575235-EPP-1-2016-1-NO-EPPKA2-SSA-N
Agreement number 2016 – 3452
Erasmus Plus Sector Skills Alliance LOT 1 project
www.blueedu.eu

Fostering Growth in the Blue Economy by developing an action plan for innovative European aquaculture VET and harmonized qualifications

D5.1 - BlueEDU European aquaculture VET inventory description of the VET system in a number of countries

WP 5 - VET supply analysis

Authors:
John B. Stav and Dag Willmann
Contributors:
Martyn Haines, Ann Cecilie Ursin Hilling, Pamela Ernstberger, Douglas McLeod, David Benhaim and Steven Mckillop

Version: Final

Date: 15.12.2018

Funded by the Erasmus+ Programme of the European Union

This project has been funded with support from the European Commission. This publication reflects the views only of the authors, and the Commission cannot be held responsible for any use, which may be made of the information contained therein.

Summary

This main report on European Vocational Education and Training (VET) for Aquaculture is composed by several national reports from several countries. The report describes how vocational education and training is organized on a general basis and in relation to aquaculture in particular.

The BlueEDU project's studies show that aquaculture education is poorly developed and also fragmented in most of Europe. Norway and Scotland are the two countries that have an aquaculture VET offer that leads to a national qualification (NQ). In practice, the Norwegian NQ is considerably more extensive than the Scottish NQ. In Norway, for example, the NQ implies that the students will learn about both the hatchery part and the sea-based part of the aquaculture industry. In Scotland, you can opt out significant parts of what a Norwegian NQ contains, although there is existing education for most parts also in Scotland.

Students must get a job before they can begin their NQ education in Scotland. In Norway you may take two years of education at a vocational school after primary school and then continue for two years as an apprentice in a company.

In Norway, practice is closely integrated via a network of 14 schools. There is also very close integration between the workbased VET and the schools.

In Scotland, e-learning is used in combination with practice training provided by the industry. All schools that offer classroom-based education like Norway are closed down in Scotland.

The remaining countries lack an NQ. In Croatia, Cyprus, Greece, Finland and Italy there is no aquaculture VET.

In all countries, the academic communities in the schools are small and there is a lack of updated teaching materials. There is also little cooperation between schools in different countries. On the other hand we have a financially strong industry, based in rural areas, hungry for knowledge and expertise.

Country reports:

BlueEDU WP5 VET supply, Norway

John B. Stav, NTNU
Dag Willmann, Trøndelag County Authority

Table of content

Development of VET supply in Norway

National policy strategy for VET mission and legislation

Mission

The VET system, including apprenticeships, is an integral part of the Norwegian education system. The government views VET as a central means for achieving national goals in areas such as economic, regional and employment/labour market policies. Education and training including VET are considered a public responsibility. VET is available all over the state so as to ensure an equal education for all. Equal access to high quality education is a fundamental political principle. There are no school fees at any level including higher education in the public education system. Only a small share of pupils and students attend private education.

The government recognises the major role of social partners, accordingly the formulation and implementation of VET policies are shared between public authorities and the social partners such as employers and employees' organisations and trade unions. This cooperation is institutionalised through the Vocational Training Act. It is also expressed through procedures for representation in central bodies and active participation in preparatory, implementation and control tasks within the field.

Strategy

Reform is an on going process associated to VET national policy in Norway, for instance, a comprehensive curriculum reform was introduced in 2006 so-called 'The Knowledge Promotion Reform' (Kunnskapsløftet). New national curricula were developed for each subject in both school-based and apprenticeship-based education and training. The Norwegian Directorate for Education and Training (Utdanningsdirektoratet) managed this process through a broad and open process. Each Subject Curriculum were developed by a curriculum team and been subject to a broad consultation process (electronic questionnaires, seminars, meetings) that has involved schools, school owners and the social partners.

The government works to promote participation among low-skilled students in upper secondary VET. For example since 2000, through 'the training candidature scheme' (lærekandidatordningen), low-skilled students are given the possibility of obtaining a specially adapted qualification of a lower degree. As opposed to the apprentice (lærling) who signs an apprenticeship agreement (lærekontrakt), the training candidate (lærekandidat) signs a training contract (opplæringskontrakt) which will lead to a competence exam (kompetanseprøve) as opposed to the trade or journeyman's certificate (fag- og svenneprøve).

The Norwegian strategy towards VET attempts to bridge the general and vocational divide and particularly the gap between the vocational schools and the apprenticeship system. The most important reform in this regard is "Reform 94" in 1994, which encompassed rights, structure and content.

Legislation

Reform 94 produced changes in several aspects of VET. At the upper secondary level, both the act regulating education and training in schools, and the act regulating apprenticeship training were revised and harmonised with the aim of achieving a more uniform education and better coordination between education in school and training at work. The following acts regulate the current VET system:

1. Act of 17 July 1998 no. 61 regulates the county authorities' responsibility for public upper secondary education and training, objectives and scope, organisation and division of responsibilities, financing and content of education and training delivered by both public and private institutions.
2. Act relating to Upper-secondary Vocational Education and Training (lov om fagskoler 2003, latest amendment December 2010) regulates public and private post-secondary vocational education and training with courses and programmes of 6 months' to 2 years' duration. Education and training under this law are not part of higher education.
3. The Adult Education Act (Lov om voksenopplæring – 1976, latest amendment 2003) regulates different types of adult training that is not covered by the Education Act. Education and training for adults is provided by a variety of public and private institutions. Among the most important are private adult learning study associations (studieforbund), labour market training, work based training and distance training.
4. The Act relating to Master Craftsman Certificates (Lov om mesterbrev, 1986) establishes the framework for the master craftsman certificate (mesterbrev). It stipulates that only a person awarded the certificate is entitled to call him or herself a master craftsman (mester).
5. The Act relating to Universities and University Colleges (Lov om universiteter og høyskoler 2005, latest amendment 2009) applies to all higher education, both state and private. The Act regulates organisational and management aspects, provides for the recognition of study programme, examination and certification, for quality assurance as well as for the learning environment for students.

Sources:

- CEDEFOP (1999). Vocational Education and Training in Norway. Thessaloniki: European Centre for the Development of Vocational Training.
- CEDEFOP ReferNet (2012). Norway VET in Europe – Country Report. Thessaloniki: European Centre for the Development of Vocational Training.

The formal VET system

Levels

Tertiary education, age above 19
Upper secondary education, age 16-19
Secondary education, age 13-16 compulsory
Primary education, age 6 - 13 compulsory

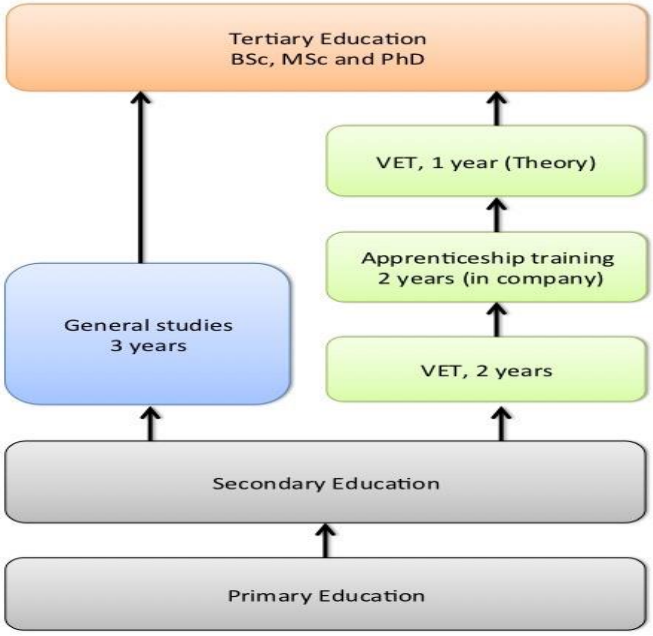


Figure A. The main educational levels in the school system in Norway.

NKR			
NKR levels	**Qualifications**		**EQF levels**
8	PhD degree		8
7	Master degree		7
6	Partial bachelor (short higher education)	Bachelor (Bologna first cycle)	6
5	5.1 Certificate of completed post-secondary VET (*Fagskole*) 1	5.2 Certificate of completed post-secondary VET (*Fagskole*) 2	5
4	4A Certificate of completed general upper secondary education	4B Certificate of completed vocational upper secondary education (*Fagbrev*)	4
3	Certificate of partially completed upper secondary education and training (*Kompetansebevis*)		3
2	Certificate of primary and lower secondary education		2
1	Not part of the NQF. No qualifications included.		1

Figure B. Extension of figure 1 with The Norwegian national qualifications framework for lifelong learning (Nasjonalt kvalifikasjonsrammeverk for livslang læring, NKR) with linkage to the EQF levels.

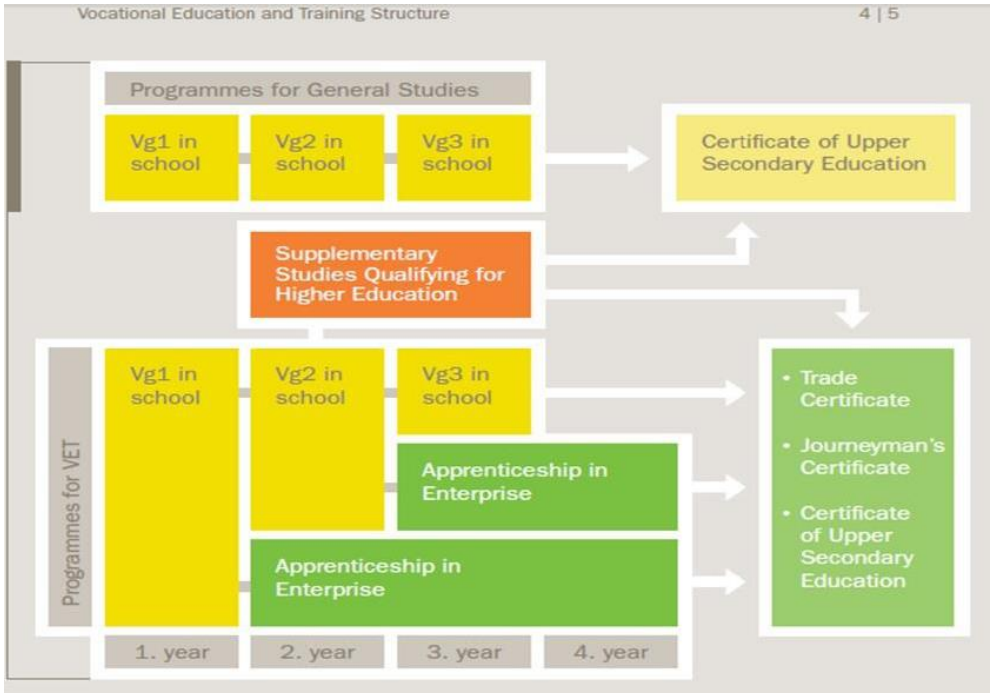


Figure C. The organization of the upper secondary VET education in Norway, including the apprenticeship system.

All young people leaving compulsory school have a statutory right to attend three years of upper secondary education. Since 1976, general and vocational education and training were subject to the same law, under the same roof. Thus, today nearly all upper secondary schools provide both general education and vocational training, often in the same building. Students may choose from twelve programmes categorised as three general studies programmes and nine VET-programmes. The VET-programmes are as follows:

- Technical and Industrial Production
- Electrical Trades
- Building and Construction
- Restaurant and Food Processing Trades
- Agriculture, Fishing and Forestry
- Health and Social Care
- Design, Arts and Crafts
- Media and Communication
- Service and Transport

The upper secondary VET leads to the trade- or journeyman´s certificate (fag- og svennebrev). The majority of upper secondary VET students are in the age group 16-21.

Upper secondary VET normally includes two years at school with practical training in school workshops and short work placements in industry, followed by two years of formalised apprenticeship training and productive work in an enterprise or public institution. During the last two years, the apprentice is engaged in one year of training and one year of productive work. This is known as the “2+2 model”. However, not all

VET programmes follow the 2+2 model. A few programmes are entirely school-based. Another small group of programmes follow a "1+3-model", with one year in school followed by three years of apprenticeship training.

The first year in upper secondary VET consists of general education and introductory knowledge of the vocational area. During the second year, VET students choose specialisations and the courses are more trade-specific. While in school, students participate in practical training in workshops and enterprises through the subject In-depth study project (prosjekt til fordypning). The two-year apprenticeship takes place with an employer (or employers) and follows the national curriculum.

In Norwegian higher education, all vocationally-oriented courses and programmes are part of the ordinary higher education system. There is no formal or other distinction between vocational and non-vocational higher education.

The Tertiary Vocational education (fagskole) is an alternative to higher education and is based on upper secondary education and training or equivalent informal and non-formal competence. Higher Education entrance Qualification is not required. The education consists of vocational courses lasting from half a year to two years.

The institutions of the tertiary VET level have developed through one of the following four main paths:

- county post-secondary technical colleges building on vocational secondary education, often leading to qualifications as master craftsmen or certificates for seamen;
- state funded private schools originally recognised as "secondary education without parallel to public provision", several of which are in art, culture or Bible studies;
- state and county funded programmes in health and social studies;
- other private provision, generally developed through training needs resulting from new and emerging technologies and demands in the labour market since the 1980s, particularly in media, design, communication, administration, logistics and ICT.

The Act on upper secondary (tertiary) Vocational Education No. 56 of 20 June 2003, revised in 2007, regulates short (e.g. six months' to two years' duration) vocational training courses and programmes at the postsecondary non-tertiary level. In this Act, the term vocational denotes programmes leading to qualifications that can be immediately used in working life without further training. As a consequence of the 2007 revision, all providers must document quality assurance systems, and it is also possible to obtain institutional accreditation for programmes within a defined field of study, rather than having to apply for recognition programme by programme

Sources:

- CEDEFOP ReferNet (2012). Norway VET in Europe – Country Report. Thessaloniki: European Centre for the Development of Vocational Training.
- Norwegian Ministry of Education and Research (2007). Education from Kindergarten to Adult Education. Oslo: Ministry of Education and Research.

Governance

Norway enjoys a high degree of decentralisation amongst the three administrative levels: state, county and municipality.

The municipalities (kommuner) are responsible for primary and lower secondary education.

- While county authorities (fylkeskommuner) are responsible for public upper secondary school, their associated tasks include: operational responsibilities for the development of curricula, examinations and quality control, running of schools, the intake of students, and the appointment of teachers.
- The Ministry of Education and Research (Kunnskapsdepartementet) (MOER) has overall responsibility for national policy development and administration of education and training at all levels, from kindergarten to higher education, including adult education. Higher education falls directly under the responsibility of the Ministry.
- For upper-secondary (tertiary) vocational training ("fagskole"), the situation is slightly more complicated as the counties are responsible for most of the public funding, most schools are private, and a few schools are funded directly by the Ministry.

The Directorate of Education have responsibility for the continuous curriculum development. For this purpose it makes extensive use of expert groups from both school and companies that provide upper secondary education. When the need for a new qualification is identified a tripartite group is set down to write vocational profiles (kompetanseplattform). This will make the basis for developing the subject curricula. The Directorate appoints teams for curriculum development consisting of professionals (most often suggested by the employer and employee organisations) and VET teachers. Also, the Directorate has recently developed a follow-up system for curricula called SOL (System for oppfølging av læreplan). The system aims is to get a more holistic and systematic knowledge about the state of affairs with regards to the curriculum.

Social partners

The VET national policy is built on a close cooperation between public authorities and the social partners on a formal and informal basis. The formal basis for the role of the social partners in VET at upper secondary level is to be found in the International Labour Organisation Convention 142 (of 23 June 1975) which Norway ratified in 1976. The convention establishes that the employers' organisations and trade unions shall influence and participate in the framing and development of vocational guidance and training.

The social partners have representatives in all important advisory and decision-making bodies at state and county level:

- the National Council for Vocational Training (Rådet for fagopplæring i arbeidslivet — RFA);

- the 20 national Vocational Training Boards (Opplæringsråd) which represent the expertise in different sectors and recognised occupations;
- the Vocational Training Committee (Yrkesopplæringsnemnda) for each county; and
- the examination boards (prøvenemndene) in each county and the national appeals boards (ankenemndene).

Through this representation, the social partners are directly involved in, among others, the framing of structure and content of recognised occupations, the development of curricula and framing the trade and journeyman's examination. The participation of pupils, apprentices and students in the preparation of education and training is, moreover, stated in the acts concerning education and training.

Financing

Norway spends considerable resources on its education system, including VET, relative to many other countries. For instance, Norway spends more than the OECD average in Education per student. In 2008, Norway spent 5 per cent of its GDP on primary and secondary education and training as a whole, whereas the OECD countries spent only 3.8 per cent on average.

There is varied spending of resources because of differences in geography and demographic structure. This gives rise to substantial differences in the spending of resources among different municipalities and country authorities.

There are no school fees at any level, including higher education, in the public education system. The finance comes from country authorities for public upper secondary schools while MOER is responsible, include finance, for tertiary education.

Only a small share of pupils and students attend private education. The Financial Support to Students and Pupils Act (Lov om utdanningsstøtte til elever og studenter-1985, latest amendment 2005) states that all registered students on formally recognised study programmes, at both public and private higher education institutions may receive grants and subsidised loans from the State Educational Loan Fund (Statens lånekasse for utdanning) for subsistence costs.

Sources:

- CEDEFOP ReferNet (2012). Norway VET in Europe – Country Report. Thessaloniki: European Centre for the Development of Vocational Training.
- Norwegian Directorate for Education and Training (2012). The Education Mirror, Analysis of Primary and Secondary Education and Training In Norway. Oslo: Norwegian Ministry of Education and Research.

Groups of VET teachers and instructors

There are three main groups of VET teachers and trainers at the upper secondary level:

- VET teachers who provide formal school-based education and training;
- Trainers (instruktører) and training supervisors (faglige ledere) in enterprises; and

- VET training facilitators who are involved in non-formal and informal workplace training.

The formal qualification requirements for VET teachers are specified in national regulations. In principle, there is no difference between teachers in VET and other teachers. Both groups must have two sets of formal qualifications: in the relevant subject and in teaching. VET teacher education programmes follow the general degree system, with a three-year Bachelor's degree and a two-year Master's degree. To become a qualified VET teacher, one must either complete vocational practical-pedagogical education or vocational teacher education.

Vocational practical-pedagogical education (consecutive model) is a 1-year programme (2-year for part-time study) for students who already possess a vocational/professional degree or other qualification. The main fields of study are pedagogical theory, vocational didactics and supervised teaching and training practice. Admission requirements are:

- qualification as a skilled craftsman/worker, or a bachelor's degree in a specific profession; and
- two years of occupational experience; and
- two years of further studies (technical, vocational, managerial); and
- general matriculation qualifications or recognition of non-formal qualifications.

Vocational teacher education (concurrent model) is a comprehensive 3-year bachelor programme that covers both vocational training and pedagogy and qualifies for the teaching of specific subjects in years 5 – 7 in primary school, and in lower and upper secondary school. It is also available as a part-time study. Admission requirements are:

- an upper secondary vocational qualification and two years of relevant work experience
- general matriculation qualifications or relevant non-formal qualifications, e.g. long work experience

All teacher education programmes for the lower and upper secondary levels (grades 8 – 13) including those for VET teachers are at present undergoing revision as part of the implementation of the Norwegian National Qualifications Framework of 15 December 2011, following both the European Qualifications Framework for Higher Education in the Bologna Process and the European Qualifications Framework for Lifelong Learning (EQF).

Trainers (instruktører) in enterprises are vocationally skilled, but not required to have a teaching certificate. Training supervisors (faglige ledere) in enterprises or other workplaces with apprentices must ensure that the training meets the requirements set by the Education Act. They must have one of the following qualifications:

- trade or journeyman's certificate in the relevant trade or craft
- master craftsman's certificate in the relevant craft

- relevant higher education in the trade or craft
- adequate educational background in the parts of the trade which, according to the curriculum, will be taught in the enterprise
- six years of experience in the trade or craft

There are no formal qualification requirements for training facilitators that deliver training outside formally approved education institutions. Still, VET training personnel involved in non-formal and informal workplace training often have a formal vocational qualification. Some training facilitators have not formalised their vocational skills, but perform solely on the basis of skills developed through work practice.

Enterprises that provide apprenticeship training must be approved by the county authority. Formal regulations simply state that the management of the institution must ensure that training personnel have "the necessary qualifications" (Education Act).

Teacher training for pre-primary, primary and secondary education was regulated by the Teacher Training Act of 1973, repealed in 1998. Provisions concerning teacher education are now under the Education Act of 1998 (e .g. teacher qualifications requirements), and in part under Universities Act of 2005. Following the Report to the Parliament (Storting) No. 11 (2008-2009), White Paper on Teacher Education (The Teacher-The Role and the Education), in May 2009 MOER appointed a National Curriculum Committee in order to propose national guidelines for a new teacher education programme.

Sources:

- CEDEFOP ReferNet (2012). Norway VET in Europe – Country Report. Thessaloniki: European Centre for the Development of Vocational Training.
- UNESCO-IBE (2012). World Data on Education VII Ed. 2010/11. Norway. Geneva: UNESCO-IBE.

Qualifications and qualification frameworks

Secondary vocational education

Secondary VET mainly leads to either a trade certificate (Fagbrev) for industrial and service trade or a craft or journeyman's certificate (Svennebrev) for traditional crafts. Graduates must pass the journeyman's examination, through which apprentices demonstrate their vocational skills and explain and justify the methods they have chosen to use to solve the test assignments.

Holders of a trade or journeyman's certificate may pursue further studies at a Vocational College (fagskole) and can also qualify for higher education. This has developed through four main paths mentioned in section 2 and leads to qualifications as master craftsmen or certificates.

National Qualifications Framework (NQF)

NQF gives a view of the Norwegian educational system and its levels of qualifications. NQF is a contribution to facilitate the work on lifelong learning and is to be used as a

transparency tool for comparison of Norwegian qualifications with qualifications from other countries, via the European Qualification Framework (EQF) and/or the European qualifications framework for higher education (QF-EHEA).

Quality assurance

The County Vocational Training Board (CVTB) provides advice concerning strategies for quality development in the vocational education system in the county, and evaluates the system of quality assurance. The Board is also responsible for securing the attainment of qualifications in vocational education and promotes cooperation between schools and the regional labour market. Other public bodies at the state and countries levels are involved in quality control for primary and secondary schools as well.

The Norwegian Agency for Quality Assurance in Education (NOKUT) was established in 2002, operative as of 1 January 2003. It is an in dependent agency with the task of carrying out external quality assurance of higher education and tertiary vocational

- Accreditation of higher education institutions;
- Accreditation of higher education programmes and courses;
- Revision of accreditation;
- Evaluation of internal quality assurance in higher education institutions;
- Evaluation of specific types of educational provision or defined aspects of such;
- Recognition of tertiary vocational education; and
- General recognition of foreign qualifications.

All courses must be accredited by NOKUT and an up-to-date list of recognised courses can be found on NOKUT's website.

As a consequence of the 2007 revision, all providers must document quality assurance systems, and it is also possible to obtain institutional accreditation for programmes within a defined field of study, rather than having to apply for recognition programme by programme.

Sources:

- CEDEFOP ReferNet (2012). Norway VET in Europe – Country Report. Thessaloniki: European Centre for the Development of Vocational Training.
- Norwegian Ministry of Education and Research (2007). Education from Kindergarten to Adult Education. Oslo: Ministry of Education and Research.
- Webpage of the Norwegian Agency for Quality Assurance in Education.
- UNESCO-IBE (2012). World Data on Education VII Ed. 2010/11. Norway. Geneva: UNESCO-IBE.

General principles for assessment

The Education Act regulates assessment in Norway VET and the regulations connected to this law, Chapter 3 – "Individual assessment in primary and upper secondary education". Persons in public primary education and students, apprentices, diploma candidates and apprentices in public upper secondary education are entitled to receive individual assessment by the law. The right to assessment includes a right to take part in continuous assessment, final assessment and documentation of the training process that ahs been done.

It is the owner of the school that is responsible for ensuring that the student or apprentice gets fulfilled their right to get individual assessment according to the Education Act. For apprentices and private candidates in companies, the company is responsible for offering the individual assessment.

The purpose of the assessment is to promote learning, express the competence of the student or the apprentice during the course and at the end of the course. The assessment process should provide feedback and guidance to students or apprentices such that they may use it to improve their learning.

At High School and Upper Secondary School (VET) level, assessment will be given with grades. There will always be given grades as numbers, on a scale from 1 to 6. The individual grades have these levels:

- Grade 6 expresses that the student has advanced competence in the subject
- Grade 5 expresses that the student has very good competence in the subject
- Grade 4 expresses that the student has good competence in the subject
- Grade 3 expresses that the student has quite good skills in the subject
- Grade 2 expresses that the student has low competence in the subject
- Grade 1 expresses that the student has very low competence in the subject.

In order to pass the minimum level in a subject, grade 2 is required.

Continuous assessment:

Continuous assessment in subjects will be used as a tool in the learning process, and as a basis for offering adapted training and help the student or the apprentice to increase his and her competence in the subjects. This assessment in subjects must be given on a continuous and systematic basis, and may be both oral and written.

Continuous assessment must contain information about the competence of the student or the apprentice, and provide guidance on how he or she can develop his or hers competence in the subject.

The correspondence between continuous assessment and final grade in subjects:

Continuous assessment should promote learning and allow the student to improve his / her competence throughout the entire training period. For students in public upper secondary school the competence the student has shown throughout the entire training period forms part of the assessment when the final grade in subjects is to be determined.

For adult private candidates and apprentice in adult learning courses the final exam will determine the final grade. However; also the adult students are entitled to continuous assessment during the courses.

General principles for examination

The exam must be in accordance with the curriculum. The county authorities are responsible for the completion of the professional certificate test in accordance with the regulations and the curriculum in the subject. Registration for the professional certificate test must be sent to the county authority in the county where the learning contract or training contract is registered.

Private candidates must apply for a professional certificate test. The application goes to the county authorities before the deadlines set by the same county authorities.

Before applying for the professional certificate test, the candidate must have passed a theoretical examination according to the prerequisites set by the Directorate of Education. This exam will test to what extent the individual candidate has reached the competence levels defined in the curriculum. The exam is prepared centrally and censored locally. If the candidate does not pass the examination, a new examination may be reapplied at the earliest six months later.

The contents and scope of the practical professional certificate test

An Examination Board for the program subject is responsible for the design of the professional certificate test. The teaching company, possibly the school as an alternative to training in a company, can make suggestions for work tasks.

The professional certificate test will test the candidate's knowledge and skills in the subject as described in the curriculum for the profession. All the competence objectives in the curriculum of the subject could be tested. The tasks in the test must reflect the requirements that are defined for professional competences. The Examination Board is responsible for ensuring that the candidate's competence in the subject is tested in a reasonable manner.

The task should clearly define the content of what is expected of the candidate's work. Within the framework of the learning outcomes specified in the curriculum, the assignment will test the candidate in

A) Planning of work, and foundation for selected solutions
B) Carrying out a professional work
C) Assessment of own test work
D) Documentation of own test work.

The extent of the test should be clearly defined, and within the timeframe set in the curriculum.
In a summary conversation, the Examining Board may ultimately ask the candidate theoretical questions for professional clarification.

The assignment must be designed in such a way that it gives the candidate a realistic opportunity to perform a good quality work within the stipulated timeframe. The assistance that the candidate has been given during the learning period can also be tested during the exam or test.

In addition to the task, the Examining Board shall prepare a basis description for assessing the candidate's work with the examination. The main points of this description must be explained to the candidates.

The Examination Board

The Examination Board for professional certificate tests is appointed and administered by the county authorities, according to the Education Act. The examiner committee must have at least two members who have formal professional competence within the subject area and, as far as possible, have updated work experience in the subject. The county authorities must ensure that there is satisfactory assessment competence in the Examination Board.

The county authorities shall collect proposals for members to the Examination Board from the business sector. This should include both representatives from the employer's and the employee. The county authorities may also, if necessary, retrieve suggestions from others.

Aquaculture VET quantitative data

There are in the year 2018, 12 public

- Nordkapp VET school, http://www.nordkapp.vgs.no
- Nord-Troms VET school, http://www.nordtroms.vgs.no
- Senja VET school, http://www.senja.vgs.no
- Sortland VET school, http://sortland.vgs.no
- Meløy VET school, http://www.meloy.vgs.no
- Guri Kunna VET school, http://www.blueedu.eu/vet/guri-kunna/
- Fræna VET school, http://www.frana.vgs.no/Fraena-VGS
- Ålesund VET school, http://www.alesund.vgs.no/AAlesund-VGS
- Måløy VET school, http://www.maloy.vgs.no
- Fusa VET school, https://www.hordaland.no/nn-NO/skole/fusavgs
- Austvoll VET school, https://www.hordaland.no/nn-NO/skole/austevollvgs/
- Strand VET school, http://www.rogfk.no/strand

and 2 private

- Val VET school, https://val.vgs.no
- Norsk Havbruksakademi (started in 2018), http://www.havbruksakademiet.com

aquaculture VET schools in Norway.

The aquaculture curriculum including learning outcomes, is available at https://www.udir.no/kl06/AKV2-01?lplang=http://data.udir.no/kl06/eng

Description of the three main aquaculture programme subjects

Operation and production

The programme subject covers work processes and vocational practice related to the operation and maintenance of an aquaculture facility. It involves hygiene, health, environment and safety, equipment selection, economics and the farmed organisms' optimal weight and welfare. The programme subject deals with the use of freshwater and seawater for growing fish, algae and animals in different stages of life, annual cycles and environments. It also deals with the quality assurance of work processes and products. Regulations and framework conditions that regulate the industry nationally and internationally are included in this programme subject.

The learning outcomes consist of wide descriptions:

1. carry out work at a fish farm in line with current regulations and ethical guidelines
2. register feed amounts, mortality, average weight, density and environmental parameters
3. calculate feed amounts and feed farmed organisms
4. explain the importance of optimal feeding
5. observe organisms and environments and evaluate changes in relation to the species' normal appearance and behaviour

6. plan, implement, evaluate and document the cleaning and maintenance of boats, engines and equipment in the aquaculture industry
7. carry out sorting, weighing and transport of farmed organisms
8. assess risk in work operations and implement measures to reduce the risk of injury or damage to personnel, farmed organisms and equipment
9. prepare routines for safeguarding the quality of processes and products in the fish farming industry
10. carry out work at a fish farm in accordance with relevant environment, health and safety regulations
11. plan, implement and evaluate a production schedule with numbers, growth rate, biomass, density, water and oxygen requirements and feed consumption
12. 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
13. describe the organization of an aquaculture company, starting with type of organization and an organizational chart
14. 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
15. explain connections between input factors and finance in an aquaculture firm, with particular emphasis on the significance of their own work
16. describe how the market for fish-farmed products has changed, and discuss possible future prospects
17. give examples of the market's demand for quality and choice of fish-farmed products

Construction and technology

The programme subject covers the construction, mode of operation and operation of facilities, tools and equipment. This includes the use and maintenance of equipment, tools, means of access, and instruments related to work at a fish farm. It also deals with knowledge of materials and the security and maintenance of facilities. It involves the use of trucks, cranes and limited radiotelephony.

The learning outcomes consist of wide descriptions:

1. describe the construction and function of facilities for egg, brood, table fish, algae and shellfish production
2. use the correct tools and equipment based on the situation, the equipment's construction and mode of operation
3. clean, inspect and maintain a facility and equipment based on the materials' properties and application
4. choose ropes and chains according to purpose and connect them together using appropriate methods
5. operate modern fish-farm boats in line with relevant regulations
6. use digital tools in production control, environmental monitoring and documentation
7. use a truck in accordance with relevant regulations
8. carry out stropping, hooking, rigging and signalling in accordance with relevant regulations with the use of a quayside crane or boat derrick

9. use modern radio communication equipment and follow emergency procedures

Aquaculture and the environment

The programme subject covers actual farmed species and the surrounding environment. It also involves the measurement and evaluation of chemical and physical environmental parameters, the fish's health and practice hygiene work. Feed and feeding of farmed organisms and species-specific dietary requirements are central elements in the programme subject. It also deals with ecology and the mutual effect between the fish farming facility and the environment.

The learning outcomes consist of wide descriptions:

1. plan, implement, document and evaluate optimal operations based on the biology of the farmed species
2. describe chemical and physical properties in water and elaborate on the most important environmental factors in the aquatic environment
3. carry out routine measurements of relevant environmental parameters and assess the results based on the species' environmental requirements and tolerance limits
4. carry out work in line with relevant regulations for preventive health work, animal welfare and hygiene
5. identify environmental problems linked to aquaculture and discuss how they can be prevented locally and globally
6. propose damage limitation measures for an incident at a fish farm
7. recognise normal behaviour and appearance in fish farm organisms and elaborate on common diseases and parasites
8. handle and use chemicals correctly in accordance with information in an EHS data sheet
9. elaborate on breeding targets for actual fish-farm organisms
10. discuss how an aquaculture business can be run in co-existence with other commercial interests, preservation and leisure activities

National conference venue

Representatives from all the 13 VET schools (2017) offering aquaculture studies in Norway were attending the national "Fosfor" conference in Oslo in November 2017. The 20 representatives representing the aquaculture VET schools and the aquaculture apprenticeships education replied on a survey set up in the frame of the BlueEDU project.

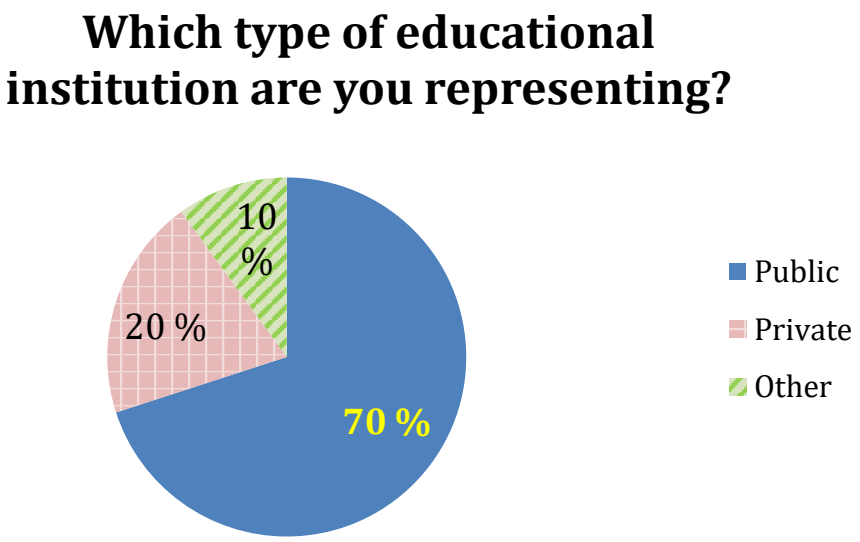


Figure 1. Attendance from private schools, public schools and training centres (owned by public VET schools).

Figure 1 shows that 4 persons represented private VET schools, while the remaining ones work at the public funded VET schools.

Figure 2. What role do the representatives have in their organizations?

16 of the participants did either teach aquaculture classes or organize aquaculture VET teaching programs. The remaining 4 organize the apprenticeship program.

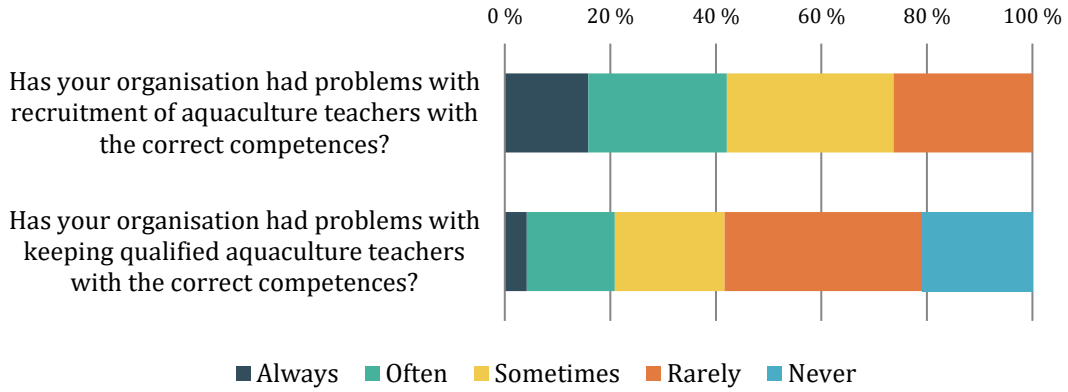


Figure 3. How easy is it to recruit and keep qualified teachers?

4 out of 10 teachers point out that they always or often have problems in recruiting aquaculture teachers with the correct competence. The later includes practice from fish farming companies. However, when the teachers get engaged and start on their work, less than 3 out of 10 teachers mention that it is difficult to keep the teachers. Nearly 6 out of 10 teachers point out that the aquaculture VET schools keep their aquaculture competence.

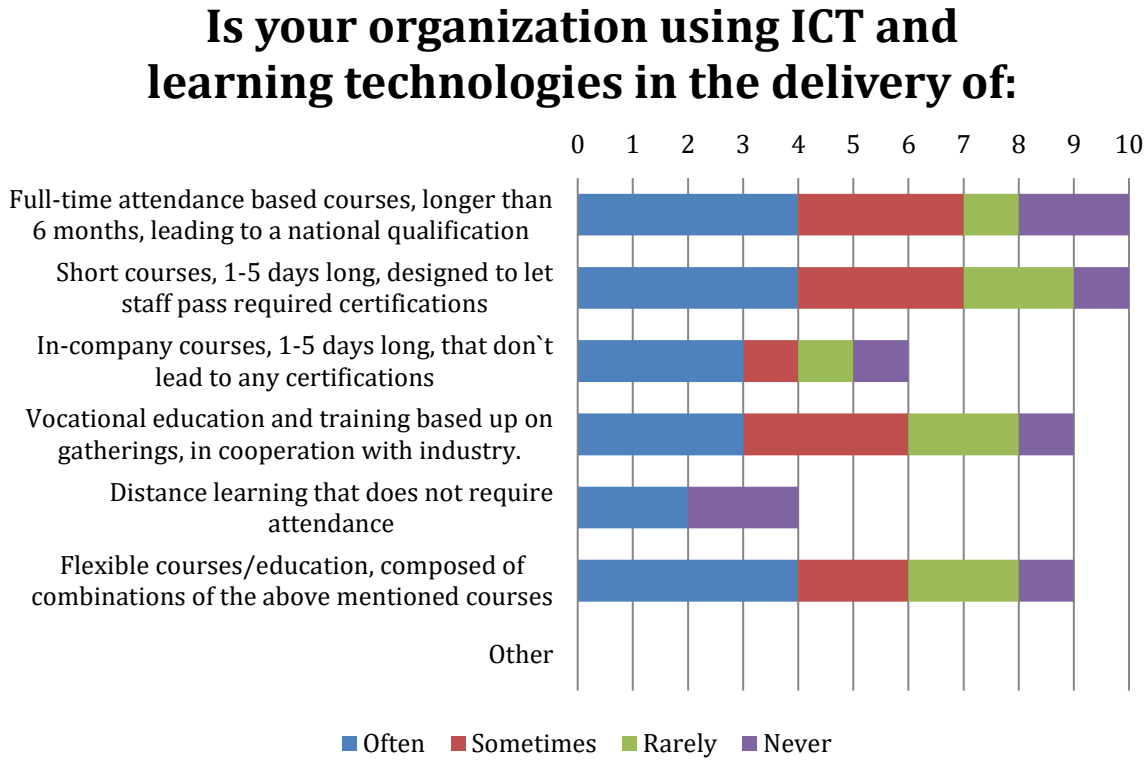


Figure 4. How do the aquaculture VET schools apply ICT?

Approximately one third of the teachers are involved in courses applying ICT and learning technologies in their various training activities. At the same time, almost one third of them are not involved in courses applying these technologies, while one third use them sometimes. This shows that teacher-training programs are needed in order to better utilize and deploy ICT in training within the aquaculture sector.

Distance learning is not used frequently. It should be noticed that the majority of the teachers don't reply anything to this question, indicating that they don't know what to answer for this question.

These survey data confirm the results gathered during Aqua Nor2017, showing that approximately 50% of the aquaculture schools offer VET programs to industry. The major method for delivery of training to staff from industry in Norway is based up on on-site training where students attend gatherings. Only one teacher includes distance learning into the training, despite that fish farming industry in Norway request if e-learning and distance learning may be utilized more in training of their staff.

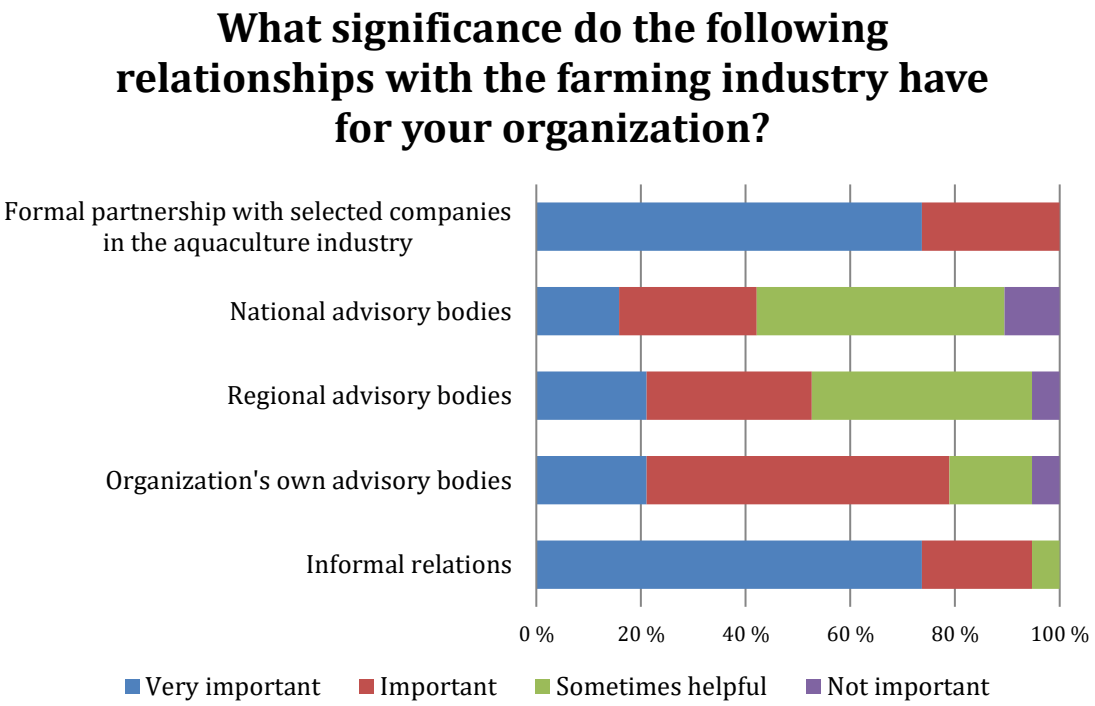


Figure 5. Which types of relationships are important for aquaculture VET schools and the farming industry ?

Formal partnership with industry, usually organized as 2-3 formal meetings per year, in combination with informal relations organized through the daily visits to farms by their classes, are the two most important channels for engagement and communication with industry. The third most important relation is the aquaculture VET schools own advisory body.

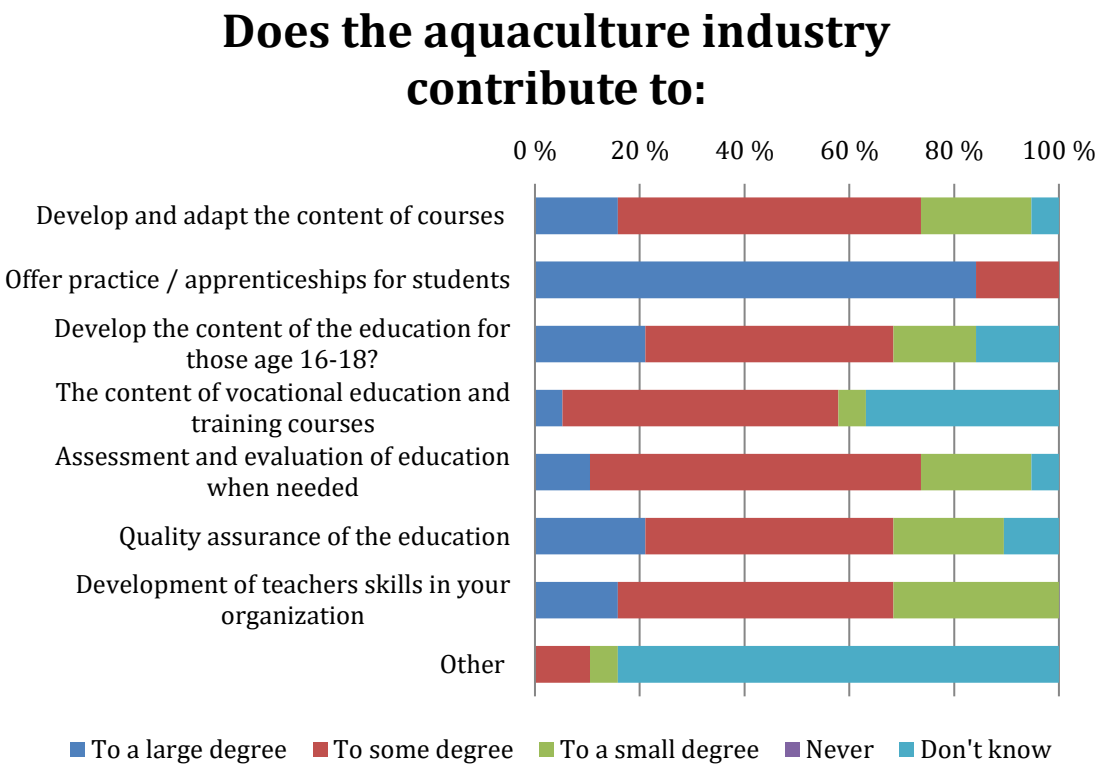


Figure 6. What contribution does the farming industry offer to aquaculture VET supply?

To facilitate work-based learning, offer periods with practice and to offer apprenticeships for students age 18-20, is by far the most important contribution from industry to the aquaculture VET supply sector today.

The teachers at the schools, however, point out that industry may have a potential for doing more than contributing with just these two activities. This includes using personnel from the industry with relevant experience and expertise, as well as engagement and interest, to

- support development and adaption of existing courses
- take part in development of learning materials for young students as well as students from industry
- take part in assessment of knowledge and evaluation of training programs
- help offering quality assurance to the training programs
- help developing teachers skills, e.g. by offering periods with practice and internships for teachers.

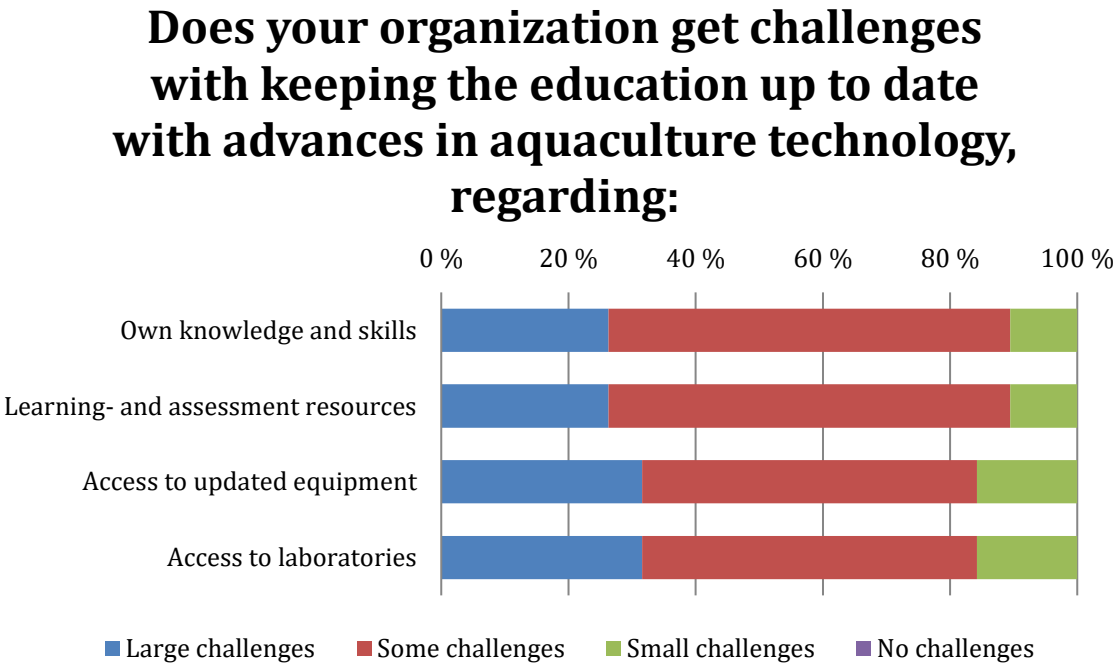


Figure 7. What are the main challenges for keeping the aquaculture VET updated?

The persons from the aquaculture VET school and the apprenticeships system feel they struggle, figure 7, with maintaining their own knowledge and skills, as well as development of learning materials, and to offer students access to modern equipment and laboratories.

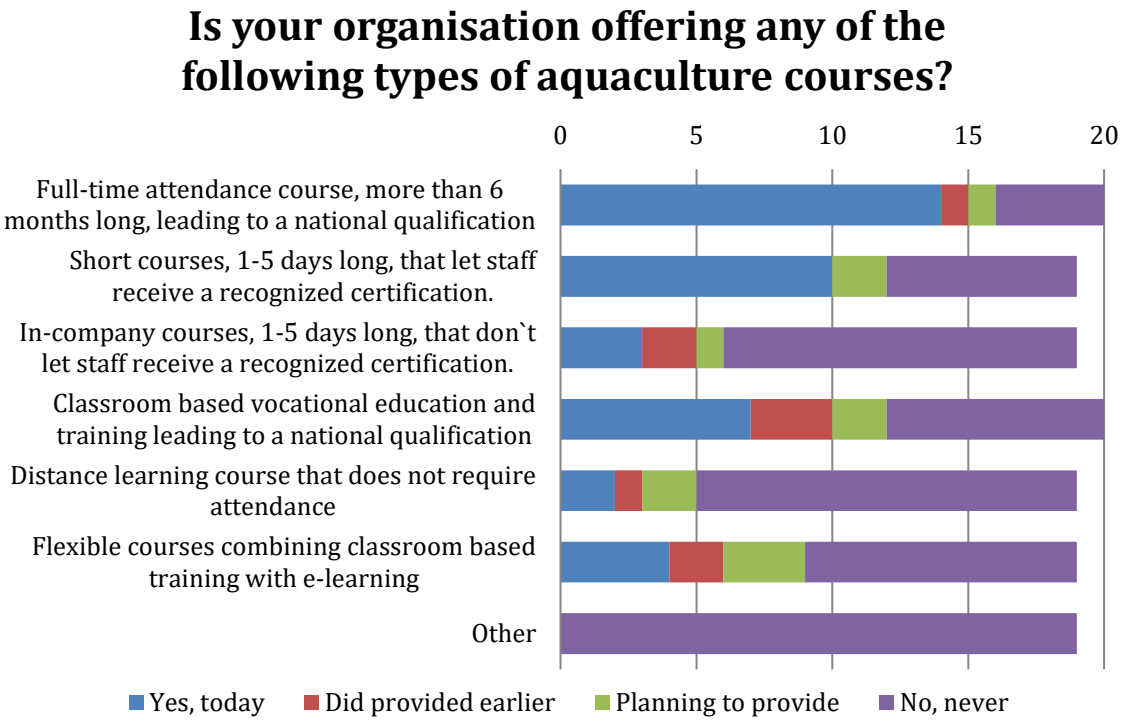


Figure 8. Which type of courses are the aquaculture VET schools offering?

College based attendance training to the students age 16 to 18 are the dominating training activity offered by the aquaculture VET schools in Norway. Approximately half of the responders mention that their school have been involved in offering shorter courses leading to a certification. 7 persons report that their school offers on-site based training to students from industry that give them a national qualification, confirming the results gathered during the Aqua Nor in 2017 where 50% the aquaculture VET schools in Norway offered such courses. Only 2 persons reports that their school have been involved in distance learning courses, while 4 persons mention that their organization are involved in flexible courses that include e-learning.

Farming industry in Norway, on the other hand (WP 6), would like to increase the share with e-learning and/or flexible training solutions, such that their staff may study when they are in work at the cages. To close this gap will require development, distribution and sharing of digital learning resources, training of teachers in application of e-learning and distance learning training solutions, and to consider unitization of the curriculum.

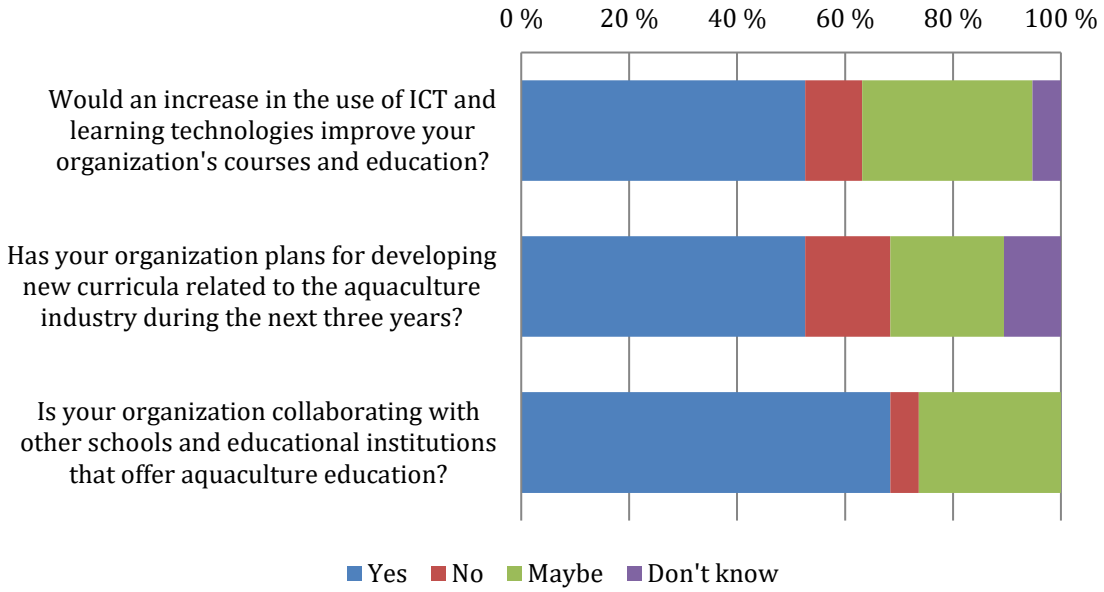


Figure 9. What are the plans for further development of the aquaculture VET at the schools?

Half of the responders believe that an increase in the usage of ICT and learning technologies will improve the aquaculture VET offered by their school. The same number of persons report that their organization has made up plans for development of new curricula during the next 3 years. However, 2 out of 3 persons report that collaboration between schools that are offering aquaculture VET is even more important. These data shows that it could be possible and realistic to consider initiating collaborative pilot projects that may both raise and improve aquaculture VET in Norway. Our data indicates that approximately 50% of the VET schools may take part in pilot projects addressing new models for delivery of VET to staff from industry.

Teachers in the aquaculture sector in all 12 European countries cage farming fish in marine cages, mention the lack and need for developing and producing updated aquaculture related earning materials.

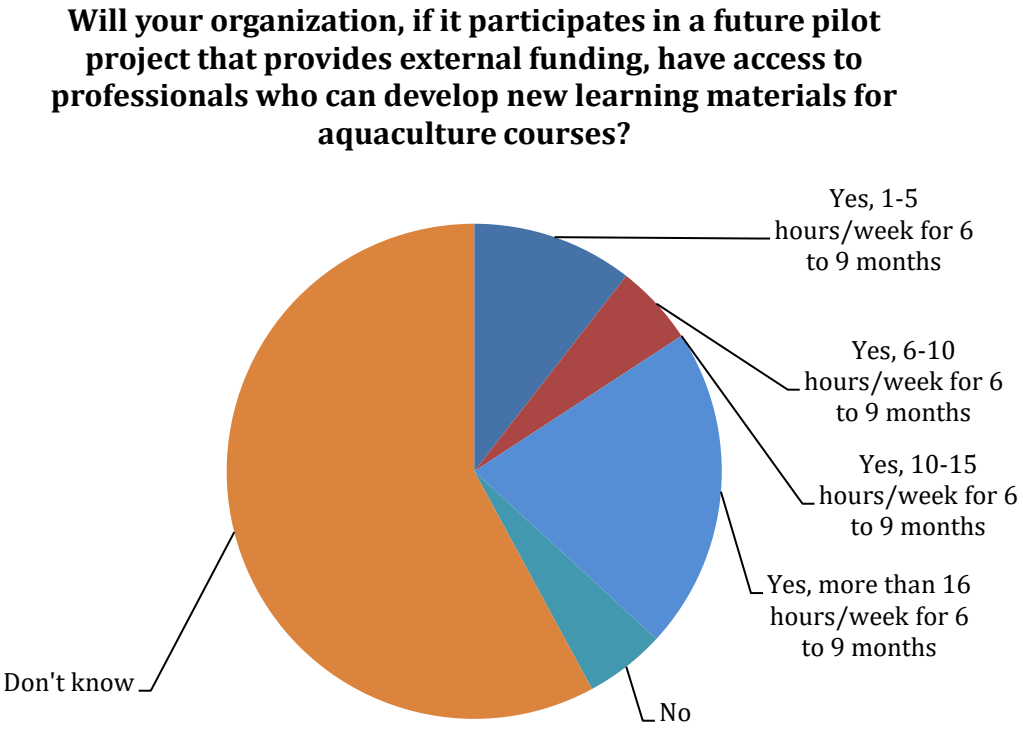


Figure 10. May professional teachers from VET schools take part in development of new aquaculture VET learning materials ?

Interestingly, 11 out of 20 responders from Norway don't know if their organization may take part in such development given that funding of the work existed. This result reflects that aquaculture VET teacher will often need to teach 24-25 hours in the classroom per week. Since they are teaching aquaculture courses in rural areas, it is difficult to consider replacing them with new teachers on a contract basis.

Only 4 out of 20 responders point out that they may contribute with more than 16 hours (approximately 2 days of work) during a period of 6 to 9 months. No one believes that their organization could take part in such development by offering 10-15 hours per week during a period of 6 to 9 months. It is worth noticing that to invest 2 days of work per week in a project that develop new learning materials is a minimum in order to achieve continuity in the work and have enough time to test out, evaluate and give feedback to the professionals developing the material.

These data indicates that, though the whole VET supply sector in all countries requires development of learning materials, only a few of the aquaculture VET schools in Norway actually have personnel that have interests, engagement and capacity for actually taking part in such work. Our data indicates that only a few VET schools may take part in

development of new aquaculture learning materials. A few of their teachers may supervise, test out and evaluate what professionals could develop. In a country like Norway, with 14 aquaculture schools offering VET in 2018, probably less than 5 aquaculture teachers may actually have the skills, competence and time available to take part in pilot projects addressing development of curriculum materials. Thus, projects with the ambition of start developing, distributing and sharing new learning materials, may fail unless resources are spend on finding and engaging these few teachers.

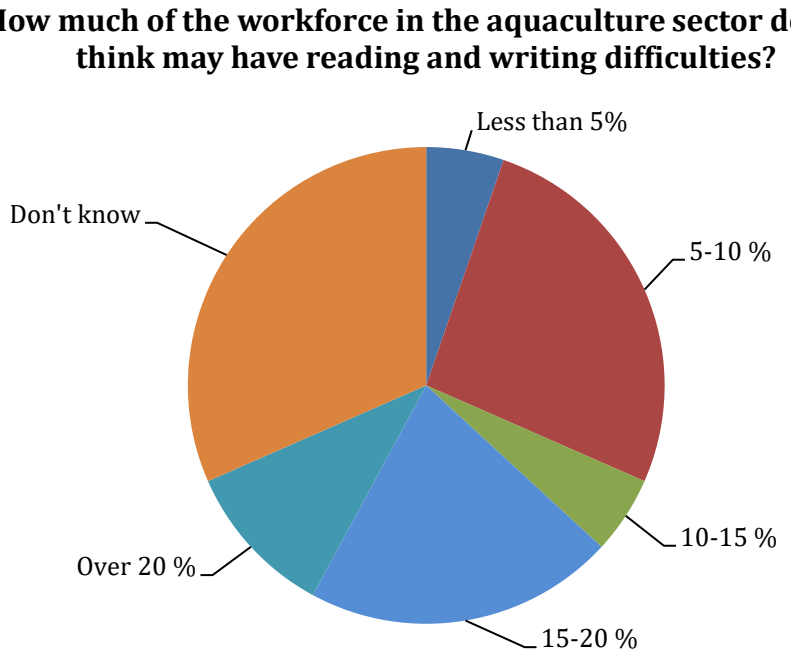


Figure 11. How do the persons from the VET supply sector consider challenges related to reading and writing difficulties?

1 out of 4 persons from the VET sector believe that 5-10 % of the workforce in the cage farming sector struggle with reading and writing. 1 out of 5 believe that 15-20% of the staff get challenged with reading and writing difficulties, while 1 out of 10 believe than more than 20% struggle with this. On the other hand, 3 out of 10 point out that they don't know. The dataset from this small survey, as well as the information gathered through interviews in Norway, shows that the personnel working in the VET supply disagree about the importance of writing and reading difficulties.

Teachers mention that there may be two groups of students in this group. One is the staff from industry that suffers from dyslexia. The other group are the staff that prefers to learn by carrying out practical work, and has selected to work in this industry as it requires good problem solving skills. Our data shows that further investigations should be done in order to figure out what is the correct numbers.

It may be mentioned that our results indicate that personnel from industry don't consider this to be important, since they believe that the numbers are small. On the other hand, in order to obtain a national qualification within aquaculture, the students have to pass a 5 hour long theoretical exam, where they have to write 5-6 pages that describe for instance a full production plan for fish during a period of 14-15 months.

It is worth noticing that 6 out of 20 persons from the aquaculture VET schools believe that the workforce from industry are facing serious challenges related to writing and reading difficulties. At the same time, 6 out of 20 persons don't know if this is a serious challenge at all. If the impression of the teachers are correct, how could then those persons from industry that are facing reading and writing difficulties expect to ever manage to receive a national qualification within aquaculture in Norway, if the current assessment practices are not changed or made more flexible ?

The results from this project shows that this is an area that need further research, in order to document if and to which degree writing and reading difficulties are a serious challenge or not within the fish farming industry. If our indicative results turn out to be correct, there is a huge need to introduce new assessment practiced in aquaculture VET in Norway for this type of personnel.

Aquaculture VET qualitative data

The qualitative data has been gathered by applying structured interviews with representatives from a selected number of aquaculture VET schools in Norway.

Interviewing representatives from 11 out of 13 aquaculture VET schools attending Aqua Nor 2017, the largest exhibition and aquaculture conference in the world, have provided a range of qualitative data, observations and results. In addition the BLueEDU project has visited 3 schools in Mid-Norway and 2 schools in Northern Norway, in order to carry out a structured interview with their teachers. Each interview lasted from 60 to 90 minutes.

The structured interviews with teachers from VET schools, have identified and made up the following categories of teachers impressions:

- Teachers` impression of common and typical challenges within aquaculture VET

Companies' mange to find solutions to technical problems. It is the knowledge of the biology of the fish that is the challenge. It is important for companies that those that have obtained a National Qualification (NQ) should be able to start working immediately after graduating without offering additional training.

Students graduating with a NQ, needs about 3 years with experience at the cages before they know how to operate all type of machines and processes.

One of the main challenges is how to combine knowledge about fish biology, fish health and the needs to train various types of technical skills in order to prepare the students to take part in work operations with various types of machines. The aquaculture curriculum could have been made wider in order to manage to do that. On the other hand, if the curriculum is increased, it is difficult for the VET teachers to have enough time to train the students - that to often don't like to attend theoretical training, but instead expect practical training - in just 2 years at the school.

In the forthcoming years, farming companies must start employing staff that has various types of skills, not just aquaculture VET background. This could for instance include mechanical skills, electro skills, etc. in order to offer sufficient specialization during complex work operations out at the cages.

It is important to investigate how to better develop "local curricula" based up on farming companies' need in one region. Could some of the ideas, principles and models from Scotland, where students may select and put together smaller course modules, be extended and applied in Norway too? The existing system for curricula in Norway is wide, whereby it should be possible to apply it further and include unitization.

There is a continuous on-going discussion addressing the level of the exams in the NQ in Norway with respect to handle the fast advances in technology, while at the same time satisfying the request for farming industry needs at regional levels.

The biggest companies like Marine Harvest and Salmar have developed their own quality assurance systems, while medium sized and smaller farming companies don't have resources to do this. Forthcoming projects must try to link up to those specifications applied by the big companies, to include them in forthcoming educational projects in such a way that the medium and smaller companies may take part and start applying them.

In Norway we may need to look into levelling of NQ, inspired by the system in Scotland, since growth of the farming industry requires more specialization. Higher VET is going to be a long study, whereby it may be a good idea to develop modules for addressing particular topics within fish farming that goes beyond the NQ, while they at the same time they are below the level required within higher VET level. Such specialized courses within for instance fish welfare or fish biology, may be offered to a few persons at each farm, whereby they become specialised operators for certain operations.

It is a key issue to offer and build new aquaculture competence for the staff at the farms. Additional levelling of the competence may be needed in the near future in order to offer more specialization to the rapid growing farming industry, and in particular the supply industry where there is expected to be a significant grow of new jobs.

The certification system applied in the oil industry may serve as an inspiration for the aquaculture industry. Many of those working in the oil industry works off shore for 2 weeks to be followed by a period of 4 weeks on shore (at home). During these 4 weeks they have to take courses and complete new certificates in order to keep their job. Such a similar model may be investigated by the farming industry too.

Today specialist workers to a large degree carry out the various types of jobs at the farms and at the cages. This work methodology has changed during the last 5-7 years due to technical innovations and new machines. The current NQ is, however, designed to offer general knowledge within production of smolt and farming of fish, in combination with provision of a wide technological competence. The VET schools should do this during a period of just 2 years. It is necessary to add more in depth knowledge, either organized as optional courses during the second study year at the VET school, or as new specialized courses that may be taken after the completion of the NQ. Such a specialization is inspired by how the oil industry organizes and set up a system with certificates, which staff must take in order to work in the industry.

One of the big, global companies in Norway is trying to establish a model consisting of many short, certificate based courses that are linked to their quality assurance system. Those courses will to some extent be taken by staff that has completed their NQ. Their model include in company based training that are directly related to use of advanced equipment, to be followed by training that are part of the current NQ in Norway. On top of this they require their staff to take shorter certificate based courses. The certificate-based courses may be done at the farm and offered by external organizations.

Unfortunately, industry companies still disagree about how new and more specialized VET programs should be organized and set up. The reason is that many companies still don't understand how the VET system is organized.

Needs and wishes differ from company to company, depending on where the staff is working in the farming companies. Industry must engage more in order to take part in the development of new VET systems.

The aquaculture VET schools in Norway are distributed across a large geographical area in the rural costal zone, separated by fjords, mountains, valleys and islands. Due to the distances, travelling is time consuming and expensive. It would be very useful if parts of the aquaculture curriculum could be digitalized and organized in such a way that it in an easy way could be shared and updated among the teacher experts at the 14-aquaculture VET schools. Many of those teachers are today working together in small groups at each rural VET school, facing a teaching load with up to 24-25 hours in the classroom. This makes it challenging to develop digital resources at the individual level or at the aquaculture VET school level.

If parts of the theoretical training were available as e-Learning, it would be easier for the farming companies to send their staff to attend courses that prepare them for the theoretical exam within their NQ.

The companies meet the same limitations with respect to distances as teachers meet, whereby this some extent limits their willingness to let their unqualified staff attend training that only is based up on classroom activities.

Is it possible to set up a digital database containing new and updated learning materials for usage all over Norway, such that a teacher in Fræna (southern Norway) may use it in the same way and at the same time as a teacher at Meløy (Northern Norway) to offer specialized training courses? This could be done by applying flexible training solution consisting of distance learning solutions in combination e-learning and with practice at the farms where they are working. Fish welfare and fish health courses, boat operations, anchoring of cages and farms in the sea, work operations including use of simulations, farming and the environment, are examples that could have been organized and structured to educate specialized staff at each farm, such that they get a higher level of competence. These skills may afterwards be applied to support staff when they take part in advanced operations at the farms. Furthermore, knowledge within automation and the electrician field area could have been organized in a similar way, making it easier for the teachers to apply this knowledge in their teaching courses towards specialized staff at the farms.

The aquaculture VET schools are and will be challenged by the rapid technical developments within the farming industry. This requires more specialized training. Such training materials could be structured and organized in a digital format, and then distributed, shared and re-used by teachers at the aquaculture VET schools to offer decentralized, but specialized training courses to staff at the farms. The costs of developing and maintaining such material will be high, whereby it is not realistic that each single aquaculture VET school can do this.

To offer remote synchronous training by use of two way video is challenging, since it becomes difficult to follow up each single student. Test courses run in Northern Norway have included teaching groups of aquaculture VET students through videoconferencing. The results would have improved if the VET schools have had access to high quality

digital learning materials, in combination with services that better engage and motivate especially young learners. It is also important at the same time to apply tools and methods that better evaluate and assess students' continuous learning progression during the course at the group level and at the individual level. It is difficult to achieve this by applying only distance learning solutions and e-learning in particular, in combination with a 5 hour long written exam.

The current model with 2 years at a VET school consisting of a combination of theoretical training and workplace-based training at farms, and 2 years as an apprenticeship in companies, works quite well today for young learners. This education and training offers the students a wide national qualification. Specialization beyond this level may be done by combining application of e-learning and distance learning solutions to be offered from specialized VET schools, in combination with on-site gatherings organized through the network of regional VET schools in Norway. The farming industry is still not big enough to let each single aquaculture VET school set up, maintain and offer specialized training courses beyond the level of the national qualifications in every aquaculture subject area.

The network of 14 aquaculture VET schools consists of many small schools. However, there isn't today any system solution available to support development and coordinate the work at these schools at a higher national level. This includes for instance easy access to updated digital learning materials, technical infrastructure and platforms for online delivery solutions to students from industry, teacher training programs addressing the needs for offering additional specialization within the aquaculture sector to staff from industry, and system solution for offering higher level expert training to staff from fish farms beyond the national qualifications.

If a system with module-based aquaculture training has been developed and organized to support specialized training of staff at farms and quality assured by for instance aquaculture staff from the universities and the industry, a similar system solution may have been used to support the training of the young students age 16-18. This would have been a more rational way of working and cooperating, instead of developing a VET programs at each aquaculture school.

It is worth remembering that it today (2017) probably are more people from industry taking an aquaculture VET course preparing them for national qualifications, than there are young students following an aquaculture education path within the apprenticeship system.

To obtain a national qualification for staff from industry when working at a RAS based farm-producing smolt, or in a farm feeding up the smolt to big salmon or trout, are today two very different disciplines that require specialized knowledge. There is a large need to develop specialized training addressing application of RAS technology in production of smolt.

The aquaculture VET schools offer a wide basic VET today that are similar and comparable, based up on the fact they have regular formal meetings with the farming industry, as well as informal contact on a day-to-day basis with the farming companies in their region. This allows the VET schools when required by the farming industry,

every year to adjust their aquaculture training to reflect industry needs for in-dept knowledge in certain areas.

Service companies will probably need more training than the farming companies during the next upcoming years. This is a consequence of the larger growth in this sector, compared to the farming companies where the growth of staff is not expected to be large due to technical innovations and digitalization of the production.

The most important strength of the aquaculture VET schools are their ability and willingness to partner up with farming companies in order to educate young students through the apprenticeship system, thus supporting the development and growth of the industry in their region with skilled personnel that have got a NQ. Courses are adjusted every year to better fit the needs within the industry in their region. This helps creating a "local ownership" from the locally owned industry towards their regional VET school.

Students that have practical problem solving skills are very attractive for the farming industry. By offering and including practical work based learning, VET schools manage to motivate and engage these students to invest additional time on the theoretical subjects too.

Some VET schools have registered that the culture for delivering training within some the farming companies has changed during the last couple of years. There is today (2018) much more focus on reducing the fees for the courses, and the cheapest course is selected even though they are much shorter than any previous course given, thus affecting the quality of the training.

The VET schools organize formal network-based meetings where all the companies in their region attend, 2-3 times per year. During these meetings industry informs the school about what they consider to be important areas to cover with training activities next year, which parts of the training that are old-fashioned due to change in methods, equipment and processes, and which new equipment that they have got and will start using. The schools may inform the companies about when the various activities with practice and work-based learning should have approximately been done during the next months, giving the industry a chance to offer feedback such that the schools to some extent may adjust their plans.

The aquaculture VET schools have experienced that the industry after some years with practice, have got competence to request changes in the forthcoming training programs. Industry know that it takes time for the schools to adjust their training programs, whereby the industry usually start contacting the schools at an early stage in order to get in dialogue and take part in a joint development process that introduce changes in the training. This results in a dynamic interplay between the VET schools and the farming industry.

The close formal and non-formal cooperation between VET schools and farming companies, leads to changes in the VET programs at a yearly basis. As a consequence must learning materials and training methods be easy and fast to change. Traditional textbooks cannot anymore being used. New formats must be developed that makes it easy, fast and cheap to update and share learning materials.

If the farming companies should improve their production, this must be done together with the VET schools with results that are created and aggregated in a continuous way. Companies should be integrated into the development process through a partnership with regional VET schools. The VET schools should order internationalization by starting with the needs in the farming industry, and not vice versa.

- Teachers´ impression of needs for teacher training

Further specialization supported by development of new digital learning materials within aquaculture, will require support by relevant instructor and teacher training programs that demonstrate how to apply them in combination with modern methodologies.

Teachers needs to spend a limited period of time where they may attend a farming company as an auditor ("hospitering") in order to get updated on the latest production methods. Before 1994, this was possible to do in Norway. After the major reform carried out in 1994 for upper secondary education, there have not been any resources available at the County level to let aquaculture teachers take part in such internships.

Aquaculture VET teachers are today supervising young apprenticeship students specializing in farming of halibut, lumpfish, stations where veterinary research is done, production of smolt, farming of salmon, treatment of sea lice, service boats and RAS technology based farming. They are at the same time supposed to supervise staff from industry in these areas too. It s however, impossible for an aquaculture VET school in Norway to offer specialized training in all these sectors. It would have been very useful to attend specialized teacher-training courses addressing the upcoming need for offering specialized aquaculture training to staff from industry.

Industry should get engaged and better involved into the training in order to make up concrete recommendations for training activities that will support the emerging needs for specialization within the farming industry. This should in particular targets the specialization courses to be offered beyond the national qualifications. Site managers and regional leaders in the farming companies will decide in which fields their staff needs to be upgraded. Thus, industry should be represented when designing and developing modern teacher training activities and programs.

It is important that the rectors office and the county representatives (owners of the VET schools) get involved in the planning of teacher training programs in order to allocate sufficient resources for the teacher, allowing them to spend some time to test out and implement new methods, tools and services into their own practices.

Aquaculture VET schools will need to replace the teachers attending a teacher-training program, in order to deliver their on-going aquaculture VET courses. This is challenging and difficult in rural areas, and would require long term planning. One way could be to test out a model where VET schools in partnership with industry, let experienced staff from farming companies replace the teachers during a limited period of time. Combining this with programs offering in-company work based training where students spend a period in a company could do this.

The industry owned offices organizing and coordinating the practical 2 years long training apprenticeship period in companies, could be engaged and take part in the planning of the teacher training programs at the aquaculture VET schools.

Teacher training programs and training courses could be organized as a combination of gatherings, distance-learning solutions combining e-learning and synchronous usage of video lessons, and own studies with practice in their classes.

To establish a national forum addressing emerging aquaculture VET needs, like the "FosFor conference" for fisheries, would be useful in order to better support and implement teacher training development within the aquaculture sector.

- Teachers` impression of how training courses for young students are organized, structured, evaluated and assessed

It is important for the aquaculture VET schools to give the young students good attitudes and respect for industry needs within the farming companies, before they start on their apprenticeship education. This includes for instance how to manage and organize their work time, how to deal with the employer and how to get a good a handcraft in their fingers. It is important that the teachers become a good role model for the students.

Aquaculture VET includes production of smolt and farming of salmon and trout. The aquaculture VET schools use various types of teaching methods. They experience that a combination of a theoretical review together with a practical review at a fish farm, with and without a teacher, is important. It is important to know the farms and get an overview with examples of how the production is done at various farms before the theoretical review at school, because then, the students have specific experiences to talk about during the review of the theory in the classes at school. When the teacher talks about a farm and the process and tools they apply, each single student has seen it. Thus, the aquaculture relevant education consists of a combination of observing work operations at the farm; take part in work based learning, and to learn the theory in classes at the VET school. After the first year of studies, the students may continue by either selecting agriculture or aquaculture based training during their study year number 2.

Practical work based training is very important due to two reasons. The students may apply their experiences to link theory towards their practice and they may use it to establish networks within the aquaculture industry. There are many students who receive their first apprentice contract already during the first period with practice during year one at the fish farms.

During the first year of study at a VET school, the students are offered a period of 6 weeks with work based learning at farms. This is increased to 8 weeks during their second year of study. During these periods the teachers are visiting each single student at each farm in order to evaluate and offer continuous assessment. The practice at the farms are important, since the VET schools must demonstrate and learn the students how the various production companies apply different methods and tools during the production. After their periods with practice, the students present what they have

learned to the other students in the class. In this way each student may have a chance to learn about the quite large variation in the production methods and processes. In addition to these long periods with practice, each class is visiting the fish farms one or two days per week. Those shorter visits are applied to introduce tools, methods and operations before the teacher in class gives the theoretical training.

Aquaculture VET schools apply internships from companies. Staff from industry is invited to visit the schools and take part in the training, by giving the latest and up to date knowledge about production methods and processes. This could for instance be done by inviting the manager that is responsible for the health, environment and safety issues at a farm, to give a lecture (half a day) in a class. Alternatively, the VET schools may invite personnel from different companies to come to the class and together present the latest updated knowledge about important production methods and tools to the students. For instance, subject covered by experts from industry through internships include the latest knowledge within feeding, analysis of moorings or development of fish feeds.

The VET schools have various types of formal and informal agreements with external organizations like veterinaries, marine research institutes, etc. When personnel from these organizations are visiting a region, the teachers at the VET schools expect this is going to be combined with a presentation of the latest knowledge at the regional aquaculture VET schools and to their aquaculture VET classes. This contributes to secure updated state of the art knowledge, as well as creating interests and engagement in classes.

The students are still to a large degree recruited from the costal region around the aquaculture VET schools. During the last 2-3 years, however, the VET schools have started to recruit some students at the County level. The VET schools visit systematically many secondary school classes (up to 50 classes per year) in their region and to some extent at the County level, in order to inform and market the potential for getting a well-paid and interesting job within sustainable aquaculture industry. Aquaculture has become and is a popular study program. At some of the aquaculture VET schools there are today lists with students that are waiting in order to start on their aquaculture education and training.

There are some examples where VET schools organize aquaculture camps for girls in a region, in order to help motivating and engaging them. In addition some VET schools organize entrepreneurship and innovation camps for youths that target the aquaculture sector. They receive cases from the companies, work on solving them for one day, before staff from the farming companies assesses and evaluate the proposed solutions. The winners from each local region, municipality etc. get 14 days to improve their proposed solution, before they meet in a final “competition” where a winner from the region is selected by staff from industry. This is done together with an entrepreneurship organization for youths and has become a popular activity among youths in the costal area.

Some of the VET schools that are offering maritime education, fisheries education and hotel and service education, provide VET that gives national qualifications while at the same time the students have taken all certificates required according to national

regulations. These students are very attractive by the companies. When they start working the companies don't need to send them to take the certificates regulated by law. This is, however, still not the normal procedure in aquaculture VET in Norway.

Some VET schools start the apprenticeship system at the begging of study year number two. Students will every week partly work in a company and partly attend classes and courses at the VET school. They receive continuous assessment in the form of written and oral tests, as well as assessment of their workplace based learning activities. For those who follow the 2+2 system, there is an interdisciplinary exam at the end of year 2, to better train and prepare the students for the final practical exams. The goal with the assessment process is to figure out what the students know and which skills they have obtained. This is partly done through assessment of work operations, partly through traditional tests.

Courses leading to a certificate include theoretical tests and exams. The students must manage to reach a minimum level/threshold on each test in order to pass the exam(s).

VET schools enhance that long term mobility support for their students would be more useful than the short term two weeks exchange programs they take part in today. To receive students from Scotland that could stay for half a year would be very interesting to test out in cooperation with offering practice in the regional fish farming industry.

VET schools try to engage experienced personnel from the farming companies to start working as teachers, in order to get updated, relevant experience from the cages and wide farming competence into the training. This keeps maintaining the network towards the industry too, thus help utilizing this as a resource for engaging students to take part in periods with practice at the farms, and to organize work-based learning in combination with continuous assessment at the farms. In addition the VET schools must recruit some teachers from universities.

The VET schools "help fish farming companies to recruit new staff" by engaging the companies to offer demonstrations, practice and work based learning to students. Some of their company staff is engaged to take part in teaching and assessment practices that are directly linked to some of the training delivered at the VET school. They are also engaged to support networking activities by establishing partnership programs. The partnership programs include training and updating of the teachers knowledge and competence, and periods where students take part in the work at the cages.

Challenges related to reading and writing difficulties for students (e.g. dyslexia) depends on how well each teacher adjusts and differentiate the teaching towards each student and how to follow up, give feedback and evaluate the students learning progression. It is important to apply methods where the student performs best. Some VET schools don't think that the ratio of students with such challenges is larger in the aquaculture sector, compared to other sectors. At the same time teachers from other VET schools mentions that this may be a significant challenge.

The farming industry would like to keep employing staff that at one side have very good problem solving skills, while at the same time they have obtained national qualifications within aquaculture. The recruitment process to the VET schools, however, is based only

on the grades from secondary schools, where the theoretical training are in focus. The teachers have registered that industry start expressing some worries related to the forthcoming recruitment processes; since there is a risk of that they will loose those who are "doers" from the secondary schools as they don't manage to quality.

The students with good theoretical skills, and a majority are girls, start on their aquaculture VET education with an ambition to get a national qualification. However, after completing their two years with theory-based education in combination with practice, they decide not to apply for an apprenticeship position. While 80% of the students did earlier apply for an apprenticeship position in order to complete their NQ, this number has dropped to 40% now at one VET school in 2018. The other 60% of the students instead take one more year with theory at the VET school, in order to start directly at the university. By doing it in this way, they don't get the first practical production experience through the apprenticeship system follows by a period with work in a farming company. The farming companies, on the other hand, estimates that 80% of their staff needs a national qualification, while only 20% of their staff needs a university degree.

There is a challenge to manage to give the students enough theoretical knowledge during the first 2 years at the VET school, as required by the farming industry. One way to try to solve this is by letting two or three teachers collaborate on reaching the predefined learning outcomes in aquaculture. The mathematics or language teachers' collaborate with the aquaculture teacher, in such a way that the students' work with aquaculture-based calculations in math, while they at the same time write an aquaculture related report in a language course. In this way mathematics and languages become part of and integrated with their practice. This training and assessment methodology requires that the staff at the VET school have a joint goal within the schools aquaculture VET program, that they collaborate closely and that the teachers get engaged and keep on working at the school.

- Teachers' impression of how skills and qualifications are assessed and graded in order to give professional feedback on students learning

When the VET school starts to teach a new subject, the students have got the learning outcome descriptions and what are the criteria that will be applied to evaluate and assess their knowledge. The students take part in a continuous assessment process. This process targets what do each student still need to learn, as well as how the student should try to access this knowledge in order to reach the competence goals. The process is organized in such a way that the student takes part in it and may evaluate them self towards the criteria that has been defined. The continuous assessment process includes practical tasks like checking the motor or to prepare a boat for a certain activity at a farm. It also includes that the student should select a work operation to carry out. This starts by registering in the digital portfolio what to do, before the work afterwards is done. The continuous assessment process then includes the planning phase, the execution phase and the evaluation of how successful the learning outcomes where reached after the work has been completed. The students are expected to make up a presentation of such a project. The format they select by them self. If could include a power point presentation, a video, an audio file, etc. since there are no limitations in the format. The teachers encourage the students to select presentation

modes that show what they have learned, what they know and which competence they have got. In addition the VET schools offer some multiple choice based testing and assessment, though this is a small activity.

The assessment and grading process varies for each type of course. Some courses in year two are more theoretical, whereby there are some formal assessment situations consisting of oral and written tests. During the first year a more practical approach is used. Practical exercises at the farms are included in the assessments. In one specialized course "yrkesfag til fordypning", companies will do the assessments and give the student a grade.

The teacher will visit the students during their several weeks with practice at the farms. Towards the end of this period with practice, the teacher will spend several hours together with the students during their work at a farm. The teacher will use these observations to assess the students' knowledge, organized as a practical exam at a farm. For example, it may include a review and discussion of the planned work tasks that the student is going to do out on the farm, to be followed by observations of how the student is doing the practical work. The assessment is finalized through a discussion with the student.

Multiple-choice based test are not much used in aquaculture VET. In stead written tests are applied several times during a study year for each course. Each test is targeting one subject area. This is done in order to train and prepare for the final written theoretical exam. For students who may not be so literate, a minor part of a test may be multiple choices based tests such that they could demonstrate their knowledge. For this type of students, this is an alternative that gives them an opportunity to demonstrate which skills they have got. At the end of the second year of studies, there is in addition a written, interdisciplinary theoretical exam where they for instance set up a production plan based up on a number of predefined parameters. This exam is developed at the local level, but graded by an external examiner.

In program subjects, such as for instance "Farming and the Environment", there is a final test at the end of the year at the school. During this test it is possible to assess all the competence goals within the course, in order to obtain a comprehensive assessment of knowledge and competence before the student receives a grade set by the teacher in this course. This is organized like a dialogue where the student may demonstrate what they have learned. Students will receive a grade for each course they take. In addition to the final tests in the program subjects at the school, there is a final oral, practical exam at a farm towards the end of their second year of studies. During this exam the students may demonstrate what they have learned during two years, demonstrated by solving various types of work operations at the farm. When passing this exam, the students demonstrate to which degree they are capable of entering the apprenticeship system with two additional years of practical training in a company.

After two years with practical training in a company, the students have to pass a practical exam. The length of this exam is one day long and it is assessed by experienced personnel from the farming industry it self. In advance the students get a description of what should be done and such that they may prepare them self. This is a comprehensive exam where the students demonstrate how the practical work should be done. They

make up a plan for how to solve the various operations during the day. When demonstrating how the various operations should be done, they in addition get theoretical questions from the examiner from the farming industry. Those questions must be answered in parallel to the work operations.

- Teachers` impression of how training courses for students from industry are organized an assessed

The two final theoretical and practical exams that give the students national qualification are at the same level of difficulty as for the young students. The course that is preparing students from industry for the theoretical exam is approximately 60-70 hours long. This is much shorter compared to the course that the young students get (approximately 500 to 600 hours), since it is expected that the students from industry shall have approximately 5 years with relevant experience.

For instance, each year during the period 2010 to 2016 at the Frøya and Hitra region, approximately 25 students from industry passed these two exams per year in order to receive the national qualification. These numbers are approximately at the same level as those for the ordinary young students taking a national qualification within aquaculture at the VET school at Frøya.

The farming companies like that all their staff shall have got a national qualification. They regularly contact the aquaculture VET schools requesting when the next aquaculture VET course starts, whereby the recruitment of new students from industry is easy. The farming companies consider this as a good investment, whereby the students may attend the course free of charge.

The students need to get trained in answering the theoretical exam. They must understand and learn how to document in writing, how they carry out operations at the farms. For many students, this is a new experience. In the day-to-day work this is just a natural part of their operations, which they don't need to document in writing. Thus, a central component in the aquaculture-training course is to train the students in answering an exam.

The schools offer the students a flexible training framework, where the training courses are divided into a number of on-site teaching activities. Each gathering may be organized during a weekend or in an evening, and the teacher may travel in order to meet the students in their local or regional area.

Students attending this type of training have attended a full day at the job just before the training starts. The training must be done as practical as possible in order get attention. It is the farming companies that require that the training be offered outside the working hours during students' free time. During the period from April to September, the companies are very busy as the fish is growing fast during this period, whereby they need all their employees. Thus, in the future VET schools could try to organized and offer training to students from industry during the quiet production period from January to March. This would make it easier for the companies to let their staff participate in training during their working time.

The pedagogical methods must apply various tools in order to vary how the training is done, and to better engage the students attending the on-site gatherings. Teacher may apply power points to present the training materials during class. However, discussions inside the class are one of the central and most important methods that are applied, since the students as a group have experience from the production. Often some of the students know more than the teacher, e.g. they are updated on the newest production methods, work operations as well as how to handle new tools and machines. The teachers may for some subjects apply provocations to engage the students to take part in the discussions. The health, environment and safety area is a good example, since the teachers know that it is challenging for the farms to follow all the obligations regulated by laws during every single working day.

The teacher applies information from Internet as their main resource for learning material during their courses. They don't use learning management systems or books, since no updated books with updated learning material exist, nor do updated digital learning material exist.

Towards the end of the course, the students must learn how to read, understand and interpret the text in the final theoretical exam and link this towards their daily work at the farms. Students must get trained in answering the theoretical exam in such a way that they may apply their knowledge and experience from the practical production at the farms.

There is a huge difference between teaching students with experience from industry, and teaching young students that have no experience. The VET schools try to give the young students experience by offering them time to visit farms, observe and get involved in work operations in order to acquire experience that may be used to link the theory towards. This may be done by offering the class as a group, one day per week at a farm together with 2 teachers.

VET schools apply a pragmatic approach when organizing their VET courses. Their teachers may travel out to a local geographical area and set up a course, if many students are living in a certain area in the costal zone. On the other hand, those living in the rural costal zone are used to travel by car, whereby one hour driving one way is not considered to be any problem in order to attend a VET course that are recruiting students from a wider geographical area.

VET schools recommend that the employers allocate at lest some of the staffs` working time for training. The farming companies on the other hand, during the last 2-3 years, have started to request that the training should be organized outside the working hours, either as training in the evenings or during weekends.

To pass the two exams leading to a national qualification in aquaculture is challenging for many students from industry. It is particular the theoretical exam that are considered to be difficult. The reason is that the candidates must demonstrate that they have the required overview and apply their knowledge and experience to write down a specification of a full production plan. This is a new experience for many candidates, which is used to spend all their time on practical work and take part in the daily problem solving processes out at the farms. Thus, the VET schools must spend time

during these courses on motivating the students and train them on the writing processes. Many students have got the practical competence through experience, but lack practical training in writing. Several VET schools have mentioned that an oral examination process could have been better in order to document students' knowledge and competence.

- Teachers´ impression of which skills students should get during their education?

There has become a culture within the farming companies that their staff should have taken a national qualification when they start working. In 2018 most new positions announced by farming companies, requires a national qualification.

From the farming industry's point of view, the students must get enough knowledge and skills to carry out the day-to-day work operations and activities. In addition they would like to employ students that have got good problem solving skills, since the staff at the farms every day needs to solve new tasks and challenges that are linked to the on-going production.

Industry expects that students have got indebt knowledge about sustainable production in the farming sector. This is very important, since the production must be based up on sustainable resources in order to both survive and grow the business further. When the production is expected to increase in the near future, this becomes even more important. Thus, students should graduate with good attitudes with respect to greening of the production and applying sustainable production methods.

Aquaculture VET should combine and give the students holistic knowledge and skills for doing the day-to-day work, enhance their attitudes towards achieving sustainable production, while at the same time each single student should learn how to take care of their own life. Health, environment and safety issues are one of the most important targets to address properly in the VET courses, in order to help reducing accidents and failures in the production at the farms.

The aquaculture companies want to have close collaboration and dialogue with the VET school in their region. The aquaculture VET schools set up 2-3 formal meetings per year with the farming companies. During these meetings all companies in a region around the aquaculture VET school, are invited to participate and express their interest and wishes for how the training should be organized and set up during the next year of studies. In addition there are numerous informal meetings on a day-to-day basis between the staff at the cages and the teachers following their students on visits, practice and work based learning.

The learning output descriptions and the competence goals must be defined in a wide way in order to catch up with the fast technical developments within the industry. Every year the aquaculture VET schools need to update and adjust the curriculum to reflect the current production methods and production processes applied by industry. For instance, the teachers must teach how to apply cleaning fishes or to reduce the challenge with sea-lice, based up in the production methods applied by the farming companies every single year. This is only possible to achieve by having a close and on-going dialogue with the aquaculture industry as described above. The schools engage

the industry by asking them about their needs for skilled workers during the next year and what they should focus on in their training. The schools cannot always promise to satisfy the wishes from the companies. However, too often they manage to do that in order to offer students that graduate the latest knowledge within farming and production.

Tenders set up by the County who are the owner of the schools, regulate the learning management systems applied by the aquaculture VET schools in Norway. Those companies who win a contract may offer their learning management system for a period for at least 4-5 years. ICT engineers at the County administration manage these systems centrally, including setting up the students' user accounts. The primarily end-user group are the young students age 16 to 18. They may be located several hours driving away from each school. Schools report that it is challenging to manage to engage the ICT engineers to help them to set up accounts for the staff from industry. This may indeed be a bottleneck for application of e-learning for staff from industry.

- Teachers` impression of how to develop their skills

Teachers attend the most important places where the education system and the industry representatives meet. This consists of conferences and other types of meetings at regional and national level. This help the teachers to develop and maintain their networks, they learn in order to better understanding how other schools organize their VET practices and they get direct feedback from industry.

The teachers try to bring their students to some of the industry conferences and meeting locations in order to show them progress in industry developments, as well as the linkage between the farming industry and the society.

Teachers underline that their personal contacts and networks within farming industry are important in order to offer updated VET to both young students as well as students from industry. When they meet these people from industry, often in informal meetings, they always discuss trends and development within aquaculture. This become at the practical levels a quite large informal network, which the teachers may use this to help each other when needed during their training practices.

- Teachers' impression on their personal motivation and engagement

If the European aquaculture industry is going to increase their production of salmon and trout in order to help increasing the production of food in the World, the industry must move further compared to the current situation in Scotland and Ireland. Teachers from Norway that have visited these countries, mention that Norway may have a lot to offer to Scotland and Ireland with respect to transfer of competence within farming of salmon and trout.

Teachers mention that participation in international activities; like participation in international mobility and pilot projects, contribute in the recruitment process of students to their aquaculture VET courses.

Participation in projects help improving the training offered by the teachers at their VET school. This gives the school and the teachers resources to develop their own courses and their own delivery of training activities.

The role of the rector at the VET school is very important. If the rector take the lead and motivate, engage and open up for teachers involvement in projects and development processes, the staffs in the organization will respond and take part in many different activities leading to new training courses and innovative processes that prepare for further developments within the industry and how training shall be done for both youths and staff.

To take part in the close interplay between the regional VET schools and the needs in the regional fish farms, to further help developing an industry that creates jobs and values in the rural costal zone is a huge motivation. This help securing that the people in these rural societies may live there and keep on living their life's in way that is considered to be attractive.

When the teachers take part in other, external professional environments, this helps them to create reflections around their own teaching. What is good today, what could be improved in the future? Each time they attend an event; they usually learn some new things, which they afterwards may bring back to their own classes.

In the future, a larger share of their students will probably in periods need to work in other countries. To take part in internationalization activities are important, thus improving language skills and understanding of culture barriers in other countries.

The competence within methods for framing of salmon and trout is probably something that may be exported to other countries.

Many aquaculture VET schools in Norway have got their own permission to farm salmon through a licence dedicated to education and training. Professional farming companies operate these licences, whereby the aquaculture VET schools earn money while at the same time may offer students relevant practice next to their school. The income from this activity is dedicated to improve the VET offers to students in their region and at the County level. This gives the VET schools a strong economy and they may use their own income to invest in improving their aquaculture related training activities. The rector, the leader group at the VET school and the aquaculture teachers operate in close partnership when they decide how the grant from renting away their cage farming licences, shall be prioritized.

Aquaculture VET schools would like to take part in pilot projects. However, since their primary tasks are to educate students and since they are located in rural areas, it takes some time to replace a teacher to work on a project with another qualified teacher. It is especially teachers with experience from the farming industry that is challenging to recruit. Such a recruitment process may typically take from 6 to 9 months, since it must be linked to other vacant positions at the school. Vacant positions for the next school year are often announced in the period from February to March each year.

Aquaculture teachers recommend VET schools in other countries to apply for an educational farming licence. This gives flexibility with respect to purchasing new equipment, take part in projects, to increase the number of teachers, which is required in order to offer relevant practice and work, based training. The schools don't mention any negative consequences of receiving such a permission to farm salmon through an educational licence. It gives the school additional resources outside the ordinary budget and thus flexibility, when organizing their aquaculture VET courses such that they include various type of practice and work based learning activities.

The close collaboration and cooperation between aquaculture VET schools and the farming industry, have not been driven by the partnership where industry rent the schools licence to farm salmon. Instead it has helped creating a closer partnership between the industry and the VET schools in such a way that the industry better understand what is required to offer high quality aquaculture work based VET courses. As a consequence, the farming companies have engaged them self and let the students in the apprenticeship system visit many other farms in the region around the school. By doing this, the VET schools may for instance teach the students how the companies apply various techniques, methods and tools to solve the same type of operation. Due to this the competence of the students increase and they become more attractive to get engaged by the companies.

Due to the close and long term established partnership between the VET schools and the farming companies, some times they contact the school asking if they may contribute with a number of students when the company is going to organize an operation at a farm and lack personnel. The industry understands that they must contribute with knowledge transfer when they start applying new equipment and methods. The VET schools try to be responsive to these requests, in order to let several small groups of students get additional indebt knowledge about usage of various types of equipment, processes, methods and tools.

Many of the industry representatives have background from the regional VET schools and have graduated from those. This makes it easier to get back to the school when they start working, engaging and make up new partnerships with the VET schools in order to welcome their students to attend work operations at the cages.

The needs from the farming industry and the needs within the society, are the two main pillars to fulfil for the aquaculture VET schools in Norway. It leads to trust based VET delivery. To underline the responsibility towards the need within the society and the importance of protecting the wild salmon is important in the aquaculture VET delivery today. For instance, this is done at the practical level by bringing the students at the aquaculture VET schools to the salmon rivers, demonstrating what will happens with the environment if farmed salmon escape from the cages and mix up with wild salmon in the rivers.

- Teachers` impression of how aquaculture VET schools may help developing specialized courses to fish farming industry?

Aquaculture VET schools may contribute with design and development of shorter, certificate-based courses within boat operations with linkage to fish biology, fish health,

and fish welfare. This would be a tailor made course that will require industry engagement during the process of developing it. For instance, recently new supply companies have emerged that build new type of boats that support fish farming companies during the summer season, while they catch wild white fish during the winter season. Both VET within the maritime- and wild fishery sector, could be linked up towards aquaculture sector in order to offer short specialized courses for staff from the farming companies.

In some regions in Norway, the offices that are responsible for the practical part of the apprenticeship system based training, organize the aquaculture VET provision to staff from industry. These offices are owned by the industry. They could partner up with staff from the aquaculture VET schools that offer the theoretical part of the training in the apprenticeship system, to let some of their instructors and teachers offer the training. In addition they may engage staff with expert competence from external stakeholders, e.g. regulating bodies, to offer parts of specialized training courses. Within this perspective, the network of aquaculture VET schools could act as a facilitator for offering new specialized courses towards farming industry.

The aquaculture VET schools have the competences, they have the close contacts with the industry in order to offer required practice and work based learning, and they may engage with the regulating bodies. What is missing is to formalize and specify "new educational paths" for staff from industry based up on combining the resources within the existing VET delivery systems.

To establish and support networking among teachers, experts from stakeholders in the aquaculture sector and industry representatives is important in order to support joint engagement towards establishing new pilot projects at regional, national and international level.

- Teachers` experience with international activities and international projects

The regional aquaculture VET schools have little experience with international pilot projects. Many schools have taken part in mobility projects with short-term exchange of students during a period of two weeks. This may involve other sectors than aquaculture too. The rest of their time they prioritize to spend on organizing the apprenticeship education for the local and regional farming industry. Longer-term mobility exchange periods would be interesting to take part in for some of the aquaculture apprenticeship students.

Aquaculture VET schools in the costal zone of Norway have traditions for "changing the direction" fast in order to adapt their training based up on new needs in the farming companies. This has been their method for survival in the rural costal zone. Their teaching staff is in many cases engaged in professional development and may participate in projects, given that they get resources to engage other teachers to offer their scheduled training. The recruitment process of such teachers may be from 6 to 9 months long.

In the future internalization should be part of the aquaculture VET training, and not an addition to or a change of the existing aquaculture training program. The challenge will

be to integrate the theoretical training courses like mathematics, social sciences and foreign languages. However, if a student takes part in a long-term mobility in Scotland, the student does not actually loose training in English as remarked by one aquaculture VET school. Setting up a system may, for instance help managing the other courses like mathematics and social sciences, where the students abroad at certain days just work with these courses. The variation between the level of the aquaculture VET in Norway compared to the level in the participating countries, e.g. Scotland, will be a challenge for establishment of longer-term mobility programs. In addition, courses in Norway must be thought in English.

In the future aquaculture production is not just something happening in Norway, it is going to be production activities and farming operated by transnational companies in several countries. Due to this, the aquaculture industry needs to be better aligned. It is in particular the level of aquaculture competence that could be aligned, and not the way the training is organized, delivered and synchronized. Today it does not exists good methods for comparing the levels that are applied in the Norwegian aquaculture VET quality framework, with the lower levels in the quality framework models applied by aquaculture VET in UK and Ireland. Aquaculture VET schools should create enthusiasm, engagement and motivation among the students for participating in internalization activities by addressing this in the training the VET schools give to the students.

Some external customers that buy fish from farming companies in Norway have started to define which competence levels their staff shall have with respect to minimum competence. Non-qualified workers that lack documentation of their competence are not allowed to take part in work operations. This is a new way of thinking within the farming industry. Their staff will not get access to farms without becoming certified after taking a particular course in advance. Thus, in this way the national qualifications offered by the aquaculture VET schools become part of the quality assurance system inside the companies.

Recommendations for an action plan for Norway

Based up on the results and feedback provided from the teachers in Norway, the BlueEDU project recommends carrying out the following actions:

1. To produce digital aquaculture learning materials for farming of salmon and trout as open educational resources (OER)
    a. Develop, test and evaluate quality learning materials
    b. Apply a multilingual format with the languages English, Icelandic and Norwegian. This will ensure usage in Norway, The Faros (they understand Norwegian), Island, Scotland and Ireland.
    c. Let professionals develop the learning materials in partnership with aquaculture VET schools
2. Develop a joint digital platform system for distribution, sharing and maintenance of learning materials
    a. Set up a learning management system (LMS) based up on open source and with a multilingual platform
    b. Populate the system with the aquaculture OER
    c. Integrate an assessment systems for accreditation of prior learning into the LMS
    d. Integrate a system solution for evaluation and recognition of students' previous learning. This should include collecting immediate or nearly immediate responses from students, as well as offer immediate or nearly immediate feedback on students learning progression
    e. Let one organization be responsible for delivering this service based up on actual costs. Aquaculture VET schools pay a small fee per year in order to use the LMS in their courses towards staff from farming industry
3. Set up and organize a mobility program targeting the aquaculture VET sector, where
    a. Teachers may visit VET schools and farming industry companies in Scotland, Iceland, the Faros and Ireland
    b. Students may attend long term mobility programs consisting of a combination of attending classes at VET school and getting practice in various types of farming companies
    c. It is 14 schools in Norway, 3-4 schools at Iceland, one school (from 2019) at the Faros, 3-4 schools in Scotland and 1-2 schools in Ireland that should be invited to take part in such a mobility program targeting the aquaculture sector
    d. Develop and share an English version of the aquaculture course thought in the second year at the aquaculture VET schools in Norway. This will make it much easier to let foreign students attend classes at schools in Norway
4. Prepare for harmonization of knowledge and skills between Norway, Scotland, Iceland, the Faros and Ireland, by
    a. Developing a new system for unitization of the aquaculture curriculum, to be inspired by the system applied by the Scottish Quality Authority. Share this system with Iceland and the Faros.
    b. Developing harmonized aquaculture curriculums for production of salmon and trout

    c. Develop a module based aquaculture VET training system that apply unitization, whereby staff from industry may study module by module, instead of one full aquaculture course.
    d. Set up pilot projects that test out continuous assessment practices in combination with worked based learning, for students from industry
    e. Investigate and document how many of the staff in the farming industry that struggle with
        i. Dyslexia
        ii. Reading and writing difficulties based up on the fact that they prefer to learn by doing
5. Offer better alignment of the aquaculture industry, by
    a. Aligning the level of aquaculture competence between the VET systems in Norway, Scotland, Iceland, the Faros and Ireland. As an example, the gap between the levels applied in VET in Scotland and Norway, is approximately 1.5 levels at the European Quality Framework scale
6. Develop aquaculture VET further by
    a. Developing flexible learning and training solutions combining on-site training and e-learning into a blended learning framework
    b. Developing pedagogical methods that help strengthen industry cooperation and collaboration during industry problem solving processes
    c. Testing out new continuous assessment solutions and learning paths
7. Developing aquaculture higher VET by
    a. Help developing new curricula
    b. Test, evaluate and implement new pilot programs
    c. Developing flexible learning and training solutions combining on-site training and e-learning into a blended learning framework
8. Support and help developing specialization of skills within farming industry by
    a. Developing and sharing module based specialist courses that go beyond the level included in the national qualification course. The courses should give dedicated staff in the farming and service companies in depth knowledge with for instance fish biology, fish welfare, boat operations, specific work operations, automation, etc.
    b. Preparing the courses for flexible training solutions that are combining e-learning, on-site training and other blended delivery modes
9. Develop a teacher training program for application of new methods, tools and services within aquaculture VET that support the forthcoming need of offering more specialised training to farming industry
    a. Structure the program in modules, each targeting one specialization like farming of halibut, lumpfish, service boats, treatment of sea lice, production of smolt and farming of salmon and trout, etc.
    b. Offer teachers a period with internships inside a farming company in order to update them on the latest production methods. This could be part of a course.
    c. Make up partnership with industry in such a way that some of their experienced staff may offer training to students, maybe out at the cages, when the teacher is attending a specialist course to be delivered as flexible learning solutions including the usage of e-learning
    d. Share this program with teachers from Scotland, Iceland, the Faros and Ireland

10. Support and help greening European aquaculture VET
11. Support and help developing processes targeting digitalization and automation within aquaculture VET
12. Transfer of experiences and best practice aquaculture VET towards networks of stakeholders within the fish farming sector by
    a. Establishing and taking part in international aquaculture networks

Establishing VET partnerships with VET

BlueEDU WP5 VET supply - Scotland

M Haines, Pisces Learning Innovations Ltd)
S McKillop, University of Stirling

Contents

Tables

Scotland summary

The aquaculture sector in Scotland is growing and aims to double its output by 2030 (1). To achieve this as the sector will become more reliant on technology it will need some staff with a fish husbandry knowledge and understanding and others with specialist operative skills. Currently there are problems recruiting qualified and experienced staff. Skills shortages in key areas such as engineering are growing, due to competition within the wider labour market. Serious concerns raised about the lack of aquaculture career awareness in most Scottish Secondary schools have been raised. The Scottish stakeholders plans to address this high priority issue to ensure that the industry can compete more effectively for young talent.

An unavoidable trend towards the employment of 'unqualified' recruits has led the sector to become more reliant on 'in house' training to ensure they develop the skills the company require. Consequently, all the larger salmon producers have established comprehensive 'company specific' internal staff development programmes. However, some of the smaller organisations function on an 'ad hoc' basis, providing training as and when required on a 'just in time' basis and are largely compliance driven.

This 'self-sufficiency' has arisen because the mainstream public sector VET pathways are limited. In the past, there were several VET options available, including work based training and full-time college courses up to higher VET level. Latterly, the choice has narrowed and the Modern Apprenticeship (MA) from levels 2 – 4, delivered by one centre in Inverness and one in Shetland is the only formal VET available. The MA is generally well received by those companies with a provider able to serve their needs. The West coast and Western Isles are currently serviced by Inverness College; however they have a limited staff capacity and any significant increase in demand for the MA on the mainland would be difficult to meet. As the industry starts to grow, VET capacity issues will need to be addressed on the mainland.

When recruiting lecturers and instructors, the lack of suitable applicants has been identified as a problem by some VET providers. Few meet the minimum requirement of suitable qualifications, relevant industry experience and good communication skills. Once employed, keeping pace with the industry can be a challenge for those staff who do not maintain close personal connections with industry.

This could be overcome through the formalisation of communication networks to include VET providers (public and private), aquaculture production companies and supply companies (technology and services). Most VET providers on the mainland would welcome better collaboration, particularly when re-instating the full-time aquaculture VET provision that was lost from the Scottish curriculum this century, and now needed to better support youth development (16-18-year olds). In addition, progress with the development of innovative approaches to work-based VET, such as the use of ICT within work-based learning systems, could be accelerated.

1 National aquaculture VET sector and providers

The national aquaculture 'formal VET' supply does not meet industry requirements currently, as evidenced by the increased reliance on informal inhouse training (non-formal VET) across the sector. The main aquaculture stakeholders have an important role to play in the development of aquaculture VET provision in Scotland. This includes public and private sector aquaculture VET providers, aquaculture production companies and aquaculture supply companies.

1.1 Public Sector

The Scottish Government has overall political responsibility and legislative control of all education in Scotland under the Scotland Act 1998. The principal legislation governing all education in Scotland is the Education (Scotland) Act 1980. Inspections and audits of educational standards in Scottish education are the responsibility of:

- Care Inspectorate (Social Care and Social Work Improvement Scotland-SCSWI) – Provides public assurance and protection of vulnerable individuals and those at risk, including inspection of care standards in pre-school provision;
- Education Scotland – responsible for supporting the delivery of learning and teaching in pre-school, primary, secondary and further education;
- Quality Assurance Agency for Higher Education (QAA) – responsible for higher education

Local authorities own and operate all state schools and have responsibility for the provision of education in primary and secondary schools. As such the local authorities perform the function of Education Authorities.

1.1.1 Scottish Qualifications Authority (SQA)

The Scottish Qualifications Authority (SQA) is the national awarding and accrediting body in Scotland. The SQA is responsible for the development, validation, assessment and certification for all national qualifications at secondary and post-secondary level (non-degree), delivered through schools, colleges and training centres. All SQA qualifications have been developed and routinely updated in partnerships with industry representatives, including Sector Skills Councils responsible for development of National Occupational Standards (NOS) and those who work in education. The SQA manages the development and validation of all new and updated awards including VET qualifications. They are responsible for the approval of all Vocational Education & Training (VET) centres that deliver SQA awards, validation of all new VET qualifications and Quality Assurance (QA) of VET systems in place with approved centres. The QA system ensures that consistent standards of assessment are maintained in all delivery centres.

1.1.2 Scottish Credit and Qualifications Framework (SCQF)

The Scottish Credit and Qualifications Framework (SCQF) (57) (58) is the national credit transfer system, which brings all mainstream Scottish educational qualifications together. It was created to enable comparisons to be made between all academic levels from lower secondary school to university level, including vocational and other work-based qualifications. All traditional academic and vocational qualifications offered in schools, Further Education (FE) colleges, Higher Education (HE) universities and the workplace are included in the framework. Each qualification is given a credit level on a scale of 1-12 and includes all mainstream qualifications from Access to Doctorate level. The SCQF is a tool which can assist learners to improve their understanding of the Scottish qualifications structure in planning as they plan their learning goals or pathways. (Table 1)

The Scottish Credit and Qualifications Framework Partnership (SCQFP) is responsible for the management of the SCQF and is made up of representatives from the QAA for HE, College Development Network (CDN), Universities Scotland and the SQA. The main aims of the SCQFP are:

- To develop and promote the SCQF as a lifelong learning tool in Scotland;
- To include all assessed learning and qualifications in Scotland within the framework;
- To extend the recognition of informal and non-formal learning;

- To develop international relationships.

SCQF levels	Examples of Qualifications	EQF levels
12	Doctoral Degrees, Professional Apprenticeships, Professional Development Awards (PDA), Award	**8**
11	Master's Degrees, Integrated Master's Degrees, Professional Apprenticeships, SVQ5, PDA, Postgraduate Diplomas, Postgraduate Certificates, Award	**7**
10	Bachelor's Degrees with Honours, Professional Apprenticeships, SVQ, PDA, Graduate Diplomas, Graduate Certificates, Award	**6**
9	Bachelor's/Ordinary Degrees, Technical Apprenticeships, PDA, SVQ4, Graduate Diploma, Graduate Certificates, Award	**6**
8	Higher National Diplomas (HND), Diplomas of Higher Education (DipHE), Technical Apprenticeship, PDA, SVQ4, Award	**5**
7	Higher National Certificates (HNC), Modern Apprenticeships, PDA, SVQ3, Certificates of Higher Education (CertHE), Scottish Baccalaureate, Advanced Higher, Award	**5**
6	Higher, Modern Apprenticeships, SVQ2, PDA, National Progression Award (NPA), National Certificate, Award	**4**
5	National 5, Modern Apprenticeships, SVQ2, NPA, National Certificate, Award	**3**
4	National 4, SVQ1, NPA, National Certificate, Award	**2**
3	National 3, NPA, National Certificate, Award	**1**
2	National 2, NPA, National Certificate, Award	
1	National 1, Award	

Table 1 - Scottish Credit and Qualifications Framework (SCQF) compared with the European Qualifications Framework (EQF) adapted from QAA: Qualifications can cross boundaries: a rough guide to comparing qualifications in the UK and Ireland, "014

1.1.3 Sector Skills Councils (SSC's)

Sector Skills Councils (SSC) are independent, employer led organisations, which actively involve trade unions and key stakeholders. They are a UK wide network of sectoral representative organisations, which are responsible for identifying the skills, education and training needs of the workforce in each sector they represent whilst maintaining the National Occupational Standards (NOS) of those sectors. All SSCs in the UK are licensed by the UK government, and all SSCs have the same four key goals:

- reduce skills gaps and shortages

- improve productivity, business and public service performance
- improve learning supply
- increase opportunities to boost the skills of all individuals in the workforce

The Sector Skills Council which represents aquaculture is Lantra, the awarding body for land based and environmental training courses and qualifications

They are the guardians of the National Occupational Standards (NOS), statements specifying the standards of performance, and knowledge and understanding, for specified occupational profiles. The NOS are used to inform the development and revision of all National Qualifications (NQs). In Scotland the NOS have been used by Lantra in partnership with industry, to create the Modern Apprenticeship (MA) in Aquaculture, validated by the SQA. The NOS define the practical skills and knowledge requirements of the fish husbandry operative and site manager, reflected in the MA composition, which includes; key mandatory units, and a selection of optional units. By design, learners can choose the units which best fit the job they are doing and the farm they are working on.

1.1.4 Scottish Funding Council (SFC)

The Scottish Funding Council (SFC) is a non-departmental public body which operates within a framework set out under the Further and Higher Education (Scotland) Act 2005. The SFC is the national, strategic body for funding teaching and learning, research, innovation and other activities in Scotland's 25 colleges and 19 universities and higher education institutions.

The role of the SFC is to govern and develop the tertiary education system (colleges and universities) contributing to Scotland's educational, social, cultural and economic life. The SFC achieve this by:

- Developing national policies for learning, skills, research, and innovation.
- Implementing policies by negotiating and agreeing Outcome Agreements through which colleges and universities set out their education ambitions in return for public funding.
- Investing in the people, buildings and equipment that allow learning, teaching, research and innovation to happen in colleges and universities.
- Providing strategic funding to promote change in the college and university sectors, ground-breaking new initiatives, or to support mergers or shared services.
- Being an active, creative and reliable partner with others where we have shared goals: Scottish Government, Scottish Enterprise, Highlands and Islands Enterprise. (HIE)
- Supporting a range of agencies, including; Enterprise, Skills Development Scotland, NHS Education Scotland, UK Research and Innovation, NUS Scotland and local authorities.
- Promoting the learner voice in education and supporting continuous improvement in the quality of learning and governance, and in the financial sustainability of colleges and universities.
- Providing high-quality advice and evidence to the Scottish Government and others on issues affecting further and higher education and Scotland's research base, thus shaping and implementing national policy and strategy on post school education, skills, and research.

1.1.5 Skills Development Scotland (SDS)

Skills Development Scotland (SDS) is the national skills agency in Scotland, which supports the people and businesses of Scotland in developing and applying their skills. The aim of SDS is to improve the response of education, training and careers services to the needs of Scotland's economy and employers. Working in partnership with a diverse range of stakeholders SDS seek to understand and articulate the needs of industry and employers within the Scottish economy and build a robust labour market and careers intelligence base.

The SDS also support the development of a high-performing and inclusive labour market by encouraging and supporting employers to adopt fair work practices, with a focus on workforce development and inclusive recruitment. They are responsible for ensuring that individuals are equipped with the skills they need, through their career services (for all age groups), work-based learning options and employability support. These include career management skills; empowering individuals to make informed decisions and achieve their potential throughout their learning and career journeys.

Learning providers are also funded by SDS for the delivery of work based NQS (Scottish Vocational Qualifications and Modern Apprenticeships). All learning providers receiving funding from SDS are required to demonstrate that they meet SDS quality assurance framework standards. The learning providers will record their actions, achievements and improvements by completing a self-assessment and a 'quality action plan' workbook.

The follow up action planning session in response to the recent AILG 2030 Aquaculture Skills Survey (2) in Scotland was led by SDS. Working in partnership with the Highlands and Islands Enterprise (HIE) they led a workshop to bring together industry representatives from aquaculture and the supply sector with VET providers and support agencies. The aim was to develop an action plan for aquaculture skills supply as part of the definition of the future 'Skills Pipeline', which SDS orchestrate to ensure the future education and training supply are well aligned with industry demand.

1.1.6 Further Education (FE) Colleges

Further Education Colleges in Scotland are the main providers of further education and Vocational Education & Training (VET) to young people and adults. This includes courses ranging from half day courses up to two years or more. Colleges generally have strong links with their local communities and work with employers and other organisations to offer relevant training to individuals, communities and employers. They promote inclusion and wider access, offering courses full time, part time, distance learning or work based, to encourage lifelong learning.

Most of the college courses offered are vocational and can range from access level (SCQF 1-3, EQF 1) to courses at higher national level (SCQF 7-8, EQF 5), recognised as higher VET. There are also opportunities to gain awards accredited by other awarding bodies, which can be industry specific such as the City & Guilds and National Proficiency Testing Council (NPTC). The courses include a combination of theory and practical, preparing learners for further study or entry to the labour market. Some learners can progress to university as many colleges have university degree articulation arrangements, accessible by students with relevant higher national qualifications.

The Awards (NQS) offered in Scotland's FE colleges are composed of Units which have been validated by SQA and are standardised. This ensures that all centres are assessing the performance and knowledge of learners at the same level, irrespective of the provider and its geographical location. Each of the units from the SQA catalogue will define the learning outcomes and assessment evidence requirements, including performance and assessment criteria.

The mainstream awards offered in Scotland's FE colleges are listed below:

- 1 Year Access courses – 12 credits (SCQF 2-4, EQF 1-2)
- 1 Year National Certificates (NC) – 18 credits (SCQF 5-6, EQF 3-4)
- 1 year Higher National Certificates (HNC) – 12 credits (SCQF 7, EQF 5)
- year Higher National Diplomas (HND) – 30 credits (SCQF 8, EQF 5)

A credit is worth approximately 10 hours of learning and assessment activity e.g. a 12-credit course - 10 hrs x 12 credits = 120 hours of learning.

1.2 Private Sector

The private sector providers can access SDS contracts for the delivery of the MA in Aquaculture if they are an SQA approved centre and have gained approval for the delivery of the MA. This requires them to demonstrate that they have the staff resources and connections to industry. However, they cannot access Scottish Funding Council grants, which supports the mainstream college-based full time VET (NC, HNC and HND, referred to above). Some private trainers focus on providing specialist short courses on a commercial basis. There is a limited competition between the private and public sector, largely restricted to the bid for MA contracts to the SDS.

It is possible for a company to become an SQA approved centre to deliver SQA quality assured 'customised Awards' which the company can own, for a fee, and/or NQs. This radical strategy, which has a major staff development implication, is under consideration by on of the major salmon farming companies, keen to standardise their internal assessment processes.

1.2.1 Aquaculture Supply Companies

A large proportion of aquaculture VET in Scotland is being provided inhouse within companies and by external technology supply companies. This is non-formal VET and does not lead to certification or contribute towards the attainment of a National Qualification (NQ). The two main supply companies providing training to the industry in Scotland are:

- The Fish Vet Group (FVG) UK & Ireland, provide fish health related training (Appendix 1). The group was established in 1995 to provide veterinary health services for fish farming operations around the coast of Scotland. They are the world's largest provider of dedicated evidence-based veterinary services, diagnostic technologies and environmental monitoring to the aquaculture sector.

- The AKVA Group, equipment and service training – Established for over 40 years and provides equipment supported by complete technical solutions and services to the global aquaculture industry including land based and cage farming operations.

As both FVG and AKVA have great expertise in their respective fields, their training is up to date and relevant. However, as candidates receive 'attendance certificates' only there is no formal recognition of their learning. Arguably, this is a missed opportunity, as they could be receiving credits towards formal qualifications for VET if the training was aligned to NRQ's and an additional SQA quality assured assessment process introduced.

The interview with AKVA acknowledged that improved collaboration between all stakeholders could improve the quality of the VET available. Access to aquaculture facilities by learners to gain valuable hands on experience would need formal access agreements to be negotiated with companies. As an aside, there may be much to learn from Norway, as all the main aquaculture companies offer the Upper Secondary School and their staff and learners a very high level of access to large scale sophisticated technology and equipment, under careful supervision. Well managed school/industry partnerships under the local jurisdiction of each county are the norm and operate extensively throughout their coastal zone, to great effect.

1.3 National VET and Higher VET systems

There are several public sector providers currently offering aquaculture VET and some previous providers who have recently renewed their interest. A review and revision of the NOS, NQs, and delivery systems and learning resources has been muted by the AILG 2030 Skills Survey Action Planning initiative led by SDS industry, commencing in October 2018.

The provision currently available in 2018 is illustrated by table 2 below. A wide range of alternative Aquaculture Vocational Education and Training (VET) has been delivered in Scotland over the last 30 years, but peaked in the 1980's to 90's. There are also a small number of private training companies offering the MA in Aquaculture under SDS contracts, which are not referred to on table 2.

During the last 30-year period, Further Education colleges offering aquaculture VET have developed and delivered a range of National Qualifications, including:

- Scottish Vocational Qualifications (SVQ)
- Modern Apprenticeship (MA)
- National Certificate (NC)
- National Progression Awards (NPAs)
- Higher National Certificate (HNC)
- Higher National Diploma (HND)

The NC, HNC and HND are currently unavailable, but were all offered as full-time attendance-based courses in the past. The NPAs at level 5 addressing fish husbandry related subjects were designed with industry and piloted with a salmon farming company in 2012, as a work-based delivery and more manageable alternative to the MA. There were three NPAs composed of a small cluster of Units, designed to be delivered in series, to build the work-based learners, skills, knowledge and confidence. These NPAs still exist on the SQA catalogue but are not currently active.

1.3.1 Aquaculture VET

Full-time college-based provision for aquaculture was dominant in the 1980s and 90s, but recruitment gradually declined. Anecdotally, this has been attributed to a range of reasons, including; restricted public sector funding and a negative perception of the industry impacting on course recruitment.

Currently, the bulk of formal aquaculture VET and skills training in Scotland is confined to delivery from two centres, the North Atlantic Fisheries College (NAFC) Shetland and Inverness College, both of which are part of the University of the Highlands and Islands (UHI).

Whilst the demand for full time college provision and the number of delivery centres has declined, the need for well qualified aquaculture staff has risen. The skills levels required by employers are expected to increase as the industry grows and advances technologically. This is currently exemplified by an increasing interest by leading companies in large offshore cage installations and land based Recirculating Aquaculture System (RAS) and Closed System Aquaculture (CSA). Both systems require staff that can solve challenging technical issues. If not addressed, technical and engineering skills gaps will limit the sectors growth and development.

There are a range of VET level qualifications available within the Scottish system. Some are live and being delivered whilst others are live on the catalogue and not being delivered. There is also a legacy of NQs that have lapsed but still have potential value, if revised in line with the updated NOS and offered within more flexible delivery modes.

Scottish Vocational Qualifications (SVQ)

A Scottish Vocational Qualification (SVQ) is made up of Units derived from NOS, to assess the practical skills and underpinning knowledge required to conduct a specific job role. The delivery of SVQs can be flexible and the underpinning knowledge can be studied in college, in the workplace or some other combination to suit the employer and learner. This differs from MA's (See below), which require learners to be in employment. However, the assessment of SVQ practical skills must be undertaken in a real place of work.

SVQs can be available at five levels, defined as:

1 Aimed at those tasks which requires basic, routine work skills (SCQF 4, EQF 2)

2 Requires a broad range of skills where learners must demonstrate competence in a range of tasks, some of which are complex and include some individual responsibility and teamwork. (SCQF 5, EQF 3)

3 Learners perform a wide range of activities complex and non-routine and includes more emphasis on individual responsibility and supervisory skills. (SCQF 6-7, EQF 4-5)

4 A high degree of personal responsibility required in a wide range of complex and technical activities. Includes considerable management skills and responsibility for others. (SCQF 8-9, EQF 5-6)

5 Requirement for competence and understanding of complex principals and techniques across a wide range and variety of contexts. Candidates will have significant responsibility at a personal level and for the work of others. Requires a high level of senior management skills, which include analysis and diagnosis, design, planning, execution and evaluation. (SCQF 11, EQF 7)

In aquaculture, there have been SVQs designed at SCQF5-7 only. In practice, the SVQs and their constituent Units, form the core of the Modern Apprenticeship below, which is available through work-based delivery on the main land and some outer isles.

Modern Apprenticeship in Aquaculture

The Modern Apprenticeship (MA) programmes are available to those over 16, including mature adults. There are no academic entry requirements for the MA level 2 (SCQF 5, EQF 3), but candidates must be over 16 years of age and be employed in an industry relevant to the MA pathway selected. The employer is involved in practical training and some assessment activities. Commonly, as well as a requirement for a technically competent and qualified assessor to observe the candidate working on occasion, most assessment strategies rely heavily on- witness testimonies provided by the manager or site supervisor. Knowledge assessment can also take place on site under invigilated assessment conditions, or in an assessment centre.

Although the MAs in Aquaculture in Scotland tend to be predominantly work based, the learning process can include a combination of methods; practical training on site, distance learning, college attendance and short course training. Modern Apprenticeships are designed for training in the workplace. However, they can have some flexibility, whereby apprentices can attend college for

additional training. This is normally done on a short-term basis which can be anything from day release to two weeks, to minimise disruption. The MA programme is also flexible regarding the time given to complete the course. There is no fixed term start dates or course length, but each programme normally takes 1-2 years for a candidate to complete.

Modern Apprenticeship frameworks are available at three levels, as shown below corelated to occupational levels:

- MA Level 2 Operative (SCQF 5, EQF 3)
- MA Level 3 Supervisory (SCQF 6-7, EQF 4-5)
- MA level 4 (Technical Apprenticeship) Managerial (SCQF 8, EQF 5)

The level 2 operative is restricted to aquaculture technical skills only and helps learners to develop their knowledge and understanding of aquaculture that underpins their own farm operations. The level 3 includes all the technical requirements in addition to supervisory competences. The MA at level 4 (SCQF 8, EQF 5) is often referred to as a 'Technical Apprenticeship' and pitched at managerial level. Launched over the last 6 months, this new program has been well received by industry, as it addressed a recognised gap in skills and VET provision. Successful completion of the MA level 2 commonly provides the candidate with an opportunity to progress to MA level 3, which is an award with more supervisory level content.

The MA targets those currently employed in the aquaculture sector as opposed to for those looking to enter the sector after leaving school or changing careers.

National Certificate (NC) in Fish Farming

The full-time college based National Certificate (NC) course, previously offered by Scottish aquaculture colleges, up to and including the early part of this century, covered subjects such as salmon trout and shellfish aquaculture, welding, construction, engine maintenance and repairs and boat handling as core elements of their training. This course was producing candidates with a range of basic skills required by the industry at the time, and long before the advent of 'specialisation' within the workforce. Although those skills are still relevant and useful, there is an increasing awareness that higher levels of technical and engineering skills are becoming more important.

As the MA is only available to those already in work, there is a growing interest in the re-instatement of an updated National Certificate that can widen access to include those not resident in the coastal zone, but with an interest in aquaculture employment. This revised NC will be composed of four National Progression Awards covering the important core knowledge and understanding, including; fish biology, fish health, fish feeding and nutrition and the aquatic environment. The reintroduction of the NC will help to reduce the investment in inhouse training by companies for new entrants who have undertaken the NC and provide a fast track pathway to MA completion at level 3 (Supervisory level)

Qualification/course - Work based (WB), Full Time (FT), Part Time (PT), Short Course (SC), Distance Learning (DL)	Shetland College (NAFC) UHI	Inverness College UHI	Lews Castle College UHI	Argyll College UHI	North East Scotland College	West Highland College UHI
SVQ 2 (WB)	Y	Y				
MA2 (WB)	Y	Y				
MA3 (WB)	Y	Y				
MA4 (WB)	Y					
Fish Health-Introductory (1 day SC)	Y					
Fish Health-Advanced (1 day SC)	Y					
Biosecurity in Aquaculture (1/2 day SC)	Y					
Capstan Safety Awareness (1 day SC/DL)	Y					
Fish welfare (1-2 day SC/DL)	Y					
Internal Auditing Techniques for Aquaculture (1 day SC)	Y					
Sea lice Identification and recording (1/2 day SC)	Y					
RYA Powerboat Level 2 (2 days SC)	Y			Y		Y
Workboat Skipper part 1 (10 days FT/SC)	Y					
Workboat Skipper part 2 (4 days SC)	Y					
RYA Marine radio (SRC) (2 days SC)	Y			Y	Y	Y
Fire fighting (1 day SC)	Y		Y		Y	
Sea survival (1 day SC)	Y				Y	Y
Schools Aquaculture NPA 4&5 (PT)	Y			Y		
SQA Level 5 Maritime skills certificate (20 weeks FT)				Y		Y

Table 2 FE Colleges in Scotland currently (2018) offering aquaculture qualifications or related courses that are in demand by the industry.

1.3.2 Higher VET and University Degree articulation

Entry to Higher Education (HE) in Scotland is available to all who can satisfy the entrance requirements. For school leavers this is normally at the end of 'senior phase' year 5 or 6 when Highers and/or Advanced Highers have been completed. University entry requirements vary, with some requiring higher grades in specific subjects. Adult learners, mature students (>21yrs), who don't have the required academic qualifications for entry to HE can access university via other routes. There are access courses available that are designed to prepare adult learners for HE, which upon completion can guarantee entry.

If a learner has not achieved the required grades to qualify for direct access to university, they can enrol on a higher national VET course at an FE college. This can either be used to gain employment or as a stepping stone to university. Some articulation arrangements have been designed to encourage access to university upon successful completion of a Higher National Certificate or Higher National Diploma course, leading directly to the second or third year of a degree, respectively. One such articulation agreement between the former Barony College and the University of Stirling worked very well in the 1990s and early this century, providing college students that had performed well on their 2-yearr Higher National Diploma, a degree pathway.

A first-degree programme in Scotland requires four years of study for an Honours degree, but an Ordinary degree can be achieved after three years. The Honours degree programmes normally offer specialisation in their third and fourth years. Upon successful completion a first class, upper/lower second class or third-class degree will be awarded by the university. The curriculum for Scottish Universities is developed and maintained by each department within each University.

University or college higher VET courses which lead to professional qualifications are treated differently and are normally be created in collaboration with the appropriate professional body. Higher Education programmes are often designed to be delivered using a combination of methods such as lectures, laboratory and field work. Some courses are available using distance and flexible learning combined with attendance at seminars and workshops, but there appears to be very little available that is entirely distance learning or VET. There is however an undergraduate distance learning online course in Sustainable Aquaculture available at the University of St Andrews. Due to the lack of practical application in this course, it would not normally be recognised as VET, although it is pitched at the higher VET level.

There are other higher VET qualifications available on the SQA catalogue which could be reviewed, revised and utilised by the colleges if there was a demand (Table 3).

SQA Code		Unit title	Qualification	SCQF level	EQF level
G95R 47		Fish & Aquatic Science	Professional Development Award (PDA)	7	5
GA1G 46		Seal Management	PDA	6	4
G95W 15		Fish Farming	Higher National Certificate	7	5

Table 3 – Higher VET qualifications available on Scottish Qualifications Authority (SQA) catalogue, November 2018

A general inquiry to SQA revealed that there are no current candidates registered for the higher VET level aquaculture qualifications, and no centres are approved to deliver them. The PDA in Seal Management is a specialist award and candidate numbers enrolling will be low due to the specific requirements of that job role.

The PDA Fish and Aquatic Sciences was designed to meet the needs of two groups of learners.

- Those studying from home to gain an initial qualification that will assist them in entering the fish farming industry at husbandry man level.

- Those in employment wishing to increase their understanding of fish biology, fish health and disease and the aquatic environment in order to improve their prospects of progression.

The PDA in Fish and Aquatic Science is subsumed within the HNC in Fish Farming and meet the needs of distance learners with limited opportunities to visit a training centre. If ever offered, it could be achieved through distance-learning with limited centre attendance. It is composed of knowledge-based Units which suit a distance learning delivery mode and access to a fish farm is not required. To successfully achieve the PDA a candidate must complete three of the mandatory units contained within the HNC award (Appendix 2). Successful completion of the PDA and suitable employment in the aquaculture sector will provide an opportunity for practical skills to be assessed. This would then enable a candidate to progress to the HNC Fish Farming award, if made available within a flexible delivery mode, subsequently.

The HNC was designed to be achieved within one academic year of centre-based study, or over an extended period, whilst in employment, through distance-learning and the development of farm-based practical competence. The candidate must complete a selection of units from those shown in Appendix 2, including; all mandatory units (56 SCQF points), a minimum of one optional unit from Group 1 (16 SCQF points) and a minimum of one optional unit from Group 2 (8 SCQF points).

1.4 Aquaculture VET staff

Staffing numbers for aquaculture VET provision are generally low in Scotland. This may be due to the limited provision of aquaculture VET training courses currently and reflects the decline of full-time college-based VET. There is also an increased reliance on inhouse training schemes employed by many aquaculture companies, which will also have a significant impact on aquaculture VET staffing. When experienced VET staff are required however it can be difficult to recruit staff with the right mix of skills.

The main FE colleges delivering aquaculture VET in Scotland, NAFC Shetland, Inverness College and Argyll College currently employ aquaculture qualified staff and are all part of the University for the Highlands and Island (UHI). Precise staff numbers are unavailable, but their staffing capacity is approximately equivalent to 6-7 full time equivalents (FTEs). The skillset VET staff require includes a relevant National Qualification normally a level above that being taught, relevant industry technical experience and good communication skills. One VET provider stated, "*We have had difficulties recruiting work-based assessors with appropriate experience and communication skills*".

It is commonly believed that appropriate experience can be of more value than qualifications as a preparation for VET level teaching, however a mix of the two is usually necessary especially when responsible for delivering specialist training and/or HE level courses.

There is a growing awareness in Scotland that vocational education and training delivery, may require a more 'itinerant' approach to training as opposed to offering training at one or two centralised locations. In Ireland the BIM provide a mobile system which takes the trainer and training to the candidates. This may be an option worth considering in Scotland due to the geographical locations of some sites. Iceland may also provide further inspiration, as they depend on distributing learning to a small and thinly spread population of learners, supported by communication technology and a network of learning centres. The UHI in Scotland has well networked facilities which include video conferencing, that could be accessed if a better cooperation between VET providers was established. Both potential changes of emphasis, and a higher dependency 'e learning' and learning technologies such as conferencing, may have a significant implication to staff development and the 'sharing of staff' in the future.

1.5 Adequacy of national aquaculture VET supply

The bulk of aquaculture training is supplied by NAFC Shetland and Inverness College There are regions of Scotland where the demand for aquaculture VET is not fully met.

Due to the geographic location of NAFC in Shetland most of their provision serves the Shetland aquaculture industry. However, the development of e learning has successfully expanded access to learners from the mainland and overseas to some of their on-line courses. A growing demand for VET on the Scottish Mainland and Western Isles could potentially be met by Inverness College. However the staffing capacity at Inverness College is currently limited. This may imply a need for a more centrally based aquaculture VET facilities, that can be accessed by farms/companies on the West coast and Western Isles and more VET practitioners.

A proposal for a west coast facility requiring a significant capital investment is being seriously considered currently by a wide range of stakeholders with a strong vested interest in developing the capacity to for maritime education and training. To take full advantage of this opportunity as it emerges will require a major collaborative effort, which will be challenging. In the past, Scottish collaboration has had limitations, particularly when educational establishments have tried to work together. Intellectual Property Rights (IPR) can become an issue, when utilising existing learning and teaching resources and vested business interests are under threat (whether real or perceived). However contractual agreements could be drawn up to ensure that copyright and ownership are recognised, allowing FE colleges to pool and share existing resources and work on the development of new resources together. If part of a well-prepared business model for the sharing of costs and income, it would then be possible for a new collaborative grouping of Scottish VET providers to revitalise Scottish aquaculture VET and improve provision to the mainland.

1.5.1 Inhouse training

Generally, VET providers acknowledged that the aquaculture industry in Scotland has become increasingly self-reliant regarding their company staff development. However, not all training can be catered for inhouse, so there is a requirement for external provision to be brought in such as specialist health training and specialist equipment operator training. Inhouse training is perceived to offer greater reliability and control as it is tailored to the individual company needs and Standard Operating Procedures (SOPs) and driven by compliance requirements for Health and Safety auditing and QA scheme certification. Other potential reasons for producer company reliance on inhouse training have been identified:

- External VET provision available often does not satisfy the needs of the industry due to limited technical relevance

- The cost of some external training and lack of external funding support
- Poor accessibility of some VET provision and the limited availability of qualified instructors for some subjects

Most companies combine their company internal training scheme with external training provision such as technical skills based short courses. However, the potential for a lack of consistency in training across the sector as each company tailors the training to suit their own needs, has been recognised. This can result in training being repeated if an employee moves between companies. Whilst this status quo has been acceptable in the past, the Scottish Aquaculture Industry lead group (ILG 2030) Skills Review (May 2018), commissioned on behalf of the indicates that some companies are starting to acknowledge the cost and inefficiency incurred. Therefore, the climate is now more conducive for the creation of new industry/VET provider partnerships that would enable pathways from non-formal company training, to NQs to be forged. Consistency in training could be improved if some companies placed a greater value on the completion of Nationally Recognised Qualifications (NRQ's). This could not only lead to a greater consistency in staff training and qualifications across the sector, but also save time and money, as staff would not require so much retraining if they move between companies.

It is worth noting that the demand survey in Scotland indicated that young 'new starts' are being encouraged to complete the MA and many are receptive. Consequently, recruitment to this program has risen dramatically the last few years. However, it was reported by the ILG 2030 Skills Review that many mature employees were not prepared to risk undertaking a National Qualification for fear of failure and went no further than uncertificated in company training. This 'learner confidence' issue is one that VET providers in Scotland could usefully consider and resolve collectively.

2 WP5 Investigative process

Both qualitative and quantitative survey methods and resources were devised to support a balanced survey strategy that included qualitative and quantitative approaches. Ultimately, the analysis of Scottish VET supply was solely based on the qualitative methods.

2.1 Qualitative survey

The information and opinions of VET providers on aquaculture VET in Scotland was gathered using structured interviews with VET providers from the public and private sectors. The BlueEDU stakeholder analysis for Scotland identified 13 organisations (public 7 private providers) as relevant to current (2018) aquaculture VET provision in Scotland. All were contacted, and requests made to carry out structured interviews with relevant staff. Of the 13 organisations identified 8 agreed to complete a structured interview, which was a positive response of 62%. The VET providers interviewed included supply companies, private training providers, FE and HE providers.

All the interviews were pre-arranged and, in most cases, included some pre-interview information gathering which set the scene for the structured interview. Some were followed up with request for additional information or clarification in some areas.

2.2 Quantitative survey

A set of generic survey questions were devised during the first year of the project to allow VET practitioners and departmental managers the opportunity to provide information and opinion regarding future VET requirements. A bespoke question set was offered to each occupational level on entering the on-line survey system which was presented via the BlueEDU web-site. The question set was quality assured by several VET practitioners

However, as one major VET provider was not cooperative, reducing the number of potential participants, the decision was made to rely entirely on the qualitative surveys and information collection, adopting a much more flexible and informative enquiry-based approach.

3 National VET supply inventories

There is a range of non-formal and formal VET that the industry utilises and relies on to complement their own inhouse training systems. The currently available VET supply that leads to an NQ or some other form of certification is shown in table 2 on page 11.

3.1 External certificated and uncertificated short courses for industry

3.1.1 Certificated short courses

There are short courses offered in each region that lead to certification that aquaculture companies require their staff to compete, in order to remain compliant, such as Fork Lift Operations, Boat Handing and Capstan winch. Others are required to comply with the wide range of consumer driven QA requirements, including Freedom Foods and Global Gap. There is a plethora of local providers offering courses that lead to certification to serve this requirement. However, a recent Action Planning meeting in response to the Scottish Aquaculture Skills Survey published in May 2018, led by Skills Development Scotland, indicated that the industry would welcome rationalisation and the formal recognition of equivalencies to help them make sense of this very cluttered landscape

3.1.2 The Fish Vet Group (VG)

The Fish VET group offer a range of courses (see Appendix 1) which include half day and one day practical site-based courses, and classroom/laboratory-based courses. None of the courses are certificated or formally assessed. However, the trainer does informally check that the candidate has the competence to carry out on site task without supervision

3.1.3 AKVA technology supply

The training provided by AKVA is carried out to meet the demand from the industry for operative skills for the deployment of new equipment, software or techniques supplied by AKVA. They provide instructions on how to operate all equipment supplied in the form of an installation manual. This also acts as a 'user manual' and provide a follow up service as part of every sale which includes additional instruction if there are problems. AKVA also provide technically focused training on how to set up and use the equipment e.g. feeding systems.

AKVA are careful with any advice they give and emphasise that "*we do not try to teach the farmers how to farm or feed their fish*".

This tends to be carried out on an individual company and site-specific demand rather than a formal course set up to bring candidates from several companies. The AKVA interview revealed that the option for bringing staff together from a range of companies would be a more efficient way to deliver some of the training they offer, such as the Fish Stock Program. None of the training AKVA provides is certificated or assessed other than informally by the trainer satisfying themselves that the candidate can use the equipment unsupervised.

3.2 Typical VET pathways to employment

There are several VET or VET assisted pathways to aquaculture employment in the Scottish sector. These include secondary school senior phase (14-16 years), work-based apprenticeship, VET enhanced degree / post graduate degree entry and non-formal VET. One previously important pathway providing recruits last century during the 80s and 90s, the full-time aquaculture VET at National and Higher National Certificate and Diploma levels has been lost this century.

3.2.1 Secondary school (14-16 Years)

There are a limited number of learners undertaking the National Progression Award (NPA) in Aquaculture at SCQF level 4 (EQF level 2) offered through UHI Argyll College and the North Atlantic Fishery College (NAFC). This program has been designed to expose senior phase pupils to aquaculture careers by introducing north European aquaculture and some on farm experiential learning. (See Appendix 2) To achieve the NPA students are required to complete a selection of units that includes two Mandatory units (total one SQA credit), and Optional units totalling three SQA credits (at least one must come from the Restricted Optional section).

Some of those learners that were successful have been employed by aquaculture companies who were part of the tripartite delivery team (college, school and local fish farm). Once recruited, they progress to a work-based learning program (see 3.2.2 below)

3.2.2 Work based learning

The options available to the new entrant or those changing career to enter aquaculture are twofold.

Most of the larger companies have comprehensive induction and staff development programmes, classified as 'non-formal VET' as they do not lead to a National Qualification. Commonly these company schemes are complemented by non-certificated compulsory short-courses and mandatory training, usually provided by external trainers. Some of the non-certificates short courses are important for compliance with quality assurance requirements such as RSSPCA Fish Welfare, Freedom Foods and Global Gap. Mandatory training, such as Water Safety, Boat Handling and Fork Lift Operations, must be completed by staff from all companies, irrespective of their size to remain legally compliant. It is possible to progress through in company development programmes to site manager level, without having to undertake a National Qualification.

Alternatively, once in employment, if a new entrant wished to gain a National Qualification, they can follow the MA pathway. Each MA level must be completed in turn, as a pre-requisite to the next level, as the award is cumulative according to the following sequence:

- MA Level 2 Operative (SCQF 5, EQF 3)
- MA Level 3 Supervisory (SCQF 6-7, EQF 4-5)
- MA level 4 (Technical Apprenticeship) Managerial (SCQF 8, EQF 5)

The MA level 4 has been launched over the last 12 months, and there has been some uptake by experienced site managers and aspiring managers, particularly on the Shetland Isles.
However, NQ completion is not mandatory prior to or after entry at operative level to any Scottish aquaculture company. As the producer companies have become increasingly self-reliant through inhouse training, they have employed staff with no training or qualifications and enter them on to their in-company schemes (See 3.2.2 above).

An industry survey carried out for the 'Skills Utilisation' aquaculture work-based learning project in 2011 revealed that the smaller National Progression Awards (NPAs) were suitable qualifications for new entrants, especially the younger learners. There was the potential for the NPA's developed in the pilot to be delivered and assessed using blended learning, including; paper based, online and face to face practical training and assessment. The NPA units and awards are still available on the SQA catalogue, but to date have not been taken up by any centre.

3.2.3 Distance Learning

There is a knowledge-based distance learning option available from a Scottish University at higher VET level that can help to prepare graduates for employment. The program is 100% based on 'on-line learning' and there is no development of practical competence. For some learners this is irrelevant, as they are already in full time employment on a Scottish Salmon farm and have undertaken the course in order to gain a prestigious university qualification that can improve their prospects for career progression or employment at another company.

4 VET providers opinion of the aquaculture VET supply

The VET providers were encouraged to give their opinion of the Scottish aquaculture VET supply at operative and managerial level, from a wide range of perspectives, including; industry needs, VET design and staff development needs and their organisations attitudes towards innovation and collaboration.

4.1 National formal VET provision leading to a National Qualification

Only one National Qualification (NQ) is being delivered in Scotland currently to the post 16 age group, the Modern Apprenticeship in Aquaculture (Levels 2-4), and one to pre-16-year olds in the senior phase of secondary school, the National Progression Award in Aquaculture at SQF level 4.

However, there is a rich legacy of alternative NQs in Scotland at VET and Higher VET level, some of which are designed for college as opposed to work-based delivery. When interviewing providers with experience of these alternatives, their opinion was sought, as some 'legacy NQs' could be revised and offered in the future.

4.1.1 VET provider opinions on VET/NRQ's

The MA (Levels 2-4) is the NQ that most providers are aware of and many interviewees were focussed on this group of qualifications. Although there was a general feeling that the MA was 'doing the job' and allowed learner progression, the need for a review was acknowledged. The VET providers believed the optional and mandatory units available for the MA levels 2 and 3 were suitable for a husbandry qualification, however, they questioned whether the needs of specialists in the workforce, such as 'treatment boat' operators were adequately served. There were also suggestions the MA was not sufficiently flexible for some learners, despite the plethora of optional units.

The occupational levels within the MA were thought to be appropriate, however there was a tendency for overlap, especially at MA levels 2 and 3, which may be necessary for some subjects, but not others. When the University of St Andrews were asked the same question in relation to their on-line Sustainable Aquaculture Programme at Higher VET level, they felt that the level was appropriate for the target audience as it is equivalent to the 1st/2nd year of a degree, academically and equivalent to higher VET in the Scottish system.

The aquaculture National Occupational Standards (NOS) underwent a review process in 2017 and provided the opportunity for representatives from industry and VET providers to comment. Some of the VET providers interviewed were involved and acknowledged it went smoothly and included representation from industry. However, despite this claim, not all VET providers agree that the NOS fully reflecting industry needs currently, and as technology quickly advances, and the NOS are struggling to remain current. The sector could lose confidence in the NQs if they feel the NOS underpinning them are not meeting their requirements.

To try and overcome this problem, it was suggested that the industry should be more regularly consulted in a more meaningful way to ensure the NOS fully satisfy their needs. Subsequently, during a meeting led by the Skills Development Scotland (autumn 2018) in response to the Industry Lead Group 2030 Skills Survey, a commitment was made to conduct a 'root and branch' review of aquaculture occupations and occupational profiles (knowledge and skills requirements).

4.2 Employer engagement with FE

Colleges do work closely with their local industry and employers, who will advise on course content, and some employers are represented on college Boards of Management.

4.2.1 Industry involvement in NQ updating

The stakeholders interviewed believed the aquaculture industry values Scottish NQ's but agreed that it is difficult for them to remain technically current. With their agreement, future NRQ's could have input from producer and technology supply companies, and their endorsement, to keep them technically current. At the SDS led post Skills Review Action Planning meeting referred to in 4.1 above, it was agreed that the technology supply sector should help to define the industry's knowledge and skill requirements, as they have a unique foresight regarding the impact of technology on workforce skills.

4.2.2 Collaboration by VET providers

The VET suppliers agree that the use of ICT and learning technologies would improve the accessibility of aquaculture training courses, but some note that these approaches do not suit all learners. Some providers are currently using ICT in course delivery and assessment and would consider collaborating to develop online content within blended learning delivery modes that included employers within the delivery team. Some already have some informal collaborations ongoing. However they also recognise the need for caution regarding Intellectual Property (IP) rights, when sharing resources between educational organisations within a competitive environment.

4.3 VET provider/industry relationship

Although VET providers generally have a good relationship with the aquaculture companies in their local area, for some that relationship has weakened. This is due to a range of factors. As the relationship between some VET providers and the industry deteriorated, the confidence in the quality of the training being delivered also declined. This has contributed to the increase in reliance on inhouse training which VET providers acknowledge, has made the aquaculture industry in Scotland increasingly self-reliant regarding staff development.

The veterinary and equipment supply companies interviewed felt that there needs to be an improvement in the relationship between supply companies and those who deliver VET. As they have a close relationship with the sector and work with the producer companies' staff on a regular basis they are well placed to facilitate. This would help VET providers to keep up to date with technological or fish health and welfare advances. The development of a visible and more formal relationship between VET providers and supply companies could lead to improvements in the producer company's confidence in the quality and currency of the training being delivered.

4.4 Suitability of VET pathways to employment for learners

VET providers believe that there is poor awareness of aquaculture career opportunities by school leavers and the general public. This could be attributed to weak promotion but may also be influenced by the constant negative industry portrayal by the media.

The localised aquaculture regions are providing employment opportunities to residents aware of the industry. When a wider or national geographic perspective is considered, this awareness drops considerably.

4.4.1 Promotion of aquaculture careers to school age learners

Evidence from the interviews would suggest that there is a need for a more positive promotion of aquaculture career opportunities to a much wider audience, particularly in Scottish secondary schools. Promotion should target a national audience and not just the coastal zone. Some also note that the re-introduction of full time VET would provide a more accessible education career entry point, greatly assisting any national campaign.

The VET provider interviews revealed a lack of younger recruits in the 16-19 age group to the MA qualifications, compared to the mature learners. This may be indicative of a lack of interest in aquaculture in the younger generation or a lack of knowledge of the available opportunities.

Although an Aquaculture National Progression Award (NPA) is available for schools (14-16-year olds), it is only offered in the coastal zone, where aquaculture is dominant. If aquaculture courses and qualifications were made more widely available, school leavers and mature learners from regions away from the coastal zone could be attracted to the industry.

4.4.2 Alternative NQs to improve the accessibility of VET

To undertake the MA in aquaculture, a learner must be in aquaculture employment which can prove particularly difficult for a young person not living in the vicinity of a fish farm. It has been suggested that an NQ offered in smaller, more flexible and achievable 'chunks' may provide a better solution. This could be addressed by revising the fish husbandry orientated NPA awards (SCQF 5/EQF 3) available from the SQA and offering them in partnership industry. The NPAs could be undertaken in series, accumulating Units towards the completion of a National Certificate, designed to prepare husbandry operatives for career entry.

4.4.3 VET pathways for mature learners

Interviews revealed that not all mature employees are interested in a career. Some seek employment in aquaculture as they simply need a job to live in their area of choice. The career pathways for the more committed mature learners reflect those available to the young, but potential barriers may deter some.

The reduced level of funding made available by Skills Development Scotland (SDS) for mature learners (26 years old and over) is a disincentive to VET providers. Despite this, many are being served and their training is subsidised by industry and/or VET providers, directly or indirectly.

In addition, the Industry Lead Group 2030 Skills Survey indicated that some mature employees are avoiding registering on the MA in Aquaculture for fear of failure. Therefore, the NPAs may be a much more suitable alternative for them, building confidence as they progress through a series of smaller and more manageable qualifications, which can culminate in the completion of a comprehensive National Certificate in Aquaculture.

4.4.4 VET providers improvements summary

The VET providers interviewed suggested the following general areas of improvement to the aquaculture VET and qualifications currently available:

- The re-introduction and promotion of an NRQ which includes an element of college-based provision which can lead to a fast track MA pathway
- Improved access to funding for training, especially for those over 26 years old.
- Improved access to commercial fish farms, with industry cooperation, for practical training purposes
- NQs offered in smaller chunks of learning which do not require a long-term commitment and can slowly build the confidence of reticent learners
- Access to a wider spread learning centres that can offer access to an aquaculture curriculum, assessment and learning support.

4.5 Learning and study skills of learners

VET providers have observed a significant minority of learners with some form of learning difficulty, which resonates with the 'lack of learner confidence' that the industry have observed.

4.5.1 VET level learners

A combination of a high workload and learning difficulties can lead to increased time and learning support needs to allow these learners to progress. This can be difficult to accommodate in some situations. Although the design and delivery of the MA suits most work-based learners, the qualification structure is cumbersome for others with learning difficulties, and steady progression through the award can be daunting. The learners' ICT skills and confidence vary, which may reflect the way they are treated within the MA. (See 4.7.1)

4.5.2 Higher VET level learners

The VET providers also implied that the learning and study skills of potential managers were not being fully tested, although most appeared to be confident learners. Some VET providers suggested that the management standards contained within the MA level 4 are not generic enough and focus too much on the aquaculture technical knowledge. They felt this is not truly expanding business and management skills and "*did not 'stretch some managers'.*

4.6 Delivery and design

Some mainland VET providers were reasonably satisfied with the MA in Aquaculture for mature work-based learners who had some farm experience, despite recognising the need for some technical updating and improvements to the work-based delivery system and resources. For them the MA is an opportunity to develop a deeper knowledge and understanding of aquaculture underpinning operations at the farm they work on. Much of the MA delivery is farm specific and the optional units chosen allows any employed learner to complete by carefully selecting Units that fit their own farm operation.

Whilst this level of customisation allows considerable flexibility, it does also lead to questions regarding its comprehensiveness if used as an initial VET program and real level of transferability, bearing in mind that a lot of the practical and knowledge- based assessment is farm specific. In addition, one provider made the comment that '*there were not many realistic choices to be made for*

learners who were on a salmon growing site, as most of the apparent options were not applicable to this type of aquaculture operation", implying that a wider range of optional Units to suit salmon on-growing would further improve the flexibility.

It was acknowledged in conversation that although 16-18 year olds do embark on the MA in Aquaculture, it was not ideal for this purpose, as they had no previous experience and often lacked any aquaculture background knowledge, It was suggested that this age-group would be better served by a college based full time course of study at husbandry operative level in the form of a National Certificate (12x40 hour Units), which introduced them to all sectors and provided a wider range of practical experience and training, including; salmon hatchery and on-growing , rainbow trout and shell fish farming.

If devised of NPAs (each of 3x40 hour Units), made available through work-based learning to the employed, the interests of reticent unconfident work-based learners not currently engaging with NQs could be served, as well as school leavers, outside of the coastal zone, and in need of a broader based VET at the start of their careers.

4.7 Innovative VET delivery (including ICT supported)

The VET providers were asked specific questions about their learners' ICT and green skills and their inclusion in course delivery. VET providers were aware that when learners undertake distance learning full engagement with ICT is often a necessity, as many courses are reliant on on-line course work, assignments and assessment

4.7.1 ICT and digital skills

The VET providers have observed that some learners are unwilling or unable to use digital technology. Due to the design of the MA this can be an issue, as ICT is assumed to be embedded throughout the program and qualification, and as such does not have to be taught or assessed. However, interviews with VET providers showed that of those learners undertaking MA level 2, approximately 50% of them will engage well with ICT and the other 50% not as well.

There is a general agreement among VET providers, that the increased use of ICT and digital technologies could improve the accessibility of aquaculture training courses. Where ICT/digital technology is not required as part of the course, some VET providers encourage learners to use ICT when opportunities arise, such as emails, use of learning platforms, online research and the submission of course work online. This is up to each program tutor to lead and organise.

It was also noted by providers that although ICT is used increasingly to support course delivery and assessment by many providers, this does not suit all learners and their skills and confidence need to be developed.

4.7.2 Green/environmental skills

The importance of green skills is recognised by producer companies, VET providers and aquaculture supply companies as important and they place a lot of emphasis on awareness of sustainability in the training they provide. The VET providers interviewed identified a definite gap in the MA structure in relation to green skills, which are integrated throughout the awards, but not emphasised. The focus is on the aquatic rearing environment, but no real attention to the external environment or the sustainability and environmental impact of aquaculture. This may indicate that

the MA (and the underpinning NOS) need to fully acknowledge and incorporate sustainability and environmental impact at the next review.

5 Future VET development priorities

The main feedback from VET providers on their future development priorities, implied that better collaboration between stakeholders could lead to improved staff development opportunities and the collaborative development of valuable learning resources and delivery systems.

5.1 Specific staff development requests

When asked to identify their personal staff development priorities they included Improving contacts with the industry and keeping up to date with technical changes, including, more specifically:

- Food safety legislation update
- Quality assurance and auditing schemes update
- Specialising in fish disease treatment methods
- Maintain competence in areas such as legislation
- Keeping up to date with NQ changes

Interviews established that current and previous providers recognise the need to increase the applications of learning technologies, including e learning and digital portfolio, within their delivery systems. This is seen as particularly important to work based learning. Whilst some are very focussed on resource development, others realise that the development and application of learning technologies and resources to learning and assessment, have a major staff development implication.

5.2 VET innovation

VET providers do have an appetite for innovation in several key areas, namely: work-based learning delivery systems and resources, full time VET structures and pathways and capacity building in secondary schools.

5.2.1 Work based learning

Improvements to the delivery of the existing work-based MA in Aquaculture that are of interest, include; the application of accreditation of prior learning to help fast track the assessment process for experienced learners, the introduction of e portfolio to improve the efficiency and reliability of work-based assessment of practical competence and the development of e learning resources to learners in addressing their knowledge gaps.

Some of these improvements and new resources may be able to cross over to support the delivery of alternative work-based qualifications. particularly the NPAs (See 5.2.1 below)

5.2.1 Full time VET (NPA and NC)

In addition, there is a realisation amongst existing and previous mainland providers that full time VET should be re-instated, using revised National Progression Awards that can be delivered in series to form a National Certificate that prepares school leavers for entry to industry, and can be adapted to suit work-based delivery. Early indications from some salmon producer companies indicate that

access could be provided to farm sites to enable the training of 16-18-year olds before they enter their workforce as full-time employees.

The VET provider interviews recognised that smaller 'bite sized' chunks of learning may be a solution to addressing skills needs more effectively for reticent learners. As an aside, this was the central theme to the Aquaculture Work Based Learning pilot project led by Barony College which created two National Progression Awards (NPAs).

5.2.2 NPA in Aquaculture for Schools (14-16-year olds)

The delivery of the NPA in Aquaculture (SCQF level 4) to secondary school learners has an-established, legacy on the west coast of Scotland. The former Barony College developed the NPA and some lesson plans and a modest collection of 'e learning' resources and assessment support packs within a development funded by the European Fisheries Fund (EFF). This allowed the tripartite delivery model involving college staff, school teachers and fish farm managers to get tested, refined and proven. Today this delivery system continues, led by one mainland provider with good industry links and involves two west coast Secondary schools. The NPA delivery needs to scale up nationally and link to the STEM and Developing the Young Workforce (DYW) initiatives as it evolves to help promote aquaculture careers.

The development and further application of e learning is required, alongside the development of secondary school teachers so as they can properly lead and support aspects of program delivery. However, more VET practitioners are needed to support capacity building at school level and this is a current constraint.

5.3 Learning resources

Anecdotally it would appear that the main provider on the Shetland Isles has made good progress with the development of 'e learning' resources and approaches within its MA delivery system. However, although mainland VET providers have both used paper-based learning packs to support the delivery of work-based learning in the past with some success, they lack digital resources. They recognise the advantages that a well-designed e learning resource could bring. However, whilst keen in principle, they are also both acknowledge their staff capacity constraints that necessitate a collaborative approach to development.

Both providers are part of large organisations that have a considerable e learning resource development technical capacity, which includes Virtual Learning Environment (VLE) and multi-media technical specialists, who can develop resources according to a given specification. The specification needs to be developed by aquaculture subject experts and instructional designers working together. The process of e learning development is very familiar as both organisations have considerable experience. However, they both have capacity issues regarding the availability of aquaculture VET practitioners to overcome in the short term.

6 VET provider partnerships and attitudes towards collaboration

Throughout the BlueEDU research, interviewees made constant reference to the need for better collaboration between stakeholders and some encouraging signs of stronger and more formalised partnerships have been emerging.

At the recent AILG 2030 Skills Review Action Planning meeting in October 2018 a commitment was made to review and update the aquaculture 'occupational map'. A strong appeal was made by one industry leader asking other stakeholders to fully engage in the process. This is an important 'first step' and a foundation to other necessary NQ and curriculum developments at VET and higher VET level, as the revision depends on there being a current, credible and respected NOS, reflecting the knowledge and skill requirements of todays industry.

Generally, the VET sector has a positive relationship with the industry to build on which can be further bolstered in several ways.

6.1 National level partnerships (existing and emerging)

There is a willingness to collaborate by the two traditional leading public sector mainland providers of aquaculture VET. The formation of a formal partnership to support the re-instatement of full-time provision on the mainland is ongoing. This has several aspects under discussion:

- The development of a mainland training facility on the west coast of Scotland in proximity to the salmon farming industry
- The establishment of salmon and trout farm access arrangements for practical training and assessment
- The development of a shared delivery model for a re-instated full-time aquaculture VET provision on the mainland
- The collaborative development of learning resources and VET delivery systems

This arrangement has the potential for expansion as the organisations both have an extensive network of learning centres and facilities available nationally as well as access to a team of technical development specialists to support e learning resource development.

In addition, the main salmon farming companies are showing signs of support and some have already welcomed the idea of a full time VET course being re-introduced to the mainland. Access to farm sites and the involvement of their farm supervisors and managers, as required for a high-quality program, will be subject to imminent negotiations between a formalised VET provider collective and representatives of the main salmon farming companies producing over two thirds of Scottish production.

A leading University provider of aquaculture on-line learning has expressed an interest in collaboration with the Scottish VET sector. Their provision is 100% on line currently but could be aligned and revised to serve the delivery of SQA Higher National Units (SCQF 7-8), in partnership with an experienced aquaculture VET provider. This would allow the inclusion of practical competences as would be required within a higher VET blended learning program.

6.2 European level opportunities (existing and potential)

There are no ongoing European funded aquaculture VET development projects involving Scottish stakeholders. However, there is a keen interest by several leading Scottish stakeholders in joining several European Erasmus+ projects under discussion. They are all compatible with the aquaculture VET development priorities in Scotland and have the potential to accelerate progress.

6.2.1 Aquaculture VET (full time attendance)

Led by the largest and most influential Norwegian owned salmon farming companies in Norway, Scotland, Iceland and Ireland, there is interest in the development of a north European salmon farming occupational map and a 'shared framework of learning outcomes'.

Once established, this 'common currency' of shared learning outcomes will provide a consistent framework to inform;

- the development of improved college and work-based learning pedagogy,
- the collaborative development and sharing of resources (learning and assessment) and
- the promotion of learner and staff mobility within northern Europe.

This collaborative vision being muted by the Norwegian led industry is a central to their salmon farming workforce development thinking.

The shared learning outcomes and revised Scottish NOS can then inform the development and re-alignment of revised NQs in Scotland to better suit the needs of the Norwegian led industry. A major Scottish mainland VET provider has expressed an interest in joining development projects that can assist the re-establishment of a full-time attendance-based aquaculture VET on the Scottish mainland that targets 16-18-year olds. By maintaining a close alignment between north European occupational definitions and the revised Scottish NOS, SQA Units revised and new Units developed to address any gaps to form an updated NQ at husbandry operative level. The EQF levelled 'shared framework of learning outcomes' as well as the Scottish NOS will inform the revision, leading to equivalencies between learning outcomes and Units between north European VET partners, facilitating learner mobility and the application of ECVET.

Articulation with an 'upgraded' work-based MA will be facilitated, leading to improved 'fast-track pathways' to MA completion at levels 2 and 3, following initial employment.

6.2.2 Work-based learning (Modern Apprenticeship) upgrading

Scotland, Norway and Ireland share an interest in the development of improved systems and resources for work-based learning and formal apprenticeship pathways. This includes the development of the Accreditation of Prior Learning, the application of 'e-portfolio' and the creation of well contextualised 'e learning' that will also be of value to inhouse company training and used to entice the less confident learners to undertake a formal VET pathway, thereby helping to increase the proportion of workforce operatives that complete a National Qualification.

6.2.2 European Aquaculture Higher VET

The development of NQs at Higher VET level to support management development is of interest to Scotland, to motivate more experienced managers. The industry in Norway are keen to introduce higher level VET as they have never had a suitable provision for Aquaculture at this level, and existing University programs do not support the development of their unqualified managers effectively.

Iceland have an interest in Higher VET as the Holar University has a legacy of provision for aquaculture at this level, making them a suitable partner with a future Strategic Partnership project.

All three countries have a strong interest in flexible blended learning delivery and would work together to create suitable resources and pedagogy, following the principles of action-based learning and work place application within the course work and assessments

6.2.3 European Aquaculture curriculum for Secondary Schools

The leading provider in Scotland for the NPA (SCQF level 4) in Aquaculture for schools is developing an 'Aquaculture Skills and Knowledge for Schools (ASKS) Strategic Partnership (SP) bid with the aim of further developing the school level curriculum and establishing a formal network to support future staff and learner exchanges within southern and northern Europe potential.

An SP bid is under development for March 2019 submission, led by Scotland and including colleges and schools from the Netherlands and Spain. These countries each have a very different aquaculture industry and farmed species range, bringing much greater diversity to the European Secondary Schools' aquaculture curriculum, promoting the concept of aquaculture as a highly technological industry within the blue economy, with exciting international career potential.

References

(1)- Aquaculture Growth to 2030, accessible from: http://scottishsalmon.co.uk/wp-content/uploads/2016/10/aquaculture-growth-to-2030.pdf

(2)- Skills Review for the Aquaculture Sector in Scotland, Highlands and Islands Enterprise (HIE), 2018.

Appendix 1 Fish Vet Group (FVG) courses offered

Course title	Duration	Delivery mode	Formal assessment	Certificated
Gill health assessment	Half day	On site practical	No	No
Sea lice identification and monitoring	Half day	On site practical	No	No
Fish diagnostics course	One day	Practical laboratory	No	No
Basic Microscopy (half day) on site or laboratory	Half day	Practical on site/laboratory	No	No
Best practice health and monitoring	One day	On site practical	No	No
Plankton sampling and identification	One day	Practical on site/laboratory	No	No
Fish welfare	One day	Classroom	No	No
Cleaner fish health and management	One day	Classroom and practical (if required)	No	No
Gill health can be combined with practical Gill health assessment	Half day	Classroom and practical (if required)	No	No
Freshwater health and disease (one day).	One day	Classroom/laboratory	No	No
Marine health and disease (one day)	One day	Classroom/laboratory	No	No

Appendix 2 Structure of the NPA Aquaculture (Level 4)

aimed at schools delivery in Scotland, adapted from Scottish Qualifications Authority website https://www.sqa.org.uk/sqa/38617.html

SQA Award : G9D8 44 (24 SCQF credit points)				
Units	SQA Unit Code	SQA Credits	SCQF Credit points	
Mandatory				
North European Aquaculture: An Introduction	F6T9 10	0.5	3	
Aquatic Environment: Local Investigation	F6TA 10	0.5	3	
Restricted Optional				
Aquaculture: An Introduction to Finfish Production	F6TB 10	1	6	
Aquaculture: An Introduction to Shellfish Production	F6TC 10	1	6	
Optional				
Aquaculture: Basic Seamanship	F6TD 10	0.5	3	
Scottish Sea Fisheries: An Introduction	F6TE 10	0.5	3	
Establishing a Business Identity	F5GA 10	0.25	1.	
Business and Finance: An Introduction	F5G8 10	0.25	1.	
Business and Marketing: An Introduction	F5G9 10	0.25	1.	
Business and E-Commerce: An Introduction	F9G7 10	0.25	1.5	
Work Experience	D36H 10	1	6	

Appendix 3 – Aquaculture HNC/PDA units

Unit title	SQA code	SCQF credits	SCQF level	EQF level
Mandatory units (HNC requires all mandatory units = 56 credit points)				
Fish Farming graded unit 1	F52S 34	8	7	5
Fish Health and Disease (PDA Mandatory)	F4S5 34	8	7	5
Fish Science : Freshwater Fish (PDA Mandatory)	F4S8 34	16	7	5
Health and Safety Legisaltion : an introduction	DF87 34	8	7	5
Using Software Applications Packages	D85F 34	8	7	5
Water Resources for Aquaculture and Fisheries (PDA Mandatory)	F4N5 34	8	7	5
Group 1 Optional units (HNC requires minimum of 16 credit points, maximum of 32 credit points)				
Fish Hatchery Management (Salmonid)	F4N4 34	16	7	5
Fish Production Management	F4S6 34	16	7	5
Group 2 Optional units (HNC requires minimum of 8 credit points, maximum of 24 credit points)				
Aquatic Ecosystems	DP4V 35	8	8	5
Fish Farm Records	F4S4 34	8	7	5
Fish Production Technology	F4S7 34	8	7	5
Introduction to Genetics	A6K2 34	8	7	5
Work Placement	HJ4W 34	8	7	5
Working Within a Project Team	DH21 34	8	7	5

BlueEDU WP5 VET supply - Iceland

Ann Cecilie Ursin Hilling
NTNU

Iceland

1. Icelandic Aquaculture VET sector and providers

In Iceland, there is a lack of VET in aquaculture. There is today only one Aquaculture VET study that is governmental approved, which is on a higher level (EQF6) and therefore requires matriculation exam in order to enter. In addition, you will find one private school providing VET courses in aquaculture. It is industrial recognized but not an approved NRQ.

Efforts are presently being made in orders to create a governmental approved aquaculture VET study which meets the industrial requirements. In this description the term NRQ is defined as general studies in Iceland which is approved by the government and is part of the public-school system. The term Master Craftsman is defined as a graduate from vocational education which in addition has completed the apprenticeship period and following exam.

Investigative process

The findings from Iceland has been discovered through structured interviews with current and possibly future Aquaculture VET providers. There are not many interview objects and therefore there has additionally been conducted small interviews with public school teachers, private course providers and the industry in order to confirm or elaborate findings and to discover the needs for aquaculture VET in Iceland.

1.1 The Public sector

Iceland is a country which has over the past 20 years made major changes to their focus in kids and youth. 20 years ago, the Icelandic government was increasingly registering that the youth of Iceland was on a decrease in performance. They were increasingly turning to substance abuse, decreasing school performance and future possibilities. In 1998, the percentage of 15-16-year olds who was asked if they had been drinking the previous month was 42%, the percentage who had or was using cannabis was 17% and smoking was 23%[1].

Something had to change, and by conducting major studies via questionnaires, they found 4 things that were major factors:

1. Sports participation 3-4 times a week
2. Total time spent with parents during the week
3. Feeling cared about in school
4. Not being outdoors in late evenings

[1] https://mosaicscience.com/story/iceland-prevent-teen-substance-abuse/

Parents and the government wanted a change and the national plan Youth in Iceland was formed. Laws where changed where alcohol advertising were banned and the age limit for buying alcohol and tobacco were raised. But some of the more interesting changes were the law preventing children aged 13-16 from being outside after 10pm in the evenings in winter and midnight in summer.

Parents were educated in the importance of spending more time and more efforts in their youth via courses.

In addition, the state funds for organized sports, art, music and other clubs was increased, new training facilities were built in every town, and all families are given the amount of 250€ per year to help pay for leisure equipment for the kids.

And last, but not least changes were made in the school were the Icelandic government today is number 2 of the OECD countries on the percentage spent out of the GDP on both primary education.

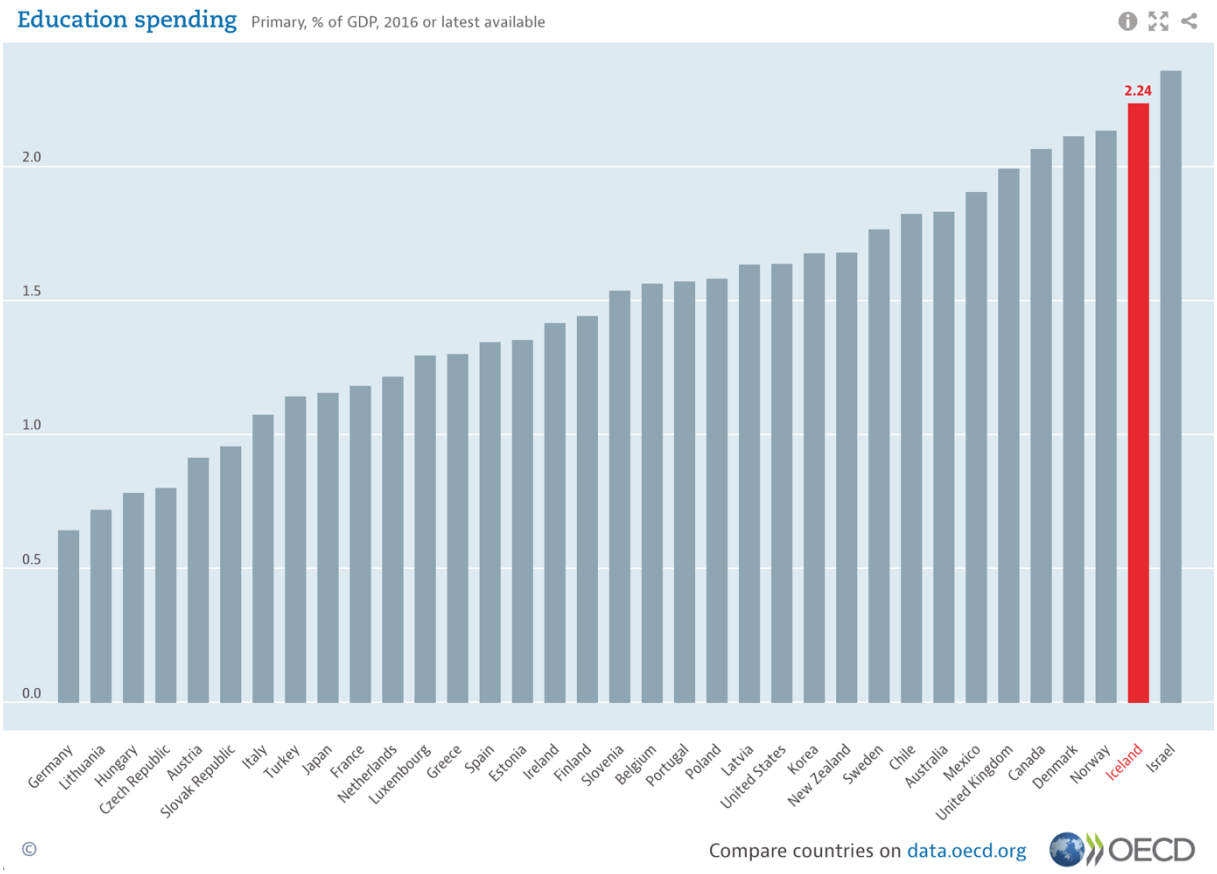


Figure 1. How various countries are spending their educational resources compared to the GDP budget.

The questionnaires have continued every year since 1998 and the numbers from 2016 showed that the 42% of teens who had been drunk the previous month in 1998 had dropped to 5%, Cannabis abuse from 17% to 7% and smoking from 23% to 3%. Iceland is now on top of the

clean teen list in Europe. Additional studies in Iceland has also shown that youth who are participating in physical activities are also performing better in school[2].

1.1.1. Governance

The governance of the Icelandic school system is divided between local and national authorities. The Icelandic government are responsible for the framework and the objectives of the school system as a whole. They are responsible for the governance and approval of National recognized qualifications (NRQ).

The municipalities are responsible for the schools from lower primary (Leikskoli) to primary and lower secondary school (Grunnskoli). Upper secondary (Framhaldsskoli/Menntaskoli) and higher education is being managed from Menntamálastofnun (Directorate of Education). All of the schools are allowed to make local adaptions to their education on all levels, as long as it is compliant with the major lines of the education framework. Thus, if the school wants to create new studies or a local adaption to an existing study, they can do so. But the directorate has to receive notice and approve.

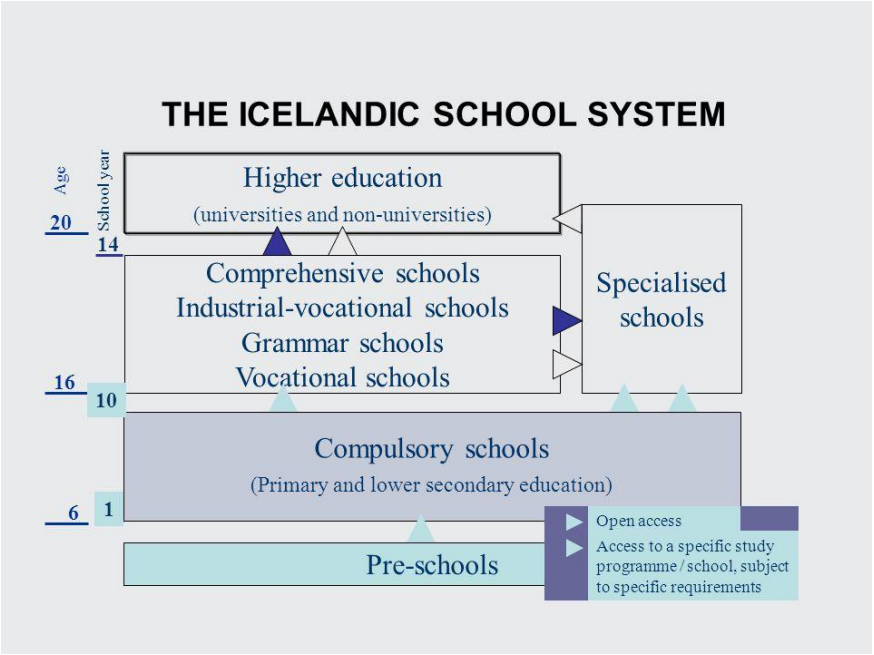


Figure 2. Simplified model of the Icelandic school system

[2] https://academic.oup.com/her/article/22/1/70/578861

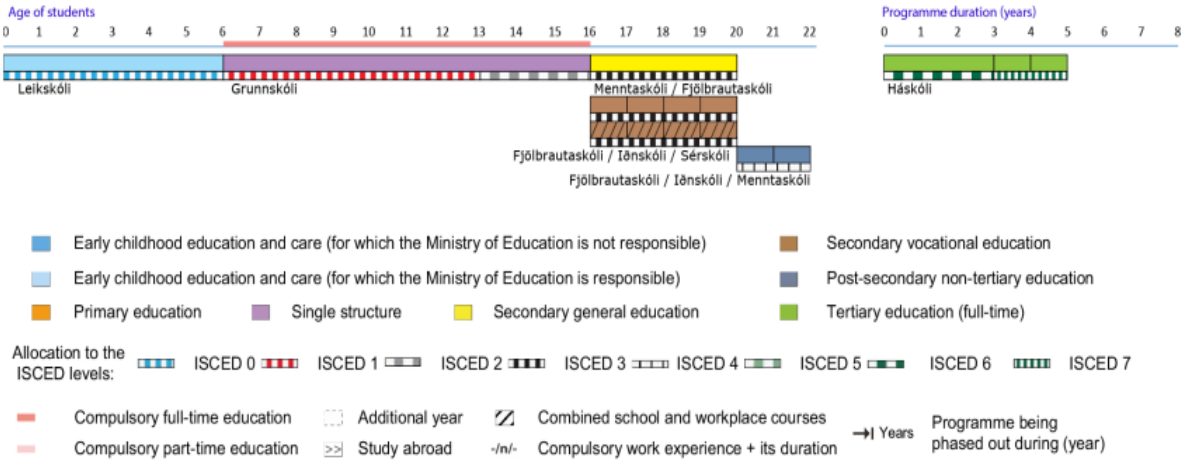


Figure 3. The educational model of Iceland including ISCED levels and dividation of responsibilities

Iceland is one of the countries that spends most on their education compared to the OECD average. Though it has to be mentioned that even if the money spent per student on the compulsory education is above average OECD level, the amount spent on students on secondary and tertiary level is below[3].

Funding

In Iceland, all public form of education is for free. This also applies for upper-secondary schools and for state run higher education facilities. However, in upper-secondary school and in higher education the student has to pay a small enrolment fee and is expected to pay their own study material. For vocational studies, students are expected to pay an additional fee to cover material expenses. If students would like to attend a private school for upper-secondary and higher education, they are eligible to apply for funding through the Icelandic Student loans fund. Iceland spends close to 90% on their education fund on the public-school system.

1.1.2. Icelandic Qualification Framework

The Icelandic qualification framework (ISQF) was created in 2006 as a part of the extensive reform of the Icelandic educational system. The framework consists of 7 learning-outcomes based levels and types of qualifications[4]. The Icelandic NQF (national qualifications framework) was referenced to the EQF in December 2013. The framework has yet to be completely established, due to there being some further assessments to be done, as for example if one should subdivide the higher education into further sublevels. The relationship of the ISQF to adult learning is still being debated, particularly addressing the added value of the framework for low-skilled adults.

[3] Education Policy Outlook Iceland, OECD, April 2016

[4] http://www.cedefop.europa.eu/files/iceland_-_european_inventory_on_nqf_2016.pdf

Icelandic Qualification Framework

Icelandic Qualification Framework (ISQF)	Descriptors of the Icelandic Qualification Framework	European Qualification Framework (EQF)
7	• Has advanced knowledge of theories, research and the latest developments in a scientific field. • Can conduct and manage research with confidence in order to develop new knowledge. • Can work independently, show initiative and be responsible for complex theoretical tasks and pass on knowledge to others.	8
6.2	• Has obtained knowledge through research and has a good understanding of theoretical challenges and arguments and is able to contextualise the latest knowledge. • Can understand complex problems and use appropriate methods to conduct smaller research projects. • Can initiate and lead new projects, evaluate the most suitable approaches, and be responsible for their own work and that of a team.	7
6.1	• Has knowledge and understanding of theoretical challenges and arguments and is able to contextualise the latest knowledge. • Can apply the methods of the relevant field/profession to formulate, develop and solve problems. • Can initiate and lead new projects and be responsible for their own work and that of a team.	
5.2	• Has an understanding of and insight into major theoretical concepts and theories and is familiar with the latest knowledge within a specific field. • Can apply critical theoretical and/or professional analysis when solving problems and evaluate the results independently. • Can work independently in an organised manner, make and carry out plans and supervise teamwork.	6
5.1	• Has knowledge of selected theories and theoretical concepts and has insights into the relevant field in a broader context. • Can develop and manage projects using the techniques relevant to the field/profession. • Can show initiative and work independently in addition to solving problems as part of a team.	
4	• Has specialised knowledge useful for supervision and management in a specific field of work and/or further studies. • Can organise work procedures, apply the appropriate techniques and develop working methods in a responsible way. • Can give guidance and professional training, review own and others' performance and be responsible for the utilisation of the relevant occupation in cross-disciplinary cooperation.	5
3	• Has specialised knowledge in a specific field of work and/or as a preparation for further studies. • Can demonstrate professionalism, show initiative, organise tasks and evaluate own work. • Can make use of specialised knowledge for improvements, give professional advice and co-operate in cross-disciplinary activities.	4
2	• Has basic knowledge of work procedures and concepts useful in work and/or study. • Can solve problems by applying the appropriate work methods, tools and information. • Can work as a part of a team, initiate interaction and be responsible for well-defined tasks.	3
1	• Has the basic knowledge for work and/or as a preparation for further studies. • Has the basic skills required to carry out simple tasks during studies and/or at work. • Can work under guidance with some independence on well-defined tasks.	1-2

Figure 4.Model of the Icelandic Qualifications Framework (ISQF)

1.2 The Icelandic Public-school system

1.2.1 Compulsory School

The school system in Iceland consists of a public framework where primary and lower secondary education is compulsory and starts from the age of 6 years old and lasts until the age of 16. The schools are governed by the local authorities with the guidance from national authorities. The compulsory school act no.91 2008 in addition with The Icelandic National Curriculum Guide For compulsory schools (INC)[5] sets the national guidelines on how the schools are supposed to provide learning, the curriculum and the evaluation. The guidelines are deeply rooted upon preparing the pupil for lifelong education with the application of Knowledge, Skills and Competence (see fig.4).

Figure 5.Definition of key points preparing pupils for life-long learning.

In addition, the educational policy is based on six fundamental pillars which the curriculum guidelines are based throughout the educational system as a whole[6]:

1. Literacy
2. Sustainability
3. Health and Welfare

[5] https://www.government.is/library/01-Ministries/Ministry-of-Education/Curriculum/adskr_grsk_ens_2012.pdf

[6] The Icelandic National Curriculum Guide for Upper secondary Schools 2012 https://www.government.is/library/01-Ministries/Ministry-of-Education/Curriculum/adskr_frsk_ens_2012.pdf

4. Democracy and human rights
5. Equality
6. Creativity

1.2.2. Evaluation and assessment

Evaluation of learning outcome throughout compulsory school in Iceland is conducted through continuous assessment with tasks, projects, tests and self-evaluation. In addition, the pupil is conducting national examinations upon completion of grade 4,7 and 10 in order to assess the achievement of national competence criteria. INC has established four standardized criteria upon evaluation if a student has achieved the competence criteria (see fig.6).

Standard	Subject Area	Key Competence
A	Exceptional learning competence and performance with reference to the competence criteria of the subject or field of education.	Exceptional competence with reference to the criteria of competence.
B	Good learning competence and performance with reference to the competence criteria of the subject or field of education.	Good competence with reference to the criteria of competence.
C	Passable learning competence and performance with reference to the competence criteria of the subject or field of education.	Passable competence with reference to the criteria of competence.
D	Defective learning competence and performance with reference to the competence criteria of the subject or field of education.	Defective competence with reference to the criteria of competence.

Figure 6.: Evaluation criteria for compulsory school assessment.

Upon completion of the compulsory school period the pupil will receive a certificate attesting to the completion of compulsory studies. The certificate is to record the pupils study assessment report for the study during their final years of education (grade 8-10). The reference is to be two-fold, with the input from the student and the school. It should also contain on which criteria the study assessment is based. This will be the document on which the entrance to upper secondary school is assessed.

1.2.3. Upper-secondary school

The entrance to upper secondary education is usually obtained by the age of 16. It is volunteer and there are several options of schools dependent of what type of education is selected.

All students who have completed compulsory education are entitled to admissions to upper secondary schools until the age of 23. Each school is responsible for the admissions requirements of the student, but the requirements shall be pre-decided and approved by the ministry of education.

The ministry might also add their own guidelines of admission to individual studies. The directorate of education (Menntamálastofnun) is responsible for the admissions process and around 99% of the students get their first or second institution of choice.

The main types of schools that offers upper secondary education are:

- *Grammar schools*
- *Comprehensive schools*
- *Industrial Vocational schools*

These schools are mainly public schools, but there are a few private options which often offers vocational education (Vet composition explained further down).

In Iceland there are 37 upper secondary schools, whereas around half are located outside the capital area.

Figure 7.: Where are the upper-secondary schools in Iceland located?

1.2.4. Upper secondary long- distance learning network

Iceland has 330 000 inhabitants and approximately 60% of the population lives in Reykjavik and the surrounding area. The second biggest city Akureyri lies in the north and populates close to 20 000. The public upper secondary schools which are spread across the outskirts of Iceland has often a small number of students and in many cases a lack of teaching body. As a

measure to this, 13 upper secondary schools in Iceland joined forces and created a network called Fjarmenntaskolinn.

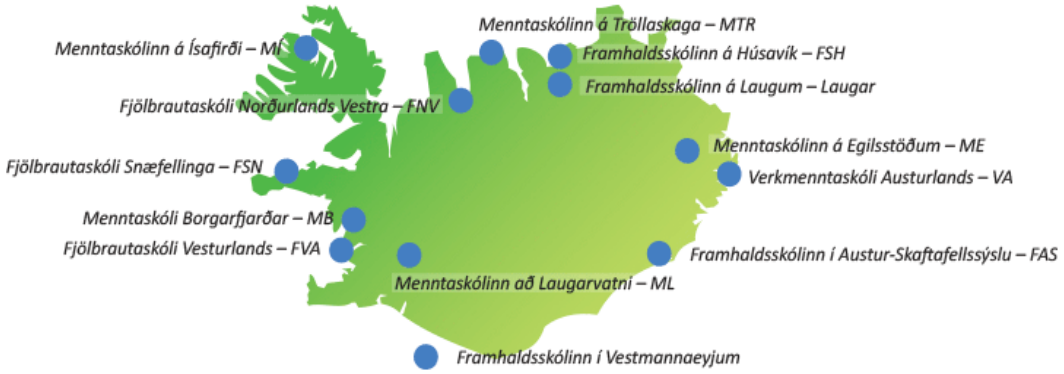


Figure 8. The schools in the network Fjarmenntaskolinn.

This network has specialized themselves in offering flexible training solutions, combining a blended online delivery mode that mix eLearning with videoconferencing, making it easier for students to be able to attend their preferred study without having to move to far from home. By doing this, the schools have been able to create hubs on smaller places like for example Patreksfjordur (see fig.6). Patreksfjordur is a small town with a population of 660 inhabitants, and in 2018, there was 24 students attending the branch which belongs to Fjölbrautaskoli Snæfellinga located in Grundafjordur a minimum of 4hrs travel away (see fig.6).

1.2.5. Upper secondary school qualifications levels

Secondary school credit is defined by applying learning outcome descriptions. One credit is the equivalent of three, six to eight hours working days. Included in this time frame is the learner's class attendance, home-work, test revision and time spent on tests.

The full school year is 180 days in total and gives around 60 credits.

Study programmes in the upper secondary school end at certain qualification levels 1-4.

Level 1: Extends to both compulsory and upper secondary school with the focus on general education. These studies can involve general preparation for employment where little specialization is required, and work is done under the supervision of others.

Level 2: Characterized by short specialization mainly aims at professional preparation for further studies or employment that requires the employee to show responsibility and independence within a certain framework and/or under the supervision of others.

Level 3: characterised by increased requirements for knowledge, skill and competence related to specialisation and professionalism. the studies incorporate preparation for university education, regulated professions, specialised vocational education and artistic studies. Upon

graduation at level three students are to be able to work independently, be responsible for planning and carrying out projects and evaluating their work.

Level 4: involves studies that take place either at the school, in organizations which are under its umbrella, or at university. Study completion at the fourth level is characterised by either increased specialisation and/or extension, or specialisation concerning management, guidance, development or innovation.

Level 1	Level 2	Level 3	Level 4
30-120 school credits	90-120 school credits	150 – 240 school credits	30-120 school credits
1 – 4 terms	3 – 4 terms	5 – 8 terms	1 – 4 terms

Figure 9. Study programmes end at certain qualification levels.

1.2.6. Adult education

In 2010 the Icelandic parliament passed the Adult education act which main aim was to meet the needs of adults with short formal education and also to meet the labour market which had a need for more skilled workers[7].

Adult education(*fullorðinsfræðsla*) is meant to target both those who are working but would like to increase their competence. And those who are unemployed with low education who needs courses/education to enter the work market.

The Adult education is provided by public authorities, private institutions, companies and organisations. Adult education and training are offered by institutions at the upper secondary and higher education levels, including lifelong learning centres[8]. This education

The adult education in Iceland include three aspects:

1. Study and vocational counselling
2. Validation of prior learning (Raunfærnimat)
3. Accreditation of study programmes

These steps are with the goal of guiding adults with little prior education into paths consisting of either secondary school options, bridge programmes into higher education or into the labour market[9].

[7] Frædslumistöd Atvinnulifsins, https://frae.is/um-fa/about-us/

[8] Government, 2018: https://www.government.is/topics/education/

[9] Gov, 2018: https://www.government.is/topics/education/adult-education/

In addition to the Adult education Act there was established an Education fund which has the *objective to promote suitable study options for adults with limited formal education. Furthermore, it is to take part in creating the conditions to enable individuals to avail themselves of such study options*[10].

This means that the fund will help finance studies for the adult students.

The biggest provider of adult education in Iceland is Frædslumistöd Atvinnulifsins (The Education and Training Service Centre – ETSC). It was established in 2002 and is owned by the Icelandic Confederation of Labour (ASÍ), the Confederation of Icelandic Employers (SA), the Federation of State and Municipal Employees (BSRB), the Ministry of Finance and the Association of Local Authorities in Iceland.

ETSC is the mother organization of 10 life-long learning centres situated across Iceland.

ETSC also hosts the Icelandic coordinator in the Nordic Network for Adult Learning (NVL) and is responsible for the administration of the Education fund.

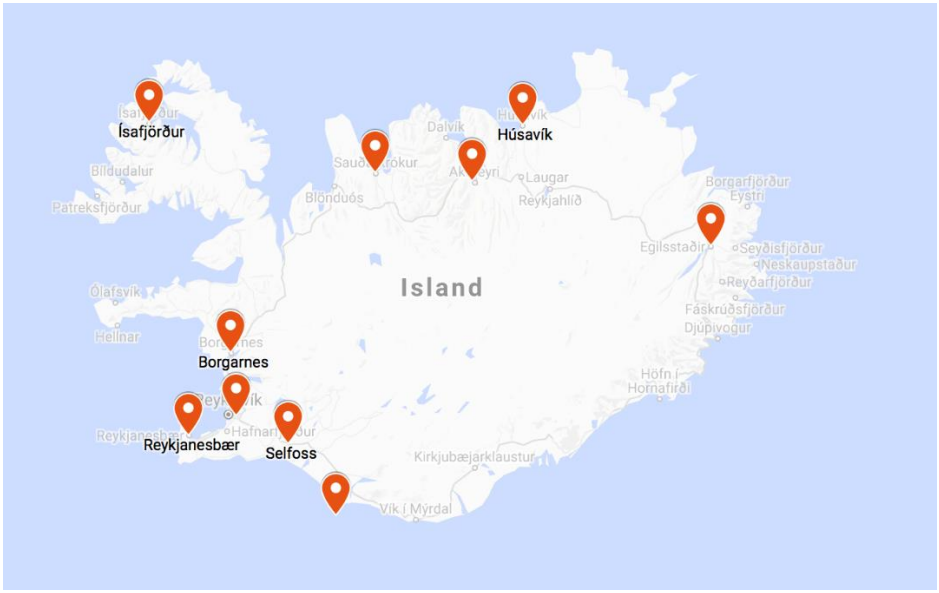


Figure 10. Location of all the life- long learning centres in collaboration with ETSC.

Icelandic VET

There are in Iceland a broad range of vocational school options and with different delivery modes. Every school can as previously mentioned shape a study or create a new study (local adaption), as long as the framework of the state is upheld. This means as example an upper secondary tourism study, a school can make a local adaption towards the parts of the country the school is in or perhaps towards a certain tourism activity (cruise lines, guiding services, outdoors activities, whale tourism, etc.)

[10] Gov, 2018: https://www.government.is/topics/education/adult-education/

In addition, for VET, every specific trade must be approved by the ministry of education and a trade committee in order for a study to become an NRQ. VET studies vary in length from 1 to 4 years, but the average is 3 to 4 years. Vocational education in Iceland has many delivery options: full time schools, life-long learning centre, evening schools and workplace training. The vocational studies are also possible to study through distance learning and for workplace training, companies often hire teachers to do courses at the job site in order to save travel costs for the workers.

The enrolment rates for VET are low and Iceland has one of the highest employment rates for young adults. Thus, re-entry of students into secondary education has been a long-term objective.

The route from vocational education into higher education is very dependent upon the vocation. Some programmes do not have an option for further higher education and lead into a so called "dead -end". This has contributed to the low enrolment issues, due to the increased popularity and expectation that a student today in Iceland should aim towards a higher degree.

Assessment and examination

Icelandic VET courses operate on level 2 and level 3 (see upper secondary qualification levels fig.8). Level 3 gives the opportunity to go into apprenticeship and to further attain NRQ. The length of the apprenticeship differs from the vocation and varies from 20-126weeks.

After completion of the apprenticeship the students are required to pass a theoretical test of 90min and furthermore a practical test. The practical test is tailored to the vocation, but its aim is to follow the student through the everyday work activities and have them show that they master the skills required for the Craftsman certificate.

Vet Teacher Training

In 2008 the requirements to teach upper secondary level in Iceland was raised to a master's degree with a minimum of 60 ECTS in teaching and pedagogic studies and 180 ECTS minimum in a secondary school subject area[11]. To be a VET teacher it also requires having thorough training in the respective trade. However, there are often made exemptions from the rules due to shortages in qualified teachers, especially in the areas outside the capital.

The Icelandic government puts great effort into improving the teaching body and it is linked towards the Unions. Iceland has the highest labour union membership-rate out of all the OECD countries (91,8%)[12]. The Icelandic teacher's union negotiate all wage increases for the teachers and they are often in correlation with the demand of teachers having to increase their competence through courses. Upper secondary teachers are entitled to at least 80 hours per year for independent professional development[13]. According to OECD data an upper secondary teacher in Iceland teaches approximately 485 hours per year.

[11] https://mms.is/licence-upper-secondary-school-teachers

[12] https://www.forbes.com/sites/niallmccarthy/2017/06/20/which-countries-have-the-highest-levels-of-labor-union-membership-infographic/#4a19f5d933c0

[13] https://eacea.ec.europa.eu/national-policies/eurydice/content/conditions-service-teachers-working-early-childhood-and-school-education-35_en

Aquaculture VET at Iceland

Today there are no schools that has government approved NRQ studies in Aquaculture on VET level. Still there are three schools that are allowed to teach courses in Aquaculture pending upon the approval of the curriculum.

These three schools are:

Fjölbrautaskoli Snæfellinga (fsn.is)
Verksmenntaskoli Austurlands (va.is)
Fisktækniskoli Islands (fiskt.is)

Fjölbrautaskoli Snæfellinga (FSN)[14] and Verksmenntaskoli Austurlands (VA)[15] are using the same curriculum which was submitted to the ministry of education (Menntamálastofnun) in April 2018. By May 2018 the schools were allowed to open the study for admissions and in august the study started. The curriculum which today is still pending approval from the ministry and the next step is for the trade committee to approve of aquaculture technician as a certified trade in Iceland. This study will be a part of the public-school system. To give an accurate timeline upon when this will be approved is difficult, but fish farming has become a popular subject in the media over the past years and therefore the schools are positive that within two years the study will be government approved. The study that is being taught today is a level 2(EQF3) vocational study. By the approval of aquaculture technician as a trade, the school will have the possibility to build the study into a level 3(EQF4) study and further a route to the journeyman/trade certificate.

Fisktækniskolinn (The Icelandic college of Fisheries) opened a few years ago a one-year study in Aquaculture which belongs on the same level as upper secondary schools. The college is a private school and the study is not approved by the ministry of education. However, it is recognized by the industry since there are few other options available[16].

[14] www.fsn.is
[15] www.va.is
[16] www.fiskt.is

		Courses					Credits		Overview	
Fiskeldisbraut	**Náms-grein**		**Þrep 1**			**Þrep 2**	**Þrep 1**	**Þrep 2**	**Programme credits**	**Hours**
Kjarni										
Danish	**DANS**				2LH05			5	5	100
Icelandic	**ÍSLE**				2MB05	ÍSLE2MG05		10	10	200
Mathematics	**STÆR**				2GR05	STÆR2TV05		10	10	200
English	**ENSK**				2SG05	ENSK2OL05		10	10	200
Gymnastics	**ÍÞRÓ**	1HA01	1HL01				2		2	40
Introductory Natursciences	**INNÁ**	1IN05					5		5	100
Fish physiology	**LÍFI**				2AA05			5	5	100
Sea and weather science	**HAFV**				2AA05			5	5	100
Fish farming	**ELDI**	1AA05			2AA05		5	5	10	200
Chemistry	**EFNA**				2GR05			5	5	100
Production and procedure	**VINV**	1AA05					5		5	100
Logistics and marketing	**FRAM**				2AA05			5	5	100
Fish health and microbiology	**LÍFÖ**				2AA05			5	5	100
Technology and equipment management	**SKVÖ**				2AA03			5	5	100
Workplace and vocational education	**VINN**	1AA10			2AA10	2BB10	10	20	30	600
Introductions to computer science	**TÖLN**	1GR03					3		3	60
Total							**30**	**90**	**120**	2400

Figure 11. Curriculum for Aquaculture VET study, FSN and VA.

Higher VET in Aquaculture

Holar university college has over the course of 10 years taught a diploma study in Aquaculture (EQF6)[17]. The study is taught both on site and through distance learning. The study is composed of a number of short courses (2-4 weeks) and is in close connection with the industry. The study is over three semesters where the student is required to take a full-time practicum at an aquaculture company the last semester (12 weeks). The study is the equivalent of 90 ECTS.

The biology section of the study has previously been focused mostly upon the biology and production in land-based facilities, but with the increase of sea-based production, the industry has expressed their need for an update in the curriculum. Including the sea-based operations, technology and biology in a higher degree.

[17] Holar.is

KDP Aquaculture, Diploma (Curriculum)

Courses in 2018–2019 (First year)		
Fall	Spring	Summer
KOH1306120 Fish Reproduction 6e SOF1406120 Larvae Culture 6e FJR1106120 Finance & Accounting 6e FOV1208180 Fish and Water 8e INF1006180 Introduction to Aquaculture 6e	SOH1604120 Health and hygiene 4e SOV1506120 Harvest and Processing 6e UMF1706120 Environmental Issues of Aquaculture 6e ÁFR1808120 Ongrowing 8e EBÚ1906180 Facilities and Equipment 6e	VER2028120 Practicum 28e (28Ve)

Figure 12. The curriculum for the diploma at Holar University College

Adult courses

Frædslumistöd Vestfjarda (FRMST) located in Isafjordur in the west of Iceland (see fig.9) are currently working on an introductory course in aquaculture intended for mature learners which are employed by the aquaculture industry. The course is intended to last for 45hours and will contain the basic knowledge in biology, physiology, ecology and weather science. Furthermore, they are creating continuing courses in fish processing and smolt rearing. The aim is for the mature learner to have the option to complete these courses in combination with work experience and further take the craftsman certificate.

FRMST are also creating a fish welfare course which is set to be completed by March 2019, which combines learning methods such as e-learning, flipped classroom and in classroom training. The courses are in process of completion.

Technical courses

As a part of working on the operational level in aquaculture, there is a need for certain courses in order to be able to perform work duties in a proper manor. All personnel working on sea, operating boats are required to have licences. In addition, all staff are required to have a safety course.

There are several providers of these courses in Iceland, the main provider is the technical college in Reykjavik (Tækniskolinn)[18].

The costs of these courses are expensive, for example the boating licence costs 1200€ per person. The costs for these courses have been paid by the aquaculture companies

Aquaculture VET Teachers

Interviews with Aquaculture VET providers in Iceland discovered that there is a lack of qualified teachers in Aquaculture. Today there is possibly a handful of teachers which have any competence in the field, and they are in demand.

[18] https://tskoli.is

The majority of the teachers are to be found on higher VET level and over. In addition, many of them are not Icelandic. Often schools will share the teaching force with other schools, leaving the few qualified teachers with a massive workload. An example of this is Fisktækniskolinn which is providing Aquaculture VET, but it is not an NRQ. They have the only Aquaculture VET teacher in Iceland (Remaining on higher VET) and they can lend him further to FRMST to teach their course once it is complete.

The demand for skilled teachers will increase with the completion of the new VET studies and it is important for the schools to provide increasingly attractive solutions for a teacher to desire to specialize in Aquaculture as main field of teaching.

As of now one school are trying to attain new aquaculture teachers by recruiting teachers with a biology major and school them further into aquaculture.

Learning and teaching material

With the lack of teaching force in aquaculture and the increased demand, the time left for teachers to create new reading material is none. Structured interviews revealed that today teachers are collecting teaching material from other countries and forming it to fit the classes being taught. This leaves for there to be a lack in quality assurance upon the input the students are receiving in addition to there being a hurdle to renew the material to fit industrial advancements.

Delivery of VET

Today the delivery of VET is divided between e-learning and in classroom lectures. This due to the challenges in lack of aquaculture teachers and distance.

In Iceland the distances are large, whereby it is difficult for all the students to travel to one school several times a year. For the mature learners who are working and want to enhance their knowledge in aquaculture, the distance to travel to a common teaching site requires one to have to take 1-2 days off in travels. The driving distance from the Westfjords to the Eastfjords is close to 10hrs. From the Eastfjords to Reykjavik the driving is 9hrs. From the Westfjords to Reykjavik the driving is 6hrs. It is long, the roads are often not good, and on winter time especially the weather is often too bad to even cross the mountains in order to reach the destination. Planes are available, but the departures are few, the tickets are very expensive and due to weather, cancellations are very frequent.

HUC has through their higher VET program 2 gatherings per semester, each one week long. This is done in order to let the students be able to meet and for them to complete lab-work etc. Hjaltadal, where the school is located, is a small valley close to the town Saudarkrokur in the north. Not many lives there and the main site there is the school itself. For students taking the courses they would have to travel 6 hours from the westfjords and 6hrs from the eastfjords and pay overnight stay for around 100€ per night. This make it more challenging to study the course when including the costs for loss of pay from work and great expenses for travelling. This is still only two weeks per semester.

E-learning is a very popular form for teaching. That way you are able to reach students everywhere, the costs of travelling are greatly reduced, but the student contact gets reduced equally and often the teachers end up performing monologues instead of getting good discussion which often is very useful for both student and teacher.

2.0 Private sector

Supply companies

Due to the lack of VET studies in the public sector, the industry often receives some of the training as a part of the equipment that the company is using.

AKVA Group is a big "turn key" solutions provider for aquaculture and is globally present. In order to ensure that the products they have sold are being used in the best possible way, they are continuously running courses with their clients[19].

The Fish Vet Group is a veterinary service provider and is known to have run short fish health courses to aquaculture staff in Iceland.

In house training

The main training that new staff in Icelandic aquaculture receives today, is in house training offered by the companies them self. This form of training varies a lot between companies and is hard to measure in terms of quality. Some companies practice buddy systems. In addition, the new employee would be presented with procedures on different working conditions (Weather, boating, lice-counting, safety equipment to wear etc.) they would be required to read before starting to work.

Some companies would state that breach of safety procedures (like wearing helmet at sea) would lead to a write up and initially if continued lead to the worker being dismissed.

Industry/VET provider relationship

The relationship between VET providers and the aquaculture industry is very good. The initiatives the VET providers have started has been highly supported and even funded by the industry. The industry has in addition been active in feedback upon their desires in curriculum build up and making available time for their employees to attain courses when available.

The industry has signed decrees stating that they are obliged to take in apprentices, when these are ready, ensuring a workplace for young and mature learners that wish to join the industry.

Cooperation

The labour union and the industry often collaborate in covering the main economic costs for a worker to do courses. Thus, giving the worker the possibility to increase their knowledge without having to pay too much.

[19] http://www.akvagroup.com/home

VET to VET provider relationship

Cooperation between schools in Iceland is very common. For aquaculture VET in Iceland due to the lack of teachers, the schools are very dependent upon the few teaching forces available and often shares these. The schools FSN and VA are sharing their lectures between them so that the students will receive some of the lectures through web and some in person. This way the schools are able to save on the expenses on teachers, but for aquaculture VET the issue is more to be able to teach courses within the field. This is also economically wise due to the great distance's teachers would have to travel in order to give lectures and the cost as well.

3.0 Main challenges for Aquaculture VET delivery in Iceland with recommendations for action plan

At Iceland there are work being done on creating Aquaculture VET studies on several levels. There are still a lot of work that remains. Following we will list some of the major issues that should be resolved in order for Iceland to be able to deliver Aquaculture Vet that will satisfy industrial needs.

Human resources

The creation of aquaculture VET in Iceland requires cooperation between several schools, the farming industry, and by combining the resources available in order to set up an action plan. It is recommended to allocate resources for one person to help solving and planning the logistics between the schools and have the major overview of how to link the needs of the farming industry towards the governmental requirements of setting up a NQ in aquaculture.

Involvement of the Government

The Ministry of Education has to approve Aquaculture technician as a trade in Iceland. That is the first step on setting up a NQ that meets industry demand.

The second step will be to approve the proposed aquaculture curriculum that has been submitted to the Directorate of Education in Reykjavik. When this has be completed, the aquaculture VET schools may further develop their VET program into the desired EQF level 4.

The aquaculture type of courses that should be obligatory within the trade certified Aquaculture Technician, should be finalized together with the aquaculture industry. A key question to address, is whether the aquaculture VET schools should offer the students shorter type of courses like boat driving licence, crane course, safety course etc. It is also necessary to figure out if the students should pay a tuition fee or if the farming companies should do it.

Teaching staff

Teaching staff with aquaculture competence is lacking at Iceland. There is today only a handful of teachers in aquaculture at all educational levels in Iceland. For the aquaculture VET studies there is today only one teacher available. He is engaged by several schools. This limited staff resource reduces the possibility for aquaculture VET schools to help contributing in developing and updating aquaculture learning materials. In addition, the possibility for this teacher to update himself on the newest of technology and to keep updated on general industry development, is limited.

For the higher aquaculture VET studies, the situation is better. At the university level there are several staff with competence in the field. However, there is a lack of updated knowledge in marine cage farming. The competence in this field must be improved.

It would be useful to develop an aquaculture VET teacher training program. Through this program teachers could continuously update their knowledge about state-of-the-art production methods and technical solutions applied by the farming industry. Through such a program, the teachers could become part of an international network for sharing of knowledge and competence. In all the 12 BLueEDU countries, including Norway, the aquaculture VET schools are small organizations that are located in rural areas. They typically employ and/or engage 1 - 6 aquaculture teachers. Due to this challenge, it is will be helpful and useful to stimulate for better collaboration between schools and countries offering marine cage farming in Europe. A teacher training programme could help supporting and strengthening such collaboration.

The teacher training programme could be organized in independent modules in a continuous education program, whereby an aquaculture teacher can take one such module while at the same time being able to offer training to their students. Such a program could be organized like some online training, in combination with study visits to industry and some onsite training.

Delivery of VET

Today there is only one VET study offered by Holar University College (HUC), that has got a NQ in Iceland. Their program consist of a combination of e-learning, video based delivery of some of the training and some on-site training where the students meet at the university twice for one week. As a consequence, the students are in periods left alone for their studies. This requires that the students have a high degree of self-discipline and motivation in order to complete their study, even though the program is only one year long. In addition, during the two weeks at Holar they have to pay for accommodation and living expenses, thus increasing the total costs. The drop out rate at HUC for this program is around 30%. The drop outs have background from the mature learners who are currently working in the industry, as well as the young learners starting after completing their secondary school education. Since the classes are often small with 5-13 students, 30% could be interpreted as a high body count.

Thus, to start testing out new methods and solutions for delivery of training should be a priority. Possible solutions mixing e-learning, onsite delivery and video based training, should be considered and tested out, in addition to investigating teaching methods that encourage the students to interact more amongst each other.

By structuring a study program in independent modules, one would be able to be more flexible in the completion of courses, instead of running 5 courses at the same time. Often for those who currently work, there can be incidents at work or at home that makes it hard to attend the obligatory weeks with on-site training. Improved flexibility may be a key to reduce the dropout rate.

Harmonization of educations in the north of Europe

In Iceland, Denmark, Norway and The Faroe Islands, the structure of the educational system is similar. Therefore, it is possible to consider a harmonization between Aquaculture VET studies. In addition, harmonization between these countries would open many new possibilities for future collaborations. The industry in these countries often have owner interests in the other countries.

For example, Marine Harvest is a key stakeholder in Norwegian Aquaculture and has an ownership of 17% of the Faroese aquaculture industry. The Salmar farming company is another key stakeholder in Norway, which have invested in aquaculture companies both in Iceland and in Scotland. This means that there is already an industrial collaboration between these countries, whereby the educational institutions could apply this network in order to follow up and start collaborating.

A harmonization of aquaculture VET programs would help increasing the collaboration between these countries, by organizing and enhancing mobility between students, workers and teachers. For a country like Iceland this would be very valuable, since the country is struggling with recruiting students into aquaculture professions. Staff and students would be able to go abroad on both long- and short-term internships and mobility actions, thus expanding their knowledge. This would help their employer to change parts of the production by letting them receive increasingly skilled workers on the field, e.g. transfer of knowledge and experience with lump-suckers as a part of lice prevention strategy.

Harmonization would also contribute in the development of creating and updating new teaching material, possibly organized like open educational resources (OER).

Teaching Material

It would benefit and help developing the aquaculture VET programs at Iceland, to take part in an international community for development of online and updated aquaculture learning materials for VET programs. This could be organized like separate international projects that investigated, developed, tested and evaluated the quality of the new learning materials in. aquaculture VET courses in several countires in parallel.

Recommendations for further development of VET

- Establishment of a north European aquaculture VET provider forum to support the development and quality assurance of shared resources for learning and assessment.
- Develop a continuous teacher skills development program for teaching of aquaculture
- Test out and validate new continuous assessment solutions in work-based training
- Set up a program for exchange of students and staff though mobility actions, that are included in forthcoming work-based training programs
- Investigate and prepare for harmonization of the aquaculture VET courses with the similar training offered in Norway and Scotland

BlueEDU WP5 VET supply - Spain

Pamela Ernstberger
NTNU

Part B Country specific report structures - Spain

Country summary

In all of Spain, education is the right and the duty of all children, regardless of their origin.

Education is compulsory until the age of 16, which is the minimum age the child must have to be able to work. After this point in time, each student may choose to continue his or her studies or to start work, provided that he or she fulfils the other administrative requirements.

Compulsory education is free in public schools. In the private schools partially subsidized with public funds, free schooling will only be available in schools that have an agreement with the Local Ministry of Education and University Planning.

STRUCTURE OF THE EDUCATION SYSTEM

The education system is regulated by the Organic Law of Education 2/2006 of May 3rd 2006. This law went into effect in the 2007/2008 school year. Basic education is made up of primary school and compulsory secondary education (ESO), for students from 6 to 16 years of age. Prior to these grades the student may be enrolled in a pre-school program and after these grades, he or she may complete the following: high school (*bacharelato*), vocational training, special programs (languages, art, sports), adult education or university education, provided that the student meets the requirements established for said programs. [1]

When it comes to Vocational Education and Training, often the selection by individuals choosing this track of the professional studies depends on the needs of the labour market. Therefore, providing them the opportunity to be better-prepared and qualified personnel specialized in the different professional sectors.

1 National aquaculture VET sector and providers

VET offers more than 150 training courses that individuals can choose from within 26 different professional focus groups, with theoretical and practical curriculum content suitable for various professional fields, including the wider aquaculture sector, responding to the current demand for employment.

In Spain, VET and professional training depends on the responsibility of the autonomous communities. Spain is made up of seventeen autonomous communities, as established under the Constitution of 1978. Galicia is one of these communities and one of the main regions that was visited as part of this study. This community has a surface area of some 29,575 km2 and is composed of four provinces: A Coruña, Lugo, Ourense and Pontevedra (where *Instituto Gallego de Formación en Acuicultura, or* IGAFA is located). The population is concentrated on the coast, particularly in the provinces of A Coruña and Pontevedra.

[9]Galicia is a historic region, which has been an Autonomous Community of Spain since 1981. It has self-governing institutions: the Parliament with legislative capacity and the Xunta de Galicia, which is in charge of the budgets and the management of the Community. The administrative capital of Galicia is Santiago de Compostela. Galicia has its own flag, coat of arms and anthem. The native language of Galicia is Galician. Galician and Spanish are the community's two official languages.

AUTONOMOUS COMMUNITY Local Ministry Of Education and University Planning. The Local Ministry of Education and University Planning has an educational portal online www.edu.xunta.es where, under the FAMILIES section, you can find basic information, legislation, links of interest, news, documents, material, aid, school calendar, training, activities, etc. The Ministry also has offices in every province. The regional offices of the Ministry of Education are where all matters related to education are handled and resolved: economic management, teaching staff, school transport, grants, diplomas, inspection and guidance.

These are centres for the education of adults. Classes are given free and are aimed at people over 18 years of age, who, for whatever reason, have not received the diploma of basic studies. These courses allow them to acquire, broaden or update their studies. There are also different courses to improve the professional qualification of workers, as well as for those who are unemployed. VET plays a significant role in up-skilling the workforce and in helping young people acquire qualifications that respond to labour market needs, helping them to enter the sector of choice.

The vocational pathway in Spain[2]

Secondary education and VET

To access the VET **intermediate level (***grado medio*), students must have the compulsory secondary school diploma *(Graduado en Educación Secundaria Obligatoria)* that is automatically obtained after compulsory schooling, secondary education (IES). The VET intermediate level program lasts from 18 months to 2 years and includes a work placement of 300 hours in a company. It leads to the title of Technician *(Técnico)*, and allows pupils to continue their education up to A-levels equivalent. The technician diploma does not open the door to higher education at university, but allows pupils to progress to the mainstream secondary education *(Bachiller*) or further education for VET higher technicians. See Table 1 EQF Framework below, corresponding to age group.

Vocational training is modular, including a training work placement module in the workplace (*módulo de formación en centros de trabajo),* but this module can only be taken once all the other modules followed at school have been obtained. The work placement occurs in the final stage of the course. The higher-level training cycles also include a module devoted to a professional project (*módulo profesional de proyecto).*

A **professional certificate** *(certificado de profesionalidad)* corresponding to a level I vocational qualification in the national vocational qualifications framework is offered to young people aged between 16 and 21 who have not yet obtained a diploma. It comes under the Employment Department and can lead to integration on the job market or a return to initial education.

Since September 2014, the FP Básica section offers to young people to start a vocational training from their 15 years old, for a period of two years in Maritime & Fisheries Studies, which covers some

introductory areas of aquaculture. This FP is only offered at one of the centres in Spain, IES Manuel Tárraga Escribano in Murcia (see Fig 1 below).

Higher VET education [2a,3]

The **higher** or **upper level** *(grado superior*) is open to holders of the *Bachiller* (A-levels equivalent*)* or the *intermediate level.* This post-secondary education prepares students for specialised vocational qualifications and lasts for 1 or 2 years. One quarter of the time is devoted to vocational training. It leads to the qualification of *Técnico superior* (higher technician).

Without taking any further examinations, holders of the diploma for higher technician are admitted to university courses leading to the *Grado* (1st university qualification).

Education authority **VET was reformed in 2013** and, from 2014/15, offers basic, intermediate and higher VET qualifications. Programmes last two years (2 000 hours), with training in a company (minimum 20%) and at a VET school (maximum 80%).

In Spain there are currently eight VET providers offering: intermediate and higher levels of VET certified qualifications that are NRQ EQF level 4, work based apprenticeship qualification and 5 respectively. Some also offer Basic (*Formación Basica-FP*), which is pre-VET to 15 year olds. [2a,4]

Fig 1: Map of VET Institutes in different regions in Spain[9]

1.2 Student Profile

In general, VET professional training students already have determined and set their minds on a specific professional career track. [13]

Even so, within a training cycle, there can be students with different educational backgrounds:

- Students, who come from high school, are eighteen years old and enter the training cycle with a high school diploma

- Business people who need to expand their knowledge or need a qualification to grow professionally

- University students, who have passed the university training and try to achieve a training cycle that allows them access to a job, or university students who, even though they have finished their degree, need to specialize

- Middle School Vocational Training students that want to expand their knowledge and improve their chances as they enter the labour market

Despite this and its heterogeneity, all must have a minimum study to access the cycle, so they are expected to have a level of competence, which must demonstrate or is accredited in the areas indicated:

- Communication in Spanish
- Mathematical competence
- Science competence
- Technology competence
- Digital competence

QA of VET System in Spain

Regional agencies with similar functions to ANECA, National Agency for Quality Assessment and Accreditation have been set up within the autonomous communities. This includes NATIONAL INSTITUTE OF QUALIFICATIONS, or INCUAL for VET. These agencies carry out training, evaluation, certification and accreditation, using internationally applied procedures and evaluation criteria such as for ECVET. [8]

1.3 National VET and Higher VET systems

1.3.1 NQ VET [2b]

EQF Levels 4 and 5 of aquaculture VET:

NFQ Level	EQF Level	Assessment strategy	Award Composition
Intermediate	4	Skills demonstration (60%) ; portfolio or collection of work (40%)	Certificate/Diploma for Aquaculture Technician
Higher	5	Assignment (40%) ; project (30%) ; exam (30%)	Certificate/Diploma Higher AquacultureTechnician

Table 2: Spanish NQ Certification for VET Intermediate and Higher and EQF equivalent

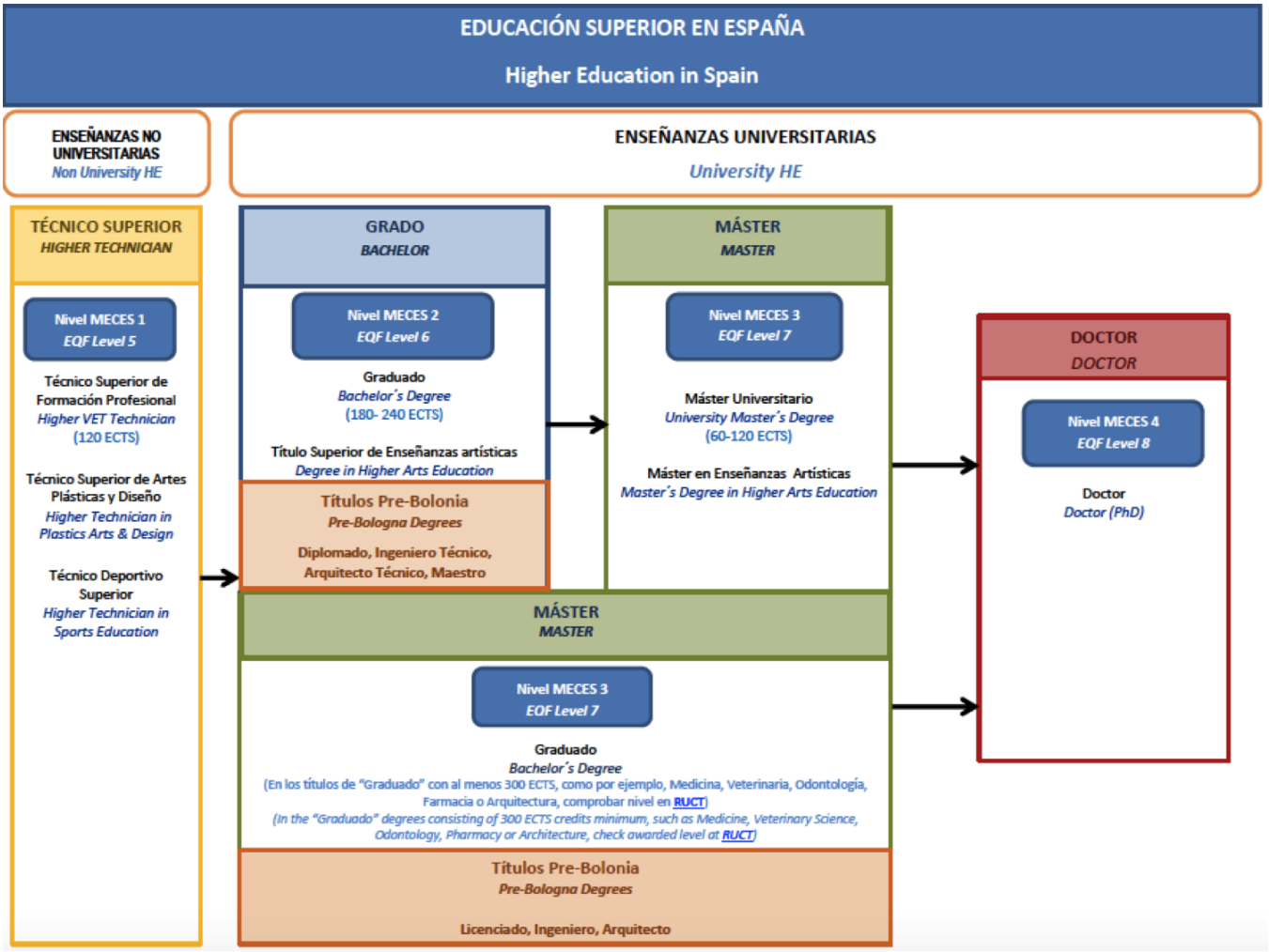


Table 1: Spain has both aquaculture VET and higher VET awards which are offered at EQF Level 4 and 5 shown in table. [2a,4]

1.4 Main VET regulatory bodies and their role [3,4]

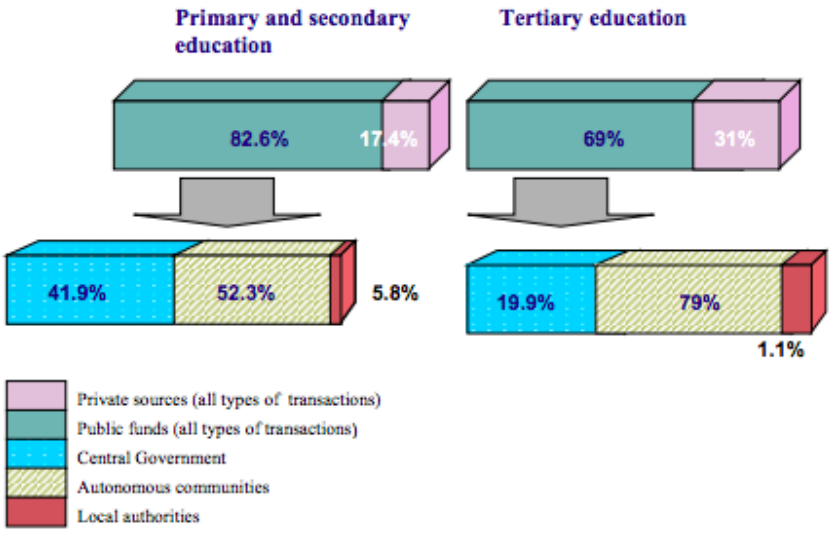
Ministerio de Educación y Formación Profesional (Ministry of VET). The Ministry of Education and Vocational Training is the Department of the General State Administration in charge of the proposal and execution of the Government's policy on education and vocational training, including all the teachings of the education system except university education. It is also the responsibility of this Department to promote cooperative actions and, in coordination with the Ministry of Foreign Affairs, the European Union and Cooperation, of international relations in the field of non-university education.[3a]

Instituto Nacional de las Cualificaciones (National Qualifications Institute), INCUAL. According to the Organic Law 2002 on Qualifications and Vocational Training, the National Qualifications Institute, or INCUAL, is the agency responsible for defining, preparing and maintaining up to date the National Catalogue of Professional Qualifications and the corresponding Catalogues of VET by modules.[3b]

SEPE Servicio Público de Empleo Estatal (Employment Services). The Public State Employment Service is the Autonomous Body, endowed with its own legal role for the fulfilment of its purposes and assigned to the Ministry of Labour and Social Affairs, through the General Secretary of Employment, whose main competencies are the management and control of unemployment benefits; maintain the databases that guarantee the public registry of offers, demands and contracts; maintain the observatory of occupations and prepare statistics on employment at the state level; carry out research, studies and analysis on the situation of the labour market and the instruments to improve it, in collaboration with the respective Autonomous Communities and collaborate with the Autonomous Communities in the elaboration of the National Plan of Action for employment, adjusted to the Strategy European Employment Agency, and the annual work program of the National Employment System. In SEPE website one can also find all the information pertaining to requirements for obtaining VET certification in specific professional families, including which institutions offer VET courses, how to validate previous VET modules completed and what steps to follow to register for the professional certificate.[3c]

1.4.1 Funding[12]

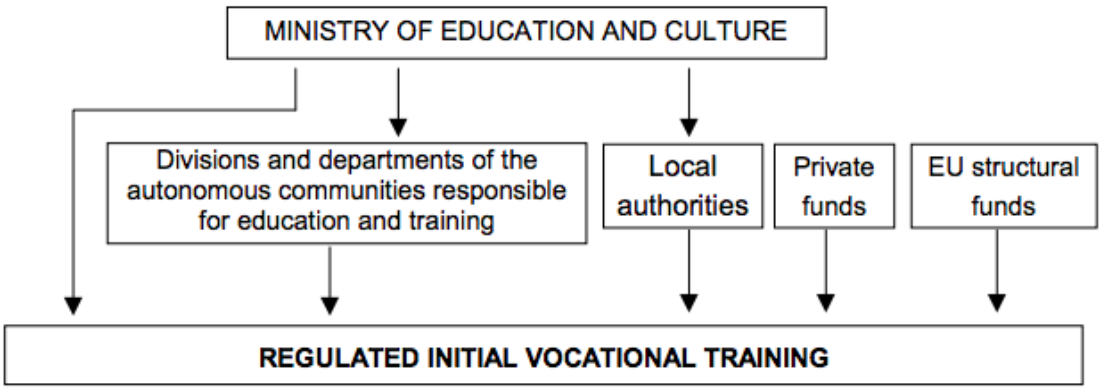
Figure 2 below shows sources of funds for Education in 1998



Source: 'Education database: educational expenditures by source, type of transaction and education level' in www.oecd.org. OECD (2001)

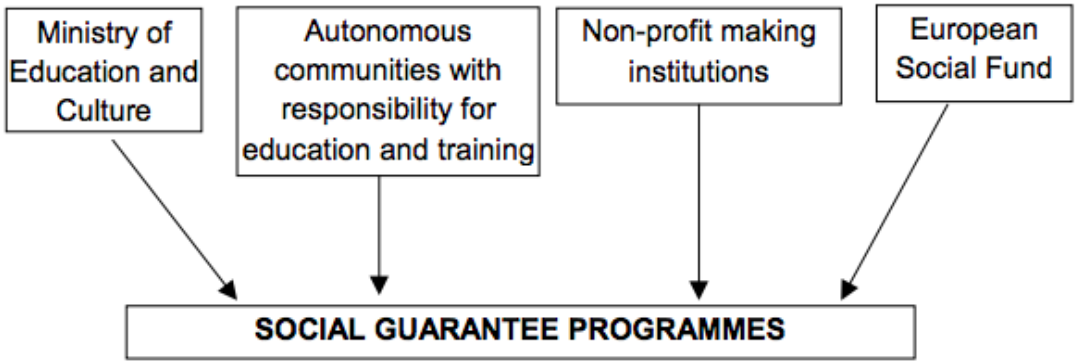
In Spain, many laws and agreements between the government and social partners govern VET. Spain receives structural funds through the European Social Fund (ESF) and European Regional Development Funds (ERDF). Financing of initial vocational training (regulated vocational training and social guarantee programs) is entirely direct. *Regulated vocational training:* for youth and adults (including vocational training for first time jobseekers who lack academic and/or professional qualifications and general basic training for the working population, whether employed or unemployed to complete other training programmes), is funded by the Ministry of Education and Culture (MEC), divisions or departments of the autonomous communities, local authorities, private funds, and structural funds.

Figure 3 below shows *Funding structure for regulated initial vocational training*[12]



Social guarantee programs: for the school age MEC, autonomous communities, non-profit institutions, and ESF fund population who lack academic and/or professional qualifications. These include course such as FP, pre-VET for 15 year old. All workers have access to training through two national continuing training agreements (ANFCs). Created by the ANFC signatories, the Foundation for Continuing Training (FORCEM) supplies financial support for the following training activities: training plans, individual training leave, and complementary and follow-up measures to training. Continuing training is funded by a training levy, ESF, and private contributions. Unemployed persons participate in National Vocational Training and Occupational Integration Plan (Plan FIP), training workshops/crafts training centre programs, and European Union (EU) employment initiatives funded from the levy and ESF. A third reform of the objectives of the EU's structural funds will lead to considerable changes in Spain, since the volume of resources from the structural funds will decline. [12]

Figure 4 below shows *Funding for social guarantee programmes*[12]



1.5 Aquaculture VET and higher VET provided by each provider

Aquaculture formal VET provision is summarised n the following table:

Provider	EFQ Level 5 Aquaculture	EFQ Level 4 Aquaculture	EFQ Level 3 Aquaculture	FP Basica (pre-VET >15 yr old)
Instituto Galego de Formación en Acuicultura (IGAFA), Pontevedra, Galicia Grados : medio y superios	Current	Current		
C.I.F.P. Maritimo Zaporito, Cadiz, Andalucia. Centro Integrado de Formación Profesional		Current		
IES Manuel Tárraga Escribano, Murcia Grados : pre-VET				Current
IES Els Alfacs, Tarragona, Catalunya Grados : medio y superior	Current	Current		
Instituto Profesional de F.P Maritimo Pesquero de Islas Canarias Grado : medio y superior	Current	Current		
Kardala LHII Gipuzkoa, Basque Country Grado ; superior	Current			
IES Institutos de Educación Secundaria, secondary schools 12-16 yr				

Table 3: VET Providers at secondary education (IES)

1.6 Aquaculture VET staff employed by each provider

Most providers have teachers that have a background in a related science subject.

Training Module/Cycle	Qualification required	Professional experience
Intermediate/Higher VET Cycle	• Bachelor of Biology • Bachelor of Marine Sciences • Bachelor of Food Science and Technology • Graduate in veterinary • Senior Technician in Aquaculture Production • VET certificate level 3 of the family Maritime-fishing (aquaculture area)	2+ years

Table 4: Aquaculture Teaching staff educational background (information obtained from INCUAL)

Most aquaculture teachers have a degree from university in a scientific discipline and will develop further skills and knowledge completing vocational training as part of their continuous professional development. It can also be a teacher from Secondary Education or Technical Professors of Vocational Training, with teaching experience in a training cycle (min 2 years).

1.7 Adequacy of national aquaculture VET supply

The Ministry of Rural and Marine Affairs offers nearly 100 courses in maritime and diving training in the region of Galicia alone. There are 92 courses of maritime training that are offered through different fishermen's associations of Galicia and the remaining 6 are offered as professional diplomas and taught in the facilities such as the Galician Institute of Training in Aquaculture, IGAFA.

There are about 50 FP courses, pre-VET for students from 15 years in the region. These consist mainly of fisherman sailor courses, which most are offered in the fishing maritime centres run by the Ministry of Rural and Marine Affairs at centres in the region (Official Fishing Nautical School of Ferrol, Official School Náutico Pesquera de Ribeira, Instituto Politécnico Maritime Fishing of the Atlantic of Vigo). These training courses are co-financed by the European Social Fund (ESF).

With respect to VET courses offered by institutes, such as IGAFA, the institute has acquired a high ranking amongst all the VET providers in Spain. The VET program is very diverse, offering students a range of practices found within the aquaculture industry, as well as acquiring the necessary skills to manage different systems and working with different aquatic species. The region offers a wealth of opportunities for the learners to acquire additional knowledge and practical skills through work experience outside of the institute, having access to the diverse sector in the area. APROMAR recognises IGAFA as one of the top institutes in Spain. To add to this, the students have the opportunity to practice outside the country, through work experience with more than 60 global partners to choose from, extending their experience farther afield and acquiring skills beyond the scope of the program. The additional skills through these experiences are in high demand by employers. These include, communication skills, networking across a diverse cultural environment and developing strong team working skills.

2 WP5 Investigative process

2.1 Overview and evaluation of investigative methods and processes

The investigative process relied on direct communication with the different centres including individual staff members: teachers and administration as well as information available on web sites of each of the centres and organisation of current school VET framework. FEAP also provided the list of centres and some of the main contacts.

2.1 Online Survey

An online survey tool, Monkey Survey, asking more limited number of key questions (10) was created. These were sent out to the 8 VET institutions and industry companies. No responses were received from industry partners. Responses were received from two VET schools (see Appendix A); the results below are from the VET school with an aquaculture programme:

Q1 Do you currently provide Aquaculture VET?

- Yes

Q2 If you answered Yes to Qu. 1, is the VET in Aquaculture leading to Nationally Recognised Qualification (NRQ) or other type of recognised qualification?

- Yes

Q3 How is the course delivered?

- In class (on-site)

Q4 Do you have trained or qualified instructors?

- Yes

Q5 How many students do you normally have at the start of the course?

- 50

Q6 How many teachers or instructors do you have?

- 6

Q7 How closely do you collaborate with the industry?

- A moderate amount

Q8 How satisfied are you with this Aquaculture VET program?

- Very satisfied

Q9 Would you be interested in collaborating in a NRQ Aquaculture VET course development funded by the EU?

- Very interested

Q10 If you would like to discuss this further with us, please add your details:

2.2 Qualitative survey results (see below 3.5)

3 National VET supply inventories

3.1 External certificated and uncertificated short courses for industry

Provider	Course Title	Duration	Delivery Mode	Certification
APROMAR	Specific concepts of aquaculture feeding	40 Hours	Online	APROMAR/APLICACIONES
APROMAR	Prevention of occupational risks aquaculture sector	30 Hours	Online	APROMAR/APLICACIONES
APROMAR	English + vocabulary terms aquaculture	6 Months	Online	APLICACIONES-MY OXFORD ENGLISH
APROMAR	HealthFish	11 Modules (flexible)	Moodle-online	Certification-Digital Badges

Table 4: External courses offered online for aquaculture sector

3.2. Un-certificated 'in company' training

In the past there has been un-certified 'in-company' training offered to all employees. This focused mainly on health and safety in the workplace.
APROMAR[7] has now started offering some course online (see table above) offering workers and those working in the industry a chance to develop their knowledge in areas of fish feeding, occupational risk awareness and developing English language skills, focusing on technical terms applicable to the industry. Certification is offered through APROMAR's own online platform, on successful course completion by the candidate.

3.3 Delivery modes available -facility based, work based or blended, including ICTL

IGAFA is a college-based delivery system, which includes an extensive work placement that requires students to complete 480 hours in work experience to complete the Technician in Aquaculture Diploma EQF level 4 during their 2 years. For the Higher Technician certificate, they must complete 384 hours in work experience to meet all requirements at EQF level 5.

3.5 Professional Certificate for workers in the industry [5,10]

Vocational training certificates and certificates of professionalism are official and valid throughout the country and are issued by the regional authorities as organised by LOMCE, Ley Orgánica para la mejora de la calidad educative (Law for quality and improvement of education). [5]

These certificates correspond in accordance with European Union regulations regarding the general system for the recognition of Vocational training in the Member States of the European Union and other signatory States. These certificates accredit the corresponding professional qualifications to

those who have obtained them, and where appropriate, provide the corresponding academic credentials according to the applicable legislation.

A person can obtain a Professional Certificate by two methods:

- A training course, passing all the modules of the certificate
- Validating their work experience or non-formal training through documentation and passing a test (see below)

The recognition of the professional competences once evaluated, will lead to a professional training certificate or certificate of professionalism, indicating the corresponding title and/or certificate related to specific professional *family* or career track.

These procedures for recognition of professional competences are carried out from the calls posted on behalf of the different autonomous communities. The information on these regional calls can be consulted on the website of the National Institute of Qualifications and at the Electronic Office of the website of the State Public Employment Service www.sepe.es.[10]

The National Catalogue of Professional Qualifications (CNCP) is a tool of the National System of Qualifications and Vocational Training (SNCFP) that organizes the recognised and accredited professional qualifications in Spain. It is divided into 26 professional families or career tracks and five qualification levels. In each case, the necessary professional training is specified according to some training modules. Aquaculture falls under the Maritime and Fisheries Industry (MAP) professional family category.

In Spain the test are done by the autonomous communities, there are some guides that assist the trainers to validate that work experience, these guides are on the INCUAL website. They are called evidence guides and reference to certificates.[10]

The 5 levels of the professional qualification (Table 5 below) correspond to the professional competence related to the practical task, knowledge necessary for its application, as well as initiative, autonomy and responsibility, of the activity developed for each level.[5]

Qualification level Description	Competence
Level 1	Tasks involving simple work activities corresponding to standardized processes, with the theoretical knowledge and limited practical skills to be applied
Level 2	Well-defined professional activities with the ability to use own instruments and techniques, which mainly concerns an execution work that can be autonomous at the limit of these techniques. Requires basic knowledge of the technical and scientific skills for activity and capabilities of transferring understanding to practical level
Level 3	Professional activities that require mastery of various techniques and can be executed autonomously, involves responsibility for coordination and supervision of technical and specialized work. It requires an understanding of the technical and basic scientific principles of the activities and the evaluation of the factors of the process and their economic value

Level 4	In a wide range of complex professional activities carried out in a wide variety of contexts that require a combination of technical, scientific, economic or organizational skills to plan set of actions, define or develop projects, processes, products or services
Level 5	In a wide range of highly complex professional activities carried out in diverse contexts that are often unpredictable, involving planning actions or creating products, processes or services. Great personal autonomy. Frequent responsibility in the allocation of resources, in the analysis, diagnosis, design, planning, execution and evaluation

Table 5: Professional Certificate accredited to corresponding competence Level 1-5. Level 4 and 5 correspond to professional competences associated with university studies level, demonstrating high level of autonomy and responsibility by the workers.[4,10b,11]

Other than provide accreditation, which is recognised throughout the country, it provides certification and validation of skills and knowledge in the working sector. The professional certificate increases employability and improves qualifications for the worker. It also promotes mobility in the labour market, both nationally and in Europe.

The last call for 2017-2018 included course list outlining tests for obtaining VET Professional (FP) titles. The tests are free and intended to allow the participants to directly to obtain one of the titles of ***technician*** or ***professional technician*** of professional training, provided they demonstrate that they have achieved the objectives established in the Organic Law 2/2006, of May 3, for vocational training, as well as those set in the respective curriculum.

3.6 VET EQF Level 4 and 5 Competence and course content

In order to obtain diplomas at EQF Level 4 and 5, learners must demonstrate the competences listed below. They will complete 2000 hours for each of the VET cycles, which takes 2 years to complete. Included in these module hours, which are classroom based, students will also have to complete workplace training with a company, meeting the necessary skills at the required competence level.

Competence	
Aquaculture Technician	Higher Aquaculture Technician
Plan, organize, manage and control an aquaculture farm achieving the required quality, in adequate conditions of safety and hygiene.	Perform aquaculture operations, the maintenance of first level of the facilities and the administration and management of a small holding, achieving the required quality of the harvest under adequate conditions of safety and hygiene.

Table 6: IGAFA VET Diploma Level 4 and Level 5 [6]

Intermediate VET Cycle in Aquaculture		Higher Level VET cycle in Aquaculture	
First Year		**First year**	
Module	Hours	Module	Hours
Installation and cultivation equipment	240	**Techniques and production management of auxiliary crops**	187
Live food cultivation technique	187	**Techniques and production management of fish**	267
Molluscs Fattening technique	213	**Techniques and production management of molluscs**	292
Fish Fattening technique	213	**Analytical techniques and methods of sanitary control in aquaculture**	107
Professional Training and guidance	107	**Professional Training and guidance**	107
Second Year		**Second Year**	
Mollusc Hatchery technique	192	**Techniques and production management of crustaceans**	175
Fish hatchery technique	192	**Facilities, innovation and automation systems in aquaculture**	192
Crustacean farming technique	193	**Environmental management of aquaculture processes**	70
Business and Entrepreneurship	53	**Fishkeeping**	140
Workplace training	410	**Business and Entrepreneurship**	53
		Project on implementation of an aquaculture production facility	26
		Workplace training	384
AQUACULTURE TECHNICIAN		**HIGHER AQUACULTURE TECHICIAN**	

XUNTA DE GALICIA
CONSELLERÍA DE CULTURA, EDUCACIÓN E ORDENACIÓN UNIVERSITARIA
Dirección Xeral de Educación, Formación Profesional e Innovación Educativa

FP FORMACIÓN PROFESIONAL

UNIÓN EUROPEA
Fondo Social Europeo
O FSE inviste no teu futuro

Table 6: Course content areas listed for the Intermediate and Higher Level Aquaculture certificates[6]

4 VET providers opinions on the aquaculture VET supply

4.1 National VET provision leading to NQ

The NQ is recognised through the certification at EQF Level 4 (Intermediate) and Level 5 (Higher) in VET diploma. The Diploma is an instrument to accredit the qualifications and competences acquired by formal channels and to assure a training level that includes professional, personal and social competences. Students who pass the intermediate level of VET will be awarded the Technical Diploma and the ones that pass the higher-level VET will obtain the Higher Technical Diploma.[5]

Providers, such as IGAFA has a set of standards which shapes the professional profile of its graduates to high level, meeting the essential tasks and practical tasks laid out in the competences to high standards. The qualifications obtained by their students, through their program are recognised and

valued in the working world and the industry at large. These standards are used by industry for their own occupational standards.

4.2 Industry attitudes towards NQs

In the opinion of VET providers, industry does not require NQs outwardly if they observe that their workers are performing well at a good job and find the work interesting. This would apply to husbandry or operative level. While some employees have entered the industry on completing a formal VET program, more mature workers have developed their skills and knowledge within the company. Most companies provide some in-company training to conform to health and safety standards. Most workers *are* interested in continuous professional development. For the industry it is not a necessity, but they do support their employees who are keen to continuing developing their knowledge and furthering their skills. VET programs, such as the ones offered by IGAFA and in other regional institutions, are well used by the industry. Often, graduates from the VET programs at IGAFA will secure a job with local industry or companies farther afield, having completed work experience with them. IGAFA has a very good reputation and graduates are recognised for their knowledge and experience they have obtained.

Due to the small size of this industry in Spain, and its stagnation condition, what is available at the current time, may be sufficient. Workers can also go for life long training courses leading to professional certificates as discussed above by completing more specific modules. APROMAR[7] delivers some non-certificated courses online which are beneficial for working in the industry, such as those listed in Table 4. The Professional Certificate was developed in 2016 and IGAFA is one of the main centres that have been assigned to deliver this through a paper-based exam and a practical assessment. It is intended for workers in the industry to obtain certification through a knowledge and practical based approach. To date, no one has come forward to do the exam. In learning about this Professional Certificate, it was found that the main fish farming company in Galicia had no awareness of it, nor did other related agencies like the Local Fisheries Group, GAC that works closely with both the the fisheries and aquaculture sector in the region. APROMAR and other professionals in the sector also did not know about this option for workers.

4.3 Innovative VET delivery, (including ICT supported)

Some centres, such as IGAFA offer exceptional diverse facilities to instruct their students and provide them the opportunity to practice managing different systems allowing them to complete varied tasks aligned at the competence levels. As part of the VET program, students are expected to be in charge of managing aquaculture systems relating to their projects. These include managing culture systems for producing live feeds for shellfish cultures and fish fry stages; managing and troubleshooting recirculating systems used to house different aquatic organisms for optimum growing conditions. The aquaculture sector in Spain as a whole is widely diversified in terms of species and farming technologies. About thirty species are cultivated: blue mussel, rainbow trout, gilthead sea bream, and European sea bass. Students have the opportunity to develop their knowledge and practical skills working with different organisms, which include most of these aquatic animals, plus types of aquatic plants, such as micro- and macro-algae species.

Unlike IGAFA other centres, for example the secondary school, IES Manuel Tárraga Escribano, in Murcia have a smaller number of students in their program (only 5 this year), and there is very little interest in the use of technology. Due to low number of students, now offer a pre-VET option. Most cage fish farming companies in this region don’t require students with a higher technician

certification, but will be satisfied with lower level technician with other skills, such as scuba or skipper. The school has a close connection to the industry but in discussions, staff expressed that there is a need for more shorter courses leading to professional certificates for example, in fish handling, which would be more beneficial to companies than the more advanced VET. Certification in scuba is also offered at IGAFA.

The Healthy Fish project[15], is a new online programme, released in 2017, designed to help train fish farm workers on the key issues surrounding health and welfare of farmed fish. The project partners, combining their expertise in the aquaculture sector, developed a standardized training program for the aquaculture sector. This program is divided in 11 modules and available in 5 languages: English, Spanish, Italian, Croatian and Turkish. It was a result of a two-year collaborative project, ready to be used online accessing Moodle platform. Registration is free and once registered, access to the Healthy Fish training program can also be done through the MoodleMobile App.

A consortium led by APROMAR, with input from SGS TECNOS Spain, the Italian Aquaculture Association (API), the Turkish University Dokuz Eylul University and the Croatian Chamber of Economy (CCE), developed the programme. It was funded by the European Commission's Erasmus+ and backed by Skretting and INVE Aquaculture.

5 Future VET development priorities

5.1 Staff development

Staffs at VET centres have a diverse aquaculture background and professional experience they themselves have acquired through attending workshops at national and regional level, supported by their background studies. Many have completed masters programs in related fields. Staff development can always benefit from exchange of different teaching strategies and ideas to create more engagement and interest amongst young people. As well as keeping up with current innovative technologies, staff offered a wealth of knowledge and practical experience in the sector. They themselves recognise the need for more mobility opportunities. This would allow staff exchange for sharing of knowledge and ideas to advance the scope of the curriculum. As well as leaning about innovative techniques to better grow and produce different cultured species and develop further essential skills in the work environment, such as communication and leadership skills.

APROMAR as the association of producers, is interested in the improvement of the sector and staff. Because of this, it recognises the importance to professionalize the sector through the professional training to qualify their needed skills adequately. APROMAR works closely with the industry and interested stakeholders to identify the needs in the skills and training: works to provide staff the learning needed, through such programmes like HealthyFish[15] and more recent short courses provided online already mentioned (see 3.1).

5.2 VET innovation

There is an interest in developing skills and knowledge of workers in the use of new technologies to make the work more efficient and increase productivity.

5.3 Learning resources

Centres like IGAFA have extensive recirculating aquaculture systems labs that are used for producing different types of species, including micro algae, shellfish sp life cycle stages, a variety of warm and cold water, marine and fresh water fish. They have a microbiology lab, mechanical room, diving pool and recompression chamber as well as facilities outside, including mussel rafts and fish farms. In the classroom they are equipped with white board technologies and video conferencing facilities. They also have a computer room.

Students have access to learning resources from the library as well as access to digital formats available through online delivery (internet) including course work delivered online through their learning platform, Moodle.

6 VET provider partnerships and attitudes towards collaboration

6.1 National level partnerships (existing and emerging)

At the national and regional level there is an active collaboration between local actions groups, such as FLAG[16], Fisheries Local Action Group. The focus of FLAG is to create more awareness of the wider fisheries and aquaculture sector, bringing members of the public and interested stakeholders to participate in local initiatives to support developments in the sector. Their educational outreach programs and activities, shed light on long established traditions, such as the mussel farming industry in Galicia, which until now, rely on skills and knowledge being passed down the younger generations, to continue the survival of these small family enterprises in the region. Centres like IGAFA focus on mussel production techniques and management to prepare future young farmers in the sector.

In other coastal regions, VET centres work closely with FLAG to bring school children to their centres, so they can take part in educational programs aimed to to gage their interest in these regional activities and more. The efforts by these organisations working together, hope to achieve that these long-standing traditions, will continue to flourish in the region.

6.2 European level opportunities (existing and potential)

The professional certificate for aquaculture workers needs further development in terms of its implementation. IGAFA is one of the centres that provide the exam, but since its development in 2016, no one has come forward to do the exam. It is aimed at workers in the aquaculture sector and funded by the EU. However, its development was based on a questionnaire to generate a response to the needs of the industry and the majority of responses were received from the shellfish sector. Most of the top needs expressed through the questionnaire were for courses in administration, hygiene and security. Perhaps the fish industry needs are different.

Based on this feedback from IGAFA, there is scope here for developing this professional certificate to a more recognised European standard, or at least, lead to its promotion across a wider range. Nobody from the company or even APROMAR has heard about this certificate. At a recognised, European level, it would facilitate the mobility of workers farther, expanding their knowledge and work experience beyond regional limitations. This would create incentives for workers wanting to advance their job and career prospects.

To add to this, its been expressed by IES school in Murcia, that creating new short training courses focusing on specific needs on the industry could provide faster and more effective solutions. Providing these opportunities for 'continuous' professional development would serve as a motivating factor, keeping workers current with new skills and knowledge. This is a need, as new advances in technologies and production techniques are driving much of the industry forward in other countries and this is one of the limiting factors that is slowing growth and improvement[6] in the Mediterranean Marine Fish Farming (MMFF) sector.

There is definitely a need to create more awareness of this procedure to obtain a professional certificate and as indicated above, even though the industry does not require it for its current worker's, it does support initiatives that will in a way 'reward' and recognise the workers' abilities and performance in the work environment. The company in Galicia, was interested to learn more about this certificate and would support it for its workers wanting to obtain recognition through a certificate for the work they do.

To advance this, there needs to be an opportunity for interested stakeholder to discuss current situation and learn about the development of this professional certificate and what it entails. It would be very useful for the fish farming industry to identify if their needs are being met, in terms of gaps in knowledge and skills that their workers have. There was a concern from both IGAFA and former staff of the company, that workers may feel intimidated by having to complete an exam in order to obtain their professional certificate. From this, it would also give a better indication of how best to develop an effective evaluating method for the workers; certifying RPL and creating new incentives to 'reward' them for their work performance, giving them more work satisfaction.

Future collaborative Erasmus+ innovative VET development activities could involve developing this Professional Certificate to meet a European Occupational Standard and issuing a certificate at a specific EQF level aligned to competence achieved by the worker. This would allow for greater transparency of the skills, knowledge and competence across the European sector as well as making it easier for mobility across the wider sector.

References

[1]Guide to Education System in Spain (Galicia) http://www.edu.xunta.es/ftpserver/portal/DXC/diversidade/educacion_guia_ingles.pdf

[1]LOMCE http://www.educacionyfp.gob.es/educacion/mc/lomce/lomce/presentacion.html

[2a]VET in Galicia http://www.edu.xunta.es/fp/probas-libres-convocatoria-actual

[3a]Ministry of VET Education http://www.educacionyfp.gob.es/portada.html; Functions of Ministry of VET Education https://www.boe.es/diario_boe/txt.php?id=BOE-A-2018-11839

[3b]INCUAL: https://incual.mecd.es

[3c]SEPE: http://www.sepe.es/contenidos/personas/index.html

[5]Professional Certificate https://incual.mecd.es/certificados-de-profesionalidad

[6]Presentation by Prof. Jose Villar at IGAFA Instituto Galego de Formación en Acuicultura

[8]Accreditation & QA http://www.enic-naric.net/spain.aspx#anc07_47

[2b]CEDEFOP EU Framework http://www.cedefop.europa.eu/files/9127_en.pdf

[7]APROMAR Training http://cenp.davinchi.es/2018/Formacion_APROMAR/Ficha%20IE0505236.html

[11]European EQF https://ec.europa.eu/ploteus/en/content/descriptors-page

[10]Certify your work experience http://www.sepe.es/contenidos/personas/formacion/certificados_de_profesionalidad/certifica_tu_experiencia_laboral.html

[10b]This website explains what Professional Certificates are: https://www.auladidactica.com/wp-content/uploads/docs/legislacion-secundaria/fp/ministerio5.pdf

[9]VET centres in Spain http://www.todofp.es/que-como-y-donde-estudiar/donde-estudiar/comunidades.html

[4]VET in Spain https://cumulus.cedefop.europa.eu/files/vetelib/2016/2016_CR_ES.pdf

[12]Financing of VET in Spain http://www.cedefop.europa.eu/files/5102_en.pdf

[13] Student Profile https://www.boe.es/diario_boe/txt.php?id=BOE-A-2012-2582

[14]Técnico Superior en Acuicultura EQF Level 5 Competences http://www.todofp.es/dam/jcr:7c6f45bc-88d2-4907-a355-544a87f5244d/tsacuiculturaen-pdf.pdf

[15]HealthFish http://healthyfish.apromar.es/

[16]FLAG/GAC https://webgate.ec.europa.eu/fpfis/cms/farnet2/on-the-ground/flag-factsheets/pontevedra-flag_en

BlueEDU WP5 VET supply - Italy

Pamela Ernstberger
NTNU

Italy

Country summary

Although Italy is one of the primary aquaculture producers of the continent, it is also one of the largest markets for fisheries and aquaculture products in Europe and the country covers its domestic consumer demand through imports. It is the sixth largest market for imported fish and seafood in the world, and the third largest among the European Union (EU) countries behind France and Spain.

The total imports of fisheries and aquaculture products in 2015 reached 1.102 million tonnes with a value of €5.034 billion, while exports totalled around 193,000 tonnes with a value of €744 million. Italy has one of the highest seafood consumption per capita in Europe an average of about 29 kg per year compared to the EU average of some 25 Kg per year.

The national aquaculture sector is dominated by small and medium enterprises (SMEs), mostly small family owned businesses or larger enterprises run on a constrained scale with a limited number of staff. Total employment in the aquaculture sector comprises 5,164 persons, of whom 1,937 hold full time positions (around 38%, highlighting the importance of seasonal work, particularly for the shellfish sector). The shellfish sector is the most significant in terms of labour, accounting for 3,774 persons employed (some 74 % of the total work force). Male employment is predominant in the national aquaculture sector with about 84 % male employees. (Eurofish report)[1]

'Knowledge is based on tradition which is passed down'

Although the industry has been growing steadily in Italy at the national level, companies still rely on the recruitment of local staff, including unqualified entrants in particular and for seasonal employment. It is difficult for work-based learners to secure Nationally Recognised Qualifications (NRQs), as they are at a major disadvantage when it comes to accessing aquaculture VET qualifications - work based NRQ pathways simply do not exist.

However, recently alternative options have been put in place especially in regions where there's an acknowledged need to develop the sector. This is also an effort to stimulate the local economy through the involvement of EU initiatives, which has been tapped into by regional focused groups and supporting organizations. These initiatives have targeted in particular individuals who have been unemployed for more than six months and need some sort of incentive through targeted training. These initiatives are intended to provide the industry with better-prepared workers.

The EMFF[2], for example, provides funding for the EU's maritime and fisheries policies for 2014-2020 and is one of the five European Structural and Investment (ESI) Funds which complement each other and seek to promote a growth and job creation in Europe.

The EMFF[2] aims to:

- Help fishermen in the transition to sustainable fishing
- Support coastal communities in diversifying their economies

- Finance projects that create new jobs and improve quality of life along European coasts
- Support sustainable aquaculture developments
- Make it easier for applicants to access financing.

These will be further discussed as well as other programs that are currently in development stage.

1 National aquaculture VET sector and providers

When carrying out this study, three regions were selected that predominate the fisheries and aquaculture sector: Veneto (Venice) region in the northeast, **Emilia-Romagna, south of Venice region,** and the island of Sardegna (Sardinia).

Fig. 1 Map of Italy highlighting regions investigated

Why Venice Region (Porto Tolle) was chosen?

A wider community action was taken by the public and private stakeholders in the fisheries sector in the Chioggia and the Veneto areas of the Po Delta. The action supported the initiatives of the FLAG/GAC of Chioggia and Delta del Po[4a] to promote an innovative path aimed at developing the area. To meet the sustainable goals of the region, it was necessary to provide more opportunities to generate qualified trained people for local industries and enterprises in the local area, so in terms of

competence, a new pathway for education and training aimed at the fisheries and seafood production sector, has been implemented.

Together with local businesses supporting these new initiatives to train young people at higher secondary level, a new Commercial Fisheries and Fish Production course has been introduced at the Porto Tolle School with the support of both Public and Private sector.

The main objectives of the GAC Chioggia and Delta del Po[4a] were:

- Promote the need for more opportunities in education and training in the sector;
- Focus on integrating the economic sectors that drive the territory;
- Strengthen local cultural identity - Veneto region has a well established fisheries industry.

To pursue these high level objectives, the GAC Chioggia and Delta del Po has drawn up the Local Development Plan entitled "Fishing and aquaculture between tradition and new markets", coordinating with all the stakeholders the needs of the sector and, once approved by the Veneto Region, has implemented the measures contained in the Plan.

1.1 Public Sector

1.1.1 The Ministry of Education, University and Research (MIUR) sets the framework for VET in national school programmes (technical and vocational schools) for higher technical training

1.1.2 The Ministry of Labour and Social Policies (MLPS) sets the framework for Regional Education and Vocational training courses (IeFP), while the regions and autonomous provinces are in charge of planning, organisation and provision

1.1.3 Regions and autonomous provinces are also in charge of planning, organisation and provision of Higher Technical Training: ITS, IFTS, post IeFP, post-higher education, and most of the apprenticeship-type schemes

1.1.4 The labour ministry sets Goals of Continuing Vocational Training (CVT) under the public system, while CVT either regions and autonomous provinces or social partners manage activities

1.1.5 Social partners play an important role in promoting company-level training plans (single or group of companies) to be financed by the regions or by the joint interprofessional funds

1.1.6 Social partners have a general advisory role in VET policy, from which VET provision is then defined.

(CEDEFOP)

1.2 Public & Private Sector (Porto Tolle, Commercial Fisheries and Fish Production school program)

1.2.1 The Fisheries Local Action Group (FLAG) or *GAC* (Gruppo Azione Costiera known in Italy)[4a] Chioggia and Delta del Po is a non-profit association founded in 2012 mostly representative of public and private bodies of the coastal area belonging to the maritime compartment of Chioggia. The members are public and private bodies operating in the fishing industry.

These organizations are grouped together accordingly:

Public Authorities: Municipality of Chioggia (VE), Municipality of Porto Tolle (RO), Municipality of Rosolina (RO), Municipality of Porto Viro (RO), Province of Rovigo, Province of Venice.

Trade associations: Confcooperative Veneto, Lega Coop Veneto - Fisheries sector, Agci Agrital - General Association of Italian Cooperatives, Agro Ittico Alimentare, Federpesca, Coldiretti, Fisheries, Unci pesca.

Private organizations: Chioggia Fishing Foundation, Upper Adriatic Fish District, Adria Bank.

1.3 National VET and Higher VET systems[3]

Italy has a long established National VET system in place, but at present has no aquaculture VET or higher VET certification being offered.

However, during the past year reformation of the educational system has made room for six more new courses to be introduced at the pre-vocational and vocational level at the upper secondary level, bringing the total of 11 different tracks students can choose from.

One of these is the new Commercial Fisheries and Fish Production course that has been introduced in one Veneto region at L'istituto di Istruzione Professionale Superiore C.Colombo (upper secondary-vocational school) in Porto Tolle. The young students (14 years) choose between general education and the vocational routes offered at the upper secondary level and to enter a vocational program, they must first sit an exam to acquire the EQF1 certificate to enter the course.

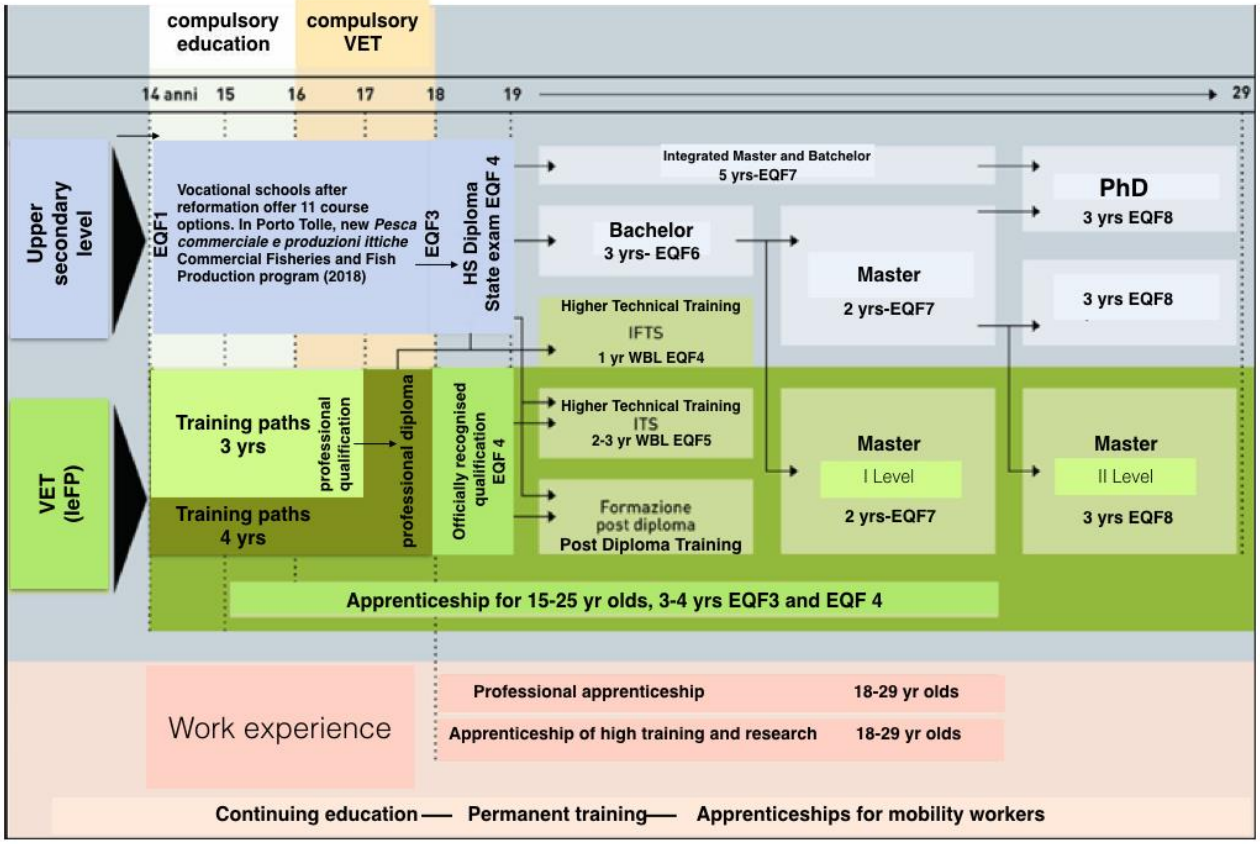
This year the course in Commercial Fisheries and Fish Production, which also includes aquaculture, was introduced at the pilot stage and, if successful, will lead to planned VET diplomas that can be obtained after 4 years (+ year 1 for the compulsory education) at EQF3. This qualification will be as Professional Operators, or following completion of the five-year program, leading to obtaining a Technical Professional Diploma at EQF4 (19 years).

The Ministry of Education (MIUR) draws up the certification models. Diplomas and certificates are written in four Community languages so that they can be understood in the different Member States. In 2016 Europass Certificate Supplements were produced by Ministry of Education together with National Europass Centre (NEC) in Italy located in the Institute for the Development of Vocational Training of Workers EU Programmes, or *Isfol*[9] and issued to all students together with the final Diploma (CEDEFOP).

This is part of the European Education and Training Goals for 2020, for 18-34 year olds with an initial vocational qualification to spend some time studying and training abroad.

1.4 VET in the education and training system in Italy[3]

In Italy, the term vocational education and training is reserved for specific programmes primarily under the remit of the regions and autonomous provinces (such as VET or *Intruzione e Formalazione Professionale* or IeFP. From a European perspective the term ‘education and training’ comprises all types and levels of general and education and vocational education and training (VET). Irrespective of the provider or governance scheme, VET can take place at secondary, post-secondary or tertiary level in formal education and training or non-formal settings including active labour market measures.



VET addresses young people and adults and can be school-based, company-based or combined school- and company-based learning (apprenticeships). Therefore, the term VET also covers the technical and vocational schools.

Table 1: An overview of the national education and VET system in Italy [7]

1.4.1 NQ VET

The anticipated levels of aquaculture VET following the success of the Secondary School program will lead to:

EQF Level	Prescribed within each Unit	Award Composition
3	Skills demonstration (60%) ; portfolio or collection of work (40%)	Professional Diploma Profesional Operator NRQ at EQF3
4	Assignment (40%) ; project (30%) ; exam (30%)	NRQ at EQF4

Table2: *Anticipated* VET programme in Commercial Fisheries and Fish Production (to inc. aquaculture)

1.5 Aquaculture VET and higher VET provided by each provider

Provider MUIR	EQF Level 5 Aquaculture	EQF Level 4 Aquaculture	EQF Level 3 Aquaculture	Higher Diploma Aquabusiness* (current)
Aquaculture formal VET provision is currently not offered in Italy				On completion and passing state exam at EQF4

Table 3: * At Porto Tolle, on completion of the first cycle (5 Years) of the Commercial Fisheries and Fish Production course, students will need to sit the state exam providing them with a EQF level 4 Higher Diploma.

1.6 Aquaculture VET staff employed by each provider

At Porto Tolle, there is no trained or certified teaching staff in aquaculture or related field. Teachers that teach core subjects modify lessons to meet the standards aligned to the skills, knowledge and competencies students have to meet.

As this is a new programme, it is yet not possible to establish the adequacy at the national level, for aquaculture VET supply.

2 WP5 Investigative process

2.1 Overview and evaluation of investigative methods and processes

The investigative process has relied heavily on meeting with people directly involved with educational programs, such as business owners, and communicating with organisations and interested groups through email, Skype meetings and social media networks (LinkedIn, Facebook and Messenger) to connect directly with people through an extensive network.

2.2 Qualitative survey results

The upper secondary vocational school, at L'istituto di Istruzione Professionale Superiore C.Colombo, is in one of the largest school districts in Italy stretching from Chioggia to Porto Tolle. There are over 8 million people living in the region and has a turnover of €830M. Fisheries and seafood represents the number one economic sector in the territory, a sector for which it is evident from discussions that there is a need for a well designed and supported VET programme. The new secondary school programme is at its initial stages and there are very little resources available at the institution. The school has good links with industry and site visits are planned to give students a closer look at the sector and opportunities that exist locally.

The regional government has supported these new initiatives in vocational education programmes that were introduced this year. This reform was put in place after concerns were shared by local businesses and the wider community that there was a lack of opportunities for (young) people and as a result many leave to continue studies or seek jobs elsewhere. In order to stimulate the local

economy and create more interest in what the region has to offer, these programmes will enable (young) people to learn more about the industries that exist in the area, as well as potentially providing a local workforce for the businesses that already exist and are growing.

Students need to be better prepared and this sector demands a good understanding of the language to relate with the international market, information technology to have those technological skills to market the product and applied knowledge of the organoleptic factors to know how the product should look like and taste, and for this the students need to learn how best to grow fish professionally to obtain a high quality product.

Thanks to the creation and efforts of the FLAG/GAC[4a,4b] in the Chioggia and the Veneto areas of the Po Delta, it was possible to learn how they coordinated and shared the knowledge and skills of many people who know the wider fisheries territory very well and who have been able to cooperate in synergy to make the opportunities offered by the European Education and Training goals executive.

With the help of European funding, GAC has implemented a Local Development Plan (LDP) with which projects have been funded with different objectives and in particular, developing a more sustainable fisheries and aquaculture sector that meets the needs of local economies, while maintaining a transparent approach and respect for natural ecosystems (EU Green and Blue Economy). In gaining support for their innovative ideas, programs at the higher secondary level (Porto Tolle) have been introduced and it is hoped that with the continued regional effort, the wider national and European support for this program will develop into a fully recognised VET/IeFP program, offering a NRQ at the European EQF Level that prepares young people to be globally competitive. Many other coastal regions are keeping an eye on these developments and it is hoped that Porto Tolle will serve as a model for more similar programs to be offered at other locations.

In discussions with the many groups and individuals, including a former fish farm owner, it is clear that there is a need to create more opportunities for education and training. Factors that drive these needs are more than economic based: the unemployment rate in Italy amongst young people is one of the highest in Europe and there are also several administrative constraints for developing existing businesses, which restrict the growth of the industry. At the same time, there is very little renewal of the workforce and with younger people not finding jobs locally, many leave their home-towns to find opportunities elsewhere.

There is a fear that these more ‘artisanal’ businesses will die out if more is not done to create incentives for education and training and job creation. What is common in the sector is that the current ‘training’ is limited to knowledge that is based on tradition being passed down. There’s no established institutional training or ‘training’ instrument in place and this needs developing.

3 National VET supply inventories

3.1 NQs currently and previously available

NQ	EQF level	Status	Comments
NFQ Level 5 Aquaculture	4	Not available	In developmental stages at Porto Tolle (only school in Italy)
NFQ Level 4 Aquaculture	3	Not available	In developmental stages at Porto Tolle (only school in Italy)
NFQ Level 3 Aquaculture	2	Not available	N/A

Table 4: VET in aquaculture

There is no NRQ or 'school' based established VET program in aquaculture. In a recent report from CEDEFOP, qualifications in 'sea and fresh water operator' are mentioned, however, it was hard to find any further information on this, or current institutional-based VET provider in Italy.

3.2 Non-Formal VET

External certificated and uncertificated short courses for industry.

Information from two regions were obtained for this part of the report:

Sardinia:

- Sardinia is still one of the leading Italian regions in Italy for marine fish production, with the greatest potential for development;
- Despite the large availability of suitable sites to undertake the activity, fish farming in Sardinia has played a marginal role in the economy in the region until the end of the 1990s;
- In 1979 an intensive breeding production was born for the fattening of sea bream and sea bass and eels in the southwestern part of the island;
- There has been a slow but steady increase of the production initiatives, which have achieved numerical stability in the last years, thanks to the growing demand for products and to the opportunities provided by sector laws funded mainly through the Community fisheries policy and initiatives driven by Fisheries Local Action Group (FLAG) or GAC.

The ForMare Program funded through the EU Blue-Green Economy 2014-2020, developed VET to meet the need for improvement in fisheries sector in the region. Although these are not 'official' NRQ, they do provide certification issued by the European Commission, which is recognised across European countries. This program was a collaboration between public and private sectors including training agencies that developed and delivered the content for the program.

Objectives: Creating new job opportunities and offering an opportunity to improve skills for staff working in local companies. Target groups included, young unemployed (16 - 35yr old) people who have been out of education for 6 months or more. The program needs to have 50% female participation. The objective is in providing skills and knowledge and improving the adaptability of beneficiaries to help them develop the 'know-how' to deliver positive impact on local businesses development (effectively administering funds).

High level targets of the initiative *"Integrated measures between local participatory development and employment in the areas of the Green & Blue economy, Sardinia 2014-2020"* to include:

- Professional training
- Certification of Skills
- Support for work
- Promotion of new entrepreneurship
- Transnational mobility in areas of Green & Blue Economy

3.3 External certificated

Emilia-Romagna[4c] (see map for location):

The entire 130km coast of the Emilia-Romagna region is characterised by its fishing and lagoon fish farming, which have a long-standing tradition expanding centuries. The local economy is mainly based on fishing, aquaculture, mari-culture and summer coastal tourism. Under the 2007-2013 programming period (EFF – Axis IV), this area was covered by two separate FLAGs (GAC Distretto Mare Adriatico and GAC Marinerie della Romagna), focusing on the revival of the local fishing community (modernising the sector and making it more sustainable), wholesale, processing and retail, youth employment and fishing tourism**.**

The Emilia-Romagna Coast FLAG, or GAC will continue their work and further develop the areas' historical, cultural, gastronomic, social and environmental peculiarities. It will support integration of local fisheries resources, maritime activities, cultural heritage elements and local traditions. [4c]

GAC activity in Italy has led to further investigation and better understanding of how VET for the fisheries sector, including aquaculture, have arisen in the last years.

Communicating with the director of 2Fish project, this was an initiative, that was developed by a consortium led by INFORCOOP: The National Institute for Training in Italy and ten partners, which included collaboration and participation of the world cooperative of fisheries and the Italian Aquaculture Association (API), as well as GAC in Emilia-Romagna. Funded through the Leonardo da Vinci programme for development of innovation project. It Started in November 2011 and ended in April 2014. Involved fishery schools, training centres, local enterprises and fishery sector stakeholders. This was an EQF level 3 VET programme developed for education and training directed at workers in the wider fisheries and fish production sector.

The programme involved 38 enterprises from 22 different sector areas within the fishery sector. In total 83 employees/students participated in the training.

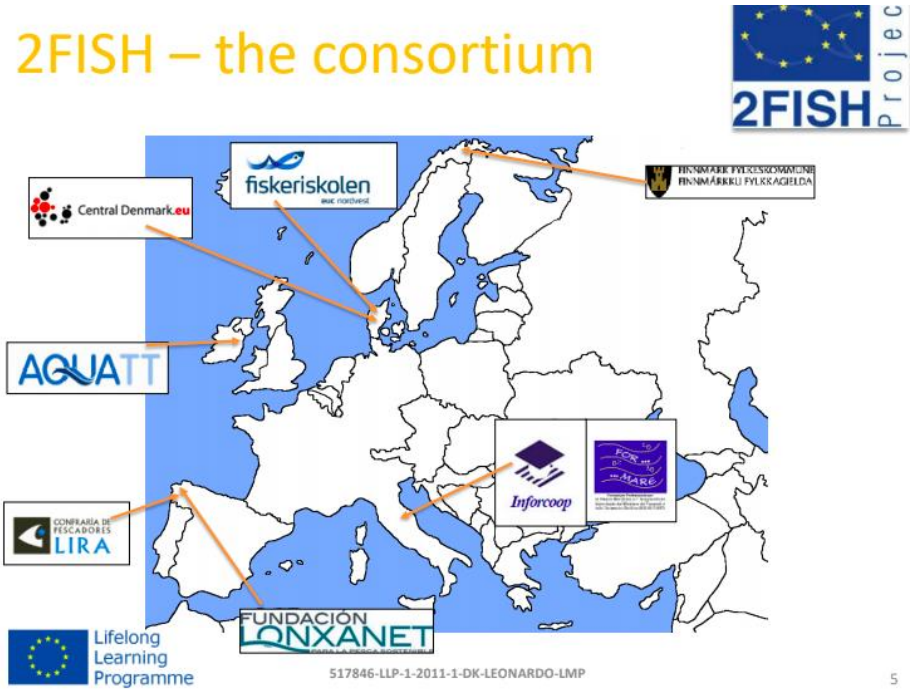


Fig. 2Fish Consortium included partner countries: Denmark, Ireland (UK), Italy, Norway and Spain.

About the 2Fish Project:

'Inclusion of SECONDary Service Professions within FISHery to the Formal VET-system'

– SECONDary refers to the professions that the project targets: retailers, restaurants, net binders, fish producers and processors.

– The name FISH refers to the sector in which the project realises the activities.

To begin with, in 2012, a questionnaire was distributed to survey the training needs by professionals in fishing cooperatives, with the support of the associations of Legacoop and Legapesca category. Results from this survey, led to the development of the 2Fish project.

This project took into consideration the economic importance of secondary professions within the fishery sector, which is high and depend on:

• Good skills and knowledge by their employees to deliver quality products and services

• Anticipation of future skills needs in the fishery sector, which will benefit the economic development in areas characterized by fishery – often in remote areas

• Fishery VET is a small sector– international cooperation is important to attract and maintain good teachers

The main objectives focused on:

Developing and testing at least 5 innovative training courses based on the needs identified in direct collaboration with enterprises related to fishery

• Support close links between fishery vocational schools and enterprises within the fishery sector

• Provide competence development for teachers involved in the project

Fig. 2Fish Project website[11], no longer available online. Maintenance of portal available for 3 years (2017).

3.4 Delivery modes available

ForMare[10]delivers training through following modes and associated organisations:

- In class and one-to-one instruction
- E-learning https://www.formazioneconfartigianato.it/e-learning/ training agency of Confartigianato Sardegna, provides **online training** offering a flexible and effective training through the activation of numerous **courses in e-learning**
- Site visits-local companies

The 2 Fish[11] project consisted of the following courses:

- Business law concerning fishery related businesses
- Quality management in seafood production
- Traceability of fisheries products
- Developing a new seafood product

- Fundraising for product development in the fisheries sector
- Fishing tourism and boat carpentry

These 6 training modules in five different languages: English, Danish, Norwegian, Spanish and Italian

- Including One module as distance learning course
- There was also Examples of teaching material (not obtained)
- 2Fish certificate available in the different partner languages and prepared for all training modules
- Also included a Cooperation plan – recommendations and good ideas for collaboration between schools/training centres and enterprises

3.5 Typical VET pathways to employment

Education and training through these initiatives, lead to various roles related to areas covered in the course content and also included, at the operative and technical level in the wider fisheries and fish production sector.

4 VET providers opinions on the aquaculture VET supply

4.1 National VET provision leading to NQ [8]

The VET system in Italy varies between regions. Regions issue qualifications and diplomas recognised at a national level, as defined in the National Classification of Professional Roles.

One public sector in Veneto region is currently working towards a National VET qualification. This is the first year, 2018-19 that their program in 'Commercial Fisheries and Fish Production' is being piloted, with all efforts and aims leading to the VET or *Intruzione e Formalazione Professionale* (IeFP)[8] certification after it has been successfully established. The program is being delivered at the higher vocational secondary level to students from 14-19 year old. In the school they have in total 90 students; 25 students are currently enrolled in the new program.

This program is first of its kind. Many other regions are keeping a close watch on its developments as a 'model' for future courses to be introduced at other vocational schools.

In recent communication with the coordinator, *"the programme is taking shape and giving staff and students a lot of satisfaction"*!

4.2 Industry attitudes towards NQs

Generally, the industry is in favour of NQ's, even though not established at this level, but recognises that this gives the industry a more professional profile and creates more incentives for workers to gain recognised qualifications.

4.3 Suitability of VET pathways to employment for learners

The initiatives taking place currently, are tailored specifically to the needs of the sector, which are identified through questionnaires distributed to the interested stakeholders and interested groups.

4.4 Learning and study skills of learners

Not sufficient information has been gathered for this section. However, from description of the course objectives for the ForMare and 2Fish project, the target learners are unemployed youth (18-35 years), that also lack additional training in any related sector or qualification above high schools; workers in the sector that are developing the skills and knowledge through these programmes to get better job prospects, taking part in life long learning programmes.

4.5 Innovative VET delivery, (including ICT supported)

Modules that have been developed also include distance-learning options as discussed above.

No additional information was collected.

5 Future VET development priorities

5.1 Staff development

Both the school at Porto Tolle and GAC in Sardinia were interested in collaborating with other European schools that have more experience in delivering similar programs. There's a need for mobility for staff to share knowledge and skills as well as experience education and training outside their home base.

5.2 VET innovation

There is an interest in collaboration at the European level and have support for developing new programs and provide opportunities for mobility.

5.3 Learning resources

At present, this is limited and teachers, for example, at Porto Tolle are modifying core subjects such as science and technology to meet the standards for the program of Commercial Fisheries and Fish Production. Funding has been provided to set up a lab in the school, as currently, they do not have a functioning lab allocated to the program. The course involves site visits to local businesses and fisheries and aquaculture farms.

6 VET provider partnerships and attitudes towards collaboration

6.1 National level partnerships (existing and emerging)

Through the FLAGs network, there seems to be a big involvement of community-based projects and group activities to create more awareness about the need to support development of the wider fisheries and aquaculture sectors in the coastal zones. Because, much of the industry are dominated by small, family owned enterprises, there is very little renewal of the workforce and knowledge is

based on ‘tradition’ which is passed down, so there is a significant requirement for the development of a training instrument.

GAC with other national and local organisations and financial support from EU social funds is investing a lot of effort in creating these alternate avenues for training, that currently do not exist at an institutional level.

There’s a lot of interest I the developments at the Porto Tolle schools. Since this is the first programme introduced in Italy, many schools and supporting organisations of the wider fisheries sector, such as GAC, are keeping a close eye on these developments. Success of the programme will serve as a positive model for new programmes started in other schools in other regions.

It is important to transfer the results to new projects, such as ForMare and 2Fish. Creation of new employment possibilities in the fishery sector, based on a higher level of competences and skills has been achieved through access to new training possibilities offered by these programmes.

For GAC and supporting organisations, efforts should continue to focus on Local development, supported by stakeholders and international cooperation. They have managed to show, in a short space of time, that such programmes can be successful; they generate interest in the regional sector, including the workforce, and are also easier to manage.

6.2 European level opportunities (existing and potential)

Following up initial discussions with school program coordinator, there is a need to develop the curriculum aligned to meet ‘standards’ set by the school district and also recognised by the industry. These standards however, are not easily found and may indicate that there is also a need to establish these at a more transparent or accessible level. The disadvantage of this is that it can lead to an educational mismatch and an absence of qualifications matching jobs.

The Porto Tolle professional technical school, has a curriculum outline for the *Diplomato di Instruzione Professionale dell’ indirizzo “Pesca Commerciale e Produzioni Ittiche”* (Professional Certification in "Commercial Fishing and Fish Productions") highlighting eight key areas of competency that students have to meet. There are no specific subjects that are designed to target these key competencies, such that you find in for example in other European NRQ programs, but using the mainstream subjects taught at the institute, for example, science, maths, history and technology, the teachers will modify these to cover the content in those specific areas needed to meet related needs of the industry. These competences were discussed with GAC and companies in the area, prior to introducing the programme.

At present they have the challenge of developing the program with the limited resources that they have. The school has been given €15,000 by the region to develop a laboratory for carrying out further applied science practices, which include setting up an indoor recirculating facility. Teachers need instructional materials as well as new teaching strategies and skills development that match the course needs to stimulate interest and increase student engagement in the classroom.

The coordinator of the program was very interested in collaborating with other schools and opportunities that provide mobility, for both students and teachers. Creating a learning network would definitely be a welcome support for this school embarking on this new program and mobility would allow for exchange of practices, as well as knowledge.

The other limitation is that not all the instructors speak English, or feel confident communicating in English. The students do study English and most young people are able to communicate in basic English. However, to create such a learning network, this would need to be a major factor to consider.

Developing a program that can be easily accessed and is designed with the non-English speaker in mind can break the barriers in communication and facilitate learning rather than impede it. This would require EU funding, but once it is established can be a sustainable resource the school and other schools nationally can rely on, able to be easily updated to stay current with developments in educational resources, instructional tools and advances in the industry sector.

Using an online approach, the course content could be matched to the regional curriculum standards, plus a 'joint' standard that all schools participating can follow. This would create a good community of practice and added value to a 'European Aquaculture in Schools' network.

There seems to be regional opportunities for non-institution based training, and innovative ideas have stemmed from initiatives driven by organizations collaborating together on project to supply the economic need: reducing youth unemployment, supporting SMEs and providing a local pool of trained workers.

Although there seems to be a need for industry to develop and grow to meet national demand, the efforts work best at meeting needs at 'local' level - more manageable with local interested groups, local businesses and local management of distribution of funding.

References:

[1]EuroFish https://www.eurofishmarket.it/index_eng.php

[2]EMFF https://ec.europa.eu/fisheries/cfp/emff_en

[3]Vet in Italy https://cumulus.cedefop.europa.eu/files/vetelib/2016/2016_CR_IT.pdf

[4a]GAC Porto Tolle https://www.gacchioggiadeltadelpo.com/

[4b]GAC Sardegna Oriental https://www.facebook.com/flagsardegnaorientale/

[4c]GAC Emilia-Romagna https://webgate.ec.europa.eu/fpfis/cms/farnet2/on-the-ground/flag-factsheets/emilia-romagna-coast-flag_en

[5]VET 2Fish Project Course outline http://formazionelavoro.regione.emilia-romagna.it/qualifiche/schede/trasporto-marittimo-pesca-acquacoltura/operatore-pesca-acquacoltura

[6]EQF https://www.qqi.ie/Articles/Pages/Qualifications-and-Skills.aspx

[7]Qualifications Framework http://www.nfq-qqi.com/assets/qualifications_frameworks.pdf

[8]Vocational Education in Italy https://cumulus.cedefop.europa.eu/files/vetelib/2016/2016_CR_IT.pdf

[9]Europass http://www.isfol.it/en

[10]ForMare https://www.progettoformare.it/progetto/

[11]2Fish Project http://2fishproject.eu/

BlueEDU WP5 VET supply – The Faroe Islands

Ann Cecilie Ursin HIlling
FEAP

The Faroe Islands

1. Faroese educational system and providers

The Faroe Islands is a small island group located north of Scotland and about 600km vest of Bergen city in Norway. The island populates close to 50 000 people and is an autonomous country within the kingdom of Denmark. They have the right to govern independently several areas of their politic. This include conservation and management of living marine resources within the 200-mile fisheries zone, protection of the marine environment, sub-surface resources, trade, fiscal and industrial relations, transport, communications, culture, education and research[20]

1.1 Govern

The ministry of Research, Education and Culture has the administrative and financial responsibility for all the schools in The Faroe Islands. It oversees the process of setting the aims and objects for the schools. The ministry is responsible for that the students receive correct learning materials. They are also making sure that the teaching body is qualified, and that rules, regulations and exams are upheld[21]. In the Faroe Islands the total school budget amounts for 1.1 billion DKK and around 8,1% of the GDP.

1.2 Organization

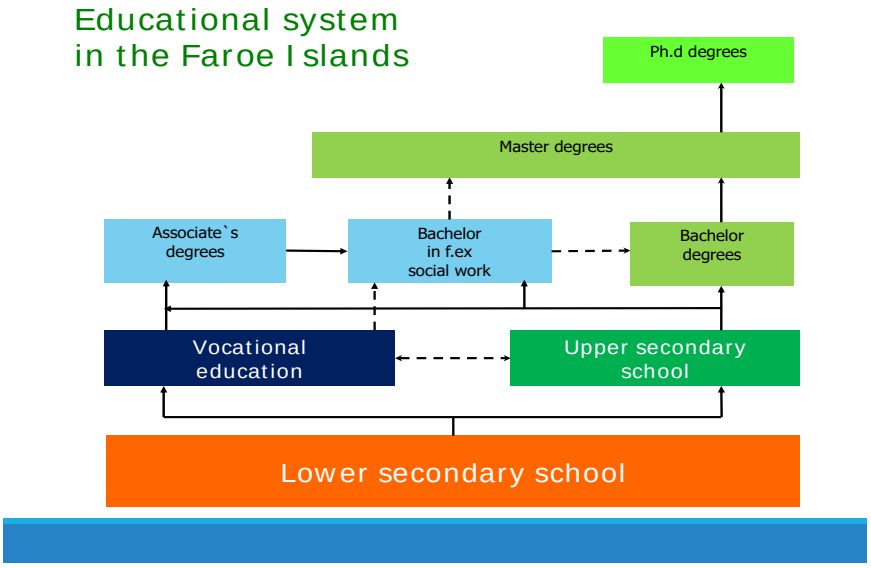


Figure 1: Model of the educational system in The Faroe Islands

[20] Faroe, 2018: Faroe Islands fisheries and aquaculture, Ministry of fishery and natural resources.

[21] Faroeislands.fo, https://www.faroeislands.fo/people-society/education-research/education/

In the Faroe Islands the education system is divided into three levels:

1. Primary and Secondary
2. Upper Secondary
3. Higher education

1.3 Primary education

The primary education (Folkaskulin) is compulsory and lasts from the age of 7 years until 16 years old. The country has a policy that every child should be able to start primary education without having to move away from home, though they might have to move to a bigger school when they enter the 8th grade. Today there is 54 schools that provide either primary or lower secondary education, and many offers both. This number includes three "free schools", which charge a small tuition fee, but are primarily state funded.

In 2017/18 there were 7241 students in the 1st level education[22].

1.4 Upper Secondary education

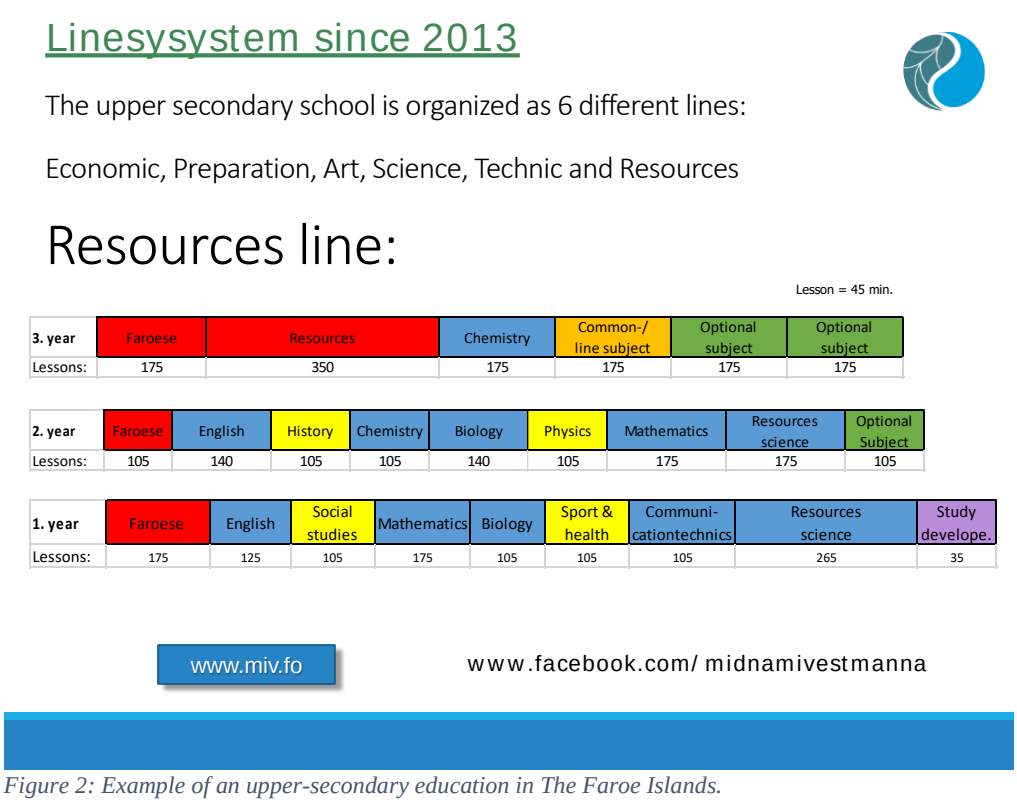


Figure 2: Example of an upper-secondary education in The Faroe Islands.

Secondary education is voluntary. There are eight upper secondary schools in The Faroe

[22] Statbank,2018: https://statbank.hagstova.fo/pxweb/en/H2/H2__UV__UV02/fs_ntalsk.px/table/tableViewLayout1/?rxid=d44fee15-3e8c-4277-b3db-ca1d7a1c2c01

Islands and one of them is former known as the fisheries college in Vestmanna (now Midnam Vestmanna). They formerly had a 3 year upper secondary education in aquaculture/fisheries with practical internship. This study unfortunately was closed down in 2012 due to a downfall of the fish farming industry and no industrial need for additional staff.

This has now changed and the need for a vocational education in aquaculture is now present.

1.5 Higher Education

In the Faroe Islands there are one university which provides 20 different bachelors and masters programmes in fields as Faroese language, teaching, earth science, oceanography, nursing and more.

The University is made up of five Departments:

- Department of Faroese Language and Literature,
- Department of Education,
- Department of Science and Technology,
- Department of Nursing and
- Department of History and Social Sciences.

The university enrolls approximately 1200 students and the official language in the university is Faroese. The university uses ECTS credits.

It is very common for students from the Faroe Islands to travel abroad to study. This in order to be able to study courses and programs that the university does not provide like medicine, dentistry, fisheries and aquaculture.

Higher education is popular in the country and about 36% of the population holds a degree from higher education.

Most students go to Denmark, but many goes to Norway and especially those who have interest in marine life and production have over decades gone to Tromsø to study at the university there. The fisheries candidate study in Tromsø is highly regarded in the Faroe Islands and they even have an own club in Tórshavn only for those who have graduated with the fisheries candidate title from Tromsø.

1.6 Mature learners

Education for mature learners (both with and without employment) has not been a big priority in the Faroes over the past decades. There is however a system established where adults lacking compulsory education exams (EQF2) can attend evening school in order to attain the credits necessary to complete. This has often been done by fishermen in order for them to go on and take further maritime exams. This system has not been in use for many years due to the high percentage of graduation from compulsory school combined with the country's low population.

1.7 Accreditation of prior skills

Accreditation of prior skills has by February 2018 been implemented into the Faroese educational system. Unfortunately, the document from the government is only available in Faroese and attempts of getting more information on the structure was unsuccessful.

2. Aquaculture VET providers and needs

2.1 Previous Aquaculture VET

The school Midnam Vestmanna opened in 2010 a study in aquaculture in The Faroe Islands. Due to the industry being on a downfall at that time, the need for skilled personnel was not present and the study was closed down a couple of years later. Figure 3 shows the curriculum created in 2010 which could be laid as groundwork for a new curriculum to be made.

Vocational education in Fish Farming

First year: In school

General subjects	Number of lessons	Vocational subjects	Number of lessons
Natural sciences C	140 h	Management	35 h
English C	140 h	Ouality management	35 h
Faroese C	140 h	Health, environment and safety	35 h
Biology C	105 h	Information technology	70 h
Social Sciences C	105 h	Mikrobilogy	35 h
Mathematics C	175 h	Fish breeding production	175 h
		Trade theory	35 h

Second year: Apprenticeship during the whole period

Third year

3 days a week apprenticeship	2 days a week in school	
Practical training	Fish farming biology A	175 h
	Fish farming techonoly B	140 h
	Fish farming economics B	140 h

h = each lesson lasts 45 minutes

Figure 3: Model of the former fisheries/aquaculture study at Midnam Vestmanna

2.2 Present Aquaculture VET needs

The industry has now expressed that they want to have a National Qualification (NQ) in aquaculture in The Faroe Islands and preferably they want it to be equal to the study which is running in Norway (EQF 4) in order to possibly harmonize the two in the future.

The Faroe Islands has collaborated with Iceland and Norway since 2017 in a project where the aim was to create an aquaculture VET NQ for upper secondary level. The project managed to submit a curriculum in Iceland, but the work in the Faroe Islands did not had the same

progress. It is mainly a governmental question as to how to structure the study, which school to undertake it and in addition the schools want the aquaculture industry to take the lead to make sure they don't end up having to close like they did in 2012.

2.3 Aquaculture teacher presence, training and needs

There is not any aquaculture VET study offered in the Faroe Islands today, whereby the need for teachers is not present. However, should there be created a new study in Aquaculture, there is today teachers with aquaculture competence in the Faroe Islands.

In the Faroe Islands it is very common for young students to move abroad for higher education. One of the studies which is very popular is the Fisheries Candidate study in the university of Tromsø (Norway). This study is a MSc. programme and covers not only fisheries, but also aquaculture. Initially the study was so popular due to fisheries being the main industry in the country.

As aquaculture as an industry grew in Norway, the university in Tromsø adapted their study to include it. By doing that and having a good cooperation in terms of receiving students from The Faroe Islands over many decades, the study continues to be popular in the Faroe Islands.

The graduates from The Faroes often move back home for work and are eligible as future teaching force.

In general, education of teachers in The Faroe Islands is conducted through the Faroese Teacher college in Torshavn[23] which is a part of the university. It is possible to study for a bachelors and a master's degree there in order to become a teacher at different school levels. In order to become a VET teacher, one would need to have a certified craftmanship suited to the courses one is teaching.

3. Aquaculture VET recommendations The Faroe Islands

2.4 Human resources

The creation of aquaculture VET in The Faroe Islands demands cooperation between the government, the industry and a school. There should be made available resources in order to fund project management which can undertake the task of getting an NQ in Aquaculture VET set up in the country suited for upper secondary youth and for mature learners employed in Aquaculture.

2.5 Teaching staff

Since there today at no NQ in Aquaculture being taught, the need for skilled teaching staff is currently not present. However, should there be created an NQ, there are people in The Faroe Islands who do have education and knowledge to be able to teach aquaculture courses.

If an NRQ were to be made there should be developed a teacher training program where teachers continuously can be updated upon development in the industry and where the

[23] The Faroese teaching school: setur.fo

teachers could be part of a network sharing knowledge and competence. In many of the small aquaculture nations, the number of teachers in aquaculture are low and therefore one should open up for more collaboration across borders. A teacher training programme should aid this collaboration.

The programme should be made in modules such that a teacher can choose one and be able to complete in between all the work they have in their normal work day.

2.6 Knowledge delivery

There are short distances in the Faroe Islands. Therefore, the location of a school is not a major issue. To gather students to attend class room based training is easy and there are great possibilities in experimenting on which delivery mode is the most effective both for the young students in upper secondary. In addition, other types of flexible delivery modes are available for mature learners which are employed by the industry.

2.7 Harmonization of aquaculture VET educations in Northern Europe

In Iceland, Denmark, Norway and The Faroe Islands, the structure of the educational system is very similar. Therefore, one should consider a harmonization between Aquaculture VET studies. A harmonization between these countries would open many routes for future collaborations. The industry in these countries often have owner interests which is originated in other neighbour countries.

For example, Marine harvest is a key stakeholder in Norwegian Aquaculture and in addition it has ownership of 17% of the Faroese aquaculture industry. Salmar farming is another key stakeholder in Norway and in addition the company has invested a significant amount into Icelandic aquaculture. This means that the industrial cooperation and communication between the countries are already present and therefore the educational institutions should follow suit.

A harmonization would increase collaboration by encouraging mobilization between students, workers and teachers. For the Faroe Islands this is very valuable due to the low number of inhabitants in the country. To find enough skilled workforce in a population of 50.000 with aquaculture being the second largest industry is hard. For them the ability to recruit aqua-students and skilled workers from other countries would be of great benefit.

2.8 Teaching Material

There is a lack of proper teaching material in The Faroe Islands. The educational institutions which teaches the field of Atlantic Salmon farming, has not previously had a good tradition of communicating. Therefore, many has written the same material several times over.
By harmonizing the NQ between countries and by collectively setting up a project where study material is created digitally. One would ease the writing process and leave more room for renewing the material with the latest technology and research. This would in addition make it easier to keep it updated, being that it is a collaborative effort between many schools. Icelanders and The Faroese people have Danish as a second language and read it very well. The written Danish language is close to identical to the written Norwegian language, whereby Norwegian could be used as the common language form. All countries are also fluent in English.

Faroe,2018: Faroe Islands fisheries and aquaculture, Ministry of fishery and natural resources.
FI,2018: Faroeislands.fo, https://www.faroeislands.fo/people-society/education-research/education/

Statbank,2018: https://statbank.hagstova.fo/pxweb/en/H2/H2__UV__UV02/fs_ntalsk.px/table/tableViewLayout1/?rxid=d44fee15-3e8c-4277-b3db-ca1d7a1c2c01

BlueEDU WP5 VET supply - Greece

Douglas McLeod
FEAP

Part B Country specific report structures - Greece

Country summary

The aquaculture production sector in Greece has been undergoing major structural changes (see WP6 for details), and this will inevitably impact on the provision of vocational training, which has already been experiencing similar significant transformation. In the past training has been largely provided by the production companies, sometimes in practical collaboration with colleges (i.e. the provision of training personnel), but with little evidence of national recognition of occupational standards, levels or progression.

The Greek general public tends to show a preference for formal qualifications and traditional assessment methods rather than non-formal and informal learning. Nevertheless since 2009 governments have committed to validation of lifelong learning and vocational training, along with the development of a Hellenic framework of qualifications and an implementation of a Learning Outcomes approach based on knowledge, skills and competence.

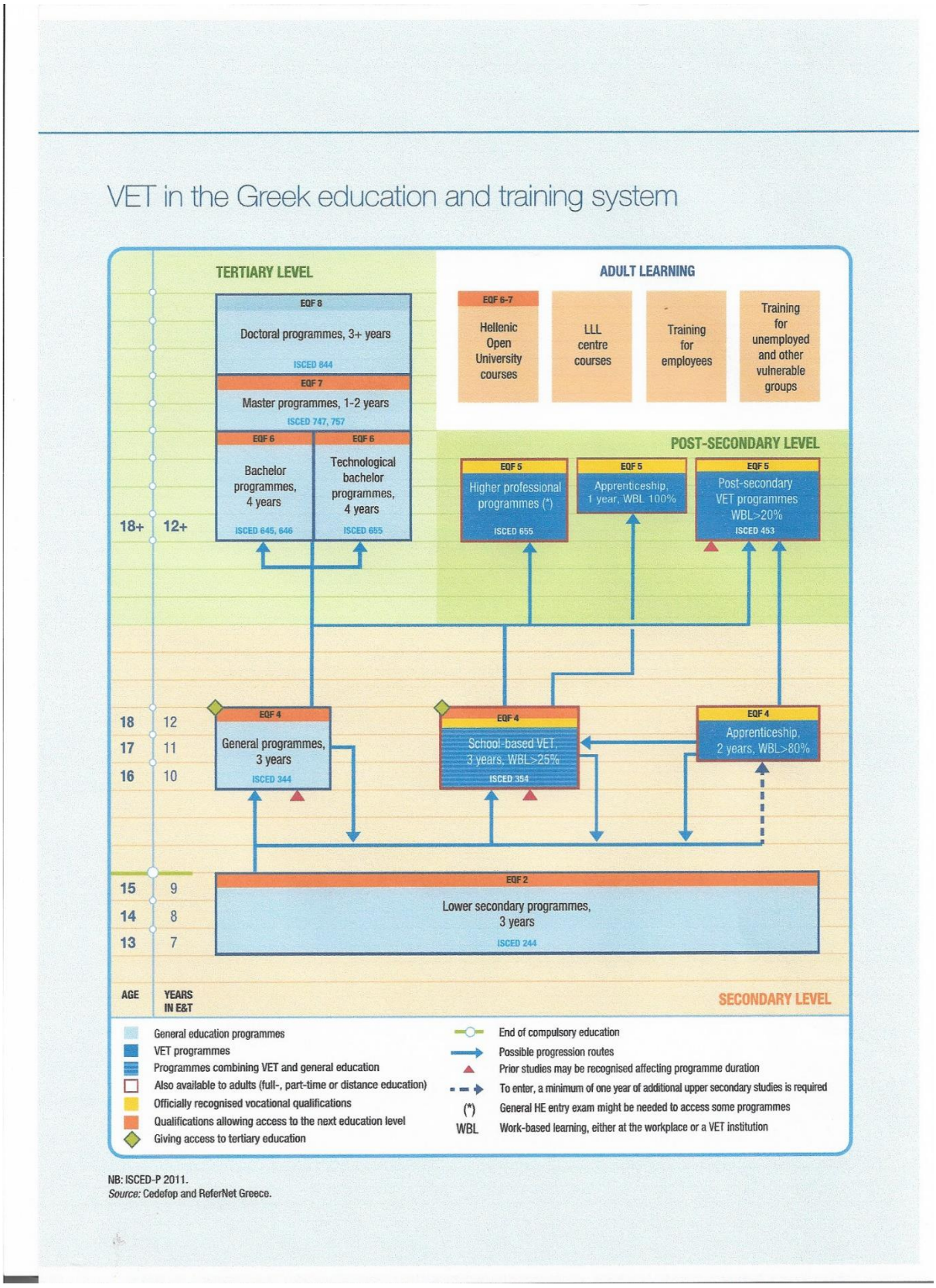
And since 2016 the Ministry of Education and Religious affairs has been conducting a major reform of the VET system, including implementation of a national strategic framework for upgrading VET and apprenticeships (with strengthened links between VET and the labour market), establishing a new structure to reduce early overspecialisation, introduction of a 1 year apprenticeship programme at post-secondary level to offer the chance to acquire labour market relevant skills along with the updating of VET curricula.

The key player in VET regulation, registration and quality assurance in Greece is the 'National Organisation for the Certification of Qualifications and Vocational Guidance' (EOPPEP) which was created in 2010 by the merger of three previous organisations, with a Mission Statement: "Geared towards linking VET with labour market needs, upgrading people's occupational qualifications, reinforcing their employment perspectives and strengthening social cohesion". EOPPEP develops and implements the 'National Accreditation & Certification System' for non-formal education, including initial and continuing vocational training and adult education, including Life Long Learning.

The position of VET in the national educational framework is illustrated in Figure 1 below.

In the case of aquaculture there is only limited provision of VET with registered qualifications restricted to Higher Education institutes offering degree level courses (EQF Level 6), with some practical/work-based elements. However, there are signs of aquaculture finally becoming involved in this reform of the VET system.

Figure 1:



NB: ISCED-P 2011.
Source: Cedefop and ReferNet Greece.

1 National VET sector and providers

National public and private sector providers both play a role within the supply of formal and vocational education of aquaculture specialists. In recent years the provision has been dominated by Universities while companies have relied on in-house training courses for operational staff. There is a current initiative (industry-led) for a 'national qualification' based on the delivery of practical skills and expertise. It will be an EOPPEP assessment and decision as to whether this becomes a nationally accredited qualification.

1.1 Public Sector

1.1.1 'National Organisation for the Certification of Qualifications & Vocational Guidance (EOPPEP):

EOPPEP which develops and implements the National Accreditation & Certification System for non-formal education, both initial and continuing vocational training as well as adult education.

Under the guidance of EOPPEP there is clearly a vigorous development of VET in Greece – unfortunately this has not extended to the aquaculture sector, at least not yet.

1.1.2 Schools of Vocational Training (SEK):

These schools offer non-formal post-lower school education (Initial Vocational Training) in a number of 'Direction Groups'. One Direction Group is 'Agronomy, Food Technology and Nutrition', with a Speciality of 'Craftsman of Fisheries and Aquaculture'. The three year courses lead to a qualification at EQF Level 3. NB SEK is scheduled to be abolished 31/08/2019.

1.1.3 Vocational School (EPAS):

There are a total of 51 vocational apprenticeship schools, delivering 2 year courses at EQF Level 4. Graduates can progress to EPAL or IEK courses or enter the labour force.

1.1.4 Vocational Upper Secondary Schools (EPAL):

These schools offer specialities of vocational training in a number of 'Sectors'. One sector is 'Agriculture, Food and Environment', and contains the speciality of 'Technician Animal Production', which in certain schools can be expected to include aquaculture. The three year course (with an optional 4th Apprenticeship year) leads to a qualification at EQF Level 4.

1.1.5 Institutes of Vocational Training (IEK):

There are over 100 public sector IEK institutes, with courses lasting 5 semesters and which lead to Qualifications at EQF Level 5.

1.1.5 Higher Education Institutes:

There are 3 Institutes offering Bachelor Degrees which include aquaculture elements:

- Agricultural University of Athens; 'Specialisation in animal science and aquaculture';

- Technological Educational Institute of Western Greece; 'Fisheries and aquaculture technology';

- Alexander Technological Educational Institute of Thessaloniki; 'Fisheries and aquaculture technology';

1.2 Private Sector

1.2.1 Private Vocational Training Institutes (IIEK):

These are licensed by EOPPEP, with a total of over 50 Institutes registered, providing non-formal education in a broad range of subjects, with the aim at the integration of learners into the labour market. Qualifications are at EQF Level 5.

1.2.2 Vocational Training Centres (KEK):

Also licensed by EOPPEP, these centres provide continuing vocational training, complementing, upgrading the knowledge, skills and competences of the labour force.

1.3 National VET and Higher VET systems

The provision of VET and Higher VET has been summarised above, although the provision for aquaculture appears to be limited to elements within EQF Level 6 University/ Technological Institute Bachelor Degrees.

1.4 Main VET regulatory bodies and their role

EOPPEP is a statutory body, established in 2010 on the legal basis of Law 3879/2010, reporting to the Ministry of Education and Religious Affairs. Its responsibilities include:

Providers and the Educational Framework:

- Accreditation/Licensing of Providers of non-formal education (Free Studies Workshops (EES), Private Vocational Training Institutes (IIEK), Vocational Training Centres (KEK), Special Centres for vulnerable social groups)
- Accreditation of Occupational Profiles
- Accreditation of Curricula (in terms of standards and specifications)

National Qualifications Framework (NQF)

- Development and implementation of the National Qualifications Framework (NQF) in correspondence with EQF & National Coordination Point for EQF (NCP)
- National Reference Point for **ECVET**
- National Centre for **EUROPASS** in Greece
- Equivalencies & Occupational Rights for VET education title holders

Certification of Qualifications:

- Development of the National System for the Certification of Qualifications
- Accreditation of Vocational Training & Certification of Vocational Training Institutes (IEK) graduates
- Certification of qualifications of "Trainers for candidates for car & motorcycle driver's license"
- Certification of teaching qualification of Trainers for Adults of non-formal education
- Certification of private security personnel

- Licensing of Providers for the certification of qualifications & Providers for computer skills certification

Vocational Guidance and Counselling

- Scientific and technical support of vocational guidance and counseling services
- Networking of providers and vocational guidance professionals
- Career development for youth & adults
- National Centre of Euroguidance
- National delegate in the European Lifelong Learning Guidance Policy Network (ELGPN)

Quality Assurance in LLL

- Cooperation in the development and implementation of the National Framework for Quality Assurance in LLL (π3)
- National Reference Point in EQAVET

BlueEDU WP5 VET supply – Ireland

Author: M Haines (Pisces Learning Innovations Ltd)

Contents

Appendices

Summary

Due to the relatively small industry and fluctuating annual production, staff recruitment is variable, which is reflected in the currently low and relatively unpredictable demand for formal aquaculture VET. There is a much higher reliance by industry on their own 'in company' staff development and inhouse training (non-formal VET), largely driven by compliance with organic standards, bolstered by highly valued accessible short course provision. Generally, although often informal, most companies have a positive and supportive learning culture. In addition, one company has a well-developed staff development process and internal training and assessment scheme supported by rudimentary digital resources.

Notwithstanding the above trend, the 'mainstream' formal aquaculture VET provision targeting the husbandry operative NFQ Level 5 in Aquaculture, is respected by both VET providers and industry and has been developed in the past with industry involvement. Changes to the delivery mode, through the increased inclusion of ICT and on-line learning and the introduction of a work-based apprenticeship system have the potential to improve access and boost the demand for formal VET. Public sector providers are receptive to both approaches; however, frequent and chronic staff resource limitations are adversely impacting on VET development and delivery. Consequently, some would welcome the opportunity to join collaborative projects targeting the development of innovative VET approaches and resources. The 'step change' required to improve the accessibility of formal aquaculture VET to a thinly spread population of learners in the coastal zone, is difficult for the national aquaculture VET sector to achieve independently.

There is one higher VET programme in 'Aqua business delivered by the Institute of Technology Carlow, Wexford campus. It is designed to serve a broad church of aquaculture interests, including managerial competences relevant to cage site managers, in addition to business and marketing skills designed to stimulate entrepreneurship within Irish aquaculture.

1 National aquaculture VET sector and providers

National public and private sector aquaculture VET providers both have an important role to play within the supply of Irish aquaculture VET. However, currently, NQs in aquaculture are not being delivered and the industry is more reliant on informal training and short courses delivered on site or near to the farms.

1.1 Public Sector

1.1.1 Education Training Board Ireland (ETBI)

The ETB operates under a statutory framework provided primarily by the Education and Training Boards Act, 2013. It is funded by the Department of Education and Skills (DES) and is advised by them through circular letters and collective agreements on an ongoing basis. A broad range of Educational Services are provided within each region, including post primary schools and colleges, further and adult education. As education and training service providers, the ETB is best placed to respond to changes in educational, training and work life needs of local communities. It addresses the demand for up-skilling, reskilling, retraining, educational progression and adaptability within Ireland's workforce.

The ETBs outlined below are the only ones with VET programmes validated for the level 5 Aquaculture. However, there is no current aquaculture VET activity within the ETBs.

Cork ETB

Cork Education and Training Board is the driving force of education and training in Cork, providing high quality services which are innovative, responsive and inclusive. Cork ETB aim to provide a pathway for every learner

The following principles underpin their strategic thinking, planning, decision making and daily actions within the delivery of their services:

- Prioritising the needs of learners
- Customer focused
- Acting with professional integrity
- Treating people with dignity and respect
- Being fair, open and accountable
- Ensuring value for money
- Operating to the highest ethical, professional, moral and legal standards

The Cork ETB are based in the same region as the Ireland's Seafood Development Agency (BIM) Castletownbere College, and share an interest in aquaculture VET delivery. (See 1.1.3)

Galway and Roscommon and Mayo Sligo and Leitrim ETBs

Galway and Roscommon and Mayo Sligo and Leitrim ETB provide a comprehensive range of education programmes and supports designed to meet the needs of young people and adults throughout their counties and have had a previous involvement in Aquaculture VET delivery. Over the years Galway and Rosscommon has developed a range of educational provision to meet the diverse demands of learners within their twenty second level schools, and extensive adult education service offering a range of post-leaving certificate courses. It is involved in many partnership activities at local level and provides a range of educational supports to enhance the quality of its education programmes.

Galway and Roscommon ETB have had a significant involvement in aquaculture NQ delivery, although have not delivered the NFQ level 3-5 in Aquaculture since 2015. There is a growing interest in promoting the provision again, once it has been revalidated, linked to the emerging Marine Park initiative. (See section 6.1)

1.1.2 Institute of Technology Carlow – Wexford campus

The Institute of Technology Carlow Wexford Campus is on the coast in the South East of Ireland and offers a range of qualifications from Level 6 through to postgraduate Level 9 on the National Framework of Qualifications (NFQ). There has been a substantial investment in student facilities with modern computing and library facilities developed and students are provided access to the software and databases in the Carlow main campus. Online access to business and educational databases through the IT Carlow library website provides students with excellent research facilities to assist with their projects and continuous assessments. This infrastructure, together with the small class sizes in Wexford, create an excellent learning environment.

The Higher Diploma in Aqua business (NFQ Level 8) is offered on a part time attendance basis (See section 1.3.2). This programme was developed in partnership with Ireland's Seafood Development Agency (BIM) and launched in September 2017.

1.1.3 Ireland's Seafood Development Agency - Bord Iascaigh Mhara's (BIM)

The Board of BIM comprises six directors, including a Chairman appointed by the Minister for Agriculture, Food and the Marine. They determine BIM's programmes in the context of EU and national policies and oversees their implementation. BIM's mission is wide ranging within the development of a sustainable Irish seafood sector across the supply chain. Their vision is to lead the Irish Seafood sector by providing effective support and expertise so that Ireland becomes the international leader in high value differentiated products that satisfy the growing demand for healthy, safe, responsibly and sustainably produced seafood.

To realise their mission BIM focus on five strategic drivers:

- Sustainability
- Skills
- Innovation
- Competitiveness
- Leadership

To these ends, for aquaculture they provide technical services, environmental quality services, business development planning, project development services and training. Some aquaculture training courses are provided near to the fish farms via mobile units, to enable access and encourage attendance.

The BIM Castletownbere College in the South West of Ireland has also been actively involved in VET delivery to the seafood sector, including aquaculture. They have offered the NFQ Leve 5 in Aquaculture up to and including 2016/17. However, there was no recruitment of learners during the current academic year (2018/19) as a result of staffing constraints and despite evidence of a buoyant demand.

1.2 Private Sector

1.2.1 Fish VET Group (FVG)

The FVG Ireland is a Veterinary Council of Ireland registered veterinary practice serving the aquaculture, fisheries, public aquaria and aquatic animal sectors. It was founded in 2000 in response to growing demand for a dedicated aquatic animal veterinary practice off the West Coast of Ireland.

In addition to providing veterinary, diagnostic and consultancy services to clients in Ireland and abroad, the team provide training to the aquaculture companies. They are also involved in several national and international priority aquaculture health issues research programs.

Research is conducted in-house and includes specific projects on amoebic gill disease (with the Irish Research Council and a second with GMIT & the Marine Institute), cleaner fish health and welfare (Irish Research Council and IRC projects with Galway-Mayo Institute of Technology) plus, climate change and aquaculture (CERES project EC Horizon 2020).

The FVG Ireland deliver a range of short courses which are highly regarded by the industry (See 3.2)

1.3 National VET and Higher VET systems

Ireland has both aquaculture VET and higher VET National Qualifications which are composed of units and learning outcomes. However, the Higher Diploma in Aqua-business offered by the Institute of Technology Carlow, first offered very recently in September 2017, is the only higher VET provision. (See 1.3.2 below)

1.3.1 NQ VET

There have been three levels of aquaculture VET offered in the past and pending QQI re-validation, namely; NFQ levels 3,4 and 5 in Aquaculture, which is equivalent to EQF 2,3 and 4, respectively. The NFQ level 5 is the NQ level appropriate for industry husbandry operatives. (See Appendix 1 Irish NQs). Levels 3 and 4 are introductory qualifications that are useful as a first step for less academically able learners in a group. These qualifications are composed of learning outcomes as opposed to units and the assessment strategy varies for each level, as summarised by the table below.

NFQ Level	EQF Level	Assessment strategy
3	2	Skills demonstration (60%) ; portfolio or collection of work (40%)
4	3	Assignment (40%) ; project (30%) ; exam (30%)
5	4	Prescribed within each Unit

Table 1 QQI Aquaculture NQs

It should be noted that in the past, some ETBs have registered cohorts of learners of mixed ability, age and experience, and the levels 3,4 and 5 have all been utilised, to encourage attainment across the entire ability range within the group.

The NFQ in Aquaculture (Level 5) has a mandatory core and options structure, organised in 4 sections.

- Section A: All 4 Units are required (Credit value 60), ensuring the learners understand and can apply Health and Safety within the context of aquaculture and have a broad appreciation of the main sectors relevant to Irish aquaculture; Hatchery Production, Finfish and Shellfish On-growing Operations
- Section B: All 4 units are core and transversal skills (communication, customer service, teamworking and personal effectiveness) and a minimum of 1 unit (Credit Value 15) must be completed.
- Section C: The two units, work experience and work practice both provide learners opportunities for experimental learning and skills development on a commercial farm and a minimum of 1 unit (Credit Value 15) must be completed.
- Section D: The 8 units address a wide range of subjects including sea food hygiene, boat handling (3 units) and engineering (3 units). A minimum of 2 units (30 credits) must be completed.

Therefore, in order to attain QQI Level 5 in Aquaculture, the learner must complete 8 units (120 credits). This includes all 4 mandatory units and a minimum of 4 optional units, chosen to comply with the awarding body regulations described above.

1.3.2 Higher VET – Higher Diploma in Aquabusiness

This programme has been developed by the Institute of Aquaculture Carlow in partnership with BIM. It was launched in January 2017, supported by the European Maritime Fisheries Fund (EMFF) which subsidised 50% of the course fees for learners. The course is designed to cater for Aquaculture, Fisheries and Bioproducts sectors of the seafood industry. The organisers are targeting three main groups of learners, those who are looking to enter;

- management roles in aquabusiness, aquaeconomics,
- financial and regulatory roles in R&D or in a seafood processing company, or
- future entrepreneurs planning to start up an aquabusiness.

The programme is designed to offer opportunities for personal development, encouraging learners to explore new insights in strategic thinking and to enhance presentation skills for supervisory and management roles in emerging aquabusiness growth areas. To improve the accessibility to mature learners in work, it is offered through part time attendance, including Friday afternoons and Saturdays, bi-weekly over the academic year.

The benefits of this program to employers are; the development of their capacity for Human Resource Planning and the completion of a business project that targets a new product/market for a host company. The module course content and core skills are described fully in Appendix 2 Higher Diploma in Aquabusiness.

1.4 Main VET regulatory bodies and their role

The Irish National Qualifications (NQs) are not designed with reference to National Occupational Standards (NOS) as this process is not a part of the system. However, NQs are unitised, and 'Learning Outcome based', similar to the Scottish Qualifications Authority (SQA) system

1.4.1 Quality and Qualifications Ireland (QQI)

QQI (Quality and Qualifications Ireland) is an independent state agency responsible for promoting quality and accountability in education and training services in Ireland. It was established in 2012 by the Qualifications and Quality Assurance (Education and Training) Act 2012.

The primary role of QQI is to:

- maintain and develop the Irish National Framework of Qualifications (NFQ), a 10-level framework for the development, recognition and awarding of qualifications in Ireland;
- approve programmes offered at a variety of schools, colleges and further and higher education and training institutions. These programmes lead to qualifications (QQI awards) listed in the NFQ, which are recognised internationally;
- regulate and promote the quality of programmes offered by schools and colleges leading to qualifications in the NFQ for the benefit of learners, employers and other interested parties;
- ensure that providers offering national qualifications offer a positive, high-quality experience to international learners, by authorising the International Education Mark (IEM)

QQI is responsible for the validation of all new NQs in Ireland and their periodic review, revision and updating. Validation is a regulatory process that determines whether a new QQI award can enter their catalogue to be offered at one of the prescribed levels (1-10) within the 'National Framework of Qualifications' (NFQ). The QQI accepts applications for the validation of education and training programmes, so long as proposals are developed in relation to QQI policies and criteria, which includes industry consultation. This system for validation is very similar to that operated in Scotland by the Scottish Qualifications Authority (SQA)

The application of diverse modes of delivery (including collaborative, transnational and e-learning) is encouraged, in order to promote high quality VET provision in Ireland and the widening of access to VET.

1.4.2 Funding

The public sector fund most of the formal VET delivered in Ireland and most undergraduate students attending publicly funded tertiary-level courses do not have to pay tuition fees. However, it is easier for young learners under 19 years old to have their college education fully funded. Under the terms of the 'Free Fees Initiative', the Department of Education and Skills pays the fees to the colleges instead. A separate annual charge is payable to colleges for the costs of student services and examinations

Those under 19 years old on 31 August before they enrol on a a full- or part-time course funded by the Education Funding Agency, don't have to pay tuition fees. However, those taking a course at a private college, may be asked to pay a fee depending on their fees policy.

Mature learners over 23 years of age returning to tertiary-level education can get assistance, as Irish tertiary-level colleges do retain some places for mature students. However, they often need to consider fees and maintenance costs, depending on whether they are undertaking a full-time or a part-time course. Depending on their circumstances, some mature learners are eligible for free fees (as referred to in policy documents).

1.4.3 National level quality assurance (QA)

The QQI provide a mature and robust VET regulatory environment in Ireland. All new National Qualifications (NQs) are developed with industry involvement and input from other social partners, leading to their validation. (See 1.4.1)

The NCs are composed of Units made up of learning outcomes prescribing the assessment criteria and methodology to be applied by VET providers. The QQI quality assure the assessment process and the quality of VET delivery, through the employment of 'External Verifiers' who have appropriate VET and sector level experience. The External Verifiers will periodically visit VET providers to sample the assessment process applied by tutors, to ensure that assessment instruments are in line with the QQI Unit standards, and assessment judgments are well founded, consistent and fair and based on robust and reliable evidence.

1.5 Aquaculture VET and higher VET provided

Aquaculture formal VET provision is summarised for Ireland to indicate the uptake for each of the level of award that has been offered from 2007 to 2018. The table below provides a clear picture of the 'stop start' nature of supply and demand and shows that there is no provision of NFQ level 3,4 or 5 in Aquaculture from any of the traditional providers currently.

	Group 1: Old Awards now deactivated			Common Award System : Current		
Year	Aquaculture NFQ level 3 (5CF0206)	Aquaculture NFQ level 4 (C10210)	Aquaculture NFQ level 5 (CAXXX)	Aquaculture Hatchery Production NFQ level 5 (5N5206)	Aquaculture NFQ level 3 (3N0925)	Aquaculture NFQ level 5 (5M5156)
2007			4			
2008		7				
2009			11			
2010			8			
2011	14		3			
2012			1	16		
2013			9	16		
2014				16		
2015					2	5
2016				36	1	6
2017					1	4
2018				14		

Table 2 Summary of Irish Aquaculture NFQ 3-5 registrations from 2007 to 2018

1.6 Aquaculture VET staff employed by each provider

All main public sector providers report difficulty in recruiting and retaining VET staff for the delivery of NQs in Aquaculture. This is attributed to the low and variable demand. In 2008 one company had a cohort of 11 learners for the level 5 in Aquaculture, but the provider they were relying on failed to recruit the staff needed. This company has become increasingly self-reliant regarding its staff development, complemented by external short courses delivered by the BIM mobile unit and Fish Vet Group.

Staff capacity is also referred to as a constraint to the development of new VET systems, delivery modes and associated resources. This is currently, limiting the public sector's aquaculture VET service to industry and learners.

Based on discussions with VET providers, including practitioners, most have had little involvement with innovative delivery approaches, such as e learning and other ICT tools, but are receptive to their introduction. One provider mentioned a willingness to learn from other countries who have experience of work-based apprenticeships, as they had an interest in developing this delivery mode in the future.

1.7 Adequacy of national aquaculture VET supply

When comparing the formal with the non-formal VET supply in Ireland, there are distinct differences. Formal VET delivery is currently experiencing some major challenges due to staff capacity issues. In addition, revision and re-validation is pending for the NFQ Level 5 Aquaculture, the most appropriate NQ for the husbandry operative level. However, the NFQ Level 5 in Aquaculture is generally well thought of by industry. The main issue they highlighted was the intermittent supply, which is caused by the variable recruitment patterns of aquaculture companies leading to a variable demand for the NQ. This poses providers major challenges with the recruitment and retention of staff and has become a debilitating cycle.

All public sector providers are receptive to both new delivery modes, such as work based apprenticeships, and the application of innovative delivery approaches, including 'e-learning'. However, one fish farming company referred to difficulties with internet access within the coastal zone in some regions. Any future aquaculture VET delivery strategy relying in part on 'e learning' would need to consider the broad band connectivity in each region.

The non-formal VET supply, including courses delivered by the BIM mobile Unit and Fish VET group are highly appreciated by industry. Generally, companies are relatively self-sufficient and dependant on a combination of their own in-company provision, bolstered by short-courses from BIM and the Fish Vet Group. None of this non-formal VET activity contributes towards NQ completion currently, as there is no externally quality assured assessment process to facilitate assessment evidence gathering.

In conclusion, as the above factors culminate in a low proportion of husbandry operatives and site managers holding a National Qualification, the supply of formal aquaculture VET is currently inadequate in Ireland.

2 WP5 Investigative Process

2.1 Overview and evaluation of investigative methods and processes

The investigative process has relied heavily on the use of structured interviews with VET practitioners and managers whose remit includes Aquaculture VET courses and qualifications. Typically, interviews have been conducted in several stages, within a re-iterative process, leading to a precise refinement of the data on the Irish Aquaculture VET (formal and non-formal)

2.2 Qualitative survey results

The structured interviews with all VET providers (formal and non-formal VET) were successful and most revealing. The range of stakeholders interviewed, included organisations who are currently

involved, and/or have had some previous involvement with formal and non-formal aquaculture VET supply. There was a general openness and awareness of the issues and challenges which were discussed and a shared agreement.

The inclusion of organisations and companies providing non-formal VET, allowed a complete picture of Irish aquaculture VET to be developed which was corroborated through discussions with QQI Ireland. There were difficulties in getting a response from some of the less active public sector providers, but the most active became fully engaged in the investigative process.

2.3 Comparative parallel surveys

There are no parallel national surveys into aquaculture VET supply and demand to take account of, as there seems to be shared awareness by VET providers and industry regarding the current issues and potential future solutions. The industry will be involved in the imminent review and revalidation of the Level 5 in aquaculture led by the QQI.

However, there have been discussions between one company and the BIM regarding the development and provision of new aquaculture courses that their staff and staff from other companies, could access in the future. (See section 6.1)

3 National VET supply inventories

3.1 National Qualifications

Both VET and higher VET have been offered in Ireland this century. The supply has been intermittent and in the case of VET (Level 3-5) is currently experiencing a hiatus, as illustrated by the table below.

3.2 External certificated and uncertificated short courses for industry

Some in company training plans are very well developed and offer a wide range of short courses. Some are uncertificated and delivered internally and others are certificated and delivered by external providers to comply with legislation or quality assurance requirements (See Appendix 3).

This illustrates the high degree of self-sufficiency established by some companies.

3.2.1 Fish Vet Group (FVG)

The Fish VET group offer a range of class-room based courses for industry and practical training sessions for subjects most valued by the fish farming industry, allowing them to comply with RSPCA welfare and organic standards. Courses can be either delivered on farm sites, or in the farm's locality or at the Fish Vet Group premises.

The Gill Health assessment practical training includes an assessment at the end of the course on gill assessment competency using live fish. In addition, the basic microscopy course aims to achieve competency, according the course descriptor. Other courses, namely the 'fish welfare' and 'sea lice dentification and monitoring' courses, are designed to ensure that those staff undertaking it satisfy the RSPCA standards for staff training, thereby keeping their farm compliant.

Classroom based courses

Course	Summary	Duration
Fish Welfare	Thsi course is RSPCA recognised, allowing farm, harvest and transport operations to become fully compliant with the RSPCA standard.	One day
Cleaner fish health and management	This course provides attendees with current state of knowledge regarding the husbandry and health of wrasse and lumpfish used as biological sea lice control on salmon farms.	One day
Marine health and disease	An introduction to the basic principles of fish health, disease and biosecurity as they apply to salmonids in the marine environment	One day
Gill health	Participants are introduced to normal gill structure and function, gross and microscopic appearance of healthy gills and the physiological implications of gill damage.	Half day
Freshwater health and disease	An introduction to the basic principles of fish health, disease and biosecurity as they apply to salmonids in freshwater systems	One day

Practical training

Course	Summary	Duration
Gill health assessment	Participants are given the opportunity for hands-on amoebic gill disease (AGD) and proliferative gill disease (PGD) assessment under the guidance of experienced fish health professionals.	Half Day
Sea Lice identification and monitoring	Identification and enumeration of sea lice. Trainers will ensure that candidates are competent in the identification of sea lice in situ and fully understand the requirements regarding sea lice monitoring under the 'Code of Good Practice' and the RSPCA Welfare Standard for Farmed Atlantic Salmon	Half Day
Basic microscopy	A short practical course to develop participants an understanding of basic microscopy. Courses can be tailored to suit the types of standard screening suitable for the site e.g. skin scrapes, gill wet preps or phytoplankton sampling	Half Day
Best practice health monitoring	The course will provide participants with a short introduction to the most common pathogens affecting farmed salmon, available tools to identify them and the knowledge to collect appropriate samples for further investigation of disease events in aquaculture facilities	One Day
Plankton sampling and identification	This course introduces participants to the equipment required to carry out effective plankton sampling and provides the participants with the skills to identify a range of common and harmful species.	One Day

Table 3 Fish Vet Group short courses

3.3. Un-certificated' in company' training

Most Irish companies deliver their in-company schemes in a relatively informal manner but maintain a training log to satisfy organic standards. Small companies tend to organise courses for the entire farm staff, as opposed to individualising staff development. Many create group learning and problem-solving opportunities, within which the person taking responsibility for leading staff development can deliver key updates, necessary for compliance with organic production and other standards.

One company has a more structured approach and presents materials on its intranet, including selected Standard Operating Procedures (SOPs) as learning resources. However, it also goes to great lengths to create a secure group environment for learning. It conducts an in-company assessment of learners using 'rapid response technology' and sets a pass mark which varies for each topic depending on its significance to the company. None of these in-company assessments contribute towards NQ completion, currently, but they could offer a potential pathway in the future.

In company staff development is complemented by compulsory compliance training and external short courses from BIM and the Fish Vet Group.

3.4 Delivery modes available -facility based, work based or blended, including ICTL

The delivery modes being applied are limited, as there's no 'e learning' or 'blended learning' available, however, there is some variation on the modes of delivery for some types of VET provision (formal and non-formal)

Course	Qualification status	Delivery Modes				
		Facility based groups	Farm based groups	Self study	Farm based practical skills assessment	e learning
NFQ Aquaculture (3-5)	National Qualification	Yes	Yes	Yes	Yes durng work experience and trainng	No
FVG short courses	RSPCA compliance (See 3.2)	Yes	Yes	No	Some courses include assessment, but not integral to NQs	Recently launcbed for salmon health
In company Training	No NQ	No	Yes	Yes in one company	Not formally	In one company with basic resources
Mandatory certificated courses	Certificated but not NQ		Yes	No	For some courses	No

Table 4 The range of delivery modes utilised for formal and non- formal VET

3.5 Typical VET pathways to employment

It is clear from discussions with industry that most new entrants are from coastal zone agricultural communities and unqualified. This was exemplified further by one VET provider who revealed that "*half of his last cohort of learners were over 30 years old and were croft owners, working on fish farms for additional income as opposed to a career*". A small minority have an Aquaculture NQ, or the aspiration to gain one. The industry has indicated that if the NQ became more accessible, they would promote it to their staff. However, a significant proportion are also unconfident learners, and some have learning difficulties.

Therefore, the typical entry criteria for entry to the industry appears to be;

- residence in the coastal zone in the vicinity of a fish farm,
- an appreciation and familiarity with outdoor work and affinity with animal husbandry and
- a willingness to learn and develop 'on the job' post-employment.

In-company staff development, bolstered by short courses from BIM and the Fish Vet Group Ireland, forms the dominant pathway sustaining employment post selection, within Irish cage-based aquaculture. One company has a much more formalised in company program for its husbandry operatives which includes internal assessment with set pass marks for selected topics. However, although this does not provide a pathway to NQ completion, they do provide a very secure and supportive learning environment.

The pathway to a site manager role takes one of two forms. The smaller family owned businesses employing 25-40 staff tend to employ the longest serving and most experienced husbandry operatives as site managers. Typically, whilst having undertaken a range on non-formal VET and some uncertificated short courses to remain compliant with organic and other standards. Whereas one company has a comprehensive in company management development program of 18 months duration and exposes learners to all aspects of the business. Generally, site managers are not expected to complete a formal higher VET NQ program in any company.

4 VET providers opinions on the aquaculture VET supply

4.1 National VET provision leading to NQ

The public sector providers is aware of the need to revalidate the Level 5 in Aquaculture through the QQI, as it has been lost from the catalogue recently following a period of rationalisation. However, they gave no opinion on the adequacy of the current framework or units, but one believed it was technically out of date now. Another public sector provider believed that the content and level of both the Level 3 and 5 in aquaculture was suitable for the intended target audience and had no recommendations for improvement. This concurs with views from industry, as no adverse opinions were expressed regarding the aquaculture NQs and some positive comments were made. However, this feedback needs to be treated with some caution. Due to a lack of reliance on NQs within their staff development strategies it is possible that the NQ has 'fallen off industry's radar' to some degree.

All public sector VET providers are aware of the intermittent nature of demand as it has impacted on their ability to recruit and retain suitable VET practitioners as well as develop innovative VET solutions. They are all receptive towards innovative VET development. (See section 5.2)

4.2 Industry attitudes towards NQs

In the opinion of VET providers industry have demonstrated support for aquaculture NQs in the past and seem to place some value on them. They have been involved in the NQ development. This concurs with industry opinion and many would like more staff to gain an NQ. However, the industry is aware of the real barriers to VET delivery, including the difficulty providers experience in the

recruitment of suitably qualified VET practitioners in aquaculture. This has driven the industry towards greater levels of self-dependence bolstered by aquaculture short courses provided by the BIM mobile unit and the Fish VET Group, in addition to mandatory training (See 3.2) The public sector VET providers recognise and concur with this reality.

4.3 Suitability of VET pathways to employment for learners

One public sector VET provider gave the opinion that the VET pathways for learners were not adequate for young or mature learners. However, they did recognise that the industry was making a great effort to engage youth in the coastal zone in order to inform them about the aquaculture industry and careers. One of the ETBs has expressed a strong interest in joining a future Erasmus project devised to develop and deliver aquaculture curriculum to the 14-16-year old age group to put into place the 'first rung' of an aquaculture VET pathway. However, the industry is relatively small, and as one provider pointed out "*there are 50-60,000 school leavers a year in Ireland and at the most, 10 new jobs a year in aquaculture.*

Another interviewee cast aspersions on the real value employers sometimes place on the NQ and remarked that "*they were disappointed that one company was not providing employment opportunities to the strongest students in their last cohort completing the NFQ in Aquaculture at level 5. The jobs seemed to be going to others in the coastal zone who were not qualified, but knew someone already working on the farm*"

This indicates that some employers might not necessarily select those holding the NQ over those that don't but live near the fish farms and have company connections, even if the access to NQs was expanded nationally.

4.4 Learning and study skills of learners

The ETB tutors with experience of delivering the Level 3 and 5 in Aquaculture to mixed age groups have observed learners with learning difficulties and a lack of confidence in using ICT. The fear of ICT has been overcome through problem solving activities that require ICT to search for information on fish farming equipment available from suppliers, gradually building up their confidence.

This is corroborated by two companies who revealied that they were aware of the need to develop the ICT confidence and competence of their staff, so as they could all deal with routine data recording and retrieval, as required by all aquaculture businesses.

4.5 Innovative VET delivery, (including ICT supported)

Public sector providers are not deploying innovative VET delivery methods, enabled by ICT currently. However, they all recognise the value of so doing (See 6.2)

Encouragingly, there are examples of innovative delivery of non-formal VET within one company that has deployed 'rapid response technology' to deliver multiple choice assessment via hand held devices to their staff undergoing the in-company training program.

5 Future VET development priorities

5.1 Staff development

With so few public sector VET providers currently active, it has not been possible to gain a reliable impression of their future staff development priorities, due to the short term 'capacity' issues that currently plague them. There has been a reference to learning technologies by one tutor, who has worked with a group of mixed ability, age and experience. He saw great potential in the application of 'Rapid Response Tools' to support delivery, as *"this could provide a secure environment for feedback that would encourage and motivate the less confident learners"*.

Regarding the challenge of keeping his knowledge of aquaculture technology up to date, this same interviewee who has tutored the NFQ Level 5 in Aquaculture, commented that "*Ireland would be a step or two behind the bigger producer countries technologically*" He implied that keeping up with technological advances had not been such an issue for tutors to date. However, he was a fully qualified and experienced fish farmer himself with his own farm operation, which may have had some influence on his opinion and priorities.

5.2 VET innovation

There is a strong interest in serving the needs of the thinly spread remote aquaculture learners and aquaculture companies more effectively. This includes consideration of;

- ICT enabled VET delivery including on-line learning and
- work-based learning, and apprenticeship systems.

A 'Seafood' Traineeship in has been developed and validated at NFQ level 6, and a delivery system is under development. The focus is on the sea food processing sector as opposed to aquaculture, but some aspects may be transferable.

Despite the heavy reliance on non-formal in company training currently, experience in Scotland suggests that it may be possible to develop formal VET pathways to NQ completion in the future. In the absence of a National Occupational Standard (NOS), this could be achieved by mapping uncertificated training, in company staff development activity and company Standard Operating Procedures (SOPs) to the NQ Unit assessment requirements. This process would reveal some 'low hanging fruit for quick and easy recognition and accreditation of prior learning. In addition, the development of company-based witness testimony providers and qualified assessors employed by a VET provider could provide the capacity for the delivery of a new quality assured NQ delivered within a work-based apprenticeship framework. As the Irish system under QQI is unitised and very similar to the SQA, Scotland would be an ideal lead partner for any future project targeting work-based apprenticeship development in aquaculture. Such a project would be complementary to the development of digital learning resources to support a work-based learning delivery model, that limited the time spent off farm. Despite the implicit reliance on aquaculture company staff within quality assured apprenticeship delivery models, some Irish employers have indicated a strong interest in this potential VET solution.

5.3 Learning resources

The delivery of the NQs in aquaculture is currently based on traditional face to face group teaching and attendance models complemented by practical experience, a mandatory element of the NFQ at Level 5. There are no resources to support innovative VET delivery through the application of ICT and

learning technologies, or paper-based work-based learning packs that could be used to reduce the time spent on attendance-based delivery.

However, all public sector VET providers have expressed an interest in ICT supported delivery and resources but recognise that they do not have the capacity currently to develop them. Correspondingly, the industry has also demonstrated they have an interest in such approaches and resources which could reduce their reliance on attendance-based delivery. Such a commitment should be made with care, however, bearing in mind the variable internet connectivity within the coastal zone, and company intranet-based approaches as well as paper-based learning packs may form a useful part of any future blended learning strategy for some learners and farms.

6 VET provider partnerships and attitudes towards collaboration

The public sector VET providers show a willingness to collaborate nationally and internationally, despite their current staffing difficulties and realise that this may pave the way to accessing the additional resources needed for a 'step change' towards a more sustainable and accessible Irish aquaculture NQ delivery model.

6.1 National level partnerships (existing and emerging)

Currently the BIM and the Fish VET group have been collaborating to deliver some short courses in demand by industry to help them remain compliant with organic standards. This has been well received by the industry, such as those delivered in 2017.

There is a significant new community partnership initiative emerging on the west coast called the 'Marine Park'. The ETB anticipate it will generate a need for 20 new VET places to develop the skills needed in the maritime economy, with most places being allocated to aquaculture. This will provide a renewed stimulus to aquaculture NQ delivery by the ETB, once the NFQ Level 5 in Aquaculture has been revalidated.

One significant commitment has been made by a public sector VET provider to develop a range of new aquaculture VET provision for one aquaculture company. It can be assumed that once available, all other companies will be able to benefit. However, this commitment was made in 2017 and the development time frame for completion was set at 12-36 months. Currently, the provider in question has staff capacity issues, which may make this a very challenging target to achieve independently. (See Appendix 4 describing non-formal and formal aquaculture VET under development)

6.2 European level opportunities (existing and potential)

There has been no mention of any relevant ongoing collaborative projects at European or international level by stakeholders. In the past one public sector VET provider joined Optimal in 2016, an Erasmus+ Strategic Partnership for the development of innovative VET. This project led by the 'Blue Competence Centre' on Froya Island mid-Norway has been developing the use of 'Rapid Response Technology' to support the 'recognition of prior learning' leading to a more customised educational package for learners with prior knowledge and experience. Unfortunately, they had to withdraw due to a lack of VET practitioners to commit to the project. This has been a recurring theme plaguing Irish aquaculture VET development.

There has been interest expressed from most public sector providers in Ireland in future collaboration. A commitment has been made by one public sector VET provider to join a Scottish led Erasmus+ Strategic partnership devised to develop aquaculture curriculum for the secondary school 14-17-year old age group, in support of national youth engagement activities undertaken by some of the aquaculture companies and BIM, seen as a high priority.

In addition, interest has been expressed in two other areas of innovative VET development, namely; the creation of digital learning resources in order to reduce face to face VET delivery and the development of work-based learning, leading to the establishment of a quality assured apprenticeship for aquaculture. Opportunities to join, but not lead projects of this nature would be welcomed and could help Irish aquaculture VET providers to overcome the impasse regarding the lack of staff resource currently available to support the VET development phase they need to undertake to progress.

Appendix 1 Level 5 Aquaculture

A) All of the following component(s)

Award Code	Title	Level	Credit Value
5N1794	Safety and Health at Work	5	15
5N5206	Aquaculture Hatchery Production	5	15
5N5285	Shellfish Ongrowing Operations	5	15
5N5286	Finfish Ongrowing Operations	5	15

B) A minimum credit value of 15 from the following components

Award Code	Title	Level	Credit Value
5N0690	Communications	5	15
5N0972	Customer Service	5	15
5N1367	Teamworking	5	15
5N1390	Personal Effectiveness	5	15

C) A minimum credit value of 15 from the following components

5N1433	Work Practice	5	15
5N1356	Work Experience	5	15

D) A minimum credit value of 30 from the following components

Award Code	Title	Level	Credit Value
5N5287	Seaweed Ongrowing	5	15
5N5288	Seafood Hygiene Management	5	15
5N5305	Safety Boat Handling Skills	5	10
5N1608	Engineering Workshop Processes	5	15
5N4628	Marine Engineering Processes	5	15
5N4629	Navigation and Stability	5	15
5N5069	Marine Engine Operations	5	15
5N5088	Work Boat Handling	5	15

Appendix 2 Higher Diploma in Aquabusiness

Course content

Aquabusiness economics

Law and regulation for aquabusiness

Strategic and innovation management

Financial Management and Planning

Marketing management in Aquabusiness

Work Placement

Core skills

Aquabusiness law and regulatory compliance

Strategic Analysis for market development

Innovation and international marketing

Management skills

Economic pricing skills

Financial analysis for decision making

Communication and presentation skills

Working in a team

Appendix3 A comprehensive Irish in Company Training plan

	TRAINING PLAN 2018
ID	**COURSE TITLE**
DIV	**Dive Supervisor Training**
DIV	**Dive Training**
DIV	**DPI Unit**
DIV	**O2 Admin Instructor Refresher**
DIV	**Part 3 Dive**
DIV	**Surface Supply**
DIV	**Dive Supervisor Training**
ENG	**Abrasive Wheels Training**
ENG	**Acetylene Burning**
ENG	**Basic Electrics**
ENG	**Boat Engineering**
ENG	**Boat Maintenance**
ENG	**Coded Welding**
ENG	**Diagnostics on Electrical Outboards**
ENG	**Electric Pallet Truck**
ENG	**Electronic Charts Display Systems**
ENG	**Electronic Navigation**
ENG	**Engine Maintenance**
ENG	**Hot Metals Course**
ENG	**Hydraulics**
ENG	**Marine Engineering**
ENG	**MCA Engine Course**
ENG	**Mig & Gas Welding**
ENG	**Plastic Welding**
ENG	**Stunner Maintenance**
ENG	**Welding Training**
ENV	**Air Supply**
ENV	**Bio Security & Fish Welfare**
ENV	**Chemical Spill Training**
ENV	**Ecolab Chemical Handling Training**
ENV	**Good Lab Practice**
ENV	**Nitrox Blending**
ENV	**AGD Awareness**
ENV	**Harvest Training**
ENV	**Lice Control**
ENV	**Lice ID Training**
ENV	**Oxy Cutting**
ENV	**Plankton ID**

KEY	
ENV- Environmental Training	
HES - Health & Safety	
SD - Staff Development	
IT-Information Technology	
Eng - Engineering	

ENV	**Plankton Training**
HES	**ADR Training**
HES	**Advanced Fire Fighting**
HES	**Advanced Power Boat**
HES	**Alluminium Scaffolding Training**
HES	**Aqua Life Pump Training**
HES	**Artic Lorry Licence**
HES	**Banksman Training**
HES	**Boat Handling Training**
HES	**Boat Masters**
HES	**Cleaner Fish Workshop**
HES	**Confined Spaces Training**
HES	**CPC Lorry Driving**
HES	**Crane Course**
HES	**Dangerous Goods Safety Advisor**
HES	**Defensive Driving**
HES	**Diverse Training**
HES	**Electronics Training**
HES	**Feed Training**
HES	**Feed Management Training**
HES	**Feed Sampling Training**
HES	**Fire Fighting Training**
HES	**Fire Warden Training**
HES	**First Aid (Full)**
HES	**Fish Health**
HES	**Fish Pathology**
HES	**Fish Husbandry**
HES	**Food Classification Training**
HES	**Food Hygiene**
HES	**Forklift Course (CB)**
HES	**Forklift Course (Telescopic)**
HES	**Gill Disease Training**
HES	**Gill Health Initiative**
HES	**H2O2 Handling**
HES	**Health & Safety Management**
HES	**Hydraulic Gearboxes Training**
HES	**Hydrolicer Course**
HES	**Internal Auditing - Integrated Management Systems**
HES	**Jellyfish Control**
HES	**Knife Handling Training**
HES	**Lice & Gill Checks Course**
HES	**Lifejacket Maintenance**
HES	**Lifejacket Training**
HES	**Manual Handling**
HES	**Multi Platt Splicing**

HES	**Nebosh Cert in Environmental Management**
HES	**PST / BSS**
HES	**Radar**
HES	**Ronc Course (Net Washing)**
HES	**Rope Knots & Splicing Ropes Course**
HES	**SafePass Training**
HES	**Safety**
HES	**Safety Rep**
HES	**Safety on Board Life Raft Launch**
HES	**Sea Lice Counting**
HES	**Skippers Ticket**
HES	**Slinging & Signalling**
HES	**Swimming Lessons**
HES	**Tarp Repairs Training**
HES	**Trailor Licence**
HES	**Treatment Pumps Course**
HES	**VHF Training**
HES	**Water Sampling Training**
HES	**Working at Height Training**
HES	**Yachtmaster Ocean**
IT	**Adobe Training**
IT	**Advanced Excel**
IT	**Advanced Word**
IT	**Advanced Computers**
IT	**Qlikview Training**
IT	**Computer Training**
IT	**North Time Pro**
IT	**Payroll Update and Calculations**
SD	**Accounts Course**
SD	**Company Secretarial/Law**
SD	**Key Account Management**
SD	**Management Training**
SD	**Microsoft Office Training**
SD	**Office Management**
SD	**Purchasing Course**
SD	**Supervisor Development Training**
SD	**Team Building**
SD	**Trainee Manager Programme**

Appendix 4 Non-formal and formal aquaculture VET under development

1) **Aquaculture Technical Training (new**) – Species Specific: Delivered regionally over 1 week. Covering:

- Basic Safety Training
- Work Boat Handling
- Manual Handling
- Lifting and Crane Arm Operations
- Health & Safety Instruction
- Forklift Operating
- Safe Pass
- Species specific training in fish stock welfare and animal husbandry
- HACCP
- Food safety and hygiene

2) **Introduction to Aquaculture (new):** 1week introductory programme for transition year

3) **QQI Level 3 Introduction to Aquaculture**: Delivered over 30 hours. Covering all subjects mentioned in the technical training above but in more detail. Currently offered in the GRETB and will also run in Castletownbere

4) **QQI Level 6 BIM Seafood Apprenticeship Programme (new)** – Relevant for Aquaculture and Fish Processing Sectors. 18-month programme which can be applied for via the CAO or direct to BIM. 12-month placement on a farm/ with a processing plant. Covering all technical training above plus:

- Medical First Aid Aboard Ship
- Fish Capture and Production Systems
- Care of the Catch
- Fish Quality & Grading
- Species Identification
- Fish Filleting
- Handling & Storage
- Common Processing Methods
- Lifecycle of Fish Species
- Cookery & Preparation
- Food Marketing
- Consumer & Market Insights
- Innovation Process

- Commercialising NPD
- Computer Skills
- Social Media
- Green Aware
- Team Development
- Customer Relations
- Food Science
- Nutrition

5) **Wider roll out of NFQ level 5 VET**

QQI Level 5 Certificate in Aquaculture: Currently running in Castletownbere but will be rolled out if the demand is there. It will be 4 months fulltime or part time over 1 year. Includes training as above plus:

- Hatchery Production
- Marine Engineering Processes
- Shellfish On-growing Operations
- Finfish On-growing Operations

6) **Leadership development**

Executive Development/ Future Leaders (new): In addition to company mentoring and supports, there will be a range of senior management and CEO/CFO development programmes on offer in conjunction with Smurfits, Enterprise Ireland and IMD.

VET supply for Aquaculture in France

David Benhaïm, NTNU

Introduction

There is no specific training on sea cage farming in France. It is included in the curriculum of many schools as a module or part of a module. Therefore, our survey did not specifically target sea cage farming training. There are about 32 institutions delivering certificates/diploma/informal courses in aquaculture at different levels (see French educational system in France for further details). Most of the time, the training offered, links the specificities of local/regional industry. We contacted all of them and got 8 interviews representing all possible vocational trainings offered in France (some of them deliver several diplomas at different levels):

- CAP in aquaculture (level III, apprenticeship)
- Baccalauréat in aquaculture (level IV)
- Baccalauréat in marine culture (level IV)
- BREA (level IV) in aquaculture
- Training for adults (280 h) to access maritime domain
- BTSA in aquaculture (Level V)
- Vocational Bachelor degree (Level VI) in continental aquaculture
- Vocational Bachelor degree (Level VI) in marine aquaculture
- Short courses.

I interviewed 3 teachers (with an educational background in aquaculture for all of them varying from level V to level VII), 2 associate professors (PhD level) involved in vocational teaching and head of the diploma, 2 directors of high-schools in aquaculture (with a MSc level), one director in aquaculture continuous learning (with a MSc level).

The number of students in aquaculture varies between 15 and 70 according to the level (see Table 1).

Vocational training	Number of students
CAP in aquaculture (level III, apprenticeship)	6
BREA (level IV) in aquaculture	10-15
Baccalauréat in aquaculture (level IV)	50-70
Baccalauréat in marine culture (level IV)	9-20
Baccalauréat in marine culture for adults	15
BTSA in aquaculture (Level V)	20-24
Vocational Bachelor degree (Level VI) in marine aquaculture	15
Vocational Bachelor degree (Level VI) in continental aquaculture	15

Table 1: number of students in different French aquaculture vocational training.

The situation varies according to the organisations. Most of them have facilities available to support VET delivery. One can access to very modern research facilities available on the same site, three have small facilities with a RAS and/or flow through system and a few tanks, 2 have some ponds. All of them have access to shared labs. All of them have small equipment (oximeter, pH-meter, conductivity meter, salinometer etc.). Most of organizations wish to improve their facilities but need funding.

Education and training practitioners employed

In France, the staff number in aquaculture vocational training is relatively low. Lecturers/teachers are between 2 and 9 according to the organizations. Most of the time, there are 1 or 2 technicians to take care of the facilities. In all cases, there are between 2 and 12 administrative fully or partly involved in the aquaculture training.

Aquaculture qualifications delivered

All French organizations involved in VET deliver aquaculture qualifications (most of them are national qualifications). These qualifications have been delivered for a very long time (at least 20 years) and only a few changes have been made. The main changes are for higher-education in aquaculture with one more year for most of level V training to follow Bologna process (most of them are now at level VI : Vocational Bachelors).

Staff profile in aquaculture VET

All persons interviewed have been working for the same organization since the very beginning of their career. The duration varies between 13 to 30 years. There is therefore very little turnover in this kind of job.
Most of them are involved in the aquaculture curriculum development (with more and less flexibility according to the type of qualifications). In addition, most of them are actively involved in the delivery.

Some employees are not teaching but are involved in VET as directors of high-schools or continuous learning. The teachers have to give courses in many different aquaculture topics such as water physico-chemistry, nutrition, pathology, reproduction, production techniques, fish welfare. Most of the time they are also teaching more general topics such as ecology, genetics, biochemistry, marine biology, environmental issues, prevention/health and safety, sustainable development.

Aquaculture curriculum and qualifications

All interviewed persons believe the current aquaculture qualifications they offer fit for purpose in all respects but pointed out a few issues.

First of all, they need more teaching hours. Furthermore, there is a lack of short courses or modules that students could take (they must currently take all of them so that it is difficult to involve adults)

According to most of them, subject content must be updated.

Concerning the level of the units in relation to the occupational level being targeted, there is no consensus. Half of interviewed persons disagreed on that particular point for the following reasons:
The students are trained at a higher level than the occupational targeted level to better respond to the reality they will face to at work (the students are between 25 and 50 years old here). Another problem pointed out is about the very low level of the students (lack of attractivity of aquaculture training so that the students do not really make the choice to take the courses). Required level is now lower than before because of the duration of the Baccalaureate that changed from 4 to 3 years.

Despite these issues, it is believed that students will complete their training in the companies (internships).

Most interviewed persons think the delivery mode of courses is not suitable (67%). They said there is a need for developing more apprenticeship, more practical courses (but farms are quite far away from the schools in France). There is also a need for more equipment and for increasing interdisciplinarity (requested by ministries) but this is expensive (it requires 2 teachers for 15 students).

Most interviewed persons think the assessment evidence requirements and assessment process are suitable (67%). It was said that a lot of progress has been made in the assessment process. Before it was only based on written exams (very classical knowledge-based examination) while this is now only based upon oral examination and much more general questions. There is also more involvement from the industry and some work-based situations evaluation. This statement is strongly depending on the training level. Indeed, at BSc level knowledge-based evaluation is still necessary and the tutorial as well as the internship accounts for more than 50% of the total grade.

The internship report required from the student is sometimes difficult (young student at Baccalaureate level). More collaboration between organizations could be useful to improve assessment process.

Development of appropriate green (environmental) and digital skills (application of ICT to work)

According to all interviewees, environmental skills are somehow included in their curricula (aquatic environment management, management of water quality, Integrated systems, aquaponics, aquaculture and ecology, sustainable development).

All interviewees responded that digital skills were of course tackled in their curricula (website design, usual softwares) and most of them are well equipped with computer rooms with some regional help. But most of them said it should be further developed.

28% of interviewees suggested to create more links between other organizations more specialized in ICT

Recruitment and retention of VET practitioners

28% of interviewees responded it was difficult to recruit teachers with both pedagogical and technical skills. All others responded there is absolutely no problem to recruit competent people because of the large network they have built. The problem is more about opening new positions at the national level and/or to get funding to hire external teachers (from the industry for example).

The minimum qualifications and experience requirements for teachers/lecturers depends on the training level. At level VI, MSc or PhD are the minimum qualifications because this is the requirement for such position (national vacancies open to competition). Ideally, they should have been doing their thesis in aquaculture-related projects. For lower level training, the minimum qualification is a BSc or a MSC in aquaculture combined with some experience in the aquaculture industry. One high-school director said that it was important to mix different competencies among teachers (some with strong technical skills, some others with good pedagogical skills). There is also a lot of organizations that hire people from the industry to give short courses/modules. In this case, the diploma does not really matter. This is more a long and significant experience in the industry that is preferred.

As soon as getting hired the staff will most of the time spend their entire career in the same organization.

Curriculum pathways and learners

Most interviewees (83%) believe that all school leavers wishing to enter the industry have access to suitable aquaculture qualification pathways (especially true for apprenticeship students).

The others pointed out the lack of maturity when completing the training (not ready yet to start working in the industry.

Several suggestions were made to improve VET supply to all or some school leavers. More practical course not directly related to aquaculture that are highly appreciated in the industry

such as electricity, pvc work, diverse manual work etc should be included in curricula as well as more interaction with industry. Scuba diving, management and trade was also mentioned.

For all interviewees, unqualified mature entrants to industry have not access to the most suitable aquaculture qualification pathways. There are too high requirements from the industry (knowledge of the products, environment, equipment, quality etc.), too much competition in this sector that does not give much chance for adults, a lack of short courses that could help adults to enter easier in the industry. They suggested to improve the VET supply to mature entrants using different ways such as convincing the industry to trust mature entrants especially because they need to employ more and more people, proposing some arranged employment for adults, creating short courses (Irish model) and some practical courses (sea cage farming), helping adults to develop technical skills, helping them to learn how to work at sea, developing some refresher courses (basic knowledge in biology, chemistry etc.).

Learning and study skills of learners

The percentage of current/future learners having the study skills and motivation to take the responsibility for their learning, if provided suitable resources, guidance and support varies between 10 and 99% (55 ± 38%) and is not linked to the training level i.e. some high-schools have very high percentage of motivated students while some training at BSc level have very low percentage of motivated students. It seems to be more related to the age of students (maturity issue). In some organizations, there is a selection process at the entrance that prevent such lack of motivation issue. An interviewee pointed out the very favourable employment context in the area of the school that is a source of motivation for the students.

The percentage of learners having learning difficulties (mostly dyslexia) varies between 5 and 25% (18 ± 8%). All organizations have some support available to learners having difficulties. This can be both formal or informal accommodation. All of them have some formal school accommodations after a medical consultation that vary according to the level of difficulty. This is most of the time funded by the ministries the schools are depending from:

- Accommodation for written exams (1/3 time majoration)
- Secretary reading the exam for the student.
- Secretary writing the exam for the student.
- Half-time nurse for the most disabled students.

There is also some more informal support to help the student in the learning process:

- Discussion with head of organization or a teacher during the year about the teaching.
- Specific courses to strengthen learning process.

Interestingly, one organization at high-school level delivering national diplomas do not need to provide such support (except for severe disability) because all student assessment is based

on oral examination and not based on specific knowledge but on more general and practical/industry-based questions.

VET staff development

100% of interviewees responded that is was difficult for them to keep technically up to date as a VET practitioner for different reasons:

- lack of time (too much teaching)
- lack of funds
- fast emergence of new technologies (e.g. Recycling Aquaculture System).

86% of interviewees would be helped by doing some short internship in the industry. Teachers rarely come from the industry. Currently, they are visiting industries with students (or visiting the students doing their internship in the industry) or have informal meeting with the industry to keep up to date but this is not enough. Two interviewees would be helped by visiting some aquaculture companies abroad (Norway was cited twice). One interviewee pointed out the lack of technical information in French (e.g. some detailed farming protocols)

28% of interviewees are interested in developing technical projects while the 72% are more interested in developing specific pedagogical projects:

Technical projects mentioned:

- To acquire a RAS with the help of regional funding.

- To develop an aquaponic system.

- To farm new species on site.

Pedagogical projects:

- Create a distance-learning course on shrimps farming.

- Establish partnership with other countries (Germany, Switzerland, Norway, Scotland, Iceland)

- Develop student mobility in other countries (Erasmus +)

- Learn about new learning technology

- Identify best possible staff from the industry for external teaching.

- To follow a specific training to teach more and more difficult students (social problems combined with very low level).

Industry attitudes and partnership

Only 43% of interviewees think the industry is well represented and actively involved in the aquaculture NOS and qualification design process the curricula are developed in collaboration

with the industry (organizations depending on ministries of education or agriculture) but one pointed out it was not enough.

100% of interviewees consider the relationships with the fish farming industry as essential. These relationships were the same in all cases:

- Informal relationships,
- College/School industry advisory committees,
- Regional level industry committees,
- Agreements for student internship and apprenticeship
- Board of directors of the organization including some people from the industry
- External teachers from the industry

The industry supports VET in contributing to the training curricula update (28%), student supervision in the industry for internship and practical courses (57%), giving information about new techniques of production (28%), giving access to the farm for practical courses supervised by teacher from our organization (14%), participating to the Professional Development Council of our organization (14%), contributing to the student evaluation process (14%).

The industry has become increasingly self-reliant regarding company staff- development for only 43% of interviewees. It depends on the size of the company according to them. This would be only true in small companies that are lacking working force. Small companies will favour trained people from organizations as long as they are able to supply enough qualified people. At labour level, it does not really matter for the company whether the person has an educational background in aquaculture. It is not the case yet but there is a risk that industry could become more self-reliant because not enough people are currently trained in aquaculture.

One important factor mentioned is the French reform on vocational training (financial help for industry to develop apprenticeship) that could lead the companies to be more self-reliant in the future.

Another factor is the difficulty for companies to recruit people. We train a lot of students in France but not all of them (far from that) will actually work in the aquaculture industry. A lot of students did not choose aquaculture training for good reasons (the main motivation was that they were anglers). Confidentiality could also become an issue as well as the cost of training were mentioned.

Curriculum development

Assessment process is managed by educational inspection in all organizations delivering diploma at high-school levels. The inspection considers the percentage of successful student at the exam as well as the attractivity of the organization (number of registered students)

At BSc level, the organization (University) must apply to the HCERES (Council for research and education assessment). If positively evaluated, they will be accredited for five years.

For 71% of interviewees the qualification assessment strategy is based on both continuous assessment and final exams. BSc level is an exception because it is mostly based on final assessment at the end of all courses. Two interviewees said this was only based on continuous assessment during the course. One of them at high-school level is based on oral examination only (not based on knowledge assessment but on general project assessment).

In all cases, the student internship account for a large proportion of the final grade (around 50%). It can be a written report as well as an oral examination or a continuous process (the student must fill out some activity sheets checked by the supervisor in the company)

All qualification assessments are devised at national level.

Industry and VET providers are somehow involved in devising the assessment. This can be through:
- Internship or practical exams supervision and assessment (100% of interviewees)
- Oral examination in collaboration with the school (43% of interviewees)
- External teachers from the industry will assess the students (written exam)

In most cases the curricula and assessment methods are developed at national level (high-school level) but there is quite a bit of flexibility at local level (mostly in terms of methods).

The consistency and fairness within assessment is ensured through different methods:

- Criterion-referenced assessment established before the exam correction (written exams)
- Validation of exams by a jury composed of a minimum of two teachers.
- Pedagogical councils in the organization (all teachers from the organization) examine each student result.
- Anonymous written exams copies

There are some external councils at BSc level (composed of people from the same university)

Aquaculture courses content are technically up to date by different kind of relationships with the industry (100% of interviewees):
- Visits on the farms with students.
- Personal visits and discussion with industry
- Discussion with external teachers from the industry delivery courses every year.

Other points mentioned are:

- By learning from the students after their internships (reports and oral examination)
- By discussions between teachers.
- By personal research (internet, books).
- By attending aquaculture conferences.

In order to assist aquaculture course development and delivery, it would be useful:

- to develop more short internship in the industry (43%)
- to acquire recent books but this is expensive (14%)
- to have access to details manuals on farming fish or courses online in French (28%).
- to acquire recent aquaculture equipment (14%)
- to get videos from the industry (14%)

All interviewees believe an increase in the application of ICT & learning technologies would improve the quality or accessibility of their aquaculture courses pointing out:

- The lack of ICT and learning technology (for distance learning) despite some progress in the recent years (14%).
- There is a need for that but this this not our priority (14%).
- There is an urgent need because they are located in a remote area (14%).

At BSc level this technology is available, but not used.

All interviewees mentioned some collaborations with different kind of partners:
- Network for high-schools in aquaculture
- Resource sharing (aquaculture equipment) between schools
- Council of partners from education, research in aquaculture to develop partnerships.