

A narrative inquiry into fishermen's experience-based knowledge

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Abstract

The context of this article is a science teacher educator's interest in experience-based learning. This led her to an exploration of the experience-based knowledge of five elderly professional fishermen in the small fishing community of Mausund in Norway. The research question guiding the article is: *How can professional fishermen's experience-based knowledge be explored through narrative inquiry?* As a conclusion, *embodied culture* or a *lived community of practice with a clear social dimension* is highlighted as a way of becoming a fisherman that the use of narrative inquiry methodology helps to become articulated and thereby visible as knowledge. This embodied culture and lived community of practice with a clear social dimension has not only shaped the fishermen's knowledge about fishing, but also their attitude to narration, to storytelling. They are brought up in a culture in which talking and telling is neither expected nor encouraged, which influences the interviews. The fishermen are not unwilling to tell, but they are not used to thinking about their own knowledge as fishermen, as knowledge. Little by little, through the interviews, their experience-based knowledge is narrated and articulated. In other words, the narrative inquiry methodology opens for embodied culture being articulated, visible as knowledge, and thereby possible to discuss as valuable within science education.

Keywords: *narrative inquiry; science education; fishermen's experience-based learning; learning in communities of practice; embodied culture*

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Introduction

The study in focus in this article is explorative and the basis for a larger study about the role of experience-based learning in science education. The study starts with a sense of wonder experienced by Author 1, which led her to conducting interviews with five elderly fishermen. Author 1 of this article is a biologist, science teacher, and teacher educator in Norway. She works in a position at a university combining teaching upper secondary school students (aged 16–19 in the Norwegian school

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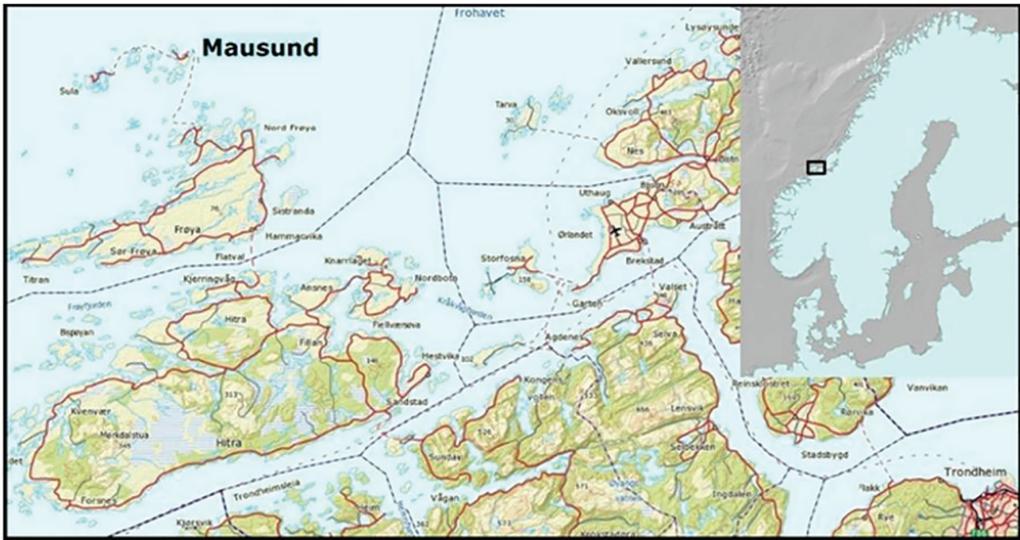


Figure 1. Mausund (63°N, 008°E) is a small island, situated at the outermost edges of the archipelagos in the middle of the Norwegian coastal line. Source: Kartverket, 2016

system) and student teachers in teacher education, as well as conducting research on learning in science. As part of her teaching approach, Author 1 often takes her upper secondary school students, as well as student teachers, on excursions to an active fishing community at Mausund, in Norway (see Figure 1). Author 1's learning goals when taking the students and student teachers out to the fishing community is to allow her students to encounter the experience-based knowledge of fishermen: knowledge about the edible crab in their environment and movement on the oceanbed during the year, and doing crab fishing, as she sees this kind of knowledge as important for learning science (see Figure 2). She has experienced that using the extended classroom as a strategy has been motivating for the students. Over the years, she has become increasingly interested in the kind of knowledge the fishermen perform, and she started wondering how this kind of experience-based knowledge could be of value in science education. Out of this curiosity, she initiated this study. Author 2 and Author 3 did not take part in the field work of this study but were invited by Author 1 into the analysis of the research material and writing of this article. They are both teacher educators, Author 2 contributing with expertise in qualitative methods, whereas Author 3 is a biologist and science teacher educator, just as Author 1.

The aim of this study is to explore the experience-based knowledge of the fishermen through narrative inquiry. This is done in a small study through interviewing five elderly fishermen at Mausund. Out of curiosity we asked ourselves questions like: How can the experience-based knowledge of elderly professional fishermen, who have been fishing their whole lives, be narrated and articulated? How did they learn



Figure 2. Upper secondary school students in dialogue with a professional fisherman during field work at Mausund. Photo: Hilde Ervik

what they know and embody? How can this knowledge be valued in today's educational system? Finally, we arrived at the following research question, which guides us through this article: *How can professional fishermen's experience-based knowledge be explored through narrative inquiry?* This means that in this analysis we explore the use of narrative inquiry as a means of understanding the fishermen's knowledge as fishermen. The use of narrative inquiry in a study that sits within science education, we see as a knowledge contribution, as we have found few narrative studies with a qualitative interest in experience-based knowledge within the larger realm of science education. Science education relies on accepted scientific knowledge, which has its roots in a positivist epistemology (Cresswell, 2008; Phillips & Burbules, 2000). Experience-based knowledge is not considered reliable within this well-established research and educational landscape. With this study, we start exploring what experience-based knowledge might contribute to science education (see also Cupane, 2008, 2011; Frodeman, 2008; Luitel, 2009).

In the following, we present previous research before explaining our methodological choices. Following that, we present theoretical perspectives that we have chosen to dialogue with through an inductive research logic: we started with the interviews and the analysis, from which ideas about theoretical perspectives arose. Finally, we conduct a thematic narrative analysis, and discuss and conclude the article.

Dialoguing with a research community – literature review

As we are interested in how the experience-based knowledge of professional fishermen can be narrated and articulated, we have looked for similar research studies. We have not managed to find other narrative inquiry studies on fishermen's experience-based knowledge, but have found research articles within the field of marine studies focusing mainly on how or whether fishermen's experience-based knowledge can supplement the results contributing to accepted scientific knowledge. Here, we shortly review the research we have found that touches on a similar struggle between accepted scientific and experience-based knowledge. For the sake of clarity in this article, we focus on fishing communities and fishermen's knowledge only.

The best motivation for fishermen to accumulate knowledge is what will help their fishing activities (Sulamain, 2018). Stephenson et al. (2016) refer to an article by Hind (2015), who explained fishermen's knowledge research (FKR). Stephenson et al. (2016) point out that it is necessary to define FKR as a concept of knowledge, and they further emphasize that scientists value and integrate fishermen's knowledge. Fishermen's knowledge is described as spanning the boundary, because the fishermen contribute with knowledge about gear design, deployment, and vessel operation. They also contribute with knowledge about bottom types, currents, and depths, and they give information to scientists about where and when to catch fish and about fish movement and behavior patterns, and in that way build their ecological knowledge. Johannes and Neis (2007) also describe fishermen's knowledge as how habitat, season, weather, moon-phases, and other factors affect the ocean life in different ways from year to year. The fishermen's expertise is, according to Johnson (2011), explained as non-scientific knowledge. But the examples of knowledge mentioned above should, according to Johnson, certainly be defined as reliable knowledge, and thus, based on that, be defined as FKR. Johnson (2010) further argues that fishermen's experience-based knowledge can supplement the results of scientific knowledge and be used as empirical data.

A research study conducted in the US showed that fishermen have detailed knowledge of the spatial and temporal distribution of cod spawning in their local environment at Georges Bank and Nantucket Shoals, and identified spawning grounds that were previously unreported in the scientific literature (De Celles et al., 2017). Fishermen's knowledge was also used in a study of the South-Eastern Brazilian coast. In that study, fishermen's knowledge was applied to investigate temporal changes in the amount (biomass) and composition (major ecological categories) of fishing resources (Lima et al., 2016). Fishermen's understanding of biodiversity and fish ecology is further understood as important for management plans and scientific knowledge (Medeiros et al., 2018). This is also supported by Ames (2002), who reported that fishermen have spent much of their lives accumulating intimate, fine scale ecological information that is not otherwise available.

Quist (2019) followed fishermen's movements in the ocean environment in coastal and offshore areas in Tabasco, in the Gulf of Mexico. One reason was to understand the fishermen's embodiment of their seafaring way of life. The fishermen have movement-bound knowledge, in this case about how increased seismic activity and pollution associated with oil-spills displace and kill marine life. The oil industry does not agree, and the environmental legislation only regards the oil industry's knowledge as valid, with the fishermen's local knowledge being excluded.

Anbleyth-Evans and Lacy (2019), in a 3-year long study, argue that there is a need to overcome the general negative perception of the accuracy of non-scientist knowledge. They mean that fishermen's experience-based knowledge in England has developed through interaction with research. They conducted sixty interviews to understand fishermen's experience-based knowledge of biodiversity and found that fishermen's experience-based knowledge is increasingly compatible with research.

This review of previous research does not say much about how fishermen's experience-based knowledge is narrated and articulated. However, it reveals an interest in, acknowledgement of, and also ambivalence towards the kind of knowledge that fishermen embody. Their knowledge is recognized as clearly embodied, experience-based, and unscientific. At the same time, scientists admit relying on the knowledge of local fishermen to guide them to the places where they can conduct their scientific studies. In this study, we are not interested in whether the fishermen's experience-based knowledge is true in a scientific way or not, but instead to focus on how the use of narrative inquiry as methodology can help articulate how they have learnt what they know, and in articulating what this knowledge consists of. However, in addition, we acknowledge that we do see that their professional, experience-based knowledge is accurate, as, throughout the years when Author 1 has taken her students to Mausund, they have always known, with great precision, where and when to fish for crab.

Methodological choices: Inquiring into fishermen's knowledge narratively

Author 1 interviewed five fishermen for this study in the spring of 2018. The five fishermen who are research participants in this study are all elderly Norwegian men, who we will call Per (58 years old), Kjell (69), Ivar (65), Leif (73), and Ole (82). They have all been, or still are, active fishermen. They have all had close relations with the ocean through their professional work experience as fishermen, and have all been shaped over the years by hazardous trips on the ocean in all kinds of weather. They have been affected by the salty ocean air, by wind that can quickly change from gentle breeze, to gale, and in the worst case, to storm. Ocean waves in areas like Mausund, located at the outermost archipelago at the Atlantic ocean in the middle of Norway (Figure 1), can be dangerous and merciless, and they have all experienced friends, family and/or colleagues who never came back from a fishing trip.

The fishermen received an oral request to participate in a survey through Mausund Fieldstation. Following this, all the participants received and signed a written

information and consent letter. Ethical guidelines were followed, and the study was approved by the Norwegian Center for Research Data. The interviews lasted between 30 and 60 minutes. They were recorded and afterwards transcribed by Author 1. This resulted in 36 pages of text.

Through the way the narrative inquiry interview situations were designed and carried out through relation-building and trust, the fishermen engaged willingly in the research and were eager to be interviewed. A research story by Author 1 tells about the interview research design:

I was invited to the five fishermen's homes, and the interviews were conducted in a peaceful atmosphere over a cup of coffee. They sincerely and honestly wanted to share their stories, and I felt that we had mutual trust in each other. Everyone knew that I had supervised the students who had previously been to Mausund and done their research work on edible crab and fish. The five fishermen well represent the aging group of active fishermen at Mausund. Even though the oldest fisherman and research participant is 82 years old, he is still actively fishing. The day I arrived to conduct the interview with him, he had just delivered 100 kg of cod at the fish delivery. We talked about his fishing day and fish delivery of the day, and then slowly started to focus on my interview questions.

The interviews were semi-structured, and Author 1 asked different follow-up questions based on how the fishermen answered. The interview started with questions about what they work with or used to work with as professional fishermen, whether they need specialized skills and knowledge, and how they use the technological equipment and machinery on board their boats. The most central, and what also turned out to be the most difficult, part of the interview guide, was the part with questions about how and where they have learnt their skills and knowledge, and what this knowledge consists of. These questions were surprisingly difficult for the fishermen to answer, and they repeatedly said that they did not need knowledge, but only experience. Little by little, and through repeated questions, and by asking the questions differently, Author 1 managed to get the fishermen to articulate their experience-based knowledge. Additionally, unexpected themes came up during the interviews. There were no planned questions about the fishermen's childhood or family lives, but they repeatedly, and not without emotional involvement, told about how they had learnt from their fathers, uncles and grandfathers as children, and also how they had lost loved ones at ocean. The ocean area around Mausund is not only a fishing place, but also a graveyard. The narration that occurred during the interviews revealed how the ocean functions as connective tissue in multilayered ways in the fishermen's embodied culture as fishermen. In other words: The interview situation described by Author 1 was one that allowed for the fishermen's stories. The fishermen's experience-based knowledge seemed tacit, unspoken for them, and only through repeated questions, little by little, did the fishermen start to articulate their experience-based knowledge. Through Author 1's experiences from the interview situations, and through our analysis of the interviews, we arrived at an understanding that *embodiment* plays a central part of experience-based knowledge. The fact that

this knowledge is experience-based, meant that it is deeply embodied, and clearly affected. The interview situation opened for deeply embodied memories of loss, grief, and hardship. This caught our attention, and through the narrative thematic analysis we arrived at *embodiment* and *bodily learning* as needed theoretical perspectives. For the discussion part of the article, we therefore bring in theory on bodily learning (Anttila, 2013/2019; Pfeifer & Bongard, 2007; Sheets-Johnstone, 2009) to understand the fishermen's difficulties in explaining their knowledge and how they gained it. The knowledge is so experience-based that the interviewed fishermen seem to take the knowledge for granted, and therefore it is hard for them to articulate it. The articulation only happens through the interview situation, through the narrative inquiry. It is characteristic that this knowledge is so obvious and embodied to the fishermen that they do not even think of it as knowledge. They call it experience.

A narrative thematic analysis of fishermen's experience-based knowledge

Our research question in this study is to explore *how professional fishermen's experience-based knowledge can be explored through narrative inquiry*. Narrative inquiry is the larger approach (Josselson, 2011; Riessman, 2008), which operates on an epistemological level and challenges the positivist epistemology that is strong within science education (see also Cresswell, 2008; Cupane, 2008, 2011; Frodeman, 2008; Luitel, 2009; Phillips & Burbules, 2000). Narrative inquiry is based in the epistemological belief that human beings create meaning through story. In other words, meaning is not (objectively) "out there," but (subjectively and relationally) created through the stories people tell to make meaning of life. Within narrative inquiry as a larger approach, thematic narrative analysis is one way of conducting analysis that is developed in this research field (Josselson, 2011; Riessman, 2008). We have therefore analysed the fishermen's storied material through a thematic narrative analysis. Riessman (2008) describes thematic narrative analysis as focused on the themes that can be created based on the stories told. According to Josselson (2011), the aim with a thematic narrative analysis is to highlight the participants' own experience with the phenomenon in focus, in concepts that are meaningful for themselves, and which are created through story, and then try to theorise based on this meaning-making (Josselson, 2011, p. 225). Inspired by Josselson (2011, p. 228), the way we have analysed the interview material in this study is as follows.

We first performed an open, comprehensive reading of the whole material, to get a sense of how the narratives in the fishermen's stories are structured, and to get a sense of possible central themes. Further, we re-read the material several times, and tried to refine sub-themes into central themes. Following that, we named the central narrative themes and checked them back to our first impression when reading the material, the first time. As a result of our analysis, we identified two narrative themes that are central to the experience-based knowledge that the fishermen embody. We will present the analysis of these two themes further on in the article, but

in short, we name these themes: a) *Interacting with the environment, time and seasons*, and b) *Interacting with older fishermen in a community of practice*. In other words, the way the fishermen narrate their experience-based knowledge points to this as knowledge learnt through, and also being activated as knowledge through, interaction with the environment, time and seasons, and through interaction with older fishermen in an embodied community of practice.

Finally, having created these two central narrative themes, we have tried to put the themes in contact with learning theory that seems relevant. In that final stage, we bring in the theory of learning in landscapes of practice by Wenger-Trayner et al. (2015) and bodily learning, mainly as defined and theorized by Anttila (2013/2019). We introduce that theory here and return to it in the final discussion.

Theoretical perspectives

Working inductively through the thematic narrative analysis, the preliminary results pointed us towards how learning in a community of practice was central for the experience-based knowledge the fishermen articulated, and also how this knowledge is embodied and affected. We therefore explored such theoretical perspectives.

We have found the work on learning in communities of practice by Wenger-Trayner et al. (2015) of interest for this study. Learning to become a fisherman in a fishing community is an example of how learning takes place within a community of practice in a landscape of practices. A key factor in understanding learning through the lens of communities of practice in a landscape of practice is that competence includes a social dimension. Wegner-Trayner et al. (2015, p. 14) state that “competence is not merely an individual characteristic. It is something that is recognizable as competence by members of a community of practice.” Identity-formation is a strong part of learning in communities of practice. Wegner-Trayner et al. (2015) argue that:

As a trajectory through a social landscape, learning is not merely the acquisition of knowledge. It is the becoming of a person who inhabits the landscape with an identity whose dynamic construction reflects our trajectory through that landscape. (Wegner-Trayner et al., 2015, p. 19)

And further, that:

Through our journey, the landscape shapes our experience of ourselves: practices, people, places, regimes of competence, communities, and boundaries become part of who we are. Shaped by our journey through the landscape, our identities come to embody the landscape through our experience of it. (Wegner-Trayner et al., 2015, p. 20)

To elaborate on the embodied character of the fishermen’s knowledge, we have further found it useful to bring in theory about what is often called the bodily, or corporeal, turn, within a spectrum of human sciences from the 1980s onwards (see, for example, Anttila, 2013/2019; Pfeifer & Bongard, 2007; Sheets-Johnstone, 2009).

Anttila (2013/2019, p. 48) states that bodily learning means that the learning takes place in the whole body, in a holistic way, and in the social and physical reality that is shaped between humans. Bodily learning further implies that bodily activity is of crucial importance for learning anything at all. Bodily activity means not only gross-motor movement, but also perceptions, experiences, and physiological changes in the body. In this way, bodily learning implies a shift from the more dominant view of learning as predominantly a cognitive, linguistic, and conscious affair. Bodily learning knowledge is non-symbolic, taking place on a bodily level, which includes affects and emotions. However, this non-symbolic learning, as Anttila (2013/2019, p. 49) points out, serves as raw material for knowledge that is turned into a reflexive, symbolic, interpreted, and languaged format. A bodily recognisable, sensuous, pre-reflexive, and pre-linguistic perception can become reflective and modified in a symbolic format like verbal language.

We will return to the theories of learning in communities of practice as well as bodily learning as we discuss the results of the analysis in the final parts of the article.

Analysis: Central narrative themes in the fishermen's stories about their experience-based knowledge

In the following, we present the two narrative themes created in our analysis in detail, before we discuss and conclude the study.

Interacting with the environment, time, and seasons

An important part of the fisherman's job is to keep focused on the daily weather report. They also follow the ocean temperature, and they know where different species usually are at different times of the year. The prerequisite for fishing is knowing where the fish are, knowing about the sediment conditions on the ocean bed, and the depth of the ocean. In the old days, this was experience-based learning. Today, the fisherman relies on GPS (Global Positioning System) and echo sounder. Older fishermen have experience of both areas, but the younger rely on new technology. Ivar stated:

We use view-marks, each of two landscape points that one can draw a line of sight between for navigation. A view-mark is the intersection of two lines of sight, a *med*, for example, an islet and one peak.

In Norwegian, these view marks are called *med*. Among older fishermen, *meds* were, and still are, common for navigating. If there was fog, they could use the speed of the boat and measure the time to navigate to the right position. Today, fishermen have echo sounders that can indicate the depth of the ocean. Ivar said:

Previously, it was common to lower a stone that was attached to a rope. The rope had a knot for each meter. That way, the fisherman found out how deep the water was. To find out if there was a sandy or hard bottom, some fishermen spread honey under the search stone. If it was a sandy bottom, sand would stick to the honey.

The fishermen memorized all this information. Some of them wrote it down, others told about the *med* just to their sons or close friends, but otherwise good fishing spots were each fisherman's secret business. Being able to interact with the environment was a way to success as a fisherman.

Edible crabs descend to depths of several hundred meters when it gets colder in the autumn. The older fishermen know from their earlier experience-based knowledge, when they went crab fishing late in the autumn and in the winter month of December, where to go to fish for crab. They have stored these *meds* concerning which areas to go to in their memory.

With their experience and embodied knowledge, the fishermen also recognized changes in the environment. Ole told:

Until 1965 there was not a single crab to be seen in Lofoten [an archipelago further North in Norway than Mausund, comment by the authors], then the temperature changed ... and now many fishermen catch edible crab there.

The fishermen are very conscious about *when* things happen. They are precise, always on time. They know what the circumstances are in all seasons. It is part of their job to relate to the temperature, to know about the depth of the ocean, and to know where different species usually are at different times of the year. They have heard this from their childhood on, experienced it themselves, and they have been reading nature and discussing with other fishermen. The fishermen have an embodied ability to orient themselves in the ocean landscape, read the surroundings in a unique way and have an ability to respond quickly if a situation arises. Through the interviews, little by little, the fishermen in this study managed to explain how they have learnt this knowledge through interacting with the environment, time, and seasons.

Learning from older fishermen in a community of practice

The second central narrative theme that we have created based on the analysis of the interviews is how they learn from older fishermen in what we, in dialogue with Wenger-Trayner et al. (2015), call a community of practice. For children born in coastal Norway between 1935–1960 it was common to participate in work from the age of 10. The children did not attend school every day. Therefore, they had to contribute to the daily work in their homes. The boys were out fishing together with grandfathers, uncles, or fathers. They had to help to prepare before they went fishing, assist during the fishing, and also take full responsibility for the fishing themselves. This also applied to crab fishing. In this way, they gained experience. It is *experience* that older fishermen set as a criterion for whether a child or youth is ready for fishing. When asked about what they should have experience of, Ole answered:

They had to know how to work with the line, handle the machines and how to treat the fish.

Ole described this as practical skills. When asked where he had learned what he should do, Kjell replied:

It was from my grandfather and uncle. We could be far out on the ocean and yet my grandfather could see viewpoints in the landscape by looking at the mountains and thus be able to tell where we were.

Children and young people notice how the older fishermen oriented themselves at ocean. They learn to locate the falls and grounds and how to triangulate to remember the place to catch fish and crab when they next go fishing. They brought these experiences with them into adulthood when they began fishing themselves. In this way, they acquired and embodied experience-based knowledge.

The fishermen used landmarks. This was long before sonars became available. Kjell explained:

My grandfather listened to the fall when it broke and then he could say precisely that we were there.

When asked about whether he could read nature in the same way as his grandfather and his uncles, Kjell replied affirmatively. This is a good example of how knowledge is transferred between generations. But it is also a good example of how the fishermen do not emphasize their own knowledge and skills in terms of knowledge, but as experience. They were also asked if the positions for good crab fishing are written down somewhere. Kjell replied:

We had to remember that. When we go out to ocean and catch fish, we look up and perform a cross-view and store this landmark in our memory.

Leif commented that:

Performing a cross-view is not something you learn at school. I have concern that such knowledge is now lost, as young people who are growing up now and want to work as fishermen rely only on technology to orient themselves on the ocean.

Communication between fishermen entails exchanging experience and information flow in the fishing of fish and crab. The fishermen have, like other professional groups, their own context and common terms when communicating. In the fishermen's professional vocabulary, developed and transferred across generations, are concepts like "*med*", *depth*, *shallow*, *embrace*, *co-operation*, *fishing gear*, *seasons* and *temperature*. The fishermen have these concepts and their meanings under their skin and are confident with them. The concepts are embodied in a lived community of practice. The fishermen create experience-based knowledge about the edible crab's movement pattern at Mausund as they interact with their older colleagues in a community of practice. This knowledge is passed on and made embodied in ever new generations through the system of learning from fathers and uncles to sons and nephews.

Discussion: Fishermen's experience-based knowledge inquired into narratively

Through the interviews conducted in this story, fathers, uncles, and grandfathers were frequently mentioned, and little by little it became clear and articulated that learning inter-generationally is the most important learning strategy for fishermen, in addition to learning through interaction with the environment, time, and seasons. However, as we want to raise the insights acquired through this study to an even more comprehensive level, *embodied culture* or a *lived community of practice with a clear social dimension* stands out as an identity-shaping way of learning and becoming a fisherman that not only shapes their knowledge about fishing but also about talking and storytelling. We create the concept “embodied culture” through combining the insights from the analysis of the interview material with Wenger-Trayner et al.’s (2015) theory of learning in a community of practice and theories of bodily learning (Anttila, 2013/2019; Pfeifer & Bongard, 2007; Sheets-Johnstone, 2009). Through narrative inquiry, we learnt that the fishermen’s experience-based knowledge is created in a coastal culture with other, older fishermen, where learning across generations is deeply embodied and transferred through bodily learning. We see this as an embodied culture of becoming a fisherman. Therefore, this fishermen’s culture or community of practice also affects how the fishermen’s experience-based knowledge can be inquired into narratively. As already mentioned, during the interviews the fishermen answered briefly and concretely to the questions of Author 1. This must not be confused with unwillingness to talk. Quite the opposite: all five fishermen willingly agreed to take part in the interviews, and Author 1 was invited to their homes. Coffee and something sweet to eat were waiting as she arrived. Instead, Author 1 realised, this way of not talking much, answering only briefly and concretely, and not talking about emotional aspects of life, is how the fishermen are shaped as part of a culture, an embodied culture, a fishermen’s community of practice. They belong to a Norwegian coastal culture where, as a boy or man, you are not expected to talk much. This also applies to the difficult and dramatic experiences of losing a father, uncle, grandfather, brother, or colleague to the death of drowning during fishing. This happened, and has happened through all times, and, as several of the interviewed fishermen said, “that is just how it is, that is not much to talk about”. The saying “The ocean takes, and the ocean gives”, which is common in Norwegian fishing areas, reveals this situation. As Author 1 discovered, life stories told by the fishermen were revealed little by little during the interviews, but more so when they could talk freely than when answering the concrete questions in the interview guide. To allow one question to lead to another, and to allow quite different aspects than those she had prepared for, seemed important during the interviews.

Questions about what kind of knowledge the fishermen needed to do their job as fishermen, were difficult for the fishermen. Author 1 was surprised that all five fishermen answered that they do not need any knowledge, just experience. We suggest this is due to their conception of “knowledge” and “experience”. We believe the

fishermen think of knowledge as a cognitive form that you achieve at school, whereas the more practice-based knowledge they have as fishermen is regarded as experience only. In our view, the knowledge they have is still knowledge, an embodied kind of knowledge, but it is achieved through experience, it is experience-based.

At this point, we want to bring in the theory of bodily learning and remind how Anttila (2013/2019, p. 48) argues that bodily learning means that the learning takes place in the whole body, in a holistic way, and in the social and physical reality that is shaped between humans. The embodied knowledge is non-symbolic, taking place on a bodily level, which includes affects and emotions. This non-symbolic learning, as Anttila (2013/2019, p. 49) points out, serves as raw material for knowledge that is turned into a reflexive and languaged format. A bodily recognisable, pre-reflexive, and pre-linguistic perception can become reflective and modified in a symbolic format like verbal language. And this is, we argue, what inquiring narratively into the fishermen's experience-based knowledge has been about: to give them a context (the interviews) and opportunity to bring up their embodied, pre-reflexive, experience-based knowledge to a reflective and languaged format. We also want to emphasise that we see the practical fishing skills themselves as clear and reflective bodily knowledge. This knowledge is not languaged, but it is still knowledge, and reflective in the body's way. The stories told during the interviews, then, is languaging of this bodily knowledge, and we conceive them as the fishermen's created meaning-making through languaging and sharing their personal experiences, in contact with their social, material, and cultural realities and surroundings. Through telling their stories, they also created meaning about how their experience-based knowledge is acquired. This is in line with narrative inquiry as epistemological positioning (Riessman, 2008), which again challenges the strong positivist epistemology that science education firmly sits within (see also Cresswell, 2008; Cupane, 2008, 2011; Frodeman, 2008; Luitel, 2009; Phillips & Burbules, 2000).

Further, Author 1 had not planned any questions about the fishermen's childhood and family relations, but this always came up in the interviews, and thereby became one of the central narrative themes that answers our research question. When asked about the knowledge needed to be a fisherman, the fishermen always started telling about their childhood, and how they had started joining their father, uncles, or grandfathers in fishing from around the age of 10. Especially connected to their childhood, unexpected and emotional stories would come up during the interviews. However, it was important that Author 1 gave space for the stories, asked frequent follow-up questions and, in a way, worked actively against the culture of silence that the fishermen had been brought up in, encouraging stories instead of silencing them.

In conclusion, answering our research question of *how professional fishermen's experience-based knowledge can be explored through narrative inquiry*, we argue that it is precisely the use of narrative inquiry methodology that opened for the insights about how the fishermen learnt to be fishermen, and how they perform that knowledge, that this article contributes. The experience-based knowledge acquired by the

older fishermen in this study is first and foremost learnt through intergenerational learning from fathers, grandfathers and uncles passed on to sons. The knowledge is learned through interacting with the environment, time and seasons, and interacting with older fishermen in a lived, embodied community of practice. Common to the fishermen who were interviewed was that they answered with very few words. They have been shaped in a community of practice, where talking and storytelling is not expected or encouraged. This culture of silence explains and reflects the fact that the fishermen are not used to explaining their experience-based knowledge, which became clear during the interviews. The fishermen had trouble explaining their own knowledge: their fishing skills were understood as something they just know from experience and which they do not elaborate on. The fishermen themselves call their knowledge experience. We, however, call it *experience-based knowledge*, and we argue that this is a kind of local, very precise knowledge that the fishermen deeply embody. This knowledge is possible to connect to Wenger-Trayner et al.'s (2015) perspective on learning in communities of practice, where learning is an inherent dimension of everyday life and fundamentally a social process. We want to add and emphasise that these communities of practices are lived and embodied (Anttila, 2013/2019). Learning becomes a self-transformative, identity-forming journey across a complex, lived, and embodied community of practices. This learning is community-based, with a very clear social dimension (Wenger-Trayner et al., 2015, p. 14). The knowledge is highly embodied and learnt in a bodily way through doing what the older fishermen do, together with them. In this intergenerational, community- and experience-based learning, a professional vocabulary is also developed: “*med*” (a specific Norwegian word), *depth*, *shallow*, *co-operation*, *fishing-gear*, *seasons* and *temperature* are examples of concepts that are much more than simply “words”. Instead, these concepts are more like “worlds” which the fishermen embody and inhabit in great and precise detail. For the fishermen, temperatures act like fishing maps, and seasons like trajectories. Through this lens of social learning, to become a fisherman at Mausund includes creating a lived and embodied identity as a fisherman in that local context. The competence, including the identity as a fishermen, is shaped from the interviewees’ trajectories through a community of practice, which is local, lived and embodied.

The review of previous research we did on articles from the field of marine studies focusing on how fishermen’s experience-based knowledge can supplement accepted scientific knowledge, reveals an interest in, acknowledgement of, and ambivalence towards the kind of knowledge that fishermen embody. Within science, this knowledge is recognized as clearly embodied, experience-based, and thus unscientific, even though all the articles we reviewed argued for the value of fishermen’s knowledge as supplementary to scientific knowledge (Ames, 2002; Anbleyth-Evans & Lacy, 2019; De Celles et al., 2017; Johannes & Neis, 2007; Johnson, 2010, 2011; Lima et al., 2016; Medeiros et al., 2018; Stephenson et al., 2016; Sulemain, 2018; Quist, 2019).

However, we are situated in science education, which is slightly different from *science*. We are researching and teaching *learning and teaching in science*. Based in the

insights from this study, we argue that experience-based and bodily learning brings value in science education. Natural science is truly based on inquiry, and we argue that students, both in school and in teacher training, would benefit from exposure to experience-based learning projects.

Looking critically at our study, we see that it is a small and explorative study that arose unexpectedly out of Author 1's teaching practice. During her teaching as a science teacher in upper secondary and teacher education, she observed the motivation for learning that students and student teachers expressed in their meetings with the experience-based knowledge of professional fishermen during excursions to the Norwegian archipelago Mausund. This led to the interviews with five elderly fishermen, and this analysis was conducted within narrative inquiry. The study is small, explorative, and cannot be generalized. However, we argue that it has contributed perspectives that open for and motivate further narrative inquiries into what knowledge types and knowledge views might be considered valuable within science education.

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