УДК 378.09.33:811.111(045)-043.5 **DOI: 10.31653/2306-5761.35.2023.76-85**

ROOT CAUSE ANALYSIS (RCA) AS AN EFFECTIVE COGNITIVE METHOD IN CONTENT AND LANGUAGE INTEGRATED LEARNING (CLIL)

АНАЛІЗ ОСНОВНОЇ ПРИЧИНИ (RCA) ЯК ЕФЕКТИВНИЙ КОГНІТИВНИЙ МЕТОД В ПРЕДМЕТНО-МОВНОМУ ІНТЕГРОВАНОМУ НАВЧАННІ (CLIL)

O. Monastyrska, *PhD, Associate professor***, M. Chesnokova,** *PhD, Associate professor*

О. І. Монастирська, *к.п.н., доцент,* **М. В. Чеснокова,** *к.філол.н., доцент*

National University "Odessa Maritime Academy", Ukraine

Національний університет «Одеська Морська Академія», Україна

ABSTRACT

This article considers Content and Language Integrated Learning (CLIL) as a dual-focused educational approach in which Maritime English is used for the learning and teaching of both content and language. In maritime business English is applied as a lingua franca because this field requires an English-language-proficient workforce.

Authors' teaching experience with navigational students at the National University "Odessa Maritime Academy" shows that to achieve professional competence on operational and management levels using English as the main communicative tool, students have to be intellectually challenged in order to transform information and ideas, to solve problems based on their situational awareness. Effective content learning should be applied through creative thinking, problem-solving and cognitive challenge. A navigator must figure out the cause of the problem and the processes that will help him to survive and save the property and crew.

The technique of Root Cause Analysis (RCA) is widely used in all spheres of life and science as an effective method of predicting, analyzing, and summarizing the facts and building a clear paradigm to solve professional tasks. RCA has proven to be a powerful loss-prevention tool and allows crewmembers to discover the true root cause of a casualty. The problem-solving approach focuses on the analytical and cognitive ability of navigators to find correct professionally-grounded solutions based on good seamanship on board the vessel.

Keywords: Maritime English, situational awareness, content, cognition, problem-solving task, case-history, creative thinking, root cause, accident investigation.

Defining the general matter and its connection to important scientific or practical objectives

Maritime education stands at the intersection of language proficiency and subject-specific knowledge, demanding a unique pedagogical approach that transcends traditional teaching methodologies. Content and Language Integrated Learning (CLIL) emerges as a progressive educational framework that intertwines language acquisition with subject matter understanding. This research paper aims to explore the application of CLIL within the realm of maritime studies, particularly focusing on its efficacy in fostering cognitive skills through the investigation and analysis of real-life case histories within the maritime industry.

The foundational premise of CLIL lies in its dual-focused instructional method, directing attention not solely towards language acquisition but also towards comprehending and interpreting content through the medium of a foreign language. In the maritime domain, where English serves as the predominant language for communication, proficiency becomes indispensable for a competent and safety-conscious workforce. The integration of CLIL within this specialized context seeks to

bridge the gap between language learning and professional knowledge acquisition, emphasizing thematic, cross-curricular content that centers on accident investigation, safety procedures, and risk mitigation strategies at sea.

Authored by Coyle, Hood, and Marsh, the conceptual framework of CLIL [1], encapsulated in the 4 Cs – Content, Communication, Cognition, and Culture, forms the basis for this exploration. Specifically, this paper aims to spotlight the tandem of Content and Cognition within CLIL, elucidating their role in enhancing the cognitive capabilities of nautical students through the analysis and evaluation of authentic maritime accident case histories sourced from recognized bodies such as the Marine Accident and Investigation Branch (MAIB) and the Mariners' Alerting and Reporting Scheme (MARS). Through this lens, the research endeavors to underscore the significance of adopting a thematic and multifaceted approach to maritime education, aligning with the vital objectives of promoting safety, critical thinking, and effective problem-solving skills among future seafarers.

Previous research analysis and definition of new trends in problem solution

CLIL approach enables students to access subject-specific foreign language terminology. In maritime business English is applied as a lingua franca because this field requires a highly competitive, and English-language-proficient workforce.

CLIL is an increasingly popular teaching approach that can be realized in a number of steps such as choosing an interesting topic (theme); a target vocabulary and grammar structure for more correct and distinct realization of students' opinions in the given real-life situation.

Successful language learning can be achieved when people are highly motivated after experiencing real-life situations in which they can acquire the language more naturally. CLIL offers opportunities both within and beyond the regular curriculum to initiate and enrich learning, skill acquisition and development.

In maritime business, in general, English has become the most dominant and leading means of communication, a crucial device for survival at dangerous situations, a vital and sufficient tool for successful teamwork, for gaining and maintaining situational awareness of every seafarer and on-board safety culture by the shipping company, for solving problems and taking decisions. The objective of a specific-domain vocational CLIL is to develop English competence of navigators so that they are able to carry out specific task-based functions which might range from giving orders to subordinates of different nationalities to monitoring, accessing and processing information, analyzing near misses, incidents and accidents causes orally (with agents, stevedores, surveyors, forwarders etc.) and in writing (in accident/incident reports, sea protests, routine correspondence, etc.) [2].

At the heart of the learning lies successful content or thematic learning and the related acquisition of new knowledge, skills and understanding. Content is the subject or the CLIL theme.

Subject knowledge becomes the motivation for students to learn their professional issues deeper on real life situations. Afterwards, it results in discussions, projects, speaking assignments etc. They are encouraged to investigate different types of accidents, their root causes, the very nature of them. Themes might include issues-led investigations into the causes of cargo-, vessel-related incidents, person-related accidents; safety operations on the vessel, which, in its turn, led to the reduction of accidents at sea.

To raise achievement levels, navigating cadets have to be intellectually challenged in order to transform information and ideas, to solve problems, to gain understanding. Effective content learning account not only of the defined knowledge and skills within the curriculum, but also how to apply these through creative thinking, problem solving and cognitive challenge.

The cognitive process for cadets consists of higher-order thinking, i.e. analyzing, evaluating and creating. For them cognitive skills are those mental processes used for gaining and maintaining situational awareness.

When talking about the best cognitive method in CLIL for teaching navigating students we mean Root Cause Analysis (RCA). As far as we can determine, there is no generally accepted

definition of what Root Cause Analysis (RCA) is. Therefore, we offer the following as possible definitions, one of them at least communicates what is meant by the concept.

One of the definitions is that Root Cause Analysis (RCA) is a structured investigation that aims to identify the true cause of a problem and the actions necessary to eliminate it [3, p. 11].

The term of Root Cause Analysis (RCA) is a comprehensive term encompassing a collection of problem-solving methods used to identify the real cause of a non-conformance or quality problem. Root Cause Analysis is the process of defining, understanding and solving a problem. The root cause has also been described as an underlying or fundamental cause of a non-conformance, defect or failure. Furthermore, the term "root cause" can also be referred to as the precise point in the causal chain where applying a corrective action or intervention would prevent the non-conformance from occurring [4].

Root Cause Analysis (RCA) is a sophisticated and regularly used technique that identifies the origin of a problem using a specific set of steps to find its primary cause. This technique is widely used in accident investigations by shipping companies to prevent recurrence. RCA has proven to be a powerful loss-prevention tool and allows crewmembers to discover the true root cause of a casualty [5].

Having good strong problem-solving skills can make a huge difference to the future career of an officer. Most of all human error types on ships are caused by making ineffective solutions with sometimes painful consequences [3, p. 2-3].

The research objective

This study aims to investigate the efficacy of integrating Content and Language Integrated Learning (CLIL) within maritime education, specifically focusing on the utilization of Root Cause Analysis (RCA) as a cognitive method in accident investigation training for navigating students. The primary objective is to assess how the implementation of CLIL, emphasizing thematic, cross-curricular content centered around accident investigation, enhances cognitive skills—such as critical thinking, problem-solving, and situational awareness—among maritime students. This research endeavors to explore the practical implications of integrating language learning with subject-specific knowledge within the context of maritime safety. Additionally, it seeks to evaluate the extent to which CLIL methodologies, coupled with the application of RCA techniques, contribute to preparing future seafarers for effective decision-making and risk mitigation strategies in real-life maritime scenarios. By examining the intersection between language acquisition, content comprehension, and accident investigation skills, this study aims to provide insights into optimizing maritime education for enhanced safety and proficiency in the maritime industry.

Presenting the main material of research with a full grounding of received scientific results

1. Statistics background of Root Cause Analysis

STCW Code (A-II/2) emphasizes the necessity to know and be able to apply effective communication on board and ashore; obtain and maintain situational awareness in respect of effective resource management. Special attention is to be paid to applying decision-making techniques such as situation and risk assessment, identifying and generating options, selecting course of action and evaluating of outcome effectiveness [6].

The last analysis of marine accidents provided by Japan Transport Safety Board [7] shows the frightening results of this year. Out of 382 cases the majority of accidents were caused by collision (98 cases) and grounding (85) cases. It is obvious that all of them are the consequence of lack of professional knowledge of COLREGs, navigating and operating procedures of the vessel, adequate communication between Officer of the Watch (OOW), pilot, crewmembers of other ships. The necessity of conducting accident investigation at different stages (learning at maritime universities, analyzing onboard the vessel at safety meetings and solving problematic tasks at simulators) is constantly increasing.

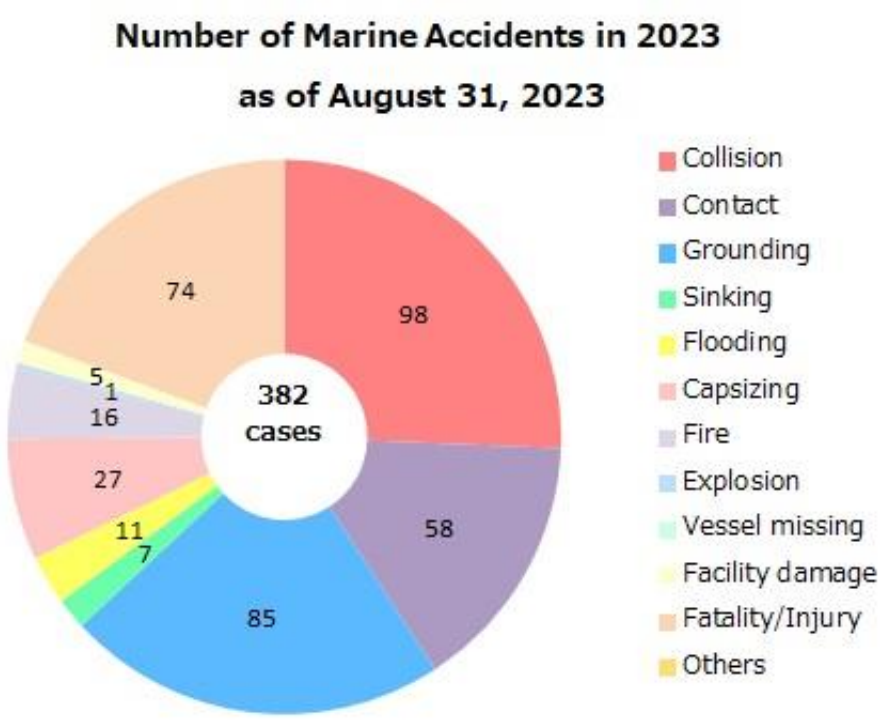

Fig. 1. Number of Marine Accidents in 2023

Unfortunately, 71% of all human error types on ships are situational awareness related problems. Situation Awareness (SA) acts as team working and effective decision-making aspect. Situation Awareness is the ability of an individual to possess a mental model of what is going on at any one time and also to make projections as to how the situation will develop. An often cited definition is "…. the perception of the elements in the environment within a volume of space and time, the comprehension of their meaning, and the projection of their status in the near future" [8, pp. 401-411].

The root cause can be defined as the most basic cause that can be reasonably identified that management has control to fix, and when fixed, will prevent, or significantly reduce the likelihood of the problem's recurrence. A root cause is a factor that caused a nonconformance and should be permanently eliminated through process improvement.

2. The strategy of Root Cause Analysis (RCA)

RCA is a collective term that describes a wide range of approaches, tools, and techniques used to uncover causes of problems. It's a method of problem solving used for identifying the root causes of faults.

RCA is a popular and often-used technique that helps people answer the question of **WHY** the problem occurred in the first place. It identifies the origin of a problem using a specific set of steps, with associated tools, to find the primary cause of the problem, so that you can:

1. Define **WHAT** happened;
2. Determine **WHY** it happened;
3. Figure out **WHAT TO DO** to reduce the likelihood that it will happen again.

RCA has proven to be a powerful loss prevention tool and allows crewmembers to discover the true root cause of a casualty. The purpose is to raise situational awareness of officers about the real and true reason WHY accidents occur. If the root cause can be established and rectified the risk of the accident reoccurring is substantially reduced.

The highest-level cause of a problem is called the root cause is shown on Fig. 2:

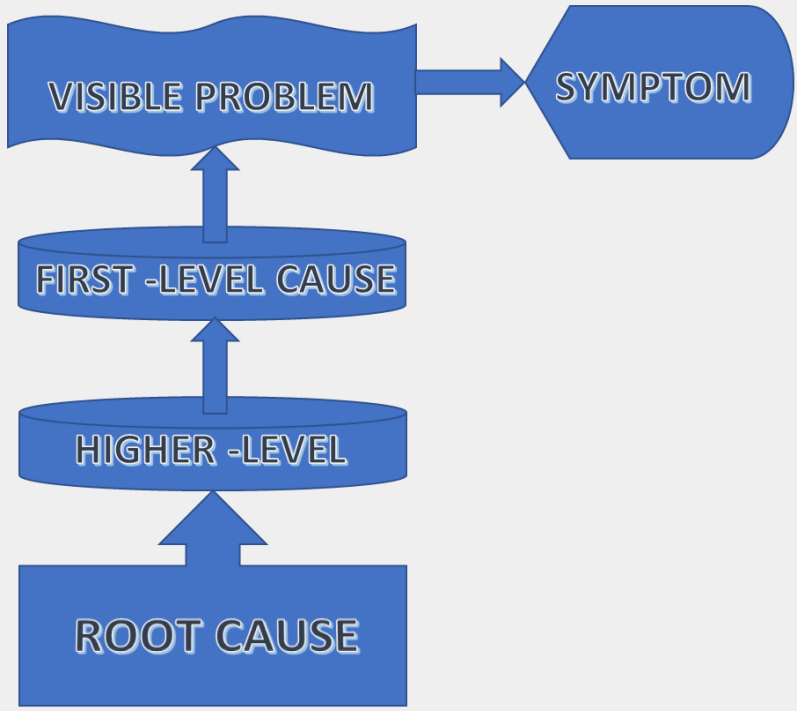

Fig. 2. The scheme of the Root Cause

The root cause is "the evil at the bottom" [3, pp.1-19] that sets in motion the entire cause-and-effect chain causing the problems. It's essentially based on 4 general principles**:**

1. Define and describe properly the event of the problem **(5 why's technique).**

5 WHY's method, in its turn, can be the separate subject for investigation. Originally, this method as an analytical tool, was invented in the automobile industry by the Toyota Motor Corporation. The main purpose is to find and identify one or several root causes to a problem. It's applied nearly in all branches and fields of human life.

The main philosophy of this advanced logical and analytical approach is to teach **HOW** to solve a problem by asking "Why?". While accident investigation a navigator five times successively analyze symptoms and delve deep enough to understand the root cause(s). By the time a cadet gets to the fourth of fifth "Why?" he will understand that the cause of the accident covers not only the operational level but directly goes to the management of the vessel and the shipping company.

However, the "Five Why's" tool does not provide a resolution to the problem itself, but it is an excellent tool to get an analysis going. The "Five Why's" method relies heavily on experience, as it draws on the opinions and observations of the people performing the task.

2. Establish a timeline from normal situation until the final crisis or failure.
3. Distinguish between root causes and causal factor.
4. Once implemented, RCA is transformed into a method of problem prediction.

3. RCA as a cognitive method in CLIL

In the frame of this article we'd like to illustrate the terms CLIL and RCA in their interactive cooperation.

It's the content which initially guides the overall planning along the learning process. The students shouldn't be reduced to using just appropriate tenses or lexical items corresponding to the discussed subject. CLIL and RCA will give opportunity to construct their own opinion and understanding of the situation.

CLIL integrates content and language learning by means of root cause analysis. It's the integration which can result in new learning scenarios or **case histories.** It demands careful planning, engagement in higher-order thinking and problem-solving.

Case histories are applied in all spheres such as medicine, economics, psychology, but the nature and methods of their implementation are identical.

It's the immersion method based on task learning which results in professional problem-solving outcome.

Case history is a modulated working situation which motivates critical analysis, creative thinking, situational awareness. It encourages discussion, interactive speaking activities.

Under CLIL the subject and language learning are realized through 4 skills – **reading, listening, speaking and writing**. So, the stages of RCA in CLIL frame will be presented through 4 skills.

4. The performance of Root Cause Analysis

Reading is based on real-life situations presented in casualty reports, case histories. The initial task is skimming the text to form an overall impression; understand it as a whole and identify its aim.

The next task is scanning the text for specific purposes. To achieve the goal in making RCA students should focus on details. This stage might include grammar and vocabulary exercises aiming at better comprehension of appropriate maritime terms and key items of specialized vocabulary which are needed to operate successfully.

In our example the target vocabulary is typed in bold.

Subject: Accident investigation

Let's follow the step sequence based on the case history "**Collision and explosion kills nine**" [9] using 5 Why's analysis.

Several vessels, including Ship A and Ship C, were in a **traffic lane** heading about 130 degrees true. Ship B was in the process of crossing this traffic lane in order to integrate **the opposite-bound lane**. **Visibility was good** and seas were light.

On **the crossing vessel**, Ship B, the 3rd officer was **Officer of the Watch (OOW). The Chief Officer (CO**) and the 2nd officer were present on **the bridge** too, as was **a helmsman**. The CO was **plotting targets** on the **ARPA radar** to assist the OOW. The Master was also on the bridge from time to time **monitoring the traffic**. Initially, the 2nd officer was **setting up the GPS units**, but afterwards he was chatting and joking with the OOW and CO in addition to catching up with some work on the chart table. The 2nd officer's presence appears to have been a **source of distraction** to the OOW and the CO.

The OOW on Ship B stated they would allow Ship A **to pass ahead**. The OOW on Ship A expressed surprise at this, as he had initially expected Ship B **to alter course to port** to join the traffic lane. When Ship B's OOW then declared their intention to alter course to starboard, Ship A's OOW considered this as an acceptable course of action for a **crossing situation**.

Later, the OOW of Ship A had identified that a **close quarters situation** was continuing to develop with Ship B. He expressed concern on **the VHF** radio several times; a bigger alteration of course to starboard by Ship B was urgently required.

At 20.45, the CO on ship B informed the OOW that one of the targets was a **false echo**. This was an incorrect assumption and could easily have been clarified by **visual observation**. In fact, the bridge team had mistaken Ship C, also in the traffic lane, for Ship A, and assumed the actual echo of Ship A was a false echo. In the final minutes before the collision, the team on Ship B also mistakenly identified a fourth ship as Ship A. At 20.52 a collision occurred between Ship A and Ship B; Ship B was at about 11kt (**full ahead maneuvering)** and Ship A was at 13.5kt **(full ahead sea speed).**

A massive explosion occurred on Ship A as a cargo tank ruptured, and naphtha **was spilt and ignited**. The ignited spill engulfed the sea surrounding the two vessels.

On Ship A, nine crew members were killed, and other crew members injured. Three crew members were injured on board Ship B. Both vessels incurred substantial fire and structural damage as a result of the collision.

Shockingly, of the many vessels in the vicinity at the time of the accident, only one stopped to assist.

Table 1. Process of Investigation

Step 1. Define the problem What do you see happening? What are the specific symptoms?	**Collision and explosion kill nine.** Collision between Ship A and Ship B which resulted in explosion and death case.
Step 2. Collect Data What proof do you have that the problem exists? What is the impact of the problem?	Aa a result of massive explosion on Ship A naphtha was spilt and ignited. It caused the **environmental pollution**. 9 crew members were killed and other crew members injured. **(death accident)**
Step 3. Identify possible causal factors What sequence of events leads to the problem? What conditions allow the problem to occur? What other problems surround the occurrence of the central problem?	Ship A and Ship C, were in a traffic lane**.** Ship B was in the process of crossing this traffic lane. Ship B: 2nd officer distracted OOW and CO. Ship B's OOW declared their intention to alter course to starboard, Ship A's OOW considered this as an acceptable course of action for a **crossing situation. A close quarter situation has been developed.** Ship B identified the 4th ship as Ship A as a result of false echo. Ship A and Ship B collided. Naphtha on tanker (Ship A) spilt and ignited and caused 9 death cases.
Step 4. Identify the Root Cause(s) **Why does the causal factor exist?** **What is the real reason why the problem occurred?**	
To pass step 4 we can use 5 Why's method. **1 WHY?** The behavior of 2nd officer **distracted the OOW and CO** which caused indirectly the wrong intention **to alter course to starboard.** **2 WHY?** The OOW of Ship A had identified that a **close quarters situation** was continuing to develop with Ship B. He expressed concern on **the VHF** radio several times; a bigger **alteration of course to starboard by Ship B was urgently required.** **3 WHY**? A collision occurred between Ship A and Ship B; Ship B was at about **11kt (full ahead maneuvering)** and Ship A was at **13.5kt (full ahead sea speed).** Both vessels were proceeding **at full speed** at the time of collision **4 WHY?** Ship A was considered to be a false echo by the Ship B team who mistook Ship C for Ship A. **5 WHY?** The bridge team of Ship B didn't follow the COLREGs. The company hasn't been able to implement a safety culture onboard the vessel which caused **environmental pollution and death accident**.	
Step 5. Recommend and implement solutions What can you do to prevent the problem from happening again? How will the solution be implemented? Who will be responsible for it? What are the risks of implementing the solution?	Bridge teams must follow correct procedures in compliance with Rules 6, 10, 14, 17, 18 of COLREGs and work as a team under correct supervision in high risk areas.

Listening is the vitally important skill in the learning process as well as the safety means to avoid hazardous situations and survive in any accident using situational awareness of all crewmembers.

To motivate and encourage the students in the class the most brainstorming tasks are as follows: - **listening for specific information** - VHF in emergency and distress communications; communications with Vessel Traffic Service (VTS) and Port control, communications with other ships in collision preventing. Afterwards, in this very case it would be fruitful for cadets to make up their VHF messages and role play them. The situations are offered by the lecturer in the frame of the above-mentioned case history.

E.g. **Scenario**: the OOW of Ship A had identified that a **close quarters situation** was continuing to develop with Ship B. He expressed concern on the VHF radio several times; a bigger alteration of course to starboard by Ship B was urgently required.

MAYDAY THIS IS 271100090 M/V "NORTH STAR'. WHAT IS YOUR INTENTION? CPA IS 0.5 NM. REQUEST: ALTER YOUR COURSE TO STARBORD. OVER.

The lecturer can offer different scenarios of VHF distress messages which cover:

The danger of environmental pollution;

Explosion and fire on board the tanker;

Personal injuries and death cases.

The students should adhere to the structure and procedure of making up VHF messages.

Writing is also a very effective type of communicating between the participants in real-life situation. It requires logical organizing of events with the help of active target vocabulary, appropriate language structures. In our opinion, under this scenario the following tasks would be very productive. For instance, drawing up a scheme of ships' movement; completing accident reports; routine correspondence, etc.

This task can overlap with listening and speaking skills. While listening the description of the situation, the positions of the vessels included, their maneuvering in the area, time of the consequent events and actions of OOW, Master, the cadets can draw up a scheme and then discuss it in pairs.

Another efficient writing activity is completing an accident report. Reporting is considered to be vitally important in hazardous situations to deepen problem-solving approach in analyzing root causes and choosing preventive measures to avoid the occurrence of the accident.

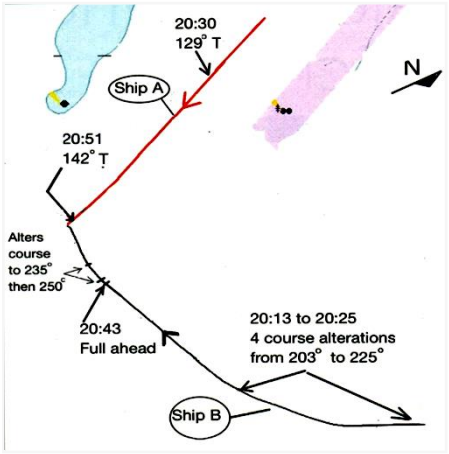

Fig. 3. Chart's extract

Here is an extract from an accident report concerning the above case-history.

ACCIDENT REPORT

Collision and explosion kill 9 persons

Description of events:

Ship A and Ship C were in a traffic lane heading about 130 degrees true. Ship B was a crossing vessel to integrate the opposite-bound lane. Misunderstanding between Ship A and Ship B caused a close quarters situation.

20.52 a collision occurred between Ship A and Ship B; Ship B was at about 11kt (full ahead maneuvering) and Ship A was at 13.5kt (full ahead sea speed). Massive explosion on tanker (Ship A) resulted in naphtha spillage and ignition. Ship A – 9 crewmembers dead and others injured.

Ship B – 3 crewmembers injured. Both ships sustained severe damage.

Direct causes: Not following COLREGs; incorrect use of equipment; incorrect navigation; inadequate controls.

Root causes: inadequate training; inadequate discipline; inadequate supervision and standards.

Remedial actions and recommendations: Bridge teams must follow correct procedures in compliance with Rules 6, 10, 14, 17, 18 of COLREGs and work as a team under correct supervision in high risk areas.

Speaking. There are many similarities between the productive skills of speaking and writing. Both motivate problem-solving activities, creative thinking and challenge cognition.

Communication in pairs and small groups in the class provides for **dialogical nature** of organizing, preparing and analyzing teaching material. The most effective approach in classroom activity in CLIL in teaching seafarers is **"dialogic learning"** [10].

Using Maritime English (ME) in the frame of real-life situations modulated in case histories the challenge in CLIL setting is that students will need to engage in dialogic learning while discussion of relevant documents, pictures and photos and other documentary evidence.

The principle is that effective learning cannot take place without active involvement of ME and thinking.

Root cause analysis step by step through four learning skills in the CLIL classroom make cadets free in expressing their professional ideas based on their personal experience and stimulate the development of the situational awareness. It could be possible through active discussion, sharing personal opinion and arguing over controversial cases.

The CLIL classroom demands a level of talk, of interaction and dialogic activity which is different to that of the traditional language or content classroom.

The interaction between 'lecturer – student' and 'student – student' motivates them to spontaneous free thinking. Lecturer's questioning encourages learners to collect knowledge and skills acquired in teaching and in practice together in order to solve professional problems and to express their personal attitude to case-histories.

5. Results

To achieve sufficient results, it's effective to arrange the learning of CLIL subject consisting of the series of lessons through the development of all language skills with the help **the Presentation, Practice, Production model (PPP).**

Presentation: having selected the language point to be taught (Maritime English terminology), techniques for creating context can be realized by showing visual images, i.e. presentations, etc.

Production: this stage can be based on introducing **"real life" situations** which are visualized and have real authentic background. Different reading activities, drawing up sketches will help them to analyze the case through asking and answering questions, which, in turn, will compose the full image of the case.

Production: This stage supposes communication activities that involve free speech and writing. **"Real life" situations** are visualized and have real authentic background. Demonstrating video films about different accidents, incidents, cargo handling procedures etc. is a most brainstorming and motivating activity which can be role-played in pairs, small groups, round-table discussions. They can simulate ship-to-ship communication, ship-to-VTS, ship-to-pilot, group participation in safety meetings on board the vessel.

Conclusions and further research prospects

The need to develop a 21st century workforce in maritime business has stressed the importance of perceiving competence as an amalgamation of knowledge and skills.

In this article we have presented the most efficient methods for obtaining professional and

language skills naturally and interactively, which can be used and adapted for high-order thinking, analysis of human errors, development of situational awareness of every officer, clear assessment of team competence.

In CLIL environments, where cognition is integrated with learning and communication, lecturer questioning, which encourages learner questioning, is fundamental to high-order thinking skills, creativity and linguistic progression.

REFERENCES

1. D. Coyle, P. H. Hood, and D. Marsh, Content and Language Integrated Learning. Cambridge, England: Cambridge University Press, 2010, p. 41.
2. O. Monastyrskaya and M. Chesnokova, "Content and Language Integrated Learning (CLIL) as a teaching approach for developing managerial skills (for Masters in Navigation curriculum)," in Joint Conference: “The new wave of excellence in maritime education and training”, International Maritime English Conference, IMEC-30, Manilla, 2018.
3. B. Andersen and T. Fagerhaug, Root cause analysis: simplified tools and techniques. Milwaukee, WI: ASQ Quality Press, 2006, pp. 1-19.
4. "Root Cause Analysis (RCA)," Available: https://quality-one.com/rca.
5. M. Chesnokova, O. Monastyrskaya, and J. Monastyrskaya, "Interactive Root Cause Analysis (IRCA) as a Practical Tool for Developing Management Skills (for Masters in Navigation)," in 19th Annual General Assembly (AGA) of the International Association of Maritime Universities (IAMU), Barcelona, 2018, pp. 129-136.
6. "STCW (Standards of Training, Certification, & Watchkeeping for Seafarers) including 2010 Manila amendments." International Maritime Organization; 3rd ed., 2011 edition (March 31, 2011).
7. C. Hetherington, "Safety in shipping: the human element," Journal of Safety Research, vol. 37, 2006, pp. 401-411.
8. "Statistics of Marine Accident," Available: https://www.mlit.go.jp/jtsb/statistics_mar.html.
9. "201628 Collision and explosion kills nine. Mariners Alerting and Reporting Scheme. 19-May-2016." Available: https://www.nautinst.org/resources-page/201628-collision-and-explosion-kills-nine.html.
10. G. Wells, Dialogic Inquiry: Towards a Sociocultural Practice and Theory of Education. Cambridge, England: Cambridge University Press, 1999, p. 81.