Guest editorial

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1 Introduction

For any research field to develop and have a lasting impact, there must be a continuous debate about the theoretical foundations of the field, which could be defined as the historically situated and socially constructed conceptual understanding of the phenomena under investigation. In an area such as Maritime Education and Training (MET), which is concerned with professional learning, researchers need to be aware of their own and others' (often implicit) theoretical assumptions pertaining not only to the conditions under which learning takes place or to what it means to learn but also to the very nature of learning/knowing (for example, Alexander et al. 2009; Illeris 2009; Lachman 1997; Sawyer 2014; Säljö 2009). More importantly, as MET researchers, we ought to actively advance the theoretical understanding of professional learning and knowledge in the maritime domain.

However, the role and meaning of theory in social and human research is a contested and multidimensional topic associated with varying interests and values (Abend 2008). While some conceive of the role of theory as an explanation, others use theory as a means to interpret complex phenomena (Cornelissen et al. 2021). A key difference between these two types of theoretical approaches is that while the former aims to identify causal mechanisms, generalizations, and predictions through the search for nomological regularities in the world, the latter is often associated with an in-depth hermeneutical understanding of human practice. Emancipatory theorizing is yet another approach, normative in character that aims to expose and challenge existing structures, practices, and systems of belief. Moreover, the conceived value of theories can range from the accumulation of knowledge (ordering of empirical data) to the abstraction of knowledge (pure conceptual analysis) depending on one's position on the empiricist/rationalist continuum (Suddaby 2014). It is therefore difficult to define what a theory consists of in a way that everyone would

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agree on. In a seminal paper on theory in social science, Sutton and Staw (1995) acknowledged this lack of consensus on what theory is and argue instead of what it is not. They write that neither mere reference to theory nor empirical patterns in the data (which they call brute empiricism), nor lists of variables, diagrams (and hence some models) or hypotheses (predictions), nor, one might add, recommendations, design approaches, or research implications constitute theory on their own. Irrespective of the choice of theoretical interest (explanatory, interpretative, or emancipatory) or the approach of deriving theory (inductive, deductive, or abductive), a common feature of all forms of solid theorizing is the need for genuine and coherent integration of research goals, empirical data, analysis, and theoretical framework. Following Weick (1995) who emphasized theorizing (the process) rather than the building or testing of some "grand theory" (the product), we hope to capture an aspect of research that all could agree on. In this reading, theorizing can be seen as "the scholarly work that researchers do in pursuit of making informed knowledge claims" (Cornelissen et al. 2021). From this perspective, theorizing and all forms of research necessarily consist of conceptualization, that is, naming and framing the "topic" that one is interested in, or studying, in terms of specific theoretical concepts and relating and contrasting them to a broader theoretical discourse. This does not mean that conceptualization should be understood as a departure from practitioners' everyday practice, but rather as an act of producing conceptual resources, sometimes approximating a full-blown theory, to understand it (although it might differ from the way practitioners formulate a problem or from the immediate demands and interests of the industry).

In the field of professional learning and education, there are many different resources for theorizing how and why learning takes place, drawing on different theoretical traditions and their basic assumptions, ontologies, and epistemologies. Since the scope of this editorial does not allow a review of all the available positions in the field, we can only hint at some theoretical directions that we believe MET could take, ranging from the highly interconnected socio-material, socio-cultural, and practice-based approaches emphasizing the constitutive relationship between agents, culture, and artifacts to embodied perspectives focusing on the lived experience and understanding of interaction (Fenwick and Nerland 2014; Green and Hopwood 2015; Loftus and Kinsella 2021; Markauskaite and Goodyear 2017). In recent years, a growing corpus of studies has emerged that contribute to forming an interpretative theoretical foundation for what professional learning means in the maritime domain. These studies provide rich and detailed analyses of the social, material, and cultural dimensions of the learning practices under scrutiny, drawing on situated perspectives of learning (e.g., Suchman 1987; Lave and Wenger 1991), sociocultural approaches (e.g., Vygotsky 1980; Engeström 2016), and pragmatic theories of learning (e.g., Dewey 1998; Biesta 2007). Studies in such traditions have advanced our knowledge of simulator-based training in MET contexts (e.g., John et al. 2019; Hontvedt and Arnseth 2013; Wahl 2020), the role of storytelling in professional learning (Emad and Roth 2016; Sellberg and Wiig 2020), and how professional reflection-in-action can be taught and learned (for example, Sellberg et al. 2021). We have also seen theoretical perspectives that, at analytical depth, strive to understand learners' experiences in MET. Examples of such explorations can be

found in phenomenological investigations of participants lived experiences in different kinds of meaning-making activities (Husserl 1931; Merleau-Ponty 2004). Previous studies in the maritime domain include Bradley Roberts's exploration of how master mariners in the offshore sector use embodied sensemaking to resolve critical events (Roberts 2018). Interest in participants' bodily experiences can also be found in analyses of students' lived experiences during basic safety training and debriefing (Viktorelius and Sellberg 2021, 2022), or in analyses of how the acting and knowing body develops when learning how to sail (Andersson et al. 2015).

2 Theory in MET

The aim of this Special Issue was to invite a corpus of studies that theorized professional learning in MET, either through theory testing or theory generation. With regard to theory testing, we searched for case studies that critically explore analytical concepts or theoretical frameworks developed in other domains, testing their analytical generalizability to explain teaching and learning practices in MET (cf. Yin 2013). On the other hand, when it comes to theory generation, we sought empirical investigations that could give rise to new concepts and/or theories on teaching and learning, rather than making use of previously developed concepts (González-Teruel and Abad-García 2012). Hence, we searched for papers that took an explicit theoretical position or conducted an empirically driven analysis to generate new theoretical concepts or frameworks. The Special Issue also invited conceptual papers focusing on advancing our understanding of the relationships among theoretical constructs, emphasizing logical arguments about their relations rather than empirically testing them (Gilson and Goldberg 2015). In this way, the Special Issue aimed to explore the theoretical traditions available for investigating teaching and learning practices in MET and invited intellectual debates that can lead the field of teaching and learning in MET forward. In this editorial we do not only summarize the papers published in the SI but also take a step back and reflect on the submitted papers and what that might tell us about the state of theory in the research field of MET.

The first study presented in our Special Issue has the title "Reviewing simulator-based training and assessment in maritime education: A topic modeling approach for tracing conceptual developments." In this study, Wiig, Sellberg, and Solberg do a historical literature review of the use of simulators in maritime training and assessment and use a combination of AI-generated document analysis and qualitative content analysis to trace conceptual discussions on learning within MET research. Their analysis concerns, first and foremost, studies published within maritime specific journals, identifying articles published in Journal of Navigation, TransNav, and WMU Journal of Maritime Affairs (JOMA) to show how MET has developed as a discipline from the 1960s to today; from the first few studies written by practitioners in the field and published in the Journal of Navigation, toward the emergence of a research field with its own dedicated section in WMU Journal. As the first review of its type in this area, combining a text mining approach with qualitative content analysis makes visible implicit conceptual notions about simulation-based education and how these notions have developed and changed over time. In particular, the results

show that MET as a research area is dominated by human factor research. Following this tradition, the central themes to describe simulator-based training and assessment are more oriented toward learning objectives as a product than toward learning activities as a process. While both aspects might be important to analyze in MET studies, the consequence of the dominance of human factors in MET research is that the concept of learning activities and learning processes is underdeveloped in the literature. The text mining approach also reveals that reflexive conceptualizations of learning in maritime simulations appear to be mainly connected to the JOMA and the IAMU sections.

The second article in the Special Issue contributes to our understanding of the ongoing increase in digitalization and automation onboard ships by conducting an empirical investigation through the lens of activity theory (AT), showing both how and why AT has descriptive power in regards to the complex socio-material systems that constitute maritime navigation. In their article titled "Theorizing Seafarers' Participation and Learning in an Evolving Maritime Workplace: An Activity Theory Perspective," Narayanan, Emad, and Fei aim to advance our understanding on the relation between learning processes and situated action in a fast evolving and technically advanced socio-material environment. Narayanan et al. argue for the need of a comprehensive theoretical framework that covers the various levels of individual, organizational, societal, and cultural aspects of work and learning practices. Such a framework should analyze and fully comprehend human practices as a sociocultural activity and a developmental process, considering multiple contexts and networks in order to capture entire processes and encompass all the training-related requirements of future seafarers. In this respect, AT is seen as a theoretical framework that is well suited for investigating dynamically interrelated aspects of knowing and learning in order to form a holistic understanding of digitalization and automation processes from a professional learning perspective. As a result of their analysis, they not only test the theory of AT in a complex socio-material environment within MET but they also show how and why the current digitalization processes in the maritime industry cause disruptions on board ships when new technologies transform traditional work practices and what it means to be a competent seafarer.

In the third article of this Special Issue, titled "Formative Assessment in Maritime Simulator-based Higher Education," Karahalil, Lützhöft, and Scanlan make use of previous research on assessment in order to provide an analysis of how assessment practices in MET and, in particular formative assessment practices in simulator-based maritime training, are understood by MET instructors. While formative assessment has been studied extensively across educational setting, as pointed out by the authors, formative assessment is still to form a clear theoretical foundation. In this respect, one can state that Karahalil et al. (2023) mainly contribute to a large corpus of studies about formative assessment as an important educational phenomenon and contribute to developing our theoretical understanding of formative assessment by conceptualizing it to the theoretical tradition social constructivism. Social constructivism is a learning theory that emphasizes the importance of social interaction and the construction of knowledge through collaboration and dialog among learners. It suggests that learners actively construct their own understanding of the world based on their experiences and interactions with others. In the context of

social constructivism, formative assessment is seen as an essential tool for supporting learners in constructing their own understanding of the world. By providing regular feedback and guidance, teachers can help learners to develop their knowledge and skills through a process of active engagement with others. This approach to assessment is based on the idea that learning is an ongoing process, and that learners benefit from frequent opportunities to reflect on their learning and receive feedback on their progress. However, the major strength in this contribution might lie in the concrete educational guidelines it offers for simulator instructors, both within MET and potentially also in other safety-critical domains that make use of simulators for training.

In the empirical study titled "Integrating Motivated Goal Achievement in Maritime Simulator Training," Hjellvik and Mallam explored theories of motivation and personality in the context of MET institutions and the adoption of novel simulation technology for the training of seafarers. Here, motivation refers to the internal process and causal stimulus of actions and behavior from intrinsic and extrinsic factors. Previous research has shown that motivation and cognition are key factors in the development of self-regulatory learning strategies for academic achievement. Moreover, there is empirical evidence that early-stage learners are most perceptible to motivational stimulation from the learning environment, i.e., their peers or instructors. On the other hand, personality draws on a well-known psychological model called the five-factor model of personality, a model composed of the following personality traits: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience. These factors were found to have a strong correlation with positive emotional disposition and academic motivation. Taking a departure from these theories and the roles of motivation and personality in learning in cloud-based simulations (CBS), Hjellvik and Mallam conducted a quasi-experimental design. The experiment was integrated into marine machinery courses at four different MET institutions and was remotely disseminated through trainees' personal computers. After participating theoretical lectures, students took an online knowledge test. Following this, the students were given access to the CBS platform and instructed to focus on repeated attempts in the scenario. After the experiment, the Big Five Inventory (BFI) and Motivated Strategies for Learning Questionnaire (MSLQ) were administered to the participants through an online survey. The results showed that a personality profile with high extraversion, intrinsic goal orientation, agreeableness, conscientiousness, and control of learning beliefs correlates with motivation scales, but also that extraversion seems to be the strongest predictor of motivation for novel students in a maritime education context. Moreover, self-efficacy for learning and performance, as well as test anxiety, was positively correlated with training performance. This indicates that self-efficacy develops during the learning process. As a result, the findings showed the crucial importance of student motivation for learning in CBS, suggesting that simulator instructors need to facilitate motivation through engaging instructional designs, appropriate instructional support, and by providing feedback. Moreover, the participants perceived CBS as having desirable characteristics, such as being engaging, flexible, adaptive, and personalized which might make CBS a useful compliment for training in MET institutions, in particular in regards to developing procedural skills. In this way, Hjellvik

and Mallam (2023) contribute to explain the relation between personality and motivation for academic success in CBS, a type of simulation "that allows for asynchronous and unlimited simulator access where participation in training sessions is at the discretion of the trainee," but where student self-efficacy is central in order to make use of the new possibilities.

In the paper titled "A Human-Centered Design approach for the development and conducting of maritime cyber resilience training," the authors address the issue of how to train crew members and ship management to be able to handle various cyber-related incidents. With the increasing digitalization of shipping, there is consequently also an increased risk for accidents caused by malfunctioning equipment and attacks targeting ships computerized infrastructure. The cyber risk preparedness of crew members and ship management is therefore an important challenge that the authors propose could be addressed with a human-centered design (HCD) approach to the construction of maritime cyber resilience simulator training. The authors argue that although the HCD approach, which is focused on user needs and abilities, has primarily been used in the design of workstations and technologies, it would be beneficial to also use it in the construction of training. In addition, they argue that this approach is aligned with what they identify as two learning theories: connectionism and constructivism. The first theory concerns, according to the authors, how individual learners form knowledge within a network of nodes, referring to technologies, humans, or organizations. The second theory emphasizes, according to the authors, how the learners "take an active approach to their learning and are encouraged to complete their learning alone by solving real work problems." In the last chapter of the paper the authors illustrate the training steps, resulting from applying the HCD approach, (including preparation, briefing, simulation, and debriefing) of an exercise simulating an attack on a ballast water management system onboard a ship.

Included in the Special Issue is a book review written by Solberg of the seminal book "Cognition in the Wild" authored by Edwin Hutchins in 1995. Although the book, which focuses on the cultural tools of navigation and the becoming of professional mariners, was written almost three decades ago, we invited this review because it still stands as an excellent example of how prolonged engagement and persistent observation of a rich empirical case can result in deep insights into the premises for work and learning. Insights can be the starting point for generating new theories on professional learning and how they should be studied. Solberg describes three important theoretical contributions that the book has made to numerous academic fields within the social sciences concerning learning, organizing, and expertise. First, it proposes and illustrates one of the most revealing units of analysis in the study of work: spatial and social properties of cognition in the workplace. Second, it redirects our traditional understanding of cognition as computation in the head and argues that cognition should be conceived of as socially, materially, and historically situated processes taking place both inside and outside the skull. Third, it sets the standard for conducting a study on cognition in practice. In particular, the book shows how the analysis of the cognitive ecology characterizing a workplace at a functional level can be grounded in detailed ethnographic fieldwork focusing on "nuances that can only be discovered in small slices of activity, by zooming in on micro-level details of verbal and nonverbal situations" (Solberg 2023). In

the last section of the review, Solberg also points out some of the components of understanding cognition in the wild that Hutchins did not sufficiently emphasize in his book, but that he later acknowledged and expanded on in some detail, namely, embodiment and affect. The book review is an excellent reminder of how engaging in theorizing can reshape our understanding of things taken for granted and open new and exciting avenues of research.

3 Discussion

Editorial works on this Special Issue have been an insightful experience for us. Having received just a few submissions altogether during the extended period of the call gave us reason to reflect on the state of theory in MET, as enacted by the research community. There might be many reasons as to why so few papers were submitted, among which one could mention the lack of time to write journal papers, simply because of other prioritizations, or perhaps because of inattention to the call. Our concern, however, is that something more alarming is going on related to the conception of theory and its relation to applied research.

In general, there is a common misconception that applied maritime research, which this journal intends to contribute to, does not have to be, or even ought not to be, theoretical (see Song (2021) for a discussion on the topic). This is often motivated by the argument that academic theory, associated with an ivory tower view, is far removed from the everyday practices of seafarers, students, and maritime instructors and therefore has little to offer them. However, this is a mistake in so far as all research assumes some intellectual paradigm and conceptualization of its phenomena (Kuhn 1970); thus, it explicitly scrutinizes one's ontological and epistemological conceptual framework against a variety of theoretical perspectives, and engaging in theorizing is a necessary part of any type of research, applied or not. This separation of application and theory is, we believe, grounded in the fact that MET as a research field has traditionally been based in the industry drawing on engineering and managerial interests rather than those of social science. However, we would like to argue that if researchers sometimes restrain themselves from immediately trying to make practical contributions and focused first on developing fundamental knowledge; then, MET as a research community might do a better job "of hitting the bull's-eye when we finally do take aim" (cf. Sutton and Staw (1995, p. 378)). The reason for this is that "simple" conceptual models that are constructed for the purpose of "easy communication" with "stakeholders" run the risk of distorting the true nature of the phenomena under investigation. A proper understanding of the complex practices of working, knowing, and learning in the maritime domain requires sophisticated conceptualizations, particularly if the final conclusions are to make sense in practice.

On a more positive note, we could also feel strong support from the JOMA community in putting together the call, seen through the eagerness to contribute to the Special Issue as a reviewer. We move forward with the insights that maritime education and training (MET) is still in the initial stages of developing a mature theoretical foundation for the study of learning how to become a maritime professional

(Dall'Alba 2009), and that this Special Issue took a small step in shaping a research community that collectively aims toward gaining a deeper understanding of learning and knowing in MET. We also take with us a vision where our small but hopefully growing community continues to adopt and explore more contemporary humanistic and critical approaches to researching professional learning and engage in more theoretical discussions that move our field forward.

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