Implementation of Micro-Qualifications

Supply Driven VET

An Aquaculture VET Approach for Flexible and Inclusive Learning Opportunities



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D4.1

A Possibility for Innovation in VET?

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A Framework for Supply Driven Micro-Qualifications in Aquaculture VET

National educational contexts across Europe differ significantly, both between countries and across various sectors of education and training. To understand changes in a qualification or credential system, it is essential to analyze them within the context of the system that produces them.

The Norwegian Aquaculture National Qualification curriculum outlines a series of broad 'goals' that are interpreted by teaching staff in collaboration with industry partners at each of the country's VET schools. This approach allows schools to tailor the curriculum and specific learning outcomes to meet the needs of local or regional employers. All components of the curriculum are mandatory and culminate in a national examination process. This includes a theoretical examination for all learners, regardless of experience, and a practical examination specifically for both young learners without prior experience, and for staff from industry with experience.

The Norwegian Aquaculture Qualification Framework

The aquaculture curriculum is divided into three sections, each with defined competence aims that are structured in 36 separate goals:

- **Operation and Production (17 goals)**
- **Construction and Technology (9 goals)**
- **Aquaculture and the Environment (10 goals)**

Operation and Production

The program subject encompasses work processes and vocational practices associated with operating and maintaining aquaculture facilities. It includes aspects such as hygiene, health, safety, environmental considerations, equipment selection, economics, and ensuring the optimal weight and welfare of farmed organisms. The subject covers the use of freshwater and seawater for cultivating fish, algae, and aquatic animals at various life stages, across annual cycles and diverse environments.

Additionally, it addresses quality assurance for work processes and products, as well as the national and international regulations and framework conditions governing the industry.





Construction and Technology

The program subject focuses on the construction, functionality, and operation of facilities, tools, and equipment used in aquaculture. This includes the usage and maintenance of tools, equipment, access mechanisms, and instruments specific to fish farm operations.

It also covers materials knowledge, facility security, and maintenance. Additionally, it involves training in the operation of trucks, cranes, and basic radiotelephony systems.

Micro-Credentials start emerging in Vocational Education and Training

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Aquaculture and the Environment

The program subject focuses on farmed species and their surrounding environment. It includes measuring and assessing chemical and physical environmental parameters, ensuring fish health, and implementing hygienic practices. Central topics include feeding farmed organisms, understanding species-specific dietary requirements, and addressing ecology. The subject also examines the interactions between fish farming facilities and the environment.

Characteristics of Aquaculture VET

Established National Qualification (NQ) in Aquaculture is “Fagbrev i akvakultur”, awarded by the Ministry of education.

EQF leveled Aquaculture NQ is set at EQF level 4-5 for the husbandry operatives.

NQ containing National Standards set by industry, where industry representatives develop the National Exam questions in the theoretical exam and industry representatives are directly involved to assess the practical exam for young learners and mature learners.

A fixed syllabus NQ where all aspects of the syllabus must be taught and assessed for fresh- water hatchery and marine on- growing. The emphasis is on the salmon and trout farming relevant to Norwegian production.

Learning Outcomes (LO) based NQs are broadly defined LOs that amount to a 3-page summary syllabus, presented in three sections and adjusted to the regional needs at local level by each VET school in close cooperation with the farming companies in this region.

There is a lot of **continuous assessment** for young learners at the VET school, but not for mature learners from industry with 5 years-experience.

The final examination consist of a final theory- and practical exam for both young learners and mature learners. The students receive their NQ after passing both. They evidence their practical competence during a two day long practical exam.

Work-based learning delivery system is integrated into the training practices. Young learners access farms local to their college several days a week, as well as in longer periods, during a period of 2 years. They receive practice orientated training and a lot of their learning occurs in a real place of work under supervision. The mature learners learn from their employment experiences.

Work-based assessment of performance is included for young learners, through continuous assessment and the apprenticeship system, but not for mature learners who are deemed competent following 5-years of relevant experience.

College classroom based delivery with a lot of group work is the norm for both the young and mature learners in classroom, in laboratory settings and out at the marine cages.

Micro-Credentials are expected to be part of Lifelong Learning, and learners will navigate qualifications flexibly.

Individual Learning plans are not used, although there is some customization of assessment approaches that encourage to accommodate the individual needs of young learners. This does not apply to the mature learners.

On-line learning and learning technologies are applied by the young students, which apply Virtual Learning Environments (VLEs) in all their courses, including in aquaculture. There is, however, limited usage of on-line learning applications for the mature learners. What still dominates are reliance on classroom based delivery in combination synchronous video solutions for those who can't travel to a physical gathering due to distance limitations. This is supplied with frequent practices out at farms for effective inclusion of the work-based learning processes.



Delivery Methods

The Norwegian NQ in Aquaculture is mainly delivered by public sector VET schools, with crucial support and in partnership with local farming companies. These companies provide VET schools with daily access to commercial farm sites, advanced state of the art technology and practical training opportunities. Regular collaboration between farms and local VET schools have fostered a strong partnership, ensuring industry confidence in the public sector's NQ provision.

Mature learners can navigate their qualifications flexibly, allowing them to decide how they achieve their qualifications at the end by passing the National Exam.

The Training Process Methodology Overview:

- Notification: A few hours before each training session, students receive a message through a Student Response System (SRS).
- Engagement: Using the SRS they respond to a short quiz consisting of 8–10 questions, including 2–3 open-ended ones, where they can provide text-based answers.

Schedule (When):

- 24 Hours before the teaching starts, the students receive the quiz on their smartphones.
- 6 Hours before a reminder is sent to prompt participation.

Target audience (Who):

- Adult VET students from the aquaculture industry, typically with 1 to 5 years of experience from working at marine cages.
- They are enrolled in a preparatory course focusing on the theoretical aspects of the aquaculture curriculum, preparing them for the national theoretical exam.

Micro-Qualifications require Learning Outcomes to be clearly and transparently understood.



Quiz details (What):

- Content: The quiz includes 8–10 questions, including 2-3 open-ended questions that encourage reflective answers, such as for instance the «Targets for breeding»: If you could freely choose properties for the 'ultimate salmon,' what qualities would you select?"
- Availability: Each quiz remains open until the teacher closes it.
- Engagement goal: During a training event the aim is to achieve responses from at least 50% of the students.

Operational details (How):

Students respond by entering open text through the SRS. The SRS organizes and displays their input as a «word-cloud," where frequently used words or phrases appear larger. This visual representation is shown on the teacher's interface, making it easier to identify the groups prior knowledge, common challenges and problems, or key areas to address by the teacher.

The teacher presents the word-cloud during the teaching session, using it as a starting point for open discussion. The word-cloud is displayed on a single classroom screen to ensure the group focuses on the same topic, thus avoiding any distractions from individual mobile devices.

During the follow up discussion(s), students are encouraged to share their perspectives, engage in dialogue, and reflect on their views. Experienced students are used as a learning resource that will help and assist the less experienced ones during the group- and class work activities.

Reason (Why):

There are no right or wrong answers to the open-ended questions. The responses serve as a catalyst for group discussions, promoting interaction between students and the teacher. These discussions act as icebreakers, fostering engagement and reducing barriers between students from different companies and farms. This collaborative environment encourages active participation, and active learning processes resulting in deeper learning.

Peer-Instruction



Dedicated training sessions on «Investigative Aquaculture Peer Instruction Methodology» utilize online response tools to collect open text-based, by applying the following six steps:

1. **Presentation of a case:** The teacher introduces a case or problem to the class in the form of an open-ended question.
2. **Individual work:** Students analyze the case or problem independently for 1-2 minutes.
3. **Response submission:** Students submit their individual responses as open text. These responses are displayed as a word-cloud, where frequently used words and phrases appear larger. Even a small class can generate a substantial number of responses.
4. **Group discussions:** Using the word-cloud as a starting point, the teacher facilitates discussions in groups where students explore the insights and ideas presented.
5. **Open class discussion:** Each group shares their findings in an open class discussion, proposing the most relevant or impactful solutions for the aquaculture industry, such as farming or hatchery operations. The teacher may compile these solutions on a physical or virtual blackboard. Students may participate in a second individual voting round to prioritize the most important solutions displayed.
6. **Session conclusion:** The teacher provides a thorough explanation and synthesis of the discussion, summarizing key points and ensuring clarity. This includes explaining why the correct alternatives are correct, and (possibly) why the incorrect alternatives are incorrect.

Peer-Instruction helps implementing nationally recognized qualification courses that enhance knowledge sharing by improving communication and collaboration among staff in the aquaculture companies.



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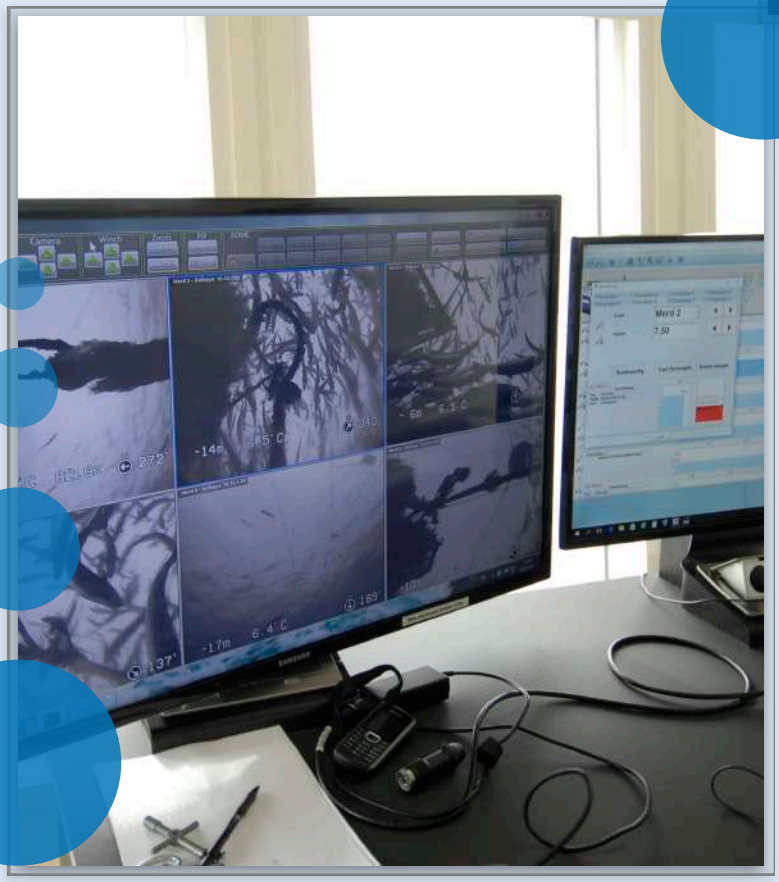
Three Aquaculture Basic VET Micro-Qualifications



A Micro-Qualification for Specialization in Operation and Production (with 17 goals)

The aims of the training should enable the students to achieve the following competences:

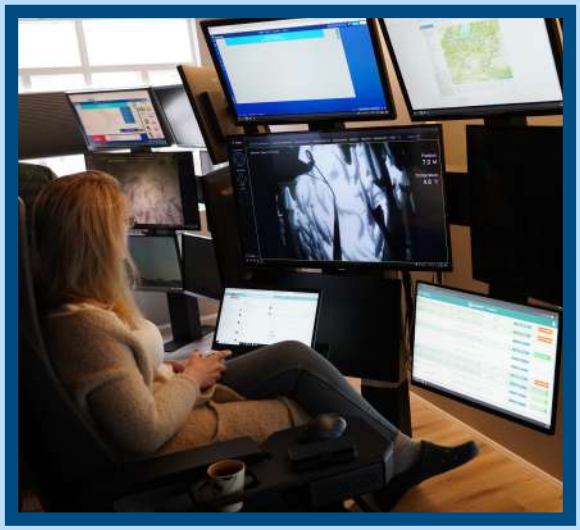
- Carry out work at a fish farm in line with current regulations and ethical guidelines.
- Register feed amounts, mortality, average weight, density and environmental parameters.
- Calculate feed amounts and feed farmed organisms.
- Explain the importance of optimal feeding.
- Observe organisms and environments and evaluate changes in relation to the species' normal appearance and behavior.
- Plan, implement, evaluate and document the cleaning and maintenance of boats, engines and equipment in the aquaculture industry.
- Carry out sorting, weighing and transport of farmed organisms.



- Assess risk in work operations and implement measures to reduce the risk of injury or damage to personnel, farmed organisms and equipment.
- Prepare routines for safeguarding the quality of processes and products in the fish farming industry.
- Carry out work at a fish farm in accordance with relevant environment, health and safety regulations.
- Plan, implement and evaluate a production schedule with numbers, growth rate, biomass, density, water and oxygen requirements and feed consumption.

The 1st. Micro-Qualification

- Elaborate on regulations that regulate the fish farming industry, and retrieve essential information related to the establishment of a new fish farm business in a specific area.
- Describe the organization of an aquaculture company, starting with type of organization and an organizational chart.
- Explain the difference between a budget and a financial statement for operation and investment in an aquaculture business, and highlight any disparities and the possible reasons for these disparities.
- Explain connections between input factors and finance in an aquaculture firm, with particular emphasis on the significance of their own work.
- Describe how the market for fish-farmed products has changed, and discuss possible future prospects.





- Give examples of the market's demand for quality and choice of fish-farmed products

A Micro-Qualification for Specialization in Construction and Technology (with 9 goals)

The aims of the training should enable the students to achieve the following competences:

- Describe the construction and function of facilities for egg, brood, table fish, algae and shellfish production.
- Use the correct tools and equipment based on the situation, the equipment's construction and mode of operation.
- Clean, inspect and maintain a facility and equipment based on the materials' properties and application.
- Choose ropes and chains according to purpose and connect them together using appropriate methods.
- Operate modern fish-farm boats in line with relevant regulations.

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The 2nd. and 3rd. Micro-Qualifications

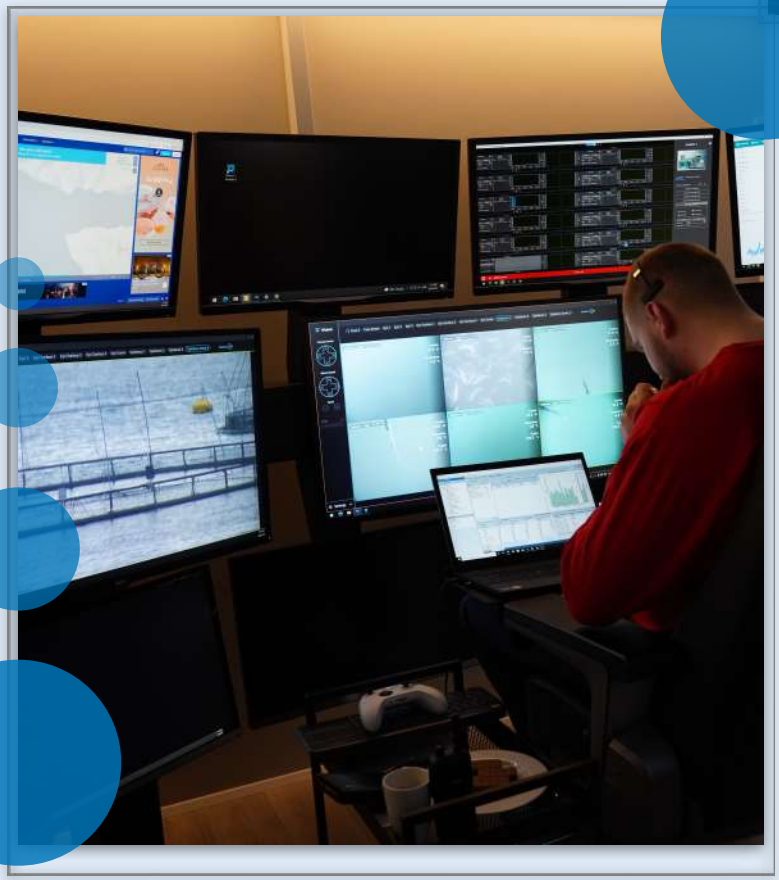
- Use digital tools in production control, environmental monitoring, and documentation.
- Use a truck in accordance with relevant regulations.
- Carry out stropping, hooking, rigging and signaling in accordance with relevant regulations with the use of a quayside crane or boat derrick.
- Use modern radio communication equipment and follow the emergency procedures.



A Micro-Qualification for Specialization in Aquaculture and the Environment (with 10 goals)

The aims of the training should enable the students to achieve the following competences:

- Plan, implement, document and evaluate optimal operations based on the biology of the farmed species.
- Describe chemical and physical properties in water and elaborate on the most important environmental factors in the aquatic environment.
- Carry out routine measurements of relevant environmental parameters and assess the results based on the species' environmental requirements and tolerance limits.



- Carry out work in line with relevant regulations for preventive health work, animal welfare and hygiene.
- Identify environmental problems linked to aquaculture and discuss how they can be prevented locally and globally.
- Propose damage limitation measures for an incident at a fish farm.
- Recognize normal behavior and appearance in fish farm organisms and elaborate on common diseases and parasites.
- Handle and use chemicals correctly in accordance with information in an EHS data sheet.
- Elaborate on breeding targets for actual fish-farm organisms.
- Discuss how an aquaculture business can be run in co-existence with other commercial interests, preservation and leisure activities.