Mastering the artful practice of navigation: The situated endorsement of professional competence in post-simulation evaluations

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ABSTRACT

In this study, the ambition is to explore *in situ* which aspects of professional performance students are made accountable for in evaluations carried out by means of simulator-based competence tests. Methodologically, the study draws on video materials collected through ethnographic fieldwork. Analytically, the study focuses on a part of the data corpus capturing authentic instructor-student dialogues after simulator-based competence tests. Using a socio-cultural perspective, and the notion of accountable talk, the study reports interaction analyses of the dialogues under scrutiny. The results illustrate that simulator-based evaluation practices inevitably introduce interactional sequences that involve both learning and grading. The evaluative situation thus becomes a setting where assessors share professional judgement and endorse specific initiatives on the part of the students as signs of skills of competent seafarers ready for taking on the responsibilities as officer of the watch.

1. Introduction

The education of master mariners serves as an example of a profession that has undergone significant transformation during recent decades. Traditionally, knowledge and skills were handed over from masters to novices through a system of extended apprenticeship on board ships. Today, knowledge and skills are taught through four-year Bachelor programs, regulated by international conventions, defining a broad range of specific competence standards to be incorporated into the education. In this context, simulator-based examinations are used to assess competence for various maritime certificates. Previous studies of simulator-based assessments highlight the challenges of conducting valid, reliable, and impartial tests for maritime certificates (e.g., Ghosh et al., 2016, 2017; Erntsen & Nazir, 2020; Sampson et al., 2011). Sellberg (2020) shows how instructors reason about tensions between academic assessment procedures, on the one hand, and, on the other hand, the practitioners' focus on developing students towards contextually relevant professional navigation skills. Attempts to address the challenges involved in conducting valid and reliable assessments are reported in the maritime literature, ranging from developing computer-assisted assessment methods to "reduce the subjective impact of the assessor" (e.g., Ernstsen & Nazir 2020; Øvergård et al.,

2017) to developing assessment models with "clear and coherent" evaluation criteria that allow the quantification of skills involved in maritime navigation (da Conceição et al., 2019, p. 90). There are also attempts to developing so-called "authentic assessment" methods, taking a practice-focused and holistic approach to evaluation of professional competence (Ghosh et al., 2016, 2017).

This study explores challenges of this kind by directing the analytical focus towards how assessments of competence are conducted in current educational practice, drawing on interaction analyses of video recorded simulator-based evaluations of competence in master mariner education (Knoblauch & Tuma, 2019). We analyze these evaluative situations by scrutinizing students' explanations of how they handled navigational dilemmas and challenges during a test scenario, as well as the assessor's evaluation in response to students' reflections. Using a socio-cultural perspective, and the notion of accountable talk (Michaels et al., 2008), the analytical focus is a) on the instructor's and student's co-production of retrospective accounts of decisions about how to navigate are made during a simulator exercise, and b) how these accounts communicate what constitutes professional competence when navigating. The aim of the study is to identify what students are made accountable for when becoming professional seafarers, i.e., which aspects of professional performance are regarded as important to master when being evaluated

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as a maritime professional in simulated contexts (cf. Mäkitalo, 2003). Our objective is to provide rich descriptions of the complexities involved in evaluations of professional competence, in order to gain insights into how simulator-based evaluations are conducted in current educational practices. Such empirical analyses, we argue, are needed to advance our understanding of the mechanisms in play in evaluative situations.

The study took place at a Scandinavian university, focusing on a four years Master Mariner program that lead to a Bachelor of Science in Nautical Science. The curriculum includes courses on navigation, basic safety, cargo handling, maritime management, mathematics, and physics, but also of several periods of apprenticeship on board vessels. The empirical material that serves as basis for the analysis was collected during a course on maritime navigation for specialization towards the offshore industry. The course is a part of the fourth and final year of training. The data corpus has been collected during the final competence test, evaluating students' proficiency in all elements of the operative work as officer of the watch on board a ship before completing the bachelor program. According to the assessment criteria for the simulator-based competence test, the students should demonstrate skills in the following areas: setting up navigational equipment for taking over a sea-watch, navigating safely according to the voyage plan, applying the rules of the road, conducting correct chart work and deck log bookkeeping, as well as conducting proper radio communication with other units. During the scenario, the students' activities on the simulated bridge are monitored from an adjacent room where the assessor keeps a record of the students' performance as described by the predefined assessment criteria. Immediately after the scenario has been completed, there is an evaluation of the exercise, opening for student and assessor reflection, feedback, and communication of the grade in terms of Pass or Fail.

2. Learning to reason through accountable talk

Knowledge and reasoning develop best in tandem; neither precedes the other. Yet it is no easy task to orchestrate this interdependent development. Indeed, teaching good knowledge using discursive methods is perhaps pedagogy's greatest challenge (Michaels et al., 2008, p. 291).

In this study the notion of *accountable talk* serves as a starting point for the analysis (e.g., Michaels et al., 2008, 2010; Resnick et al., 2018). Accountable talk refers to the discursive practices that "support and promote equity and access to rigorous academic learning" (Michaels et al., 2008, p. 283). Accountable talk takes place in pedagogical practices that combine carefully designed tasks with teacher-led discussion and other activities, where students are encouraged to explicate their reasoning and bring forward arguments for what they claim and what they do. Hence, studies of accountable talk focus on how dialogues between teachers and students go beyond being able to reproduce what is known as established facts, directing the analytical interest towards how instructional dialogue may foster reasoning and understanding of complex and ambiguous problems that require professional judgement (Resnick et al., 2018). When analyzing this corpus, the nature and quality of talk are under scrutiny, taking into consideration how teachers orchestrate discussions and how students are invited to engage in dialogue with teachers. Our focus is also on the expectations of accountability at play during such evaluative activities (e.g., Åberg et al., 2010; Michaels et al., 2008; Wiig et al., 2019). We will draw specifically on three dimensions of accountable talk outlined in Michaels et al. (2008). These dimensions are analytically separable, however in practice, they are interdependent, intertwined and must co-occur if the intention of the discourse is to promote learning (O'Connor et al., 2015, p. 112). The three dimensions of accountability will be outlined in the following sections: accountability to the learning community, accountability to accepted standards of reasoning and accountability to knowledge.

2.1. Accountability to the learning community

The first dimension is related to the learning community in which the discursive practice takes place. The accountability is related to mastering the forms of talk and ways of acting and making sense that are relevant within the community. In the perspective of Michaels et al. (2008), the learning community is co-created by the participants in which they listen to and build their contributions in response to those of others. This implies that the teachers and students are developing *in situ* knowledge of how to reason and behave in the particular learning community. In our context, the learning community can be contextualized as the course on maritime navigation for specialization towards the offshore industry. In this learning community, making use of simulator-based learning and assessment practices is central. During brief, exercise and debrief-settings instructors orchestrate discussions and students are invited to engage in the dialogue, i.e., to listen and articulate their contributions to explicate their reasoning and actions as future mariners. Each setting has its own forms of talk and ways of acting, since the premises for action are shaped by the temporal and material circumstances of each setting (Sellberg, 2018). For example, in the briefing situation, talk on the upcoming scenario is balancing between being general enough to apply to a wide range of possible circumstances that might occur during the exercise. Talk in the debriefing phase, on the other hand, are orchestrated to facilitate reflection on the specific details of prior situations to which the students are held accountable to (Sellberg, 2018). Talk during the simulation, in contrast, are often orchestrated as role-plays, designed to mimic working-life professional encounters between mariners at different locations and in different work roles (see e.g., Hontvedt & Arnseth, 2013). Thus, the accountability to the learning community is co-constructed and negotiated through the ongoing dialogues in the training and assessment practices.

2.2. Accountability to accepted standards of reasoning

The second dimension is related to the accepted standards of reasoning in a learning community. The accountability is related to norms and rules of how the participants explicate their reasoning and bring forward their arguments. According to Michaels et al. (2008), this is talk that emphasizes logical connections and that documents the capacity to draw reasonable conclusions. These standards, in our context, are related both to the criteria describing what future mariners are accountable for, and to the tacit ways of thinking and reasoning that are central when solving problems and attempting to become a professional in the learning community. In our context, the accepted standards of reasoning are contextualized in the social and material recourses of the simulated activities. In these activities, the norms and rules of how the teachers and students perform and display their reasoning are demonstrated in carefully orchestrated conversations that serve as elements of acting as a mariner while at the same time inviting students to reflect on their actions. For example, in Sellberg et al. (2021) the instructor's post-simulation demonstrations on how to apply maritime traffic regulations in a specific situation offer a model for professional reasoning for the novice students participating in the exercise. Discussing mistakes, correct and incorrect maneuvers regarding the rules of the road, the teachers and students co-construct accepted standards by drawing reasonable conclusions and by making use of conceptual knowledge and previous experiences.

2.3. Accountability to knowledge

The last dimension regarding accountability to knowledge is related to understanding and making use of relevant knowledge *in situ*. Michaels et al. (2008) underline that accountability to knowledge goes beyond being able to recite facts or information taken from written texts or other public information. They highlight the role of discursive reasoning

about complex problems as a source of rigorous academic learning. Participants in the learning community make explicit the evidence behind their claims. They challenge each other when evidence is lacking or not available and when the content under discussion involves new or not yet mastered knowledge. In such discussions, misunderstandings and misconceptions will be attended to and resolved. Adopting a socio-cultural perspective, the development of professional knowledge should be seen as an evaluation of how the participants engage in and appropriate an *epistemic practice* characteristic of a community (Nerland & Jensen, 2012).

In our setting, accountability to knowledge is demonstrated through a certification-process in which students' skills are tested in a formal sense. In the simulated exercises, the instructors invite students to reflect on how to make use of different kinds of knowledge *in situ,* and they encourage them to make explicit the evidence behind their claims or explanations. Accountability to knowledge in a navigation course include mathematical knowledge (e.g., formulas for calculating distance, acceleration, turn rate, bearing and so on), navigational concepts (e.g., latitude and longitude), navigational methods (e.g., dead reckoning, radar navigation or pilotage), maritime laws and regulations (e. g., the anti-collision regulations that apply at sea). In a sense, the students are to document *actionable knowledge,* i. e. the competence to make relevant judgements when navigating (cf. Markauskaite & Goodyear, 2017).

Previous research on accountable talk has centred on school subjects such as math or natural science, where students are expected to master a body of authoritative knowledge, for example, algorithms, formulae, symbolic tools, as well as facts and accepted theories (Michaels et al. 2008). In a sense, authorative knowledge can be used as a gloss for describing the kind of rational thinking that is relevant when solving given problems with clear beginnings and ends, i.e., when the answers are known. Our empirical materials offer a different point of entry to the issue accountable talk, putting on display a discursive practice in which the body of knowledge the students are learning to master involves professional competence and judgement rather than straightforward, authorative knowledge. We will further elaborate on what this means in our analyses of authentic evaluations of future maritime students. In particular, we will discuss how the participants in our empirical material orient towards evaluating professional competence.

3. Methods, materials and the empirical case

Using a videography approach, data collection for this study was organized in two steps (Knoblauch & Tuma, 2011). During the first step, in the beginning of 2019, ethnographic fieldwork was conducted at different points in the course. Two days of observations of Anchor Handling and Dynamic Positioning exercises were carried out in 2019. These initial observations guided the selection of simulator-based activities to be recorded, as well as details about how to capture activities that are distributed between a full-mission navigation simulator and the instructors' room (Heath et al., 2011). During 2020, video-recorded data were collected with a focus on bridge teamwork during Dynamic Positioning exercises as well as on the simulator-based competency test at the end of the course. At this time, there were two instructors teaching the course, both former masters with many years of professional experience from the offshore industry. As the course is chosen for specialization towards work in the offshore industry, the groups of students are quite small, eight students in 2020. All participants were informed, both orally and in writing, about the data collection as well as routines for storing, sharing, and communicating research data in line with the guidelines provided by the Swedish Ethical Review Authority (*Swe.* Etikprövningsmyndigheten) and the General Data Protection Regulation (GDPR). Following this information, all participants signed an informed consent form to participate in the study. For matters of confidentiality and anonymity, the participants' faces have been blurred in photos used and names that occur in transcripts are fictive.

Using a multiple camera set-up, a wall mounted GoPro™ camera captured the students' activities in the simulator, and a fixed camera was used to record the activities in the instructors' room. In all, the video recorded data cover approximately 30 h of training in the course. For this study, a corpus of seven video recorded evaluations from the students' last simulator-based exercise will be used as a basis for analysis. Out of the seven evaluations, one student failed the examination and had to return for a re-examination later on. The evaluations in total make up approximately one hour of the video corpus, and they have been transcribed in verbatim. Additionally, documents from the course are part of the analysis, i.e., the course PM, the syllabus, the task description, and the written assessments from the exercise, have been collected to be able to relate the assessments during debriefings to the curricula. When narrowing down the analysis, two excerpts from the empirical material were chosen to represent the data corpus. Both excerpts illustrate evaluations of students that passed the examination and they are endorsed by the assessor as competent seafarers, offering explicit displays of what matters as accountable practices.

3.1. The empirical case

In focus of this study is a Master Mariner course at a Technical University in Scandinavia. The course takes place during the fourth and final year of the program and can be chosen for specialization towards the offshore industry. Hence, the students taking this course have prior experiences both of making sense of navigation as an academic discipline and of practically oriented simulator-based training. They have also had periods of on-board practice. The course consists of lectures and three different simulator-based exercises, based on a continuous scenario of travelling from Milton Haven to an oilfield in the waters east of Shetland Islands (Fig. 1). The aim is to train both generic navigational competences, such as route planning, bridge teamwork, risk assessment, communication and leadership as well as offshore-specific skills. These include offshore navigation, mooring and installation as well as bridge teamwork supported by offshore-specific standard operations procedures (SOP) and checklists.

While the students work in teams of two or three during the first two exercises, the last simulator exercise in the course is an individual competence assessment. The test is performed in a full mission simulator, and the students are assigned different time slots for taking the test over a course of two days. During the test, the student should demonstrate skills in the following areas: setting up the bridge navigational equipment for taking over a sea-watch, navigating safely according to the voyage plan (anti-grounding), applying the rules of the road (anti-collision), conducting correct chart work and deck log bookkeeping, as well as conducting proper radio communication with other units/organizations. At an overall level, the simulator-based competence test is divided into three parts: preparation, scenario and debriefing. First, the student is assigned to navigating part of the route between Milton Haven and Aberdeen (Fig. 1). For this task, the students must construct and enter a detailed voyage plan in the electronic chart (ECDIS), and they must prepare the bridge for the watch. In this planning part of the test, the instructor is available to answer any questions concerning the bridge equipment.

During the second part of the assessment, the students take on the role as Officer of the Watch on the bridge during a scenario (Fig. 2). Each student is assigned a different scenario, i.e., navigating different parts of the route and entering different traffic situations. A scenario takes approximately 50−70 min to perform, and the student is responsible for following the voyage plan, avoiding collisions with others and communicating with other actors in the scenario. During the scenario, the students' work on the bridge is closely monitored from the instructors' room (Fig. 3). Meanwhile, the instructor documents the students' performance on an assessment sheet (Table 1).

During the third part, and after the scenario is completed, there is a debrief of the exercise, allowing for reflection, feedback, and
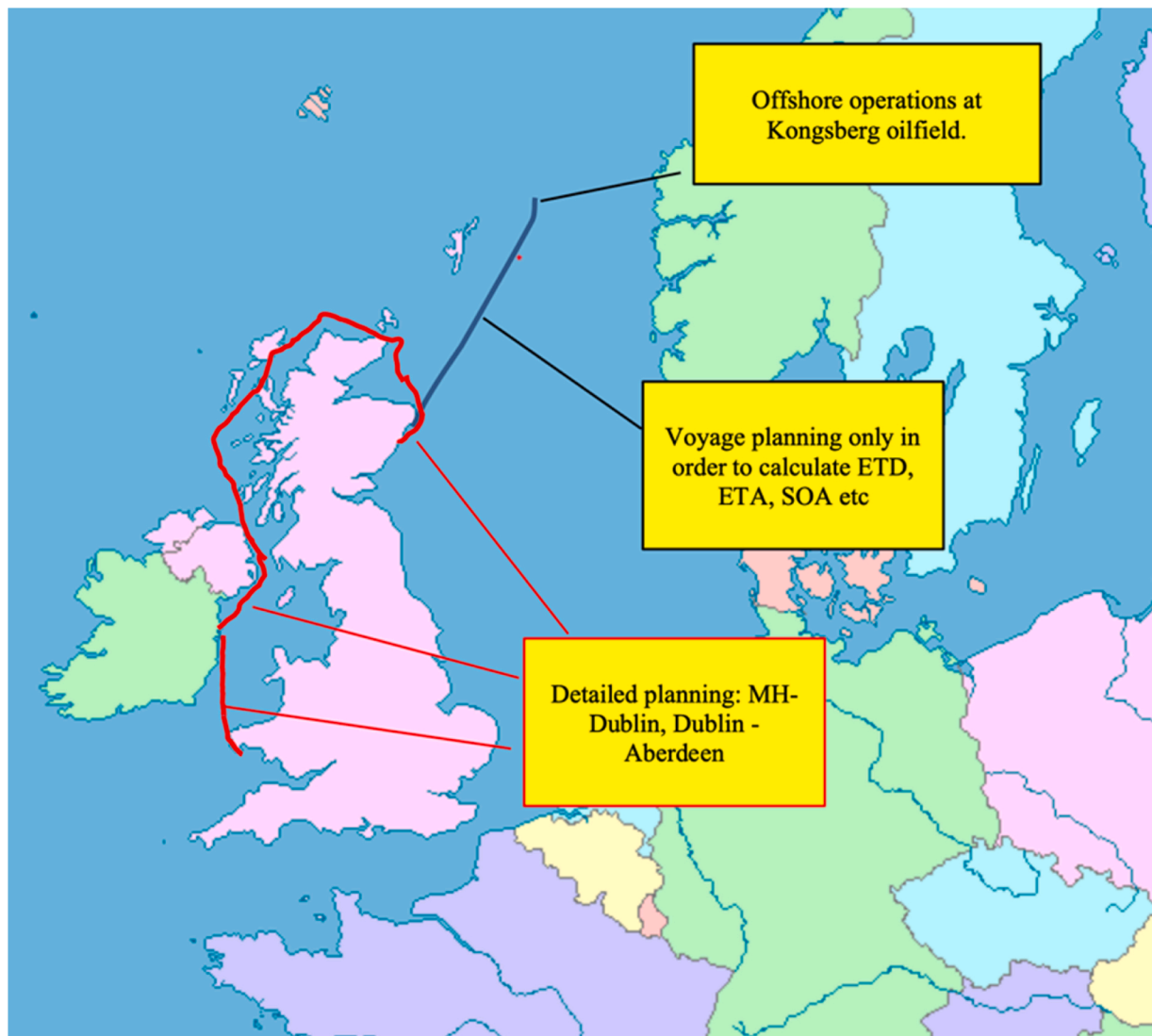
Fig. 1. Overview of the navigational route as presented in the course PM.

Fig. 2. Competence test in a full mission simulator.

Fig. 3. Monitoring a competence test from the instructors' room.

communication of the result in terms of Pass or Fail. In the analysis that follows, it is these debriefs that will be analyzed with a focus on the instructor's and student's co-production of retrospective accounts of the decisions made during a simulator exercise, and the role of retrospective accounts when evaluating professional competence.

4. Analysis

Since the aim of the study is to identify what students are made

accountable for when taking decisions, i.e. their capacity to handle complex situations and document seamanship, it is relevant to start the analysis by explicating how the assessment criteria are presented for the students in the context of the examination. Hence, the analysis will start with a section on briefing followed by a section on debriefing.

4.1. Introducing the assessment criteria

Before the scenario starts, there is a briefing in the instructors' room

Table 1

Assessment criteria for the exercise.

	Fail	Pass
Setting up the bridge navigational equipment for a watch at sea		
Navigating safely according to the voyage plan		
Applying the rules of the road		
Conducting correct chart work and deck log bookkeeping		
Conducting proper radio communication with other units/ organizations		

where the instructor explains the conditions of the upcoming scenario as well as introduces the assessment criteria to the student. This is not done in much detail. Rather, the instructor introduces the overall conditions of the upcoming scenario: time of day, weather and traffic conditions and visibility. Each scenario is slightly different, but they are all designed in such a way that students will enter a situation with a some traffic, decent weather, and a clear outlook. Through its design, the scenario is used for evaluating the students' ability to handle the everyday work of a master mariner. This design is visible also in the assessment criteria which are presented as five forms of navigational skills, referred to by the instructor as "blocks of basic skills." When presenting these "blocks", the instructor uses the assessment criteria printed on a paper sheet to point towards each criterion, and he explains what is expected of the student to pass the criterion. The instructor also explains that if the students fails to meet any of the criteria, there will be a re-examination. The one exception is keeping logbook. If failing on this criterion, the student will be given the opportunity to complete the examination by handing in a revised logbook as a supplementary assignment. When presenting most of the criteria, such as setting up the navigational equipment in an adequate way, following the voyage plan and keeping distance to other vessels as prescribed in "the rules of the road", most students confirm that they understand the respective criteria by simply answering "yes" or "okay." However, the criterion of how to conduct proper chart work and deck log bookkeeping elicits further questions from the students and spurs navigation technical discussions on what correct chart work means in this specific situation and how to handle it professionally.

4.2. Applying the assessment criteria after the test

After the session has finished, the student joins the instructor in the instructors' room for an evaluation of the exercise. The evaluation takes place while sitting in front of the screens and monitors used for keeping an overview of the students work in the simulator during the exercise. The student and instructor are oriented towards the paper sheets containing the assessment criteria and the instructor's notes from the exercise (Fig. 4). Hence, a range of socio-material tools in the instructors' room that in themselves exert support is present in the assessment situation.

The first episode presented from the empirical material starts in the

Fig. 4. Discussing the scenario in retrospect.

middle of an evaluation with a student, who, when entering the instructor's room, was told that he had passed the examination. Consequently, the debriefing was oriented towards discussing how and why each of the five forms of basic skills had been documented in a satisfactory manner, and towards displaying and reflecting on the details of different aspects of bridge work and navigational situations. When the excerpt starts, the instructor is pointing towards a specific situation in the exercise, enquiring about trouble with another vessel, *Wilston Star*, in the scenario (line 01). The student confirms the statement with a "yeah, precisely", admitting that there were some problems and that these concerned this specific vessel (line 02). Hence, through these first two turns the instructor and the student establish a shared understanding of the situation in focus of their attention (Table 2).

In the third turn, the instructor delivers a positive assessment "Still, you solved the situation beautifully" (in Swedish "snyggt") and continues by delivering an account of why this was solved "beautifully" also in relation to another vessel in the scenario named *Little Minch*. Thus, the communicative pattern here implies that a) you found yourself in a difficult situation, but b) you handled it "beautifully". The student responds to this assessment with a simple "yes" (line 06), and the instructor continues to deliver praise, again using the Swedish word "snyggt", in this context translated as "neat", and he reinforces with the Swedish word "jättefint"[1], in our transcripts translated to "really nice" (line 07). The instructor then moved on to assess the logbook and chart work, emphasizing that "that's exactly what it should look like." The instructor continues his assessment, moving on to comment on how the

Table 2

Excerpt from debriefing student 3.

01	INS	Du fick ju lite bekymmer med den där rackaren som kom där, var det *Wilson Star* eller någonting sånt? You had some trouble with that rascal there, was it *Wilson Star* or something like that?
02	STU	Ja, precis Yeah, precisely
03	INS	Men det löste du snyggt, så jag kan tycka din återgång där, efter *Little Minsch* på babord där, lite tidigt där Still, you solved the situation beautifully, so I reckon that your return after *Little Minsch* there on port side, [was] a bit early …
04	STU	Ja, det kändes…jag drog tillbaka lite grann Yeah, it felt… I pulled back a bit
05	INS	Ja, du gjorde det, för sen dröjde… Yeah, you did, 'cause you held off…
06	STU	Ja Yes
07	INS	Ja, det var, det var snyggt. Det var bra. Jättefint. Det är bra loggboksförning, eh, positionerna såg jag i sjökortet, så ska det se ut. Eh, bra koll på trafiken har du liksom. Det känns vaket. Jag noterade" här tittar du ut" frågar jag mig… Yeah, that was, that was neat. Well done. Really nice. The logbook is well written, uhm, I saw the positions in the chart, that's exactly what it should look like. Uhm, additionally you keep good control of the traffic. I noted though "here you look outside" and I ask myself…
08	STU	Ja, jag försökte titta ut, men … Yeah, I tried to look outside, but…
09	INS	Jag noterade att du gjorde under girarna, vilket är positivt. Bara glöm inte bort det sen heller… I noted that you did that while turning, which is positive. So don't forget doing it in the future too…
10	STU	Ja, ja Yeah, yeah
11	INS	Bra jobbat. Då är du cool med att åka ut och köra båt, då, eller? Well done. So now you're cool going out and drive boat, or what do you say?
12	STU	Jajamän! Oh yeah, absolutely!

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[1] In Swedish, the word "jättefint" refers to something that is performed in an aesthetically pleasant way.

student has maintained visual lookout, a criterion that is not explicitly mentioned in the assessment sheet, but that is part of navigating in accordance to "the rules of the road." After clarifying and agreeing on that the student kept visual lookout when turning, the instructor continues to deliver positive assessments, first with respect to keeping visual outlook "which is positive" (line 09) and then with an overall assessment "Well done" (line 11). In the last turns of talk (lines 11–12), the instructor explicitly asks the student "so now you're cool going out and drive boat, or what do you say", i.e., asks the student if he feels ready for his future profession. The student delivers a prompt and positive answer "oh yeah, absolutely", clearly stating that he, at least at this moment, feels confident in his own ability and future work role. The use of the somewhat unexpected expression "drive boat" is interesting. Here the instructor alludes to the skills required for driving a car, thus confirming that the skills presented in the assessment situation demonstrate that the student is well prepared for what is required.

In this episode, the instructor takes the position as an assessor for the final exam, which is consequential for the relation and the expectations between the instructor and the students. It is also interesting to notice that the assessment goes beyond what student knows in an abstract sense. Rather the dialogue is oriented towards how he has been able to enact his understanding in a situation where there are several resources to rely on but also different situational circumstances to take into account. Through their dialogue, the student is made accountable for mastering expected standards of reasoning in the course, such as keeping a logbook, taking positions, and following the rules of the road. In addition, the instructor highlights that the student is also doing it "beautifully", and that he is having good control over the situation, which documents his capacity to act and take decisions in an accountable manner within the community of future mariners. These are actions that, in the eyes of the assessor, go beyond showing mastery of the subject specific skills in this course. The student is also credited with demonstrating seamanship in a wider sense by looking out while turning and by keeping the logbook in good order. Thus, what the assessor ascribes to the student is some kind of double accountability towards a) course specific skills, and b) the ability to demonstrate seamanship in a wider sense by performing relevant actions. The uses of expressions such as "beautiful", "neat" and "really nice" demonstrate that the performance and the wider adherence to rules of the road shown by the student are considered to be not just correct but also have an aesthetic quality. Professional competence is not demonstrated merely by performing specific forms of behaviors, but rather by displaying a professionally relevant mastery of a situation, where there are ambiguities and where choices can be made in ways that are recognized and discussed as indicators of skilled seamanship.

In the second episode, the evaluation starts when the student enters the instructors' room and is invited to sit down next to the instructor. When the excerpt begins, the instructor asks the student how he thinks "it went then" (line 01). The student answers by summarizing the experience as "chaotic" with "a lot of traffic" (line 02). As can be seen in lines 03−07, the dialogue between instructor and student in the first part mainly revolves around the design of the scenario that the student just went through. They both agree that there was too much traffic, and therefore, it was a rather stressful experience for the student. The instructor assumes responsibility for the scenario design signaling his accountability towards the learning community. In particular, in line 07, the instructor puts on display his evaluation of the learning situation: "So, I wanted you to have a moment afterwards there. I saw that you poked in a snuff you know, that you should be allowed to drive a little just as it is… I realize that there is a little too much traffic in this exercise." It is interesting that the instructor at this point starts to discuss the design of the scenario with the student. On one hand, the instructor is showing his concern to facilitate learning-by-doing in a constructive manner, but also it is evident that he treats the student as someone initiated enough to participate in discussing his instructional concerns. The students take responsibility for mistakes he made in this situation,

suggesting that he might have performed better by applying correct knowledge such as factual or standard navigation rules, thus prompting a feeling of being accountable to correct knowledge (line 08) (Table 3).

In line 09, the instructor delivers an overall assessment of the

Table 3
Excerpt from debriefing student 5.

01	INS	Okej, vad var, hur tycker du själv att det gick då?
		Okay, so what, how do you think it went then?
02	STU	Jag, jag var väldigt så här…det kändes verkligen som jag blev inkastad i det. Jag tror det har lite med positioneringen där, att jag inte låg rätt, så jag hade inte riktigt kollat trafikläget och så där. Så att det var lite kaotiskt i början och jag missade någon båt. Det var ju mitt ALF-alarm då, som gav mig… som hjälpte mig då tidigt. Det kom två, eh, styrbordsbåtar, men det…ja det löste ju sig. Annars det var mycket trafik och så.
		I, I was really … it really felt like I was thrown into it. I think it has something to do with the positioning, that I was not right, so I had not really checked the traffic situation and so on. So, it was a bit chaotic at first and I missed a boat. It was my ALF alarm then, which gave me… well that helped me then early. There was two, uhm, boats on starboard, but… Yeah, it worked out. Otherwise, there was a lot of traffic and so on
03	INS	Ja
		Yes
04	STU	Det var jäkligt tungt ett tag
		It was pretty damn heavy for a while
05	INS	Ja
		Yes
06	STU	Men det var …
		But it was…
07	INS	Så jag ville att du skulle få en stund efteråt där. Jag såg att du petade in en snus liksom, att du skulle få köra lite som det är, det är lite för mycket trafik i den här övningen, inser jag.
		So, I wanted you to have a moment afterwards there. I saw that you poked in a snuff you know, that you should be allowed to drive a little just as it is… I realize that there is a little too much traffic in this exercise…
08	STU	Men jag tyckte väl att det, det kändes ju inte någon fara så, direkt, någon gång. Det gjorde det inte. Men det kunde ju kanske gjorts bättre.
		But I thought so that it wasn't any danger, directly, at any point. It did not. Still, maybe it could have been done better.
09	INS	Nej, jag, jag är tveksam på det, vad du skulle ha gjort annorlunda egentligen. Alltså som, som det nu var, va. Alltså det, det är jävla massa båtar och där ligger man i kakan och jag tycker du höll CPA:n ganska snyggt ändå, måste jag säga. Så att nej, jag, trafikmässigt tycker jag du löste det galant, va.
		No, I'm, I doubt it, what you should have done differently really. So, as it was, huh. So, there are a hell of a lot of boats and there you are in the middle of it and I think you kept the CPA pretty neatly anyway, I must say. So no, I, in terms of traffic, I think you solved it splendidly, huh.
10	STU	Ja, vad bra
		Yeah, that's good
11	INS	Ja, för om man såg, att du gjorde, var att du tillämpade den här kunskapen av att se till att lägga dig i ett vettigt läge hela tiden. Det är inte det här vi pratade om, att:" Okej, jag är ju väjningsskyldig, jag girar med minst 30 grader åt styrbord." Det hade ju inte funkat i något av de här lägena, utan det är hela tiden snarare att du ser till att du ligger på ett bra läge liksom. Jag såg hur du aggressivt följde tillbaka när du hade möjlighet till det, va. Så nej, jag tycker du hanterade trafiken väldigt bra, måste jag säga, Mike.
		Yes, because if you saw that you did, was that you applied this knowledge of making sure you put yourself in a sensible position all the time. This is not what we were talking about, that: "Okay, I have to give way, I turn at least 30 degrees to starboard." It wouldn't have worked in any of these situations, but it is rather that you make sure that you are in a good position. I saw how you aggressively followed back when you had the opportunity, huh. So no, I think you handled the traffic very well, I have to say, Mike.
12	STU	Härligt
		Lovely

students' conduct in this difficult and stressful situation, stating that the student kept the CPA[2], i.e., the distance to other vessels "pretty neatly", followed by an upgraded assessment, using the word "splendidly". In navigation technical terms, his reasoning concerns how to position the ship in a situation with heavy traffic, a situation where the correct rules for keeping distance to other vessels would not work. In this situation, it is instead the professional standards of "good seamanship" that apply for handling a problematic situation (cf. Sellberg & Lundin, 2017). At the end of this assessment, the instructor delivers an overall positive assessment "I think you handled the traffic very well, I have to say, Mike" (line 11), and the student answers "lovely".

What is interesting in comparison to the first episode, is that the instructors overall assessment in terms of Pass or Fail comes at the end of the debriefing "Wise. Very Good, approved and fine. Let's shake on it." The instructor and student shake hands, and the student says thanks before leaving the room. In this instance, the instructor delivers the grade as part of a closing the encounter, and the encounter seems to contribute to building confidence in the student, who is told that he handled the complex traffic situation well. As can be seen in both episodes, the instructor will Pass or Fail the students based on both how they make sense of and handle the exercises, as well as on how they explicate their reasoning by making use of discursive resources developed in the learning community during the course. On the one hand, students need to reason in an academic way to display that they handle the knowledge, norms and rules of an evaluative situation, answering the questions from the teacher in a proper way. On the other hand, students are also attending their final exam, in which they are made accountable for making use of the knowledge, norms and rules in specific situations in order to demonstrate that they are on the way to becoming professional mariners. In this sense, students and teachers discursively engage in an exam situation which also displays what is at stake when experiences from the simulator practices are introduced into an exam practice developing students towards professional competencies.

5. Discussion

The results of our analysis offer a different perspective on how to develop simulator-based assessments than previous studies on maritime education and training (e.g., da Conceição et al. 2019, Erntsen & Nazir, 2020). By shifting focus from questions of validity and reliability of the testing tool towards exploring how evaluative dialogues are orchestrated to facilitate productive discussions, this study contributes to advancing our understanding of simulator-based assessments as means for building professional confidence and professional identity. Our empirical materials also offer a different point of entry to the issue accountable talk than seen in Michaels' et al. (2008) examples from lower secondary education. Our analysis of simulator-based evaluations of professional competence in Higher Education focuses on a discursive practice in which the body of knowledge the students are learning to master necessitates skillful reflection of becoming a professional when acting in complex and ambiguous situations. Accountable talk is the recognition that we, at times, are participating and expressing what we are doing while engaging in academically productive dialogues (Palinscar & Brown, 1984). This kind of academically productive dialogues is vital for developing professional competence and the capacity to participate in productive ways in situations when one is expected to provide explanations and arguments. To contribute to such dialogues, our analysis shows that the skillful instructor builds on knowledge and experiences in the simulated activities and picks up and builds on students' contributions to the dialogues, rather than resorting to ritualized use of assessment criteria. This dimension of accountable talk, we argue,

is demonstrated through artful descriptions, examples, and stories, that are invoked as arguments when reasoning about the specific features and details of situations (cf. Sellberg & Wiig, 2020; Sellberg et al., 2021). In our analysis of accountable talk in post-simulation evaluations, we refer to this dimension as *accountability to professional standards* oriented towards assessing professional competence as mastering navigation as an artful practice.

Our findings show that rather than using assessment criteria mechanically, instructors and students engage in dialogues that shape students' judgement as steps to becoming professional seafarers. Thus, accountability to professional standards is supporting student's learning to reflect on evidence for arguments and reasons for their choices when solving simulated problems where the everyday maritime practices encountered challenge the maritime laws and regulations and require demonstration of wider professional competence and judgement. In addition, the analyses of the excerpts display that instructors position students as competent contributors in the evaluation of their own navigation (exam) by asking questions that prompt students to reason about their own actions, to clarify and elaborate on their choices. In these post-simulation evaluations, instructors assign responsibility to the students expecting them to share their thinking while accounting for what they did during the simulated activities and while working through problematic situations. Thus, our findings show that the interactional processes provide opportunities to broaden post-simulated evaluations towards making students accountable for sharing judgements as professional mariners based on accepted knowledge, rigorous reasoning, and professionalism in the maritime community. In these settings, the instructor highlights challenges in students' simulated activities, an, as a next step, asks students to reason and communicate the evidence for their claims. The assessments here have little to do with pass or fail, or letters or numbers related to levels of goal achievement, rather they emerge as artful and context sensitive praise of student actions and as search for evidence of professional judgement on the part of the student that indicates readiness for taking on the responsibility as officer of the watch. In this way, this study serves as a starting point to advance our understanding of how particular talk moves serve to render professional learning and identity visible (cf. Michaels & O'Connor, 2015).

Our findings of authentic assessment practices thus show that assessor plays a decisive role in the setting, more significant tham previously assumed in research on assessment situations. The interactional work by the assessor is an active part of the evaluation of communication that ultimately ends up in Pass or Fail. The evaluation simultaneously is handled a learning situation where professional relevancies are indicated by the assessor through his or hers contributions, even in cases where he or she remains passive and silent. The educational implications of these findings show that assessors require professionalized knowledge of the subject matter of their evaluations as well as a professionalized understanding of the complexeties involved in simulator-based evaluations of professional competence (cf. Sellberg, 2020). While significant efforts are taken to develop new tools and technologies to reduce the subjective impact of the assessor, we argue that resources also need to be allocated to provide relevant pedagogical training for teaching staff that are responsible for designing and conducting simulator-based evaluations. Evaluating complex professional knowing and judgement in simulations of this kind inevitably involves assessing actions that are dynamic and open to different interpretations, and the assessor has to be responsive to how students can account for what they do.

6. Limitations and directions for future research

A common concern in regards to single case studies is if they can be used as basis for scientific generalization (Yin, 2010). The detailed analysis of video recorded evaluative situations in this study provides insights into the interactional work that goes on as students solve problems in the situation as well as into the complexities of assessing

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[2] CPA is an abbreviation for Closest Point of Approach, a feature of Radar for measuring the closes point where two ships will pass each other.

professional conduct in tool-saturated environments. We argue that insights into the complexities of such situations require case studies and intense documentation and analysis of authentic evaluative practices. Research results from case studies are a prerequisite for generalizing knowledge about professional judgement and skills. Hence, generalizing findings from single cases is based on an alternative logic than generalizing in the statistical sense from a sample to a population. Instead of drawing inferences from samples to a population, single case studies seek *analytical generalizations* (Yin, 2010). Analytical generalizations are significant for conceptual development in the sense that they make visible the functional nature of professional action in context, insights which serve as a basis for testing and developing conceptual models and for testing established conceptual assumptions about learning and the evaluation of professional skills. We believe that the approach shows promise for developing simulator-based evaluations of professional competence in a way that builds students' professional competence and identity, while at the same time strengthening the capacities of the instructors to communicate and evaluate student learning. However, further research is needed in order to be able to provide instructional guidelines on how to improve simulator-based evaluations of professional competence. As highlighted by Michaels and O'Connor (2015), we need to further explore the relationship between teachers' domain-specific knowledge and their use of accountable talk. We also need to develop a better understanding of when to use which talk moves when evaluating students and when promoting their learning. In order to address these important issues, our single case study is a step in the direction of sensitizing us to what goes on in evaluation, but, of course, it is necessary to add research that scrutinizes the expectations of how assessment situations should be designed, and what are the expectations on the two parties, the expert/evaluator and the student.

7. Conclusion

Our empirical analyses of assessment practices show that they serve important functions in addition to providing assessments of the extent to which student actions comply with the formal criteria. Instructors engage in activities such as providing endorsements that build confidence and professional identity. The activity, and in particular the post-simulation evaluation, appears as a context for learning where the instructor provides comments and meta-comments that go beyond the course contents, and where the student is treated as a member of the community of mariners ready to take responsibility. Instructors provide scaffolding that helps students to understand and they put pressure on them to detail their thinking and to demonstrate accountable talk that testify to the fact that they master navigation as a professional and artful practice. This professional recognition of a shared identity is visible in the ways in which the instructors' sanction significant parts of the actions taken by students by making explicit that they demonstrate the capacity to handle complex situations.

Declaration of Competing Interest

The authors report no declarations of interest.

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References

Åberg, M., Mäkitalo, Å., & Säljö, R. (2010). Knowing and arguing in a panel debate. In K. Littleton, & C. Howe (Eds.), *Educational dialogues: Understanding and promoting productive interaction* (pp. 13–30). Routledge.

Da Conceição, V. P., Mendes, J. B., Teodoro, M. F., & Dahlman, J. (2019). Validation of a behavioral marker system for rating cadet's non-technical skills. *TransNav: International Journal on Marine Navigation and Safety of Sea Transportation, 13*(1).

Ernstsen, J., & Nazir, S. (2020). Performance assessment in full-scale simulators–a case of maritime pilotage operations. *Safety Science, 12*(9), Article 104775.

Ghosh, S., Bowles, M., Ranmuthugala, D., & Brooks, B. (2016). Authentic assessment in seafarer education: Using literature review to investigate its validity and reliability through rubrics. *WMU Journal of Maritime Affairs, 15*(2), 317–336.

Ghosh, S., Bowles, M., Ranmuthugala, D., & Brooks, B. (2017). Improving the validity and reliability of authentic assessment in seafarer education and training: A conceptual and practical framework to enhance resulting assessment outcomes. *WMU Journal of Maritime Affairs, 16*(3), 455–472.

Heath, C., Hindmarsh, J., & Luff, P. (2011). *Video in qualitative research: Analysing social interaction in everyday life*. London: SAGE Publications Ltd.

Hontvedt, M., & Arnseth, H. C. (2013). On the bridge to learn: Analysing the social organization of nautical instruction in a ship simulator. *International Journal of Computer-Supported Collaborative Learning, 8*(1), 89–112.

Knoblauch, H., & Tuma, R. (2011). Videography: An interpretative approach to video-recorded micro-social interaction. *The SAGE handbook of visual research methods* (pp. 414–430).

Knoblauch, H., & Tuma, R. (2019). In P. Atkinson, S. Delamont, A. Cernat, J. W. Sakshaug, & A. R. Williams (Eds.), *Videography and video analysis*. SAGE Research Methods Foundations. pp. 00–00, SAGE.

Mäkitalo, Å. (2003). Accounting practices as situated knowing: Dilemmas and dynamics in institutional categorization. *Discourse Studies, 5*(4), 495–516.

Markauskaite, L., & Goodyear, P. (2017). *Epistemic fluency and professional education. Innovation, knowledgeable action and actionable knowledge*. Dordrecht: Springer.

Michaels, S., & O'Connor, C. (2015). Conceptualizing talk moves as tools: Professional development approaches for academically productive discussion. In L. B. Resnick, C. Asterhan, & S. N. Clarke (Eds.), *Socializing intelligence through talk and dialogue* (pp. 347–362). AERA.

Michaels, S., O'Connor, M. C., Hall, M. W., & Resnick, L. B. (2010). *Accountable talk sourcebook: For classroom conversation that works*. Pittsburgh, PA: University of Pittsburgh Institute for Learning.

Michaels, S., O'Connor, C., & Resnick, L. B. (2008). Deliberative discourse idealized and realized: Accountable talk in the classroom and in civic life. *Studies in Philosophy and Education, 27*(4), 283–297.

Nerland, M., & Jensen, K. (2012). Epistemic practices and object relations in professional work. *Journal of Education and Work, 25*(1), 101–120.

O'Connor, C., Michaels, S., & Chapin, S. (2015). Scaling down" to explore the role of talk in learning: From district intervention to controlled classroom study. *Socializing intelligence through academic talk and dialogue* (pp. 111–126). Washington, USA: American Educational Research Association.

Øvergård, K. I., Nazir, S., & Solberg, A. S. (2017). Towards automated performance assessment for maritime navigation. *TransNav: International Journal on Marine Navigation and Safety of Sea Transportation, 11*(2).

Palinscar, A. S., & Brown, A. L. (1984). Reciprocal teaching of comprehension-fostering and comprehension-monitoring activities. *Cognition and Instruction, 1*(2), 117–175.

Resnick, L. B., Asterhan, C. S., & Clarke, S. N. (2018). *Accountable talk: Instructional dialogue that builds the mind*. The International Academy of Education and the International Bureau of Education of the United Nations Educational, Scientific and Cultural Organization (UNESCO).

Sampson, H., Gekara, V., & Bloor, M. (2011). Water-tight or sinking? A consideration of the standards of the contemporary assessment practices underpinning seafarer licence examinations and their implications for employers. *Maritime Policy & Management, 38*(1), 81–92.

Sellberg, C. (2020). Pedagogical dilemmas in dynamic assessment situations: Perspectives on video data from simulator-based competence tests. *WMU Journal of Maritime Affairs, 19*(4), 493–508.

Sellberg, C., & Lundin, M. (2017). Demonstrating professional intersubjectivity: The instructor's work in simulator-based learning environments. *Learning Culture and Social Interaction, 13*, 60–74.

Sellberg, C., & Wiig, A. C. (2020). Telling stories from the sea: Facilitating professional learning in maritime post-simulation debriefings. *Vocations and Learning, 13*(3), 527–550.

Sellberg, C., Lindwall, O., & Rystedt, H. (2021). The demonstration of reflection-in-action in maritime training. *Reflective Practice, 22*(3), 319–330.

Sellberg, C. (2018). From briefing, through scenario, to debriefing: the maritime instructor's work during simulator-based training. *Cognition, Technology & Work, 20*(1), 49–62.

Wiig, A. C., Wittek, A. L., & Erstad, O. (2019). Teachers, tools and accountable practices. Engaging with a wiki blog as a learning resource. *Learning, Culture and Social Interaction, 22*, Article 100245.

Yin, R. (2010). Analytic generalization. In A. J. Mills, G. Durepos, & E. Wiebe (Eds.), *Encyclopedia of case study research* (pp. 21–23). Thousand Oaks, CA: SAGE Publications, Inc.