Analysis of factors influencing the effectiveness of MET instructors

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Abstract
The Maritime Education and Training (MET) instructors play an important role in maritime safety. They educate, train and prepare new and existing seafarers for efficient and safe job performance and ultimately shape the safety and sustainability of shipping operations. To assist instructors in performing their tasks appropriately, the International Maritime Organization (IMO) has developed various IMO model courses. The paper addresses the factors that bear upon the effectiveness of instructors at MET institutions. The authors developed a questionnaire with the aim of identifying the most significant factors from the instructors’ perspective and investigating whether there were correlations between factors and if they affected each other. The survey included 113 participants from 26 countries. In addition to descriptive statistics, Fisher’s exact test and chi-square test were used to analyse the obtained data and investigate the possible correlation between instructors’ competencies and perceptions of the factors affecting the teaching effectiveness. Finally, the research findings and the main conclusions and recommendations that emerge from these findings are presented.

Keywords MET · Seafarers · Instructors · IMO model course · Training · Education

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1 Introduction

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) with its amendments prompts the maritime education and training (MET) instructors to improve their teaching skills and keep up with the constantly evolving trends in the maritime industry. They have to be appropriately qualified for the respective type and level of training and assessment. This segment falls within the responsibility of each Party to the Convention. The STCW Regulations I/6 (Training and assessment) and I/8 (Quality standards) focus on the requirements for the qualification of instructors and assessors in MET institutions. Sections A-I/6 and A-I/8 of the STCW Code Part A set forth the mandatory training and assessment requirements and quality standards (IMO 2017d). The non-binding guidance in the STCW Code Part B Sections B-I/6 and B-I/8 lays down the effective suggestions for member states on how to comply with the specified requirements. In line with the Regulation I/8, training and assessment have to be continuously monitored through a quality standards system, while Section A-I/8 specifies that the training objectives and associated standards of competence shall be clearly defined by each Party. Their administrations decide which model to apply and incorporate quality policy, quality management, quality system coverage, quality control, quality assurance processes and periodic external quality assessment (Section B-I/8). The quality standard system requirements shall apply to all stakeholders involved in the implementation and activities of the STCW Convention, including MET institutions, administrations, ship operators, assessment of competencies, certification, endorsement or revalidation of certificates (Etman 2020). In accordance with the principle of autonomy, each higher education institution can choose a quality assurance system suitable to its needs (Tuljak-Suban 2013). The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) form a specialised system for standardisation. They collaborate with national bodies in their respective fields of activity and set the standards for institutions (ISO 2011; 2012; Vujičić et al. 2019). Most MET institutions abide by the relevant ISO quality model (Ruan 1999). Quality assurance in MET consists of the following three elements: (1) the proposed curriculum, (2) teaching methodology and assessment and (3) adequate resources (Manuel and Nakazawa 2008). Against this background, the International Maritime Organization (IMO) produced model courses to assist educators in designing and delivering courses in line with the STCW Convention (Horck 2003; Vujičić et al. 2018; 2019). Specific IMO model courses (1.30, 3.12, 6.09, 6.10) could help instructors prepare and conduct the official assessment of seafarers’ competency (Gamil 2008; IMO 2012; 2017a; 2017b; 2017c; Vujičić et al. 2019; Etman 2020).

However, according to an IMO study, maritime education does not always reach its desired and pre-determined goals (Kalnina and Friednies 2017). “The objective of any course is to provide the best learning experience to the students” (Boulougouris et al. 2019). The IMO model course(s) could assist in the preparation of training courses. The model course programmes are neither mandatory...
nor intended to be a blindly followed teaching package that instructors must adhere to, as educational systems and cultural backgrounds vary in each country. The following courses involve teaching methods and factors relevant to an effective teaching process. IMO model course 6.09 covers the planning and learning environment, training aids, teaching activities, subject-related planning strategies, teaching and learning evaluation, and assessment techniques (IMO 2017c). IMO model course 6.10 provides the necessary knowledge and skills for instruction techniques using simulators (IMO 2012). The importance of teaching and assessing on the approved simulators was specified in the STCW 2010. The simulator instructor should be a facilitator, dedicated teacher, manager, flexible and adaptable, learning strategist and organiser, motivator and native psychologist (IMO 2012). IMO model courses 1.30 Onboard assessment and 3.12 Assessment, examination and certification of seafarers are relevant for experienced shore-based instructors with sufficient onboard experience and for the MET staff who hold examinations for certificates of competency (CoC) and other certificates (IMO 2017a; 2017b; Vujičić et al. 2019). The education and training delivered by the MET institution leads to seafarers’ competency. The certificate of competency (CoC) is considered to be evidence that the seafarer possesses the necessary qualities to perform his/her job successfully after assessment in accordance with the STCW (Othman and Naintin 2016).

An effective educational programme should be structured to enhance and ensure its quality and to engage students in learning (Boulougouris et al. 2019). Education, certification, training, knowledge and assessment of MET instructors are determined by national authorities of member states and may vary. MET systems are influenced by different external (international and national legislation; global economy, maritime industry and technological development) and internal factors (organisation and management, teaching staff, trainees, new technologies and teaching facilities). Nowadays, we are witnessing a novel global problem, the COVID-19 pandemic, an unusual factor that affects the educational process in MET. The emergency response to this chain of events was the introduction of emergency remote teaching (ERT) (Hodges et al. 2020). People are generally flexible and adaptable, but at the same time, they can be very sensitive to change (Taleb 1999). Academic staff are the driving force of any MET institution and have to provide seafarers with the knowledge and skills required in the shipping industry worldwide. According to Gamil (2008), the greatest challenge for MET institutions is to have qualified and experienced instructors to fully comply with these requirements. The interaction of different bodies within the MET environment (the maritime industry, seafarers and national education) is necessary to provide the right synergy for effective and efficient learning (Mohammed 2019). According to Bao et al. (2021), lack of qualified instructors, lack of on board training, over-reliance on theoretical teaching, and limited sources of funding are factors affecting the quality of MET in China. Basak (2017) identified the factors that affected the implementation of the MET system in educational institutions. Student achievement can be improved if teachers possess adequate knowledge and skills necessary for performance management and motivation (Gokce 2010). According to Etman (2020), institutions should employ qualified instructors who have experience relevant to the required level and standards of competency. In
addition, the knowledge and skills of instructors are continuously improved through pedagogical training, field training, information technology (IT) training, research projects, simulator training and other necessary trainings. MET institutions should recognise the importance of upgrading the skills and knowledge of MET instructors (exchange programmes, co-operation, research activities, practical training skills on board and ashore). Although this practice is not legally binding, it is utterly important for each MET institution to foster the professional development of its instructors, even though some will be reluctant to change. High-quality pedagogical practices give an edge to MET institutions. IMO model course 6.09 is a lever that can help achieve improvement. MET institutions should be willing to make beneficial changes, not only when it is a “must”, i.e. when it is imposed by the relevant bodies. MET instructors should acquire basic pedagogical skills and methods to cope with all the demands placed on them. All stakeholders in the maritime industry should co-operate and contribute by funding the development of MET instructors (Gamil 2008). Many shipping companies, triggered by new technologies, demanded additional training for a specific type of ships not covered by the STCW Convention (Gundić et al. 2016). This may be a challenge or a factor affecting the education and skills of MET instructors (Muirhead 2002). Ziarati et al. (2010) concluded that “there is a need to improve the content of all maritime training and that the knowledge, skills and understanding of automation should be included in the basic training of all Chapters of the STCW Code of practice”. Several courses designed to improve the qualifications of simulator instructors qualifications are the World Maritime University (WMU) Professional Development Course (PDC), the Train the Trainer Course, and the Training Course for Instructors (Ali 2006). Classroom structure and instructional strategies that foster motivation were presented by Ames (1992). Cooperative learning (CL) and its five essential components are active learning strategies (teamwork) where a small group of students work together to maximise their learning performance (Asyali et al. 2005). Another method to improve student engagement in learning and motivation according to James et al. (2014) is the use of flipped classroom. This means that students are introduced to new learning topics at home and practice problem solving during classes, as opposed to traditional learning where new topics are introduced during classes and problem solving is done through homework. This teaching approach encourages active student engagement and allows instructors to interact more with them. However, in this method, it is important to encourage and motivate students to prepare themselves and complete the work before class in order to understand the subject and develop independent learning skills (James et al. 2014).

From the literature review, there is a need to improve the teaching efficiency and effectiveness in education. Efficiency and effectiveness in education are terms frequently used interchangeably (Lockheed and Hanushek 1994). However, they are two distinct terms, with educational efficiency reflecting the ratio of resources used for teaching and learning outcomes, while educational effectiveness reflects the ratio of achieved and desired level of teaching outcomes (Lockheed and Hanushek 1994; Kenny 2008; Cornali 2012; Johnes et al. 2017). As Cowan (1985) stated, “efficiency is the ratio of output to input; effectiveness is the ratio of the actual outcome to the possible or ideal outcome”. According to Cornali (2012), efficiency is the ability to
accomplish assigned goals by making the best use of assigned resources, and effectiveness is the ability to achieve learning goals. It must be noted that efficient institutions are also effective, but effective institutions are not necessarily efficient (Cornali 2012). In MET, the goals are prescribed by the STCW Convention and instructors are responsible for achieving the set learning outcomes and preparing students for adequate service on board ships.

Competence could be defined as a dynamic combination of knowledge, understanding and skills. A competent person is able to demonstrate and meet complex demands (cognitive and practical skills) and act professionally (Caena 2011). In an attempt to contribute to the development of the maritime community, the International Executive Board (IEB) of the International Association of Maritime Universities (IAMU), together with the Nippon Foundation, launched the Global Maritime Professional (GMP) initiative. A Global Maritime Professional is defined as a professional in the maritime industry who possesses relevant technical competencies in line with the international standards and also exhibits a high level of academic skills and professionalism (IAMU 2019).

The effectiveness of MET instructors might be affected by various factors, such as appropriate experience (possession of relevant certificates, seagoing and academic experience, attending various courses for seafarers) of instructors (The Nautical Institute 2012), disruptions during classes (the reasons include lack of motivation, personality, cognitive abilities, inadequate trainer’s/assessor’s competence, trainer’s/assessor’s poor communication skills, high price of the course, long duration of the course and others), and the use of adequate IMO model courses. One of the key factors for adequate learning outcomes and successful training is student motivation (Tang and Sampson 2017). It is the prerequisite for learning. Motivation is not an unchangeable feature; it changes and varies over time and is affected by many factors, such as socio-economic background, gender, ethnicity and family background of a student (Boström and Bostedt 2020). Student motivation could be hindered by a lack of communication with the instructor, the complexity of the given tasks, poor planning, unattractive classrooms, negative atmosphere during classes and inadequate or no feedback. Another interesting fact is that motivation could be positively affected by more practical teaching (Boström and Bostedt 2020). It can be concluded that instructors with experience at sea could positively influence students’ motivation by including practical problems from the shipping industry in their lessons.

This paper takes as a starting point the crucial factors affecting MET instructors and the current global requirements for maritime faculties and training centres in relation to the relevant IMO model courses. Therefore, the authors created an online questionnaire entitled “Assessment for adequately qualified instructors in MET institutions” to look into the factors affecting the work of MET instructors in different countries and to gain insight into their competencies and opinions on factors affecting their effectiveness and efficiency. The aim was to unveil possible problems that instructors encounter when delivering courses and to look into the possible causes of these problems. It also examined the differences between the opinions of instructors who served aboard ships in the last 5 years and those who did not. In addition, it was examined if there was a statistical difference between the groups of instructors
who attended different IMO model courses in terms of problems encountered in the delivery of courses.

2 Research methodology

The conceptual research model is presented in Fig. 1.

The authors prepared a questionnaire to collect the data and determine the current situation and factors affecting the effectiveness of MET instructors. It was based both on literature review (Ali 2006; Manuel and Nakazawa 2008; Gokce 2010; IMO 2012; The Nautical Institute 2012; Laguador and Alcantara 2013; IMO 2017a, 2017b, 2017c, 2017d; Tang and Sampson 2017; Dolat pour and Divsar 2018; Alibec and Sirbu 2020; Boström and Bostedt 2020) and the authors’ experience and expert opinions. Before devising the final questionnaire, a pilot questionnaire was created to test the questions, avoid response bias and test the sampling method. The survey was confidential and respondents participated anonymously and voluntarily. The questions were worded as neutral as possible. The Google Forms tool was used to create the questionnaire that was disseminated to MET instructors through online channels and social media networks and in paper form. A virtual snowball sampling method was used for the online questionnaire that was available from January 2019 through January 2020 and contained 20 questions. The first five questions (Q1–Q5) were demographic with the purpose to establish the general profile of respondents, of which four were closed-ended, and one was open-ended. The remaining 15 questions (Q6 to Q20) were designed to obtain information about the respondents’ experiences and attitudes towards courses, training and teaching. These were closed-ended with a 5-point Likert scale, multiple-choice and yes/no questions. Statistical analysis was also conducted to identify relations between the factors reported by the
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respondents. The authors used IBM SPSS 20.2 and the programming language R (version 4.0.0×64) for statistical data analysis.

3 Results

The questionnaire provided insight into the responses of 113 instructors of different nationalities and ranks working in MET institutions. In terms of age (Q1), 16 respondents (14.2%) were aged between 25 and 34, 39 (34.5%) were between 35 and 45, 28 (24.8%) were between 46 and 55, and 30 (26.5%) were 56 years and older. None of the respondents reported being younger than 24. As for their academic rank (Q2), 26 respondents (23%) reported being lecturers in maritime studies, 22 were full professors (19.5%), 19 were assistants (16.6%), 18 were assistant professors (15.9%), 17 were training instructors (15%), seven were distinguished professors (1.8%), one reported being marine training development superintendent (0.9%), and one was PhD research fellow (0.9%). The nationalities of the respondents (Q3) were the following: Croatian, Turkish, Montenegrin, Panamanian, Singaporean, British, Latvian, Indonesian, Polish, Italian, Russian, Spanish, Japanese, Georgian, Filipino, Swedish, Vietnamese, German, Peruvian, Egyptian, Bangladeshi, French, Dutch, Norwegian and Indian.

When asked where they were employed (Q4), 93 respondents reported working at a faculty of maritime studies (82.3%), 34 reported working at a maritime training centre (30.1%), and 15 reported working at a maritime high school (13.3%). A person may be employed in more than one institution (e.g. a faculty of maritime studies and a training centre); therefore, the number of responses is greater than the number of respondents. Respondents were asked which certificate of competency (CoC) they held (Q5); 44 reported holding master’s licence (38.9%), 20 reported being officer in charge of navigational watch (OICNW) (17.7%), 13 were chief engineers (11.5%), 11 were chief officers (9.7%), five reported holding second engineer’s licence (4.4%), five reported being officer in charge of engineering watch (OICEW) (4.4%), three were electro-technical officers (ETO) (2.7%), and the remaining 12 (10.7%) reported not holding CoC. The respondents’ sea experience, teaching experience and additional education are presented in Table 1.

The responses show that the majority of the respondents were experienced MET instructors. Also, more than half had practical experience on board a ship and have received additional training in other institutions since the day they were employed as maritime instructors. Thus, 44.2% of the respondents had more than 10 years of teaching experience and 37.2% of the respondents had more than 10 years of navigational experience, while 24.8% of them have sailed for more than one year in the last 5 years. Of the total number of respondents, 30% have not taken any additional training in other institutions, and 24.8% have not attended any additional courses.

In the question “Have you noticed any problems during the courses (e.g. attendees disrupting classes, etc.)?” (Q11), respondents were asked to tick if they had noticed any problems in the form of disruptions during their courses and to tick the possible reasons for this. Only two respondents (1.8%) reported that they always had problems during classes, nine indicated that there were almost always
Table 1 Respondents’ professional experience

| Question no | Questions                                                      | Answers offered  | No. of responses | Responses percentage (%) |
|-------------|----------------------------------------------------------------|------------------|------------------|--------------------------|
| Q6          | How long have you been holding classes?                       | Less than a year | 2                | 1.8                      |
|             |                                                                | 1–5 years        | 29               | 25.7                     |
|             |                                                                | 6–10 years       | 32               | 28.3                     |
|             |                                                                | More than 10 years | 50            | 44.2                     |
| Q7          | Do you have any navigational experience?                      | Yes, more than 10 years | 42            | 37.2                     |
|             |                                                                | Yes, 6–10 years  | 21               | 18.6                     |
|             |                                                                | Yes, 1–5 years   | 24               | 21.2                     |
|             |                                                                | Yes, less than 1 year | 6             | 5.3                      |
|             |                                                                | No               | 20               | 17.7                     |
| Q8          | Have you sailed on ships of 3000 GT (3000 kW) or more in the last 5 years, and how long? | More than 1 year | 28               | 24.8                     |
|             |                                                                | 6 months–1 year  | 11               | 9.7                      |
|             |                                                                | Less than 6 months | 9             | 8.0                      |
|             |                                                                | I have not       | 65               | 57.5                     |
| Q9          | Have you received any additional training on other institutions since the day of your employment? How long? | More than 1 year | 35               | 31.0                     |
|             |                                                                | 7 months–1 year  | 8                | 7.0                      |
|             |                                                                | 3–6 months       | 9                | 8.0                      |
|             |                                                                | Less than 3 months | 27            | 23.9                     |
|             |                                                                | No               | 34               | 30.1                     |
### Table 1 (continued)

| Question no | Questions                                                                 | Answers offered     | No. of responses | Responses percentage (%) |
|-------------|---------------------------------------------------------------------------|---------------------|------------------|--------------------------|
| Q10         | Have you attended any of the courses for seafarers since the day of your employment? | Yes, more than 5    | 37               | 32.8                     |
|             |                                                                           | Yes, 5 courses      | 6                | 5.3                      |
|             |                                                                           | Yes, 4 courses      | 11               | 9.7                      |
|             |                                                                           | Yes, 3 courses      | 13               | 11.5                     |
|             |                                                                           | Yes, 2 courses      | 12               | 10.6                     |
|             |                                                                           | Yes, 1 course       | 6                | 5.3                      |
|             |                                                                           | No                  | 28               | 24.8                     |
problems (8%), while 35 respondents (31%) reported the problems occurred sometimes, 29 (25.7%) reported it as rarely and 38 almost never (33.6%). Thus, in total, 66.5% of the maritime instructors identified some kind of problem.

As for the question “Can you guess the reasons for that kind of behaviour?” (Q12), the perceived reasons are presented in Fig. 2.

Lack of motivation, personality, cognitive abilities, the long duration of the courses, inadequate competence of instructors, poor communication skills and high price of the courses were reported as the main causes of disruption in classes. Therefore, each institution should look into the factors that affect the lack of motivation and try to find the best solution to improve it. These factors can be prejudice, the (in)competence of instructors, inadequate teaching and practical experience, the long duration of the courses, high prices and others. It is well known that all the topics covered by the STCW Convention Part A have to be presented to trainees, but the timeline is defined by each Party. Part B of the STCW Convention recommends the adequate use of IMO model courses with a recommended time frame for each topic.

The following question (Q13) was “Please tick the courses you have attended”, where respondents could tick off more than one answer. The offered answers were the following: IMO model course 1.30, IMO model course 3.12, IMO model course 6.09, IMO model course 6.10 and none of the above. Of the 113 respondents, 49 (43.4%) have never attended any of the courses listed in the question. IMO model course 6.09 was attended by 54 (47.7%) of the respondents, while 22 (19.4%) of the respondents attended only that course. IMO model course 6.10 was attended by 36 (31.8%) respondents, and 13 (11.5%) respondents attended only courses 6.09 and 6.10. IMO model course 1.30 was attended by 9 (8%) respondents and IMO model course 3.12 by 21 (18.6%) respondents.

When asked: “Do you use the adequate IMO model courses when organising and holding training?” (Q14), 48 respondents (42.5%) reported that they always used IMO model courses, 31 respondents (27.4%) reported often, and 24

![Fig. 2 Respondents’ perceived reasons for problems during classes](image-url)
respondents (21.2%) reported sometimes, while ten respondents (8.8%) reported that they never used IMO model courses.

In this survey, 82.3% of respondents gave a positive answer to the question “Have you ever used a simulator as a necessary part of the teaching programme?” (Q15). Since only 36 respondents (33% of the total number) indicated that they had attended IMO model course 6.10 (simulator training), this should be introduced as a teaching aid. Furthermore, in their answers to the question “Are you satisfied with the available teaching materials you use?” (Q16), respondents stated they were generally satisfied (72.6%). However, it is strongly recommended to elaborate on the problems of those who were not satisfied (27.4%). As for the question “Do you think that trainers should be more familiar with the implementation of IMO model courses prescribed by the STCW Convention and its Annexes?” (Q17), 81.4% of respondents answered yes, while a significantly smaller number of respondents (18.6%) answered no.

When asked “Do you evaluate your teaching?” (Q18), the majority of respondents (94.7%) stated they evaluated their teaching process. The answers to the question “Please tick the box(es) with the method(s) you use for evaluation” (Q19) provided an overview of the evaluation methods instructors used to assess their work. Most of them (74.3%) used written questionnaires, followed by oral questionnaires (37.1%), and assessments by supervisors (25.6%). A small percentage of instructors (13.2%) used other means of evaluation. Hence, it is evident that MET instructors use different methods to assess their work and receive helpful feedback from their trainees, thus improving the weak points of the teaching process.

In the last question: “For the courses prescribed by the STCW Convention (including the course that involves working on a simulator), my institution requires (circle all the answers that refer to your institution)” (Q20), respondents were asked to tick the requirements of their institution that they had to fulfil. The authors have analysed and ordered the competencies required by MET institutions according to the nationalities of the respondents (Fig. 3). Unfortunately, there is no equal number of respondents from each Party. The numbers next to the nationalities represent the number of respondents, while the numbers in the bar chart represent the number of participants who selected the items required by their MET institution.

Figure 3 shows that CoC is most demanded by MET institutions, followed by teaching experience (TE). Many institutions require the proposed IMO model courses and valid certificates (VC) for the specific courses. The seagoing service experience (MNE—master with navigational experience and ONE—officer with navigational experience) is almost as important as academic positions. Specific ship type (SST) experience is one of the competencies required by some Parties when their instructors deliver specific type courses. Of the total 26 countries included in this study, 84.6% require a certificate of competency (CoC), 65.4% require teaching experience (TE), 61.5% require a PhD, 50% require valid certificates for the courses they hold (VC), 73% require IMO model courses 6.09 and 6.10 (6.09/6.10), 69.2% require experience as a master/a chief engineer (MNE), 69.2% require experience as a mate/an engineer (ONE) and 50% require the seagoing service experience on the specific type of ships for the courses they hold (SST).

The researchers tried to find out if there was a correlation between the ability to identify problems during the courses (Q11) and the academic rank or position...
(Q2) \((h_{0,1})\) and the instructor’s certificate of competency (Q5) \((h_{0,2})\). The chi-square test of independence was used. It is a statistical hypothesis test used to determine whether two categorical or nominal variables are likely to be related. Table 2 shows the results of the chi-square test of independence.

As shown in Table 2, there is no statistical significance \((p\text{-values} > 0.05)\), and therefore, hypotheses \(h_{0,1}\) and \(h_{0,2}\) cannot be rejected. Thus, it can be concluded that there is no correlation between the variables tested.

Furthermore, the authors tried to find out if there was a correlation \((h_{0,3})\) between the age of instructor (Q1) and any additional training at other institutions (Q9), \((h_{0,4})\) between the age of instructor (Q1) and the number of courses taken since the date.
of employment at the institution (Q10), (h0,5) between the age of instructor (Q1) and the ability to identify problems during the courses (Q11), (h0,6) between the age of instructor (Q1) and the perceived reasons for behavioural problems during the courses (Q12), (h0,7) between the length of teaching experience (Q6) and any additional training at other institutions (Q9), (h0,8) between the length of teaching experience (Q6) and the number of courses attended since the date of employment at the institution (Q10), (h0,9) between the length of teaching experience (Q6) and the ability to notice problems during the courses (Q11), (h0,10) between the length of teaching experience (Q6) and the perceived reasons for behavioural problems during the courses (Q12), (h0,11) between the instructor’s navigational experience (Q7) and any additional training at other institutions (Q9), (h0,12) between the instructor’s navigational experience (Q7) and the number of courses taken since the date of employment at the institution (Q10), (h0,13) between the instructor’s navigational experience (Q7) and the ability to notice problems during the courses (Q11), (h0,14) between the instructor’s navigational experience (Q7) and the perceived reasons for behavioural problems during the courses (Q12). The results of the chi-square test of independence are presented in Table 3.

As shown in Table 3, only the null hypotheses h0,9, h0,10 and h0,12 could be rejected due to significant p-values. Thus, there is an evident correlation between the length of teaching experience (Q6) and the ability to identify problems during the courses (Q11), between the length of teaching experience (Q6) and the perceived reasons for behavioural problems during the courses (Q12), and between the instructor’s navigational experience (Q7) and the number of courses taken since the date of employment at the institution (Q10).

Additionally, the authors examined if there was (h0,15) a correlation between the MET institution where the instructor is employed (faculty of maritime studies and maritime training centre) (Q4) and the ability to identify problems during the courses (Q11), (h0,16) a correlation between the MET institution where the instructor is employed (Q4) and the perceived reasons for behavioural problems during the courses (Q12).
courses (Q12), (h0,17) a correlation between the MET institution where the instructor is employed (Q4) and the use of adequate IMO model courses in teaching (Q14) and (h0,18) a correlation between the MET institution where the instructor is employed (Q4) and the use of simulator in teaching (Q15). The results are presented in Table 4.

As presented in Table 4, the hypotheses h(0,15) to h(0,18) cannot be rejected since there is no statistical significance (p-values > 0.05). It can be concluded that there is no correlation between the MET instructors employed at faculties of maritime studies and maritime training centres with regard to identifying problems in classes, perceiving the reasons for these problems, and using IMO model courses and simulators in teaching.

Furthermore, the authors hypothesised that maritime instructors with the seagoing experience in the last 5 years have fewer problems during courses and are able to impart more practical knowledge to future and current seafarers. Moreover, they may complete and apply adequate IMO model courses when organising and delivering courses. However, the analysis of the results showed that 58% of the respondents have not sailed in the last 5 years, while 42% have sailed. Figure 4 is a graphical presentation of respondents who have and have not sailed in the last 5 years by nationality.

As the number of respondents is unevenly distributed by country, it cannot be said that MET instructors in some countries refresh their knowledge more while serving on board ships than MET instructors in other countries. In addition, the authors tried to find differences between respondents with and without sailing experience in the last 5 years using adequate IMO model courses in training (Fig. 5).

| Hypothesis | Chi-square (χ²) | Degrees of freedom (df) | p-value |
|------------|-----------------|-------------------------|---------|
| h0,15      | 10.8121         | 10                      | 0.3723  |
| h0,16      | 19.5813         | 56                      | 0.9999  |
| h0,17      | 4.8799          | 8                       | 0.7703  |
| h0,18      | 2.7516          | 4                       | 0.6002  |

Fig. 4 Division of respondents who have and have not sailed in the last 5 years by nationality
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As Fig. 5 shows, there is no significant difference between respondents with and without sailing experience in the last 5 years regarding the use of IMO model courses during training.

When comparing respondents with and without sailing experience in the last 5 years in terms of IMO model courses, it is evident that IMO model courses 1.30, 3.12, 6.09 and 6.10 are attended more by the respondents who have sailed in the last 5 years.
5 years. On the other hand, respondents who have not attended any of these courses have not sailed in the last 5 years (Fig. 6).

When the respondents with sailing experience in the last 5 years were compared with those without it in terms of identifying problems during courses, it was found that more respondents who have not sailed in the last 5 years encountered fewer problems than those who have sailed (Fig. 7).

Another comparison concerns the reasons for problems during classes perceived by the instructors. As shown in Fig. 8, the respondents without sailing experience in the last 5 years perceive “personalities and cognitive abilities of the person or/and the group” and “lack of motivation” as the main reasons for disruptions during classes more than instructors with sailing experience in the last 5 years. On the other hand, “inadequate competence of the trainer/assessor” and “high price of the course” were perceived as reasons for disruptive behaviour during classes more by the instructors who have sailed in the last 5 years.

The questionnaire data analysis showed no significant differences between the MET instructors with and without sailing experience in the last 5 years.

In addition, it was investigated if there was a correlation between taking the relevant IMO model course and the type and number of problems perceived by the instructors during classes. In terms of IMO model courses, the only statistically significant difference between instructors who had completed IMO model course 1.30 and those who had not was detected in responses related to the number of problems, perception of poor communication skills, high price of the course, and course duration.

Fisher’s test (Fisher Ex. test = 10.813, $df = 4$, $p = 0.029$) showed a statistically significant difference in the number of perceived problems between instructors who did not complete IMO model course 1.30 (group 1) and instructors who
completed it (group 2). Namely, four or more problems were identified by 6% of the instructors in group 1 and by 33% by the instructors in group 2. One or no problems were perceived by 67% of the respondents in group 1 and by 22% of the respondents in group 2. These results could be explained by the fact that IMO model course 1.30 focuses on shipboard assessment, competency-based assessment, communication skills and conducting practical assessment sessions, which could to some extent prepare the attendees to better identify the problems during the course delivery.

A statistically significant difference in the attitude that poor communication skills were a problem was identified among the respondents in both groups ($\chi^2 = 12.557$, $df = 1$, $p = 0.000$). In group 2, an equal number of respondents saw poor communication skills as a problem, while in group 1, 88% of respondents said they had no communication problems.

A significant difference in price as a problem was found between the two groups of instructors (Fisher Ex. test = 5.315, $df = 1$, $p = 0.021$), i.e. 34% of those who completed IMO 1.30 said that high price was a problem, and only 9% of those who did not complete IMO 1.30 provided the same answer.

There is a statistically significant difference in responses regarding personality as a problem identified by the instructors in group 1 and group 2 (Fisher Ex. test = 5.567, $df = 1$, $p = 0.018$). As many as 78% of those with IMO 1.30 said that personality was observed as a problem, while in the group of those without IMO 1.30, only 32% of the instructors provided this same response.

![Fig. 8](image-url) The reasons perceived by MET instructors for the disruptive behaviour of the attendees during classes
4 Discussion

The competence of maritime instructors depends on their continuous improvement in all aspects of education and training. Their main objective is to deliver a curriculum by applying the correct methodology in accordance with the STCW requirements. The lack of uniform competencies that MET instructors have to meet could be considered a shortcoming, as different teaching strategies and competencies required by MET institutions may in certain cases result in incompetent seafarers. However, it should be noted that the IMO mandated the Parties to the Convention to adequately address this issue and assemble highly competent instructors that will produce skilful seafarers. The research result analysis shows that the STCW Parties primarily require the CoC, IMO model courses 6.09 and 6.10, and sailing experience at the rank of master or chief engineer and/or deck or engine officer. An objective assessment of the competence of the instructor is only possible if the system of quality standards provided for in the STCW Convention is implemented in the best possible way. The factors influencing the process of knowledge transfer and the acquisition of new skills cannot be generalised as they are manifold. However, the authors suggest that those who do not have teaching experience attend courses that help to acquire new teaching knowledge and successful group work.

This research, which included experienced MET instructors, found that in most cases, they did not encounter problems when teaching. If they did, the perceived causes of problems were lack of motivation, personality and cognitive abilities, the long duration of courses and the competence of the instructor. Effective learning outcomes require the elimination of all factors that negatively affect the teaching process. Adequate motivation of students, engagement in various tasks, good interaction of the instructor with students through reflective teaching practice, or appropriate transformation of instructor’s practice could be the key to success. Another important finding of this study is a statistically significant correlation between instructors’ teaching experience and the ability to identify problems in courses and the perceived reasons for these problems.

Experienced MET instructors may encounter fewer problems during the courses, while less experienced instructors are likely to face more problems until they have acquired the necessary experience and skills. Furthermore, experienced instructors perceive lack of motivation, inadequate competence of trainers and long course duration as the main reasons for behavioural problems. As MET instructors who have sailed for a long time were used to training at the training centres, they are likely to continue to do so after taking on the role of MET instructor. As Chawla (2015) noted, maritime educators occasionally need to sail on ships to refresh their knowledge on the application of the latest regulations and state-of-the-art equipment and machinery fitted on board ships. Moreover, MET instructors generally have a positive attitude towards professional development. However, they often do not have the opportunity to refresh their knowledge and skills in practice (Chawla 2015). In addition, it was shown that there is no statistically significant relationship between the MET institution where instructors are employed (faculties of maritime studies and maritime training centres)
and instructor’s abilities to identify problems, the perceived reasons for these problems, and the use of IMO model courses and simulators during teaching. Although no statistical significance was found, it is important to note that there was a large difference between the sample size of MET instructors employed at maritime faculties \((n = 73)\) and those employed at maritime training centres \((n = 11)\). It must be emphasised that instructors employed at more than one institution (or employed at maritime high schools) were not included in the analysis \((n = 29)\).

Furthermore, Fisher’s exact test showed that there was a statistically significant difference between the groups of MET instructors who took IMO model course 1.30 and those who did not in terms of the number of perceived problems, communication issue and course price as a cause of disruptive behaviour during classes. Instructors who attended IMO model course 1.30 seem to have developed the ability to recognise problems and disruptive behaviour, in contrast to those who did not attend. As the IMO model course 1.30 covers topics such as performance observation and recording, assessing human behavioural competency, communication skills and conducting practical assessment sessions, it might help instructors who attend it to acquire specific skills needed to develop effective teaching. This may lead to the conclusion that IMO model course 1.30 helps instructors to better understand their students and realise how to resolve the causes of disruptions during classes. While this conclusion is based on the results of the statistical analysis, it should be taken with caution due to the relatively small sample of instructors who completed IMO model course 1.30.

When comparing the attitudes of MET instructors with sailing experience in the last 5 years and those without it, there were no significant differences. Although the data analysis did not reveal any significant differences, refresher sailing practice of MET instructors would benefit everyone involved in MET. MET instructors would refresh their knowledge and gain new practical knowledge and skills (introducing new technologies), and students would have instructors who could provide more practical knowledge and learn first-hand about the latest improvements, processes and technologies introduced on ships. In return, the shipping companies would have professionals from the maritime sector (MET instructors) who could occasionally sail on their ships. While sailing as part of the ship’s complement, MET instructors could improve general knowledge on board by teaching crew members and improving possible deficiencies in processes and procedures, which could improve the onboard safety. Another benefit for the companies would be the recruitment of new seafarers (students) whose knowledge would be in line with the latest technological advances. Although refresher sailing practice could benefit instructors by developing their skills and keeping them up-to-date with the latest technologies and equipment on board ships, as well as with current rules and regulations, the research findings do not support this hypothesis.

It is important to emphasise that MET instructors cannot be held entirely responsible for the quality of knowledge imparted to their students (Kenny 2008). They work within the constraints imposed by the government and its institutions while striving to produce the highest quality maritime personnel capable of navigating state-of-the-art ships and generally improving safety at sea.
5 Conclusion

The effectiveness of the MET instructor is an important element of seafarers’ education as it ensures quality learning outcomes and provides students with the necessary knowledge for the role they will take on board a ship. However, the results show that most MET instructors experienced disruptions during classes, which might affect learning outcomes and instructor’s effectiveness. Therefore, to improve the effectiveness of MET instructors, the following is suggested:

- Instructors should be competent in teaching methodology to adequately motivate students and improve learning outcomes.
- Classes should be developed so that possible long duration is compensated by an interesting lecture supplemented by real case studies concerning the subject of the class.
- IMO model courses are a tool designed to facilitate teaching in MET, and instructors should take relevant courses and use them during classes.
- Although the research findings do not confirm the importance of refresher sailing for MET instructors, the authors believe that it could have a positive effect on their teaching and at least make lectures more interesting for students, as real cases from onboard practice could be included and discussed in classes.
- The evaluation of teaching should be reviewed regularly for each instructor and, if necessary, measures for improvement should be proposed based on the evaluation results.
- MET institutions should invest in developing the competencies of their instructors to improve learning effectiveness.

This study has several limitations. First, the results and conclusions could be affected by the relatively small sample size, although it can be argued that 113 MET instructors from 26 different countries constitute a valid and commendable sample. However, another limitation is the relatively small number of MET instructors from different countries. Therefore, it was a particularly challenging task to determine the most important factors affecting teaching outcomes in different MET institutions. Future studies will include the development of a survey aiming at collecting the competencies and attitudes of MET instructors, accompanied by another survey intended for the students of maritime studies. Thus, the data comprising the attitudes and opinions of instructors and students will be collected and analysed to find the best practices in MET.

Declarations

Conflict of interest The authors declare no competing interests.
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