on effective communication. Trainers should:

- speak clearly and understandably
- make sure that there is two way communication
- present in a logical sequence
- emphasize important information
- monitor audibility: aim to vary volume so it aids the content of the message
- use pace of speech to suit the meaning of the message
- find the right pitch given the circumstances: too high may seem nervous, too low boring
- pronounce words clearly
- use pauses to allow students to think about what is said and to allow note-taking
- show energy and enthusiasm
- maintain eye contact with students
- use gestures and movement
- show confidence
- use positive motivation
- use humour
- show empathy to communicate care and concern to students
- ask questions

These guidelines clearly show the link between 'instruction' and 'communication.' Effective trainers provide information to trainees using a variety of channels and methods. Their aim is to enhance trainee learning.

6.4 Communication as a Process

Communication is a process (Figure 3), the core components of which are the sender, the receiver, the message, the channel, and the feedback. The communication process entails coding (formulas), sending (both by sender) and decoding (by the receiver). By receiving feedback, the sender can check whether the message was received, understood and accepted. Prudence is called for when formulating (the sender), but also when decoding (interpreting by the receiver).

Figure 3. The Communication Process

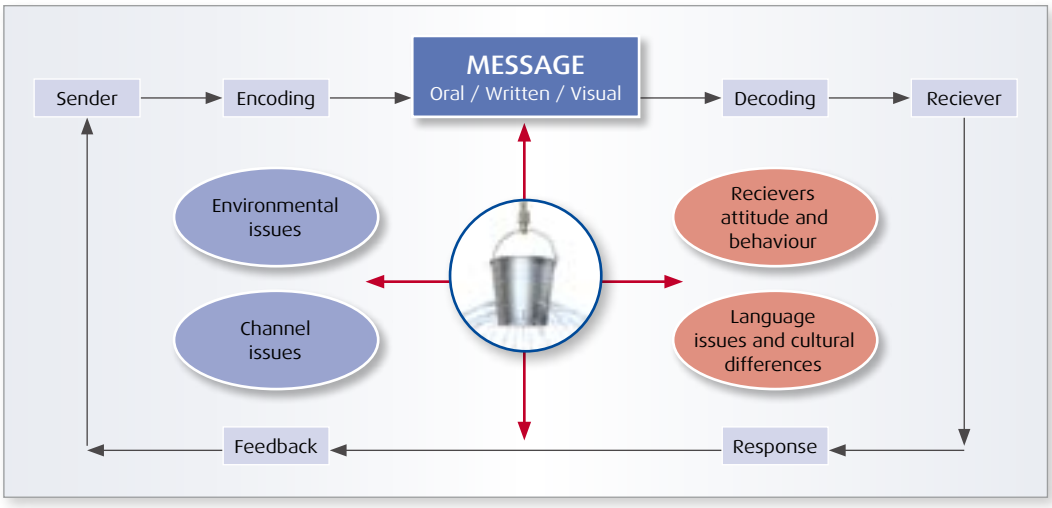


Table 2 provides an overview of the communication process as it can take place in the training situation.

Table 2. Communication Process

Instructor (sender)	Message	Student (receiver)
Thinks of a message	Verbal	Senses (hears/sees/feels)
Puts message into words	Non-verbal	Pays attention
Expresses the message	**Channel**	Receives information (message)
	Person to person	Gives feedback to instructor
	Internet, mobile phone, tablet, PC	
	Simulator	
	Written media	

Each part of the process has its unique features:

- For the sender and receiver: culture, gender, knowledge, skills, training, profession, mood, interest, values and norms
- For coding and decoding: a shared 'language', e.g., a national language such as Dutch Rumanian, English, French or German; a standard professional terminology (e.g., RIVERSPEAK) used, or VHF communication
- For the message: word, gesture, writing, pictogram, sound, message level (content, relationship, expression, appeal)
- For the channel and medium: the human senses, smart phone, tablet, VHF, computer (e-mail, Internet), CD, DVD
- For the feedback: indication of receipt and interpretation

Each feature can have a positive or negative impact on the effectiveness of the communication process and thus on learning.

6.5 Mishaps in Communication

Communication is a complex process. At any stage, things may go wrong. For instance, the instructor may be unclear in what he wants to express; the instruction environment may be too noisy; the student may not understand the words the instructor is using, but gives no indication that he is lost. One might imagine a very fast-talking instructor with a high-pitched voice, looking away all the time, seeming insecure, using technical and non-technical words at random, not being very organized in presentation, in a noisy room with dysfunctional equipment and not dressed for the situation.

6.6 Barriers to Effective Communication

There are several types of communication barriers that instructors must seek to minimize.

Examples of 'internal' barriers are:

- voice (intonation, clarity of pronunciation, voice-raising, speed of speech)
- body language (eye contact, facial expressions)
- choice of words (technical and non-technical)
- rank/position, fear/intimidation
- background/education
- assumptions/wishful thinking
- disorganized way of thinking
- stress/ tiredness

Examples of 'external' barriers are:

- noise
- work pressure
- distractions
- physical location of equipment
- physical condition of equipment

6.7 Verbal, Paraverbal and Nonverbal Communication

Communication is not only exchanging information through words. Nonverbal and paraverbal also come into play. Nonverbal communication can be body language such as eye contact, body gestures or body contact, as well as clothing, appearance and jewellery. Paraverbal communication includes pitch of voice, intonation and how fast or slow speech is paced.
A comparison of the influence of the three communication modalities shows that nonverbal and paraverbal communication are much more important than verbal communication in getting a message across.

6.8 Questions

Questions are an integral part of effective instruction and communication. A good question is precise and clear. A good question may take many forms: an inquiry, a demand for providing arguments, a request for representation, a request for answering a multiple-choice question, etc.
Good questions are often open questions. They do not limit the answering possibilities of the respondent. Good questions often start with: 'What', 'Who', 'When', 'Where', 'Why', 'Which', 'How', and 'Explain'. They are not necessarily limited to reproduction but can aim at the association of ideas or idea applications. They are an invitation to think. Bloom's *Revised Taxonomy of Learning Objectives* can be the basis for planning effective questions.

Tables 3 and 4 provide sample question stems based on Bloom's Revised Taxonomy for six categories: remembering, understanding, applying, analysing, evaluating, and creating.

Table 3 Sample Question Stems Based on Blooms' Revised Taxonomy (Bloom 1956; 2007)

Remember	Understand	Apply
- Who? - Where? - Which one? - What? - How? - Why? - How much? - How many? - When? - What does it mean? - What happened after? - What is the best one? - Can you name all the ...? - Who spoke to ...? - Which is true or false?	- What does this mean? - Which are the facts? - State in your own words. - Is this the same as ...? - Give an example. - Select the best definition. - Condense this paragraph. - What would happen if ...? - Explain why ... - What expectations are there? - Read the graph (table). - What are they saying? - This represents ... - What seems to be ...? - Is it valid that ...? - What seems likely? - Show in a graph, table. - Which statements support ...? - What restrictions would you add? - Outline ... - What could have happened next? - Can you clarify ...? - Can you illustrate ...? - Does everyone think in the way that ... does?	- Predict what would happen if ... - Choose the best statements that apply. - Judge the effects of ... - What would result ...? - Tell what would happen if ... - Tell how, when, where, why. - Tell how much change there would be if ... - Identify the results of ... - Write in your own words ... - How would you explain ...? - Write a brief outline ... - What do you think could have happened next? - Who do you think...? - What was the main idea ...? - Clarify why ... - Illustrate the ... - Does everyone act in the way that ... does? - Draw a story map. - Explain why a character acted in the way that he did. - Do you know of another instance where ...? - Can you group by characteristics such as ...? - Which factors would you change if ...? - What questions would you ask of ...? - From the information given, can you develop a set of instructions about ...?

Table 4. Sample Question Stems Based on Revised Bloom's Taxonomy (Bloom 1956; 2000))

Analyze	Evaluate	Create
- What is the function of ...? - What is fact? Opinion? - What assumptions ...? - What statement is relevant? - What motive is there? - What conclusions? - What does the author believe/assume? - State the point of view of ... - What ideas apply? - What ideas justify the conclusion? - What's the relationship between? - The least essential statements are ... - What's the main idea? Theme? - What literary form is used? - What persuasive technique is used? - Determine the point of view, bias, values, or intent underlying - presented material. - Which events could not have happened? - If ... happened, what might the ending have been? - How is ... similar to ...? - What do you see as other possible outcomes? - Why did changes occur? - Can you explain what must have happened when ...? - What were some of the motives behind ... ? - What was the turning point? - What are some of the problems of...? - Can you distinguish between ...?	- What fallacies, consistencies, inconsistencies appear? - Which is more important, moral, better, logical, valid, appropriate? - Find the errors. - Is there a better solution to ...? Explain. - Judge the value of ... - What do you think about ...? - Can you defend your position about ...? - How would you have handled ...? - What changes to ... would you recommend? - Do you believe ...? - How would you feel if ...? - How effective are ...? - What are the consequences of ...? - What influence will ... have on our lives? - What are the pros and cons of ...? - Why is ... of value? - What are the alternatives? - Who will gain and who will lose?	- Can you design a ... to ...? - Can you see a possible solution to ...? - If you had access to all resources, how would you deal with ...? - Why don't you devise your own way to ...? - What would happen if? - How many ways can you ...? - Can you create new and unusual uses for ...? - Can you develop a proposal which would ...? - How would you test ...? - Propose an alternative. - How else would you ...? - State a rule. - Adapted

6.9 Evaluation of Effectiveness

Monitoring the effectiveness of communication is important. One indicator of effectiveness can be the feedback of trainees, and another that of experienced colleagues. Using the behavioural guidelines (6.3) as a personal checklist can also be useful.

6.10 Instructor-Student Interaction

Effective instruction can only take place in a situation in which the trainee and the trainer feel safe. Effective instruction depends on mutual respect and mutual expectance.
Instruction room management can provide the circumstances in which effective trainer–trainee interaction can take place. In preparing for instruction, the trainer can create an environment in which learning can take place.

Four focus points are:

1 Instructional planning and delivery–Activities are planned and implemented in ways that optimize trainee learning, as evidenced by lesson objectives based on students' functioning levels, relevant and meaningful assignments, adequate timelines for tasks, and clear and brief task directions. The place of instruction is appropriate for the needs of all students, non-punitive provisions are made for students who need more time, and corrective feedback is provided promptly and positively during guided practice. The goal of social acceptance by peers is emphasized, as is the development of autonomy, individual responsibility, and interdependence of all students. Skills are taught in the settings and situations in which they are naturally needed, and instructors are actively involved with trainees in a manner that promotes their independence, learning, and interaction with peers.

2 Physical Setting–The physical setting is set up to promote learning and independence, as evidenced by a clean and well-furnished instruction room. Rules, routines and procedures are clear to everybody. Unnecessary and distracting items and influences are removed. All materials are organized and accessible.

3 Scheduling–The scheduling of instruction occurs in a manner that optimizes student learning, as evidenced by clear daily schedules in which there is room for each student to do independent work, for one-to-one instruction, for small and large group activities, socialization, and free time.

4 Instruction room discipline plan–The plan demonstrates responsiveness to problem behaviours, as evidenced by positively stated instruction room rules that are worded in observable and measurable terms, and clear criteria and consequences for rule violation.

6.11 Respect

Acquiring respect is often the first thing that comes to mind when it comes to effective instructor–student interaction. Without respect, students may not be willing to learn. Respect can be achieved if instructors

- behave with assertiveness and self-confidence
- have the required operational and management competence (knowledge, professional attitude, and skills)
- use the authority within their function.
- know their students and are aware of their needs and abilities.
- But there are also behaviours to avoid, such as
- demanding respect
- using authority as a means of power
- using fear as a means of power
- not listening when you are addressed
- being business-like for no reason
- disregarding the input of others
- being bossy

6.12 Behave Respectfully

'Use your position as a role model.' Behaviour is something intrinsic to human beings. A person always behaves one way or the other, and always communicates somehow. In the simulator room, in the classroom, walking down the stairs, in front of the school, in the street, in the pub--in any situation where people come together--an instructor's conduct will be observed by others. Instructors will always be judged by the amount of respect that they show and receive, by their competence, open-mindedness, empathy, and respect for others' boundaries. Ideally, the instructor will know how to motivate other people, and will promote their well-being. In short, an instructor's conduct is constantly under observation.

6.13 Dealing with Obstructive Behaviour in the Instruction Room

Learning means that students have to open themselves up to new situations, information, practices, behaviours, norms, and values. They have to leave their comfort zone. For some, this may lead to obstructive behaviour such as defiance, anger, humiliation, disruptive behaviour, lack of interest, denial, regression, withdrawal, lack of acceptance or other forms of instruction room misconduct.

The literature provides guidance on how to deal with obstructive behaviour of trainees. Questions to be asked are 'What is the reason for this behaviour?' 'Is state-of-the-art instruction room management being implemented?' 'Does the trainer's instruction repertoire meet the needs of the trainees?' In any circumstance, instructors should keep calm, address the trainee and, when necessary, consult colleagues. The "**SOAR-UP**" method (CFEP, 2014)[7] may also be of helpful. The steps in this method are

- **S**top the activity and 'count to 10' before speaking or reacting.
- Think: **O**utcomes. Can you use the conflict as a tool to reach the learning goals?
- **A**ssess the situation. Is there an underlying cause? Can the cause be eliminated?
- **R**eact to the trainees' behaviour as that of a 'third person'. This will help you refrain from becoming emotional.
- **U**se active listening techniques and be attentive to body language. By doing so, you are communicating to the trainee that you are dealing with the situation.
- **P**repare for the next time you teach this course. Turn this unpleasant experience into a learning experience--one that can help you become a better instructor.

7 www.cfep.uci.edu

7. Conducting a Simulation Exercise

The four main components of a simulation session are

1 Preparation
2 Briefing
3 The exercise
3 Debriefing

Preparation

It is important to use worksheets for planning and execution of simulation exercises. The instructor worksheet should include not only the pertinent parameters for the simulation exercise but also all additional equipment, material, etc., which may be utilized by the trainee during the session. This may include publications, manuals, charts, logbooks, stationery, etc.
The environment and ambience of the simulation space will have an impact on creating a sense of realism and encouraging the trainees to immerse themselves into the simulation experience.
Depending on the design and availability of control over the environment, attention
should be given to the levels of:

- **lighting:** it should be reflective of the time of day, of weather conditions (wind, rain, fog, water flow), mirroring lighting in the real world.
- **noise:** the addition of aural cues for the trainee is important as these environmental factors form part of conscious/unconscious monitoring and assessment of the situation. Feedback in the form of engine noise and equipment sound, weather conditions, ambient noise from the surrounding area, etc., are desirable and should be as close to reality as possible.

External factors affecting the simulation session

1. at what point in the course the exercise is given (initial session, middle or final)
2. time of day
3. preceding activities

These factors merit attention as they can influence the mind-set of the trainees. Counteracting any negative fallout will be important. For instance, if it is getting late at the end of a long day, you may wish to structure the debrief so that it does not drag out for too long.

Internal factors affecting the simulation session

- success of the exercise in fulfilling objectives
- group dynamics
- the relationship formed between the instructor and the trainees

Preparing the trainees

Trainee preparation for a simulation exercise is two-fold, i.e. trainees must be prepared both technically and psychologically.

Technically: They must be made aware that the main focus of simulation is not the acquisition of technical knowledge, but the ability to apply it in a real-time context.

Psychologically: They must be explained the context of the simulation session, its relevance to real life operations, and how the exercise is designed to meet the objectives of the session. Attention should be placed on making the trainees feel comfortable with the exercise and convincing them that the simulation exercise is an effective tool to practice application of knowledge, skills, and attitude to gain professional competence.

Ample time must be devoted to preparing the trainees for the exercise. The success of a simulation exercise is directly proportional to the time spent on detailed operational and procedural preparation. This preparation will comprise all aspects of the task to be completed. Decisions made singularly for single tasks, or group decisions for team exercises, the plan of action, a chronological introduction to events, record keeping, etc., must be covered. At this stage, the instructor has the option of observing or providing inputs when deemed necessary. An effective preparation session could be submitting a proposed voyage plan for the exercise. Details of exercise parameters such as weather, tide, current, traffic movements, navigation aids, and dangers along the route should be provided.

Familiarization

The first exercise in the programme is usually the familiarization session where the trainees acquaint themselves with the simulator. It is of vital importance that the trainees be given adequate time to familiarize themselves with the features, equipment, controls, and operation of the simulator.

Setting the scene

The trainees' comfort level is one of the most crucial factors in successful simulation training. The simulation exercise must not appear to be an isolated activity, but one that permits the continual development of professional competence.

Simulation exercises should be regarded as an opportunity to develop skills and reflect on performance for continuous improvement. It is critical that the simulator instructor understand that each trainee brings with him to the simulation programme earlier acquired knowledge, experiences, attitudes, and beliefs. Due respect to the individual is required, which implies that the instructor should find out as much as possible about the trainee's background. It is only when this atmosphere of respect and trust is built up between instructor and trainee that a simulation exercises will be successful.

Knowing the trainees' background

Based on a number of individual factors, each trainee will act differently in a simulation exercise. Some of the factors to be considered are:

- age
- rank
- years of experience
- educational level
- professional competences
- ability to work on a pc
- nationality
- incidents on board
- perception of self
- general attitude towards learning
- reason for attending the programme (mandatory for certification; company specific, individual choice; for assessment; for career promotion, for professional development)
- earlier experience on a simulator programme

Briefing

The briefing is to be thoroughly planned prior to the session. It is not a rushed summary of what is supposed to happen, but a structured and systematic introduction to the exercise and its objectives.

The following points, at least, are to be included in the briefing:

- setting out the objectives
- explaining the simulation scenario
- explaining the plan for the exercise
- listing all the relevant parameters, conditions, limits, etc.
- explaining the starting conditions for the exercise
- informing about any incidents and events which are to occur
- clarifying which standard operations/procedures are to be followed: e.g., company procedures, international or national guidelines, manufacturer instructions, etc.
- assigning roles and providing detailed instructions for each role
- explaining the type and format of the assessment and evaluation to be conducted
- clarifying whether evaluation will be individual or team
- explaining exercise procedures

Assigning roles

Special attention should be given when assigning roles. If roles are assigned at the briefing, then due regard must be given to factors such as age, rank, past experience (type of vessel/operation/equipment), apparent confidence level of the trainee, and the dynamics of the group.

Particular care should be taken in assigning roles for the first main exercise after familiarization. The initial exercise will require a greater more explanation and motivation on the part of the trainees, who may show varying degrees of interest. Some trainees may be extremely keen, while others may be sceptical, overconfident, or fearful. Knowing each trainee's frame of mind will help the instructor work effectively with each trainee. The leadership or main role for the first exercise is usually assigned to an individual who appears to feel confident or who may have more experience.

However, the trainer should be aware it is not always helpful to place the most senior or dominant member of the group in charge as they may overpower the rest of the group and impede contributions from others.
Similarly, it is generally best not to give the command to a trainee who appears hesitant or to to be lacking in confidence. This individual may need to participate in one or two exercises before he feels ready to lead the team.
It is important to set the rules regarding the conduct of the simulation, which includes fulfilling the role as assigned and respecting the roles given to others. This is particularly important for groups with mixed ranks/level of seniority. The seriousness of the simulation exercise in terms of playing the role as expected is to be reinforced at this stage.

Exercise

The key to effective instruction is striking a balance between letting the simulation exercise run without interference and injecting inputs when required. There is no right or wrong method in this, but sound judgement is required from the instructor to assess the most appropriate course of action at the time.

While it is advisable to stick to the plan, instructors nevertheless need to be flexible and open to any situation that may arise. When designing an exercise, instructors will have determined how much to 'load' their trainees, however they may decide to lighten or increase the load during the course of the exercise. The advantage of simulation technology is that the course of events can be guided to some extent by an experienced instructor. For example, if an individual is moving at slower speed than expected and a close quarter situation is unlikely to occur, the instructor can encourage the trainee to speed up as the pilot pick-up time has been preponed.
However, the instructor should never lose sight of the objectives of the exercise. An instructor would typically have a full repertoire of faults that can be introduced into the exercise at any time. Obviously, an instructor would be foolish to introduce series of faults without any real reason. The simulator is a tool that can enhance performance, but can also crush confidence in an individual.
It is the instructor's choice to provide technical stimuli and cues during the exercise. If required, this may be done directly, either in response to the actions of a trainee or if the instructor feels it is necessary. An experienced instructor may be skilled enough to introduce the cue without the trainee actually being aware; for instance, he may role play and provide additional information to the trainee as if it were the planned course of the exercise.
The parameters to be monitored, recorded, and analyzed will be determined when designing the exercise, and work sheets must be created. Other critical parameters such as communication, orders,

instructions and guidance, observation regarding the functioning of the team, detours from standard procedures, etc., should be noted as the exercise is in progress. The use of printers, data recorders, and logs are key tools to assist in recording the information and decisions taken during the exercise, all of which will be closely reviewed during the debriefing.

'Abort Point'

There may be a point in the exercise when the instructor decides that it is best to abort and either restart the exercise completely or take the scenario back in time to a particular point. Usually this decision would lie with the training team in discussion with the trainees, but there are exceptional circumstances when the request may come directly from the trainees.

The decision to abort might be considered in the following situations:

- the objectives of the exercise are clearly not going to be met
- the objectives have already been met
- the consequences of the simulation exercise may potentially damage the trainee psychologically, i.e. if events seem to be getting out of hand
- disruption, disturbance, or non-cooperation among team members
- realism not achieved due to lack of seriousness from one or more team members
- despite pre-planning, an overload or under load for trainees

Debriefing

Debriefing is arguably the most critical part of the simulation exercise. This is the platform where trainees are able to review their performance, evaluate whether they have met the training objectives, reflect on whether the action taken was appropriate and recommend changes that can be made. Creating a 'no-blame' but 'wanting to learn' environment at this point is crucial.

Goals of debriefing

The goal of the debrief session is to provide an opportunity for the performance of the trainees to be reviewed. It is important that the training objectives and parameters set at the start of the exercise are kept in mind; otherwise, the debrief session could go off track and lose its focus.

An effective debriefing session works on the principle of learning from experience with a positive and objective analysis of how things could have been improved. Indeed, the skills that are employed in successful debriefing sessions are those that, when transferred to shipboard experience, are going to be significant in continuing professional development and striving for excellence. The ability to analytically evaluate performance and to set goals for self-improvement is an extremely valuable professional skill to develop.

Planning debriefing

Simulator-run debriefing needs pre-planning.

1. **Location**
   The ideal set-up would be a room equipped, if possible, with a playback device, e.g. video and software, to review the simulation run. *If this is not available, then it is usually advisable to conduct at least some of the debrief close to the instructor unit which would have a playback feature and where actions taken, etc., can be reviewed.*

2. **Gathering data**
   All relevant information recorded by the trainer and the trainees must be gathered: documents, video records, logs, checklists, printouts, rough notes, charts, etc. This allows objective feedback based on facts rather than opinion. It also helps the trainer and the trainees to re-think and re-evaluate their plan of action in more practical and data based ways.

3. **A moment to reflect**
   It is ideal to give the trainees some time to reflect, review, and jot down their points for discussion before starting the debriefing.

Conducting the debriefing

1. **Setting the tone**
   Trainees should be reminded at the start of the debrief that the group is requested to work in a no-blame culture, that the goal is to learn from their actions, that respect for each other is important, and that comments and inputs should, as much as possible, be backed up with objective evidence and be factual in nature. The focus must be on constructive suggestions.

2. **Structuring the debriefing**
   Although not a hard and fast rule, it is often helpful to have trainees provide the first input with their comments and thoughts. If necessary, the trainer may need to facilitate this with some leading questions (table 3 and 4 in chapter 6.8). The trainer will also need to guide the discussion to ensure that positive and constructive comments are given attention.
   Positive and supportive self and peer evaluation are effective methods for internalizing learning and for ownership of the lessons learnt. This should be strongly encouraged.
   The trainer's role is generally kept low-key during the debriefing. The trainer must avoid the temptation to take over and give a lecture on how the exercise should have been performed. To illustrate a point, the trainer should reference back to the playback facility and 'show' the trainees from the actual record of the simulation exercise. The trainer should have a good overview of the points that are to be drawn out from the debriefing, and then attempt to orchestrate the session so that instruction is provided by the trainees themselves. The data and notes taken during the exercise are to be readily available for review and to demonstrate an alternative or more successful course of action.

In some circumstances, the trainer may wish to return to the simulator, take the trainees back to a certain point in the exercise, and carry out some of the exercise again. The flexibility of the simulator to provide the trainees this opportunity to 'try again' is one of its main strengths and should be exploited. In fact, a set procedure, series of actions, or combination of operations may be repeated a number of times to reinforce a critical area of learning.

3. **Elements for evaluation**

The objectives of the exercise are to be used as the basis of evaluation. The debriefing session must include an analysis of whether the trainees performed the necessary tasks and requirements within acceptable limits. Factors to be considered include, but not be limited to:

> degree of accuracy
> time taken to respond
> procedures and practices followed
> communication channels used
> clarity of instructions provided to team members
> organization of operations/tasks
> understanding of basic principles
> application of knowledge to real-life situations
> prioritization of tasks
> trouble shooting
> judgement and decision making

4. **Time allocation**

It is important to allocate generous time for debriefing. A rushed debriefing at the end of the day when the trainees are all set and ready to leave can nullify the opportunity for important learning to take place. The simulation exercise should be planned in such a manner that there is ample time to conduct the debriefing.

5. **Summarizing and Goal Setting**

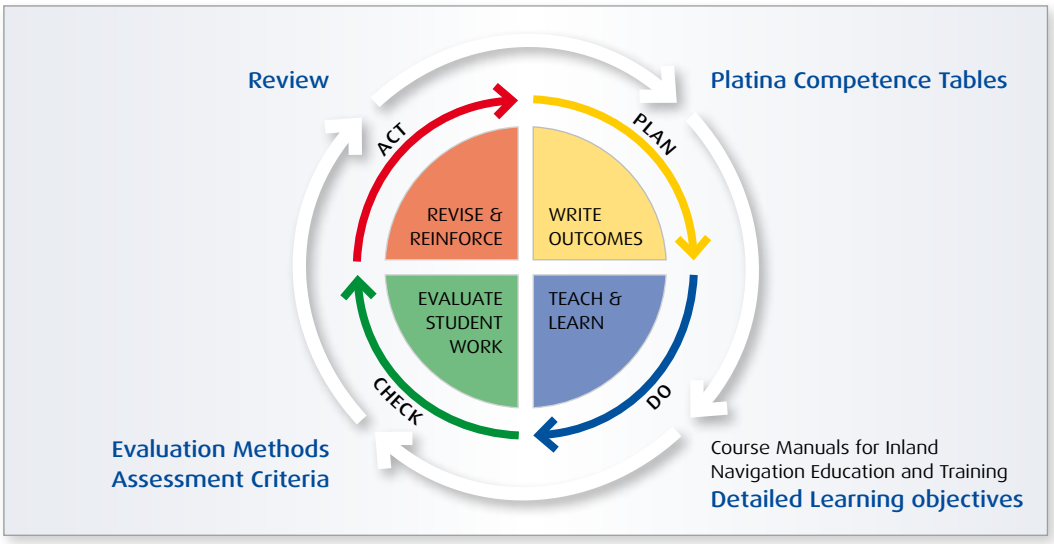
For long-term development or change to take place, writing a formal, documented summary is useful. Ensuring that the trainees note down personal goals for self-development structures the lessons learned and becomes an informal commitment to change. Providing a documented direction for further action and implementation on board is a necessary step towards effective transference of knowledge to the workplace. Summarizing and setting targets bring the session to a positive conclusion and helps trainees recognize the benefits of the simulation exercise.

8. Assessment and Evaluation

Introduction

Assessment is necessary to enhance the learning process (Figure 4), certify the competence of the learner, and monitor if learning objectives have been met. Assessment is defined as the verification of competence in learners, and in a competence-based assessment system, the purpose is to collect sufficient evidence that individuals can perform or behave to a specific standard in a defined role. Assessment techniques vary with different domains, namely cognitive (what the learner should know), psychomotor (what skills the learner should be able to do), and affective (how the learner feels or modifies personal attitudes).
A variety of assessment methods exists. In this manual the focus is on the practical assessment in an Inland Navigation Simulator

Figure 4. The Learning Cycle



The advantages of simulator assessment

Student assessment is one of the main aspects of teaching and training. Instructors should at least know the basics of assessment; they must be familiar with the types and qualities of tests. They should be able to create assessments that meet high-quality standards and be able to recognize whether a test designed earlier by others still meets present criteria.

Types of tests

There are several types of assessments in teaching/training, all with specific objectives. Some commonly used assessments are described below.

- Prerequisite assessments are used to assess whether students have enough knowledge, skills, and appropriate attitude to qualify for entry to the first, second, third or fourth year of instruction. These assessments may also serve a predictive function to anticipate a student's learning results.
- Progress tests are given to provide feedback to the student (and the teacher) on progress. It indicates how the student is doing with respect to the determined learning objectives. The results of the progress test may be of a diagnostic nature (see diagnostic test). Most important, however, is that students be given feedback on a regular basis and in an adequate way.

- Diagnostic tests are used to find out the weaknesses or shortcomings of a student, a group of students, or the learning and teaching process. The purpose of these assessments is to give students specific additional training so they can keep up with the programme, or to adjust the learning/teaching process.
- Selective/summative tests are used to determine whether and to what degree the student has reached the learning objectives. If the student has passed these tests, he may continue a study programme or, if a final test be awarded a certificate of competence.

Qualities of tests

Since assessments are essential evaluation tools in the learning and teaching process, they should be both efficient and effective. They are an important part in maintaining the quality of the learning and teaching process. To ensure that tests/assessments meet the set standards of quality, they should meet the criteria mentioned below.

Relevance

Assessments should be relevant; which means that test items relate to the subject matter. In other words, they must cover the learning objectives. The content of the assessment must provide a truly representative sample of the range of knowledge and tasks to be measured, namely **K**nowledge, **S**kill and **A**ttitude (KSA). The assessment items must also assessment the levels of learning. The test must show a reasonable balance to KSA and the levels of learning, as set by the learning objectives. This is sometimes referred to as 'content balance'. To make sure the content of a assessment is balanced, one should use a specifications table of the subject topics/learning objectives. Without a specification table, there is a risk that the test may give undue weight to some portion of the subject matter or that it unduly concentrates on basic facts and principles, when skill in their application is more relevant to the ultimate objective.

Reliability

Assessments are reliable when they are reasonably *consistent;* i.e. the results should be basically the same whether the student is faced with any one of the sets of papers or test items which are in use. Consistency in results should also prevail, no matter which examiner scores the papers. Reliability means that different groups of students who do the same test would achieve (almost) the same results/score. To enhance the reliability of a test, there should be a distinct differentiation between the scores of good and of poor candidates. To get a 'well spread' distribution of test scores, the level of assessment items should vary from very easy to relatively difficult. Reliability also means that the number of assessment items is sufficient to exclude 'accidental' scores.

Validity

Assessments are valid when they are efficient and effective, meaning that validity refers to the integrity of tests. Assessments should measure what is intended to be measured; they should be easy and economical to conduct and capable of being scored or marked effectively and efficiently. Assessment procedures, method of marking, and explanation of results should be simple and clear for the student. Each test should begin with simple, uniform instructions, and their layout well-structured and clear. Questions and test items must be clearly phrased, short, and to the point. They should resemble neither puzzles nor riddles, nor contain misleading information or 'trick' questions. The number of test items should relate to the time allotted for the examination.

8.1 Assessment Preparation

Assessment process

Learning outcomes must be measurable through applicable assessment for each outcome.
Below is an example of a step-by-step method to create measureable assessment activities:

1 Select a competence from the PLATINA Competence Tables and refer to the corresponding required knowledge, understanding and proficiency; the methods for demonstrating competence; and the corresponding evaluation criteria.
2 Create a detailed list of knowledge/ understanding/proficiency tasks and subtasks, along with learning objectives required for the selected competence, using Bloom's domains across the six levels.
3 Decide to what degree a particular activity to perform the task is critical for the overall performance of the task, and assign a relative weight.
4 Determine weights (0-10) for the knowledge, tasks, and subtasks. Those that are critical to the performance of competence should be more heavily weighted than others. The inability to show or perform them properly should be regarded as proof of non-competence.
5 Set the range of measurement for assessment of the task against the gradations. An example is needed to show how this possibly differs from attributing weights.
6 Practice with model questions. Trainees should be tested on sample assessment activities at different intervals of the course. This practice can build students' confidence by teaching them how the instructor would use the assessments in their summative assessment.
7 Review the assessment based on the results and feedback from the students, and finalize the criteria.

Suggestions for preparing assessments

Make sure the test is **relevant**, **reliable**, and **valid**, and more specifically:

> be absolutely clear about the purpose of your assessment
> give clear instructions on how to do the test
> measure whether the student has reached the learning objectives
> design a specification table to cover both KSA and the levels of learning to be assessed
> avoid over-assessment of 'easy' knowledge and skills
> use a variety of testing techniques
> prepare model answers or solutions to show students when they receive their marks
> avoid asking questions that are dependent on an answer to an earlier question
> refrain from writing trick questions about vague and difficult points
> check past assessment papers for relevance, reliability, and validity
> check the test before you have the students do the test. Ask your colleagues to check the assessment or ask them to do the assessment beforehand
> be objective; if in doubt, ask for a second opinion
> take time for preparation
> when preparing tests, ask yourself: 'What answer do I expect from the student?'

Assessment criteria

A good assessment of student performance is only possible if clear assessment criteria are defined. Also, a clear cut-off point describing the difference between satisfactory and not satisfactory performance is necessary. The criteria must be made clear to the students before an assessment session. This will enable them to focus on the most relevant aspects during their learning process. Examples of criteria such as task completion, accuracy, and completeness are shown in Table 5. Examples using scales and specific situations are also described.

Table 5. Assessment Criteria

Assessment criteria	Scale	Example
Complete a task	Yes/No	Used for a general assessment of complex skills, e.g., the mooring of a vessel. The trainee will pass or fail this task.
Accuracy	E.g., distance, speed, time	Used during assessments with numeric output
Completeness	Percentage of completeness	Used to assess knowledge where completeness is one of the criteria (e.g. 10 correct answers out of 10 questions = 100%)
According to rules and regulations	Yes/No	Used in combination with the attitude regarding specific rules and regulations (Safety and Security)
Effectivity	Yes/No, Good/Bad	Used in situations where trainees choose among different possible options that vary in effectivity, e.g., in a situation where communication, management, or planning is important
Quality	High or Low	Used in situations with complex skills and specific criteria, e.g., during the transformation of a written passage plan to specific attitude during wheelhouse operations

8.2 Conducting an assessment on a simulator

Steps in assessments in a practice simulation:

Each assessment consists of 5 steps:

1 Preparation;
2 Preliminary discussion;
3 Observation of (partial) knowledge and/or (sub) skills;
4 Determining the results;
5 Discussing the results.

A number of *considerations* apply to each step.

Step 1: Preparations

Preparation is half the battle. Good preparation contributes to the validity, reliability and authenticity of the practice simulation. Preparation for a assessment includes:

- Identifying the competences to be tested.
- Selecting the relevant assessment check-lists containing the assessment criteria.
- Conducting the simulation to be tested.
- Preparing for the assessment situation incl. materials and resources (simulator equipment and or computers).
- Setting the assessment schedule.

Step 2: Preliminary discussions

A good preliminary discussion is essential. It focuses on the goals, the assessment criteria, the assessment process, the behaviour required of the student, trainers, assessors, discussing the results, etc. The preliminary discussion with students includes:

- Providing general guidance concerning the test. These guidelines relate to the contribution of the trainer, the assessor and the support staff as well as the contribution of the student;
- Giving an overview of the knowledge and skills to be assessed;
- Discussing the required behaviour and the related outcome criteria;
- In this, the relevant assessment lists are used as well as the outcome criteria contained therein;
- Providing references to materials and resources with which the student can prepare for the test;
- Discussing the scheduling. Points to keep in mind are: the totality of the assessment process within which the specific assessment is located, the duration of the specific test, the time for discussing the results, potential opportunities for “re-testing”. In the case of a test, refer to the examination regulations in the training;
- Discuss the circumstances under which testing is stopped immediately.

Step 3: Observation of knowledge and skills

During the test, the trainer and/or assessor must determine whether the student demonstrates the requisite behaviour in terms of knowledge and skills. The following guidelines apply in relation to observing the knowledge and skills of the student during the test:

- Make sure that the student was able to become sufficiently “familiar” with the material;
- Make sure that the student was able to practice sufficiently with the materials and resources he needs to exhibit the required competences;
- Make sure that the student is able to focus sufficiently on his tasks;
- Make sure that there are no unforeseen disruptions of the assessment situation. Do not allow disruptions to occur that have not been planned for the situation;
- Provide the most realistic conditions possible. Use as many real-life situations as possible;

- Observe the student continuously. Use checklist for this;
- Stick to predetermined standard procedures except when improvisation is required. Do not allow a "game atmosphere" to develop;
- Use as few interruptions as possible;
- Do not ask "leading" questions. Ask as many "general" questions as possible;
- Do not help the student during a test. Do answer the student's relevant questions;
- Remain objective. Use the checklists as basis. Do not allow general impressions and subjective opinions to play a role in the assessment.

Determining the results

The following is important in determining the results:

- Determine the results by using the assessment checklists. Give a satisfactory/unsatisfactory assessment per (sub) competence based on the established assessment criteria.

Step 4: Discussing the results

After the test, the results must be discussed with the students. Guidelines are:

- Present again the procedure for discussing the results;
- Discuss the results as soon as possible, preferably immediately.
- Use the "feedback rules";
- Name the observed knowledge and skills;
- Using logs, video, computer/simulation replay;
- Identify what went well and what needs improvement;
- Avoid a blaming, humiliating attitude;
- Do not "lecture";
- Discuss the implications of the assessment results for the progress of the student in his training programme.

Step 5: Evaluation of the assessment by the trainer

Before the assessment results are discussed with the student, the trainer must establish whether the test:

- Was implemented as planned;
- Met the learning objectives and assessment criteria;
- Was as realistic as possible;
- Was negatively influenced by disruptive factors related to validity, reliability and authenticity.

Checklist assessment

To check off all the didactic aspects of the practical assessment, a checklist (Table 7) is included below to ensure that all the quality requirements of a practical assessment have been met:

Table 6. Quality evaluation checklist

Assessment specification	Yes/No
Is the function of the practical assessment clear (e.g. instruction and exercise, monitoring the progress and/or determining the result)?	
Is a practical assessment a good choice considering the function of the test?	
Is there a clearly described objective to be taught, the mastery of which must be assessed?	
Is a practical assessment the most appropriate means given the learning objective, the material to be learned, and the training provided?	
Is it clear what students should know and be able to do after the course is complete?	
Is the skill to be taught and tested important for the everyday life and/or the later exercise of the profession?	
Does the practical assessment concern long-term knowledge? Does it concern a universal, widely applicable skill?	
Were only the most important aspects measured (not trivial details)?	
Were any important aspects of what was to be taught and assessed overlooked?	

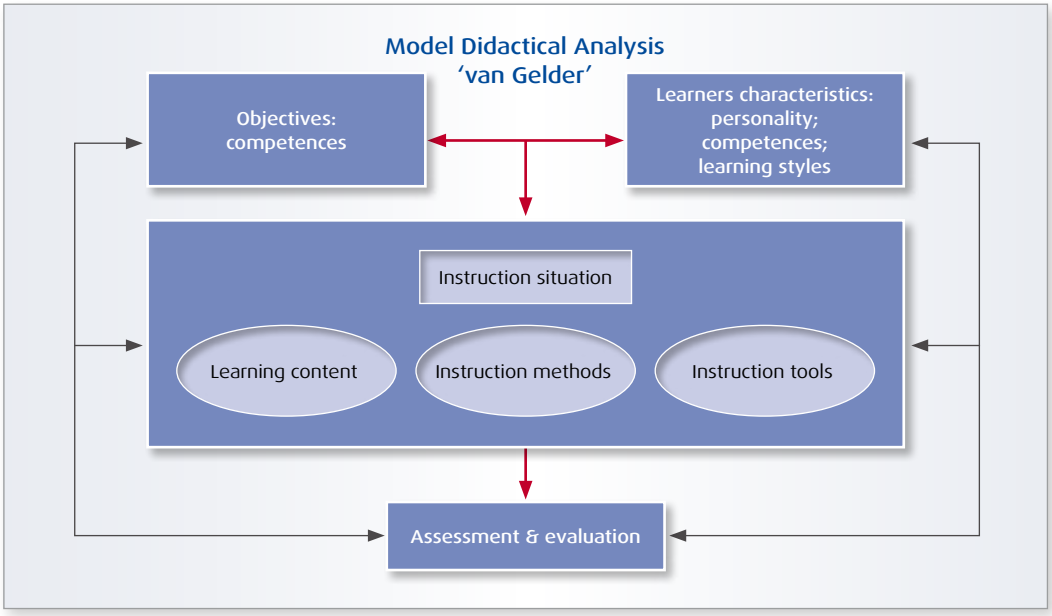
The tasks in the practical assessment	Yes/No
Does the practical assessment consist of multiple tasks?	
Are the tasks sufficiently similar in the sense that they all make use of the same overarching skill?	
Do the tasks fit the objectives and the desired knowledge, skills and/or attitudes?	
Is the question or problem formulation open in the sense that multiple good answers or solutions are possible?	
Are the students sufficiently free to determine the method, the necessary materials and tools, the final product and manner of treatment or presentation?	
Are the tasks realistic and authentic?	
Are the tasks challenging and motivating?	
Are the tasks neither too difficult nor too easy?	
Do the tasks give students ample opportunity to demonstrate their increased knowledge and skills?	

8.3 Assessment objectives

Assessment objectives and the Didactic Analysis Model

Basic to effective instruction and assessment is the development of learning objectives. These learning objectives must be formulated in SMART terms.[8] In order to be testable, the learning objectives must be translated into assessment objectives stipulating what participants should know and be able to do. Those who develop material themselves will of course also design the assessments themselves. Developing good assessment objectives is in principle a process related to the development of the learning objectives. In assessment objectives, you describe what a student should know and be able to do for the test. The assessment (called the end result in figure 5, based on Van Gelder's didactic analysis model) is a result of the assessment objectives (top right), which in turn are further derived from the learning objectives. Thus in principle the learning objectives are derived from the assessment objectives.

Figure 5. Van Gelder's didactic analysis model.



In short:

- Analyse the learning material: what is the content, degree of difficulty, etc.?
- Find out what the learning outcomes are that apply to this test.
- Choose the most important components to be tested

8 http://explearning.ucf.edu/registered-students/tips-for-success/writing-smart-learning-objectives/195

Assessment objectives and Bloom's taxonomy

An important aspect in the preparation of assessment objectives is determining the student's required level of mastery. Consider for example the following assessment objective: *"The student keeps a safe navigational watch"*. This objective refers to a skill, or an application. This means that it is not enough during training to simply tell the student, or have him read or see the steps to be taken. He will need to practice and simulate the desired behaviour.

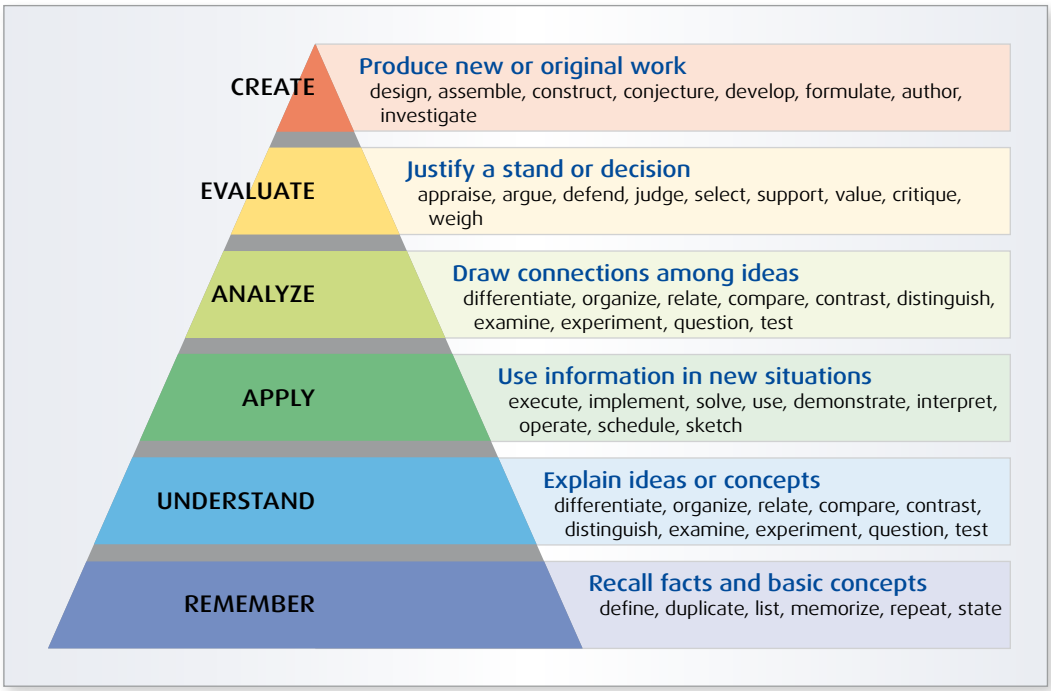
The required level of mastery can partly be seen from the wording of the assessment objective. The fact that one assessment objective has a higher priority (level of mastery) than another becomes clear. This at the same time makes it possible to establish whether the correct level of mastery is being tested. After all, the level of mastery a question is designed to address will need to match the level of mastery of an assessment objective.

A fairly common taxonomy is that of Benjamin Bloom, who published his model in 1956 and which was updated in 2000.

The taxonomy enables you to determine which end behaviour you wish to achieve. Should the student be able to reproduce knowledge, or must he be able to apply it? Do you wish to teach the student to analyse or to create? When that is clear, you then can decide which assessments to use in order to achieve the desired end behaviour.

The taxonomy of Bloom distinguishes the learning process into 6 levels of learning:

Figure 6. Taxonomy of Bloom



In these levels of learning a distinction is made between 'lower order thinking' and 'higher order thinking'.

Lower order assessment

Lower order assessment consists of assessments aimed at determining the extent of remembering, understanding and (partial) application. This type of assessment is suitable for:

- Evaluating students' preparation and understanding
- Determining the strengths and weaknesses of students
- Repeating and summarising the information given

Higher order assessment

Higher order assessment focuses on determining the skills: analysing, evaluating and creating. They are assessments that focus on:

- Thinking further and more critically
- The ability to think in a problem-solving way
- Independently searching for information

Bloom's verbs

In order to arrive at clear learning objectives, and therefore assessment objectives, Bloom uses action verbs. These (cognitive) verbs, based on knowledge, are classified according to the 6 levels of Figure 6. The higher the level number, the higher the required cognitive level. The verbs indicate what is being asked of the student and enable the assessor to observe and assess the requested behaviour. Especially the verbs mentioned from analyse level (for 'higher order thinking') are very useful in a practical assessment situation. The table also contains examples of possible assessment questions.

How to create a good assessment objective

Now that we have seen how Bloom's verbs and Van Gelder's model make possible an interaction between learning objectives and assessment objectives, we here provide you with a number of tips for drawing up good assessment objectives.

- Describe the specific content. *Example: Student places at least 3 positions correctly in the chart.* The assessment objective in this sense is derived from the learning objectives. The learning objective for this assessment objective could for example have been: *After completing the course, students are able to independently determine position using multiple navigation tools*.
- Describe the behaviour as an observable activity. *Example: explain, clarify, etc. The verbs 'know' and 'understand' are not unobservable!!*
- Determine a minimum performance level for a satisfactory result, for example in the form of a time limit or a degree of accuracy. *Example: give an answer to the assignment to three decimals.*
- Define the conditions under which knowledge and skill must be demonstrated. *Example: Use of a formula (information) or a calculator (tool)9*.

9 Eerste hulp bij toetsen [First aid for testing], Grip op Toetskwaliteit [Getting a grip on test quality], Research Center voor Examinering en Certificering (Universiteit Twente and CITO), p. 9.

8.4 Assessment methods

An assessment becomes more objective the more you assess based on firm guidelines, i.e. an assessment model. An assessment model makes possible greater comparability, and hence a more insightful assessment by and for your students.[10] The next paragraphr discusses the underlying arguments and logical sequence for using assessment models, and focuses on what type of rating scale is appropriate to the type of test.

The central question with respect to assessment is whether the student is making progress in his learning based on the stated learning objectives.

Assessment criteria and what constitutes a passing grade

A proper assessment of the performance of students is only possible if supported by clear criteria and clarity concerning what constitutes a passing grade (the difference between satisfactory and unsatisfactory performance). Students must be able to orient themselves to the criteria in a timely manner in order to enable them to use such in their learning process. This means that these criteria must be known in advance.
There are two ways to determine the passing grade: absolute and relative. In the case of an absolute passing grade, it has already been determined beforehand what level of mastery a student must have to pass. For example, 28 of 40 correct three-choice questions is satisfactory. The cut-off for passing is independent of the results of the group. In the case of a relative passing grade, the cut-off point is determined after the fact, based on the performance of the group. For example, if it can be determined that the class average was low due to errors in the assessment or in training, it may be decided that correctly answering 25 of the 40 questions is satisfactory.
The decision concerning the cut-off point between satisfactory/unsatisfactory is an important one. Sometimes a choice is made for apparent simplicity. A trainer assumes for example that a student must correctly answer half of the assessment questions. In a multiple choice assessment, the passing mark could be a correct answer to 50 percent of the questions, were it not for the fact that students are also able to answer correctly by guessing. Thus a correction for guessing is appropriate.

Weighting

In some practical situations, even the smallest error has major consequences. Some errors therefore cannot be allowed. Answers to questions or responses to tasks therefore do not necessarily carry the same weight. Account must be taken of this when determining scores.
In general, two types of weighting are distinguished. The first is a weighting based on a-priori considerations. A question can be given greater weight in order to give the topic in question greater weight in the overall score. In general, however, it is better to include multiple questions on a topic that is important. With open questions, a priori weighting can be useful. Some questions require more time to answer, and this can be reflected in giving them greater weight. The maximum possible score to the questions must be communicated to students in advance so that they can take account of this

10 Het belang van een goed beoordelingsmodel [The importance of a good assessment model], Bureau ICE, by A. Geelen and K. Heij, Website: http://www.toets.nl/uploads/Artikelen/Het-belang-van-een-goed-beoordelingsmodel.pdf

when answering. In the case of a proficiency test, an indication can be given that a specific action must be performed without error, and that an error means failing the test.
The second way is psychometric in nature, and is discussed here only in general. In short, it comes down to a psychometric weighing that, based on an analysis of the assessment results of the current group or other groups that took the same test, a weighting is sought that increases the accuracy of the overall score.
An analysis of the assessment results is important for a number of reasons. The analysis provides information about the quality of the assessment and possible problems. An item analysis may show that some items do not meet expectations. A multiple-choice item, for example, could prove to be too difficult. In retrospect it may appear that one of the incorrect alternatives could lead to misunderstandings. Grading can be adjusted on this basis. In addition, the item can be rewritten for possible future use.

Rating scales

Rating scales are a crucial means of achieving an objective assessment. A rating scale describes a student's working method or product in different grade levels. A rating scale can make use of a sliding scale to indicate the extent that knowledge, skills or attitudes are present. The sliding scale consists of several scale points that indicate a particular position or rank. An example of a rating scale for a simple professional skill is: 1 = beginner; 2 = advanced and = 3 expert.[11]

If properly designed and used wisely, rating scales offer several advantages:
- They make the assessment more objective and more consistent.
- They help the trainer to clarify the assessment criteria.
- They give students information about how their work is assessed and what is expected of them.
- They help ensure that students become aware of the assessment criteria and how to apply the criteria to the work of their classmates.
- They provide useful feedback on the effectiveness of teaching and learning.
- They provide a substantive framework to determine learning progress (long-term objectives).

There is a wide variety of rating scales. However, a distinction is made between task specific, task transcending, holistic, analytic, quantitative, qualitative, numeric, and descriptive scales. Each type of scale has its own scope for use. The trainer has the difficult task of choosing which rating scale is most appropriate given the specific circumstances. The best rating scales are designed by trainers themselves, and thereby connect seamlessly with the learning provided. Here we shall discuss a number of these scales.

11 http://www.toetswijzer.nl/html/praktijktoetsen/praktijktoetsen3.pdf

Task specific or task transcending?

We speak of a *task specific rating scale* when the criteria are applicable to only one specific task. In the case of a *task transcending rating scale*, the criteria apply to several similar tasks, problems or contexts.

Task specific rating scales

Task specific rating scales are appropriate when it concerns clearly defined knowledge elements or procedures that must be followed in a fixed order. Their use makes sense when a high degree of reliability is required, for example when important decisions are at stake. The following assessment tools are examples of a set of task specific scales for assessing the sailor's tasks of preparing for undocking and docking. The assessor evaluates the quality of each act by circling a plus sign, a plus/minus sign or a minus sign

Example 1: Rating scale for assessing 'preparation for undocking and docking'.

Actions	Assessment		
Wearing proper safety equipment	+	+/-	-
Readying hawsers, stoppers and heaving lines at the mooring stations	+	+/-	-
Radio testing and agreement on channel	+	+/-	-
Anchor windlass test	+	+/-	-
Setting anchor brake	+	+/-	-
Removing anchor claw coupling from its works	+	+/-	-
Loosening anchor chain stopper	+	+/-	-
Capstan test	+	+/-	-
Ready hawsers and stoppers on deck	+	+/-	-
Ready (mooring) fenders	+	+/-	-
Total			

Arguments for task specific scales

- The quality of the student's performance is easy to determine. After all, it concerns registering the presence or absence of concrete, usually directly observable characteristics or content elements.
- Students receive detailed feedback on their performance.
- Suitable for clearly defined knowledge.
- Suitable for procedures to be used in a fixed order.
- A level of high objectivity and reliability is possible.

Arguments against task specific scales

- It is labour intensive to have to repeatedly to again develop a new scale for each task. set
- Due to the task specific nature, the scale can only be used once.
- It often makes no sense to familiarize students with the criteria in advance because in so doing, the trainer reveals the answer or the solution.
- They are not very suitable to open questions and problem formulations. The criteria do not encourage students to think. There is little transfer of material learned to other similar tasks, problems and contexts.
- When checking, it is easy to overlook atypical answers or solutions.
- Often less suitable as a means to allow students to have valuable learning experiences.

Task transcending rating scales

A task transcending rating scale is specifically intended for repeated use over a longer period. Students apply the same criteria to different tasks, problems and contexts. Consequently, the quality requirements become internalised over time. Students learn to assess their own work, even though the tasks are different and even though they do not have the rating scale in front of them. In short, task transcending rating scales can help students with the transfer of knowledge and skills to new situations with new problems. Example 2 is an example of a task specific rating scale for assessing the preparation and implementation of a navigation route plan.

Example 2: Rating scale for assessing the preparation and implementation of a navigation route.

Assessment term: Determines the navigation route (chooses the most logical, safe and economic route and navigates)	**Satisfactory/ Unsatisfactory**
1. On the basis of information collected, chooses a safe navigation route suitable to the water level and weather conditions.	
2. On the basis of information collected, chooses an economical navigation route suitable to the water level and the weather conditions.	
3. When choosing a route, takes into account the relevant nautical laws and regulations.	
4. Correctly operates the navigation equipment and resources (after instruction).	
5. Correctly reads the GPS and ECDIS.	
6. Correctly enters the expected sailing time in the sailing times book.	
7. Discusses the proposed navigation route with the captain and explains how the circumstances were taken into account.	
8. Properly processes in the BICS the information on the ports of departure and destination, the type and amount of cargo, the draft, and the number of passengers.	
Satisfactory score	

(At least 75% (6 of the 8 criteria) must be satisfactory, and the bold criteria must be satisfactory for a passing final grade.)

Arguments for task transcending scales

- They are ideally suited to the development of 'major', universal, widely applicable and lifelong skills such as critical thinking, problem solving, communicating and collaboration.
- You can use the same rating scale for different tasks, problems and contexts.
- By repeatedly applying to new similar tasks, students incorporate the criteria into their standard repertoire earlier (internalisation); task transcending criteria contribute more to the transfer of the material learned to new similar tasks, problems, skills and contexts.
- They provide more opportunities to build on what students already know and can do.
- They provide more opportunities to involve students in the quality requirements and to further develop these together with them.
- Atypical answers and solutions can easily be involved in the assessment.

Arguments against task transcending scales

- They draw heavily on the professional and pedagogical expertise of the trainer.
- They assume a qualitatively high education in which skills are taught systematically over a longer period.
- Due to the interdisciplinary nature, they rely strongly on coordination and cooperation within and between professional departments.
- In the beginning, learning to assess often takes much time (because trainers and students must learn to apply the same criteria to a wide variety of tasks).
- They rely strongly on the judgement of the trainer and therefore are more prone to subjectivity.
- They may be too general; the feedback for the trainer and students is not specific enough

Holistic or analytic?

For general skills, a task transcending rating scale is usually the best choice. There are several design options available when creating such a scale. One is these is the choice between a holistic and analytic scale. With a *holistic rating scale*, the trainer makes a general judgement on the quality of a process or a product. With *analytic assessment* on other hand, different judgements are given on different quality dimensions. Each dimension receives a separate score, creating a profile of the strengths and weaknesses of the student. Giving one comprehensive score for the quality of a documented writing assignment is an example of a holistic assessment. With analytic assessment on the other hand, the trainer (also) gives grades for individual dimensions of quality, such as a focus on goals and target audience, content, style, organisation and technical conventions. Tables 8 and 9 are examples of holistic and analytic approaches.

Example 3: A holistic rating scale

	Description	Points
Not proficient	Candidate can *not name* any of the correct design features or operating characteristics and procedures of firefighting systems and survival crafts	**0**
	Candidate can *name some* correct design features or operating characteristics or procedures of firefighting systems and survival crafts	**1**
Proficient	Candidate can *name all* the design features and operating characteristics of firefighting systems and survival crafts	**2**
	Candidate can give an complete description of firefighting systems and survival crafts, identifies escape routes on a ship, *and* can explain the workings of breathing apparatus	**3**
Very proficient	Candidate gives a complete description of firefighting systems and survival crafts, identifies escape routes on a ship, can explain the workings of breathing apparatus *and* can describe a possible ship's safety training program.	**4**

The advantages of a holistic rating scale are evident: it is simple, takes little time and gives a clear overview of the students' performance. Holistic assessment is particularly useful in quickly obtaining an overview of performance and in expressing the quality of the process or the product in one general dimension. Provided that the number of assessment aspects is not too large, however, an analytic assessment potentially has a higher educational value.

In the example used of an analytic rating scale (example 4), based on a single topic, three competence criteria were assessed: knowledge, skills and attitude criteria: related to communication.

Example 4: An analytic rating scale

Criterion	Scale	Description
Knowledge		
25-22	Excellent to very good	Is fully informed on the topic, and correctly distinguishes the main issue from side issues and is able to draw conclusions.
21-18	Good to average	Has some knowledge of the topic. Is able to distinguish the main issue and side issues, but with little detail.
17-11	Satisfactory to weak	Limited knowledge of the topic. Is able in general to indicate topics or concepts, but not the main and side issues.
10-0	Very weak	Not relevant OR insufficient knowledge to assess WHETHER OR NOT the knowledge has any link with the topic in question.
Skills		
20-18	Excellent to very good	Is able to demonstrate tasks or assignments correctly, taking into account all possible factors and procedures, and moreover these are executed safely, without mistakes. Is also able to act in a controlled and calm way in the case of an emergency.
17-14	Good to average	Demonstrates tasks and assignments correctly for the most part, and takes into account a *number* of possible factors and procedures. Engages in *limited analysis* of safety, and there are small margins of error in the execution. Is able to act in a controlled way during an emergency, but does not have a complete overview of the situation.
13-10	Satisfactory to weak	The demonstrated tasks and assignments *are not* followed in a logical order and there are no checks performed on the proper execution of tasks. Executed only a minimal part of all tasks correctly and flawlessly. During an emergency has little overview of the situation and is unable to act in a controlled way.
9-0	Very weak	Not enough output to assess.
Exchange of information (reporting)		
20-14	Excellent to good	Communicates ideas and information in a clear and understandable manner, so that other crew members who receive the information correctly understand the message; also recognizes other perspectives from the other crew members.
13-6	Average	Communicates ideas and information but it is not entirely clear or understandable. There is also insufficient recognition of other perspectives.
5-0	Weak	Does not communicate or barely does so, and the message is not clear.

An analytic rating scale:

- Fits perfectly with the assessment of complex skills.
- Is especially suitable for giving students an idea in advance of the requirements they must meet.
- Is especially useful for teaching students how to assess the quality of their work themselves.
- Provides students with detailed feedback on what they already are able to do and what still needs further explanation and exercise.
- Fits an educational approach in which complex skills are learned incrementally. Students often are unable to master a new skill at once. An incremental approach is then preferred.

The choice of a holistic or an analytic scale depends on the number of aspects to be assessed. As a rule, one can state: the more complex the skill, the more aspects must be assessed and the more rating scales are necessary for proper coverage.
A holistic rating scale may be the best choice in the case of a simple skill. When the skill is more complex, an analytic rating scale is the most obvious choice. The type chosen also depends on the assessment function. If the scale is used only to assign a grade (determining the result), then a holistic rating scale is the most obvious choice. If the aim is to familiarize students with the quality requirements beforehand, to give them detailed feedback about their strengths and weaknesses, and offer techniques for improvement (progress monitoring and remediation), an analytic rating scale is best. The report then takes the form of a score profile, enabling students to see where they are strong and what areas they need to improve.

How many points on the scale?

Once a rating scale has been chosen, the number of grade levels must be decided. The number of grade levels determines the number of points on the rating scale. An example of a simple rating scale for a professional skill with three grade levels: 1 = beginner; 2 = advanced and = 3 expert. In the Netherlands, as is known, a rating scale with ten scale points is often used (1 = very poor, 2 = poor, 3 = inadequate, 4 = unsatisfactory, 5 = almost satisfactory, 6 = satisfactory, 7 = more than satisfactory, 8 = good, 9 = very good and 10 = excellent). This number is sufficient to distinguish students from one another on the basis of their performance.
Practical tests, however, often have a formative goal. They aim to show what the student is good at and where improvement is needed. A ten-point scale is unnecessary for this. Experience shows that more than seven points in the scale does not work well; this makes it difficult for assessors to make a reliable distinction between the grade levels. Three or fewer points on the scale in turn are often too little to properly report on the students' progress. We therefore recommend: between four and seven points on the scale. In many cases our personal preference is for a five-point scale. This is just enough to properly chart the student's progression, without making assessment on the part of the trainer too difficult.

Tips for designing rating scales

While perhaps unnecessary, we summarise here a number of tips for designing rating scales:

1 Ensure that the assessment criteria are entirely clear concerning what is expected of students.
2 Choose between a task transcending and a task specific rating scale.
3 If a task transcending scale, then opt for a holistic or analytic rating scale. If necessary, divide the assessment into different assessment aspects.
4 Allow the number of rating scales to depend on the complexity of the skill to be measured and the objective of the assessment, but don't make the number so large that it takes too much time.
5 Ensure that each rating scale applies to a relevant aspect of the skills being measured.
6 Decide on the number of scale points (grade levels) per scale. Limit the number of scale points to a maximum of five to seven.
7 Define each assessment aspect (scale) as clearly as possible.
8 Give a clear description of the scale points (in order to identify which differences in performance correspond to the different points on the scale).
9 If necessary, further illustrate the scale points by means of examples of specific student work (anchors).
10 If necessary, weight the assessment aspects. Create a clear rule that describes how a total score can be deduced from the scores on the rating scales.
11 Try, if appropriate, to involve students in the development of the rating scale.
12 Ensure that the assessor is completely clear concerning what is expected of him or her.
13 Indicate, if necessary, how many trainers must assess the students' work in order to obtain a reliable assessment.
14 Make sure the rating scale is manageable for the trainer and - if applicable - for the students.

8.5 Feedback

8.5.1 Feedback rules

Giving feedback is an important part of the assessment process. Before giving feedback, two conditions are important when giving feedback:

1 There must be an *atmosphere of trust* and safety between you and the student;
2 You must realize that the feedback is a *learning aid*.

Giving feedback is not 'to run down' a student, but to correct him and make him aware of his behaviour. The student receiving the feedback will use it to change/adapt his behaviour, have better results, etc.

There are some general rules to apply when giving feedback:

- Be factual and specific
- Make clear that you act from your own experience
- Give both positive and negative remarks
- Formulate the feedback in an inviting manner
- Restrict yourself to recent behaviour
- Be brief and to the point

Factual and specific

Tell the student exactly what he has done well and what was not so good. Indicate clearly what behaviour or which performance you do or do not appreciate. Feedback must refer to established and proven facts: describe these facts as specifically and objectively as possible.
Do: "You were supposed to have finished work at 12 a.m. It's 11.30 a.m. and you are still very busy".
Don't: "You organize your work very badly".
Departing from facts prevents you from judging the student instead of his work

Own experience

Feedback is always about your experience of the situation. Therefore, always use 'I' when giving feedback. If you use 'you', someone may deny or starts to defend himself. By using 'I' it will be your observation.
Do: "I think that you take unnecessary risks"
Don't: "You take unnecessary risks".

Positive and negative

Give both positive and negative feedback, so that the student doesn't have the impression that he only does things 'wrong' or 'right'. Positive feedback encourages the student. He will also expect (especially in the beginning) negative feedback: if he does everything well in the beginning, he will think he can't learn from you. When giving negative feedback you must tell the student how to improve this behaviour: it must be constructive and not destructive.

Inviting

Give your feedback in an inviting manner, so that the student will not feel attacked. Ask for his reaction: has he understood your comments? Are there still questions?

Another way to involve the student is to let him come up with a solution/suggestion/idea himself. You make feedback inviting by not getting emotional, by making clear that what you say is your opinion (I-message) and by asking for a reaction to your feedback. If necessary, give a student time to let of steam or reflect on it before giving his reaction to the feedback.

Recent behaviour

Give the feedback while (or: immediately after) a student while carrying out a task, so that he can correct what he is doing at once. This works more effectively than when postponing feedback: changes will be that neither of you can very well recollect the situation.

Brief and to the point

Be brief and to the point while giving feedback. The longer you 'dwell' on your story, the bigger the chance that the student misses the point and the bigger the chance he will react to a non-relevant detail.

It is important for the student that you give him feedback on a regular basis. If, while doing so, you take the above mentioned rules into account, the student will optimally benefit from your directions and change his behaviour positively (learn!).

Feedback is not only given during or immediately after a (new) instruction. Also for more experienced students it is important to be regularly given suggestions and tips for their work. This may contribute to improving the quality, productivity and the safety of their work. This form of feedback is called '*corrective feedback*'.

Corrective feedback

Corrective feedback is what you do to help students back on the right track to convert shortcomings into skill and /or to solve work problems.

It can also be used in a coaching relation/peer relation/ colleague relation.

8.5.2 Giving corrective feedback

Giving corrective feedback consists of the following steps:

1 **Make the student aware that a problem exists**

What you consider to be a problem does not necessarily have to be a problem for the student. It is possible that he does not know at all the he is taking unnecessary risks or doing something wrong.

The first step you take to change this is that you point out to the student the consequences of his actions for others, the second step is that you point out the consequences of is behaviour for himself if he does not change this.

Take care that you do not only inform him of the problem and its consequences, but that the employee also realizes that his behaviour is a problem.

2 **Try and find possible solutions together**

Let the student find solutions if possible. Through finding the solution himself, he will be more motivated to change his behaviour

3 **Reach agreements on the changes to be realized**

Both the student and you must agree to the arrangements you make. Make sure that these agreements are clear to both parties.

4 **Give the conversation a follow up/ Check whether the agreements are kept**
A non- recurring conversation will never change someone's behaviour. It is important to check after the conversation whether the students are doing what you both agreed on in step 3. Stress desired behaviour, preferably immediately when you see it, for example by paying the employee a compliment on the improvement, even if it is only one small step in the right direction.

8.5.3 Reflective questions with respect to feedback

1 Do others tell you what they think of you?
2 Or do they tell you that you should change some of your behaviour?
3 Do you feel attacked at that moment?
4 What do you do with their comments?
5 Do you pay attention to how they bring their feedback and the effect that has on you?
6 Did you ever get negative remarks on your performance or behaviour which you found accepting to hear?
7 What made the difference?
8 Do you give feedback to others on their performance or behaviour?
9 How do people respond when you do that? Do they accept your comments? Or do they start to defend themselves?
10 Do you ever change your behaviour or performance when you notice that someone is not reacting to you in a proper way?

8.6 Assessor mistakes

Answers to closed and open questions can be assessed in a relatively objective way using unambiguous answer models and scoring rules. In practical tests, the diversity of the students' responses is often much greater. Thus several trainers award different scores (grades) to the same products. This is an injustice to the students who wrongly receive a low score. In their defence, trainers may argue that assessment errors occur without being intended and without the trainers being aware of them. Proper assessment instructions, criteria and instruments, and a thorough understanding of the assessment task can go a long way to reducing assessment errors. What sources of subjectivity should trainers be particularly aware of? Important for practical assessments in particular are biased results due to the following assessor errors:

> The halo effect
> The significance effect
> The contamination effect
> The sequence effect
> The personal comparison effect
> The shifting standard effect
> The fatigue effect

8.6.1 The halo effect

The results of an aspect that is irrelevant to the assessment affects the aspect actually intended to be assessed. The aspect irrelevant to the assessment can be a general feature that affects the assessment of a particular aspect. The opposite is also possible: the assessment of partial aspect affects the general assessment.

Example

A trainer unconsciously gives the work of diligent and observant students higher grades than work by less industrious and attentive students that is just as good.

8.6.2 The significance effect

Different trainers pay attention to different aspects when assessing, or weight these aspects differently.

Example

When assessing a common written test, one trainer pays special attention to spelling, punctuation and grammar, while the other trainer looks more at the content and the structure of the written product.

8.6.3 Contamination effect (in the narrower sense)

The assessment is coloured because the assessor is (also) pursuing other objectives with the test.

Example

Despite inadequate work, the trainer gives a student a satisfactory grade because he has done his best and the trainer does not want to discourage him.
A trainer gives extra low grades to students to discipline them and get them to work.

8.6.4 The sequence effect

Allowing previous assessments of the work of other students to affect the assessment.

Example

After a series of weak work, a mediocre performance is wrongly overvalued.

8.6.5 The personal comparison effect

Each assessor assesses in his or her own characteristic way. One is more severe or milder than the other, or introduces a greater or lesser variation in the points given.

Example

One trainer assesses a similar performance stricter or milder than the other.
One trainer uses all scale points when assessing, while the other uses only the middle categories.

8.6.6 The shifting standard effect

The tendency to adapt to the 'average' level when assessing the class. This effect is difficult to completely eliminate even with very good rating scales.

Example

One class is much better than the other, yet the average assessment in the one class is not higher than the other. Thus the trainer assesses students from a good class more severely than those from poorer performing class.

8.6.7 The fatigue effect

The assessment depends on the physical and mental state of the assessor.

Example

After the umpteenth essay, fatigue and irritation increase, and the grade given is lower.

8.7 Observation

The difference between the facilitator (or lecturer) and the assessor is that the facilitator is the overall responsible for creating a learning environment in which people feel safe to learn things. Sometimes the task of a facilitator is to observe and judge performance, but his main task is to guide the learning process.

An assessor on the other hand is always occupied with observing and judging behaviour.

We can distinguish five phases in the assessor tasks (ORCER):

- ***O****bserving* behaviour during the different exercises. Observe verbal as well as non-verbal behaviour. Emphasis is placed upon what the candidate actually does and says, i.e. actual facts and not on interpretation;
- Making notes (***R****egistration*) during the observation process. This is to justify your observations afterwards and to act as a memory trigger;
- *Classification* of the behaviour in behaviour characteristics;
- Judge and ***E****valuate* the performance; and
- *Report* performance.

The core focus of the course is the understanding of the dimensions of behaviour, the observation of this conducted behaviour (facts/observations, not interpretations) and to come to a joint and weighted judgment per dimension and candidate. The assessors are acquainted with the practical tasks and their aspects. The culture within the organization (mission and objectives) is included herein

Assessment form final assessment on the simulator

Element	Criteria	Judgement
O	The participant observes objective and is able to determine which behaviour is relevant for this exercise.	☐ 0 ☐ 1 ☐ 2
R	The participant registers relevant observations on an observation form.	☐ 0 ☐ 1 ☐ 2
C	The participant links observations to observation criteria and determines which value judgement is associated to the observed behaviour on that specific criterion.	☐ 0 ☐ 1 ☐ 2
E	The participant discusses his findings and value judgement with his fellow assessor to come to a clear, valid, univocal and transparent judgement on each criterion.	☐ 0 ☐ 1 ☐ 2
R	The participant addresses his findings to the assessment candidate orally and/or written down in a report.	☐ 0 ☐ 1 ☐ 2

0 = not satisfactory | 1 = satisfactory | 2 = good

Pass level:
The participant passed the exam when a minimum of 8 points is reached. For the elements O, E and R the participant should gain a score of at least 1 point.

9. Quality control

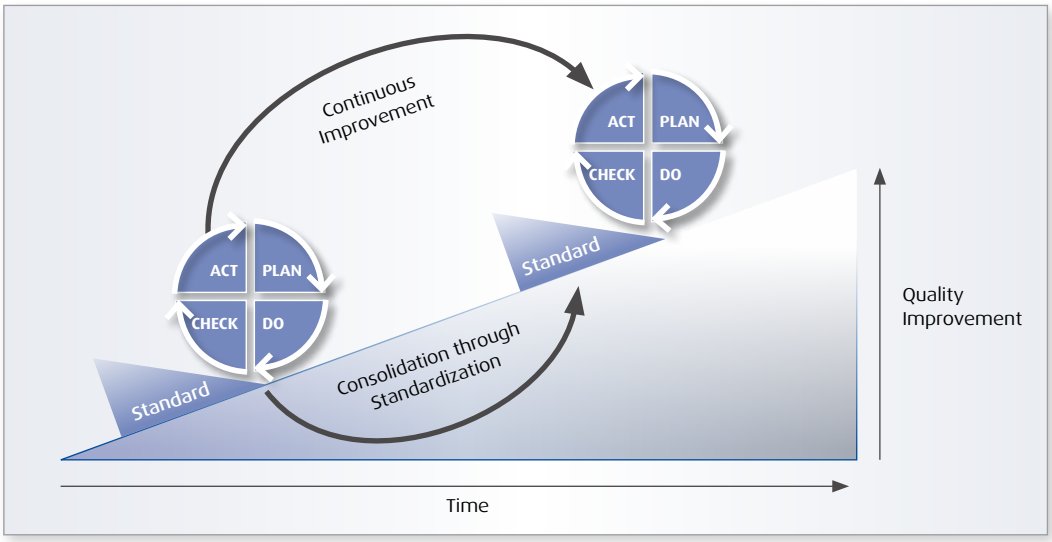
A quality system is necessary to secure the quality of the educational processes. A quality management system serves as a tool to improve quality of education by stimulating thinking in continuous improvement. This chapter provides guidelines and instructions for the realization of an efficient and effective quality assurance.

Quality control systems

Within a lot of educational institutes it is common practice to work with a quality system that is linked to an internationally accepted standard of quality. A common form is that of the ISO 9001 (International Organization of Standardization). The ISO uses a number of models and principles for quality assurance, which is a method for continuous improvement of management for many processes in education.

One of the methods is the "plan-do-check-act" (PDCA) approach (Figure 7). The idea behind this is that the prevailing standard in an educational institution is enhanced by a continuous check on the tasks to be performed, according to a certain cycle. Checks in education are to be implemented for example by evaluation forms or oral evaluations with students. Also a serious approach to handle complaints is part of the check within the PDCA.

Figure 7. The PDCA cycle



Tasks

When following the PDCA cycle it is important that clear roles are defined. When it comes to minor adjustments to course material or program, it is sufficient to schedule this only with the education providers concerned. However, it is wise, in the case of more extensive adjustments to involve a staff / management in the quality development. By defining quality objectives the management can give direction to perform quality. Together with teaching staff specific quality objectives can be defined in

accordance with the so-called SMART principle (Specific, Measurable, Achievable, Realistic and Time-bound). These quality objectives can be defined in a quality manual or in meeting documents. By periodic consultations the progress, control, practicality and feasibility of the quality objectives can be discussed.

Based on this discussion of the quality objectives action items can be generated which must be handled (act). Some examples of possible actions include:

- The establishment of a training plan for employees to raise the level of a specific part.
- Conducting internal audits in order to clarify quality objectives.
- Also, to appoint a Quality Manager to support staff in the preparation or adjustment of evaluation forms.

Document control

Within quality assurance document control is very essential. Document management is intended to ensure that the most recent version of all documents and data is present. The process also provides for the removal of obsolete documents at all locations where this or have been in use.

A practical tool for document management can be an intranet environment (a 'Sharepoint' or 'portal' environment for example). In this environment documents can be shared, information will be made available, arrangements can be made and tasks can be published. Document version control must ensure that documents will never be lost old documents will be used during training activities or projects.

Finally, when the quality systems themselves do not seem to work effectively there must also be reported and improvement actions must be established.

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