

A Q U A C U L T U R E
V E T I N
N O R W A Y A N D
S C O T L A N D



G U R I K U N N A V G S

Ressurssenteret

Sistranda, Frøya, Norway

P I S C E S L E A R N I N G
I N N O V A T I O N S L t d .

Dumfries, Scotland



AQUACULTURE WORKFORCE DEVELOPMENT

In Norway and Scotland the industry is dependent on the recruitment of staff who either have suitable qualifications and experience, or who can be developed, assisted by accessible internal and external education and training that can lead to the attainment of a Nationally Recognised Qualification (NRQ).

NORWEGIAN AQUACULTURE RECRUITMENT

It is difficult to recruit staff with NRQ in fish farming. The growth in the fish farming industry during the last 6-7 years has been outstripped the growth in the number of students attending the VET schools. There has been a long period where new recruits have had to learn through their work experience and from colleagues. Industry reports that they consider it is easier to recruit personnel to their fish processing operations than fish production, although communication can be a challenge due to the wide range of cultures and languages represented within the fish

processing sector. In 2018 farming companies recognise that there were many applications for fish production jobs by applicants who lacked a suitable NRQ.

Most of these unqualified recruits are heavily committed to the farm work schedules from the outset, making it difficult to release them for school attendance and training. However, most farms believe that the most important recruitment channel in Norway is the apprenticeship system. (See Figure 1 below). There are increasing number of young students today who are committed to an aquaculture career who have strong academic and attendance records from secondary school. Despite the

rising popularity of aquaculture careers with the Norwegian youth, only approximately 60 % of the Norwegian salmon farming workforce holds a suitable nationally recognised qualification (NRQ) in aquaculture, as many unqualified recruits have been drawn in to the industry during a recent period of rapid expansion.

The apprenticeship system is clearly the most important source of recruits for both fish farming and processing companies. Outsourcing work operations to other companies satisfies more than 25% of the fish farming sectors labour requirement.

The third most important recruitment channel is to employ new staff, in other words, mature entrants from other sectors and countries (17%) and do not hold an aquaculture qualification.

The whole fish farming industry supports the drive towards qualified staff and want as many as possible to complete training and take the exams that will award them their NRQ. In a survey undertaken in 2017 in Mid-Norway, 26 out of 30 site managers at fish farms pointed out that their staff will need aquaculture VET during the next 3 years. These 30 managers lead 270 workers at the cage farms and the survey results indicated that the second most important subject area for VET to target was technical and industrial production.

NORWEGIAN AQUACULTURE WORKFORCE DEVELOPMENT STRATEGIES

The fish farming companies encourage unqualified mature entrants to start on the theoretical part of the NRQ within aquaculture vocational education and training (VET) as early as possible. This gives them the underpinning knowledge relating to fish production operations, despite being unable to complete their practical aquaculture exam until they have complete 4-5 years of farm experience under current VET regulations. This long delay is can adversely affect the motivation of these mature, but

unqualified entrants to the workforce.

The aquaculture VET courses are delivered as a fixed program, whereby all course components and subjects have to be undertaken and assessed. The current pedagogy is to apply a combination of classroom based theory with practical on farm training, organised through cooperation between VET school teaching staff and experienced aquaculture company managers. It is a vitally important VET component and the students have often been shown how to operate some aquaculture equipment before having completed the corresponding theory session back at the school. The farm work schedule drives the arrangement and timing of practical training, not curriculum design.

Information about aquaculture courses leading to the NRQ is often distributed to the staff on the company's intranet. However, travel distances and the course timing can present significant potential barriers to access, as staff are often expected to cover the transportation costs themselves. On occasion the fish farming companies pay for 'bespoke' VET course, which often requires providers to hold courses in the evenings or at the weekends. In addition, the program has to be adjusted to students farm work schedule during busy periods.

Structured interviews with fish farming company managers has

revealed that a combination of student self-study, on-site group learning and some e-learning is seen as providing the best 'blend of delivery modes. To increase and extend the staffs network is important and this can happen during group learning activities. Furthermore, they believe that staff learn most effectively when they can apply their theoretical knowledge working within groups, during periods of practical training and experience, to encourage peer learning. The interest in the application of e-learning as a significant component of 'blended learning' has been growing, as it can help to overcome the geographic barriers to VET access. As there is not much in company training offered and external training providers need to be engaged, the same challenge of distant and dispersed farm sites is encountered when arranging external training.

In summary, the attainment of an NRQ by every member of aquaculture staff is an important aim for the fish farming companies. However, at the same time they emphasise that the increase in salary on becoming qualified should not be the motivation. The companies fully recognise the challenges associated with attending the on-site training, mainly due to the distances that need to be travelled and the staff work schedules.



AQUACULTURE VOCATIONAL EDUCATION AND TRAINING (VET)

Although the VET systems in Norway and Scotland share the same general mission and both consult industry and other stakeholders to inform VET design, they are very different regarding their assessment strategies. This is reflected in their aquaculture VET programmes.

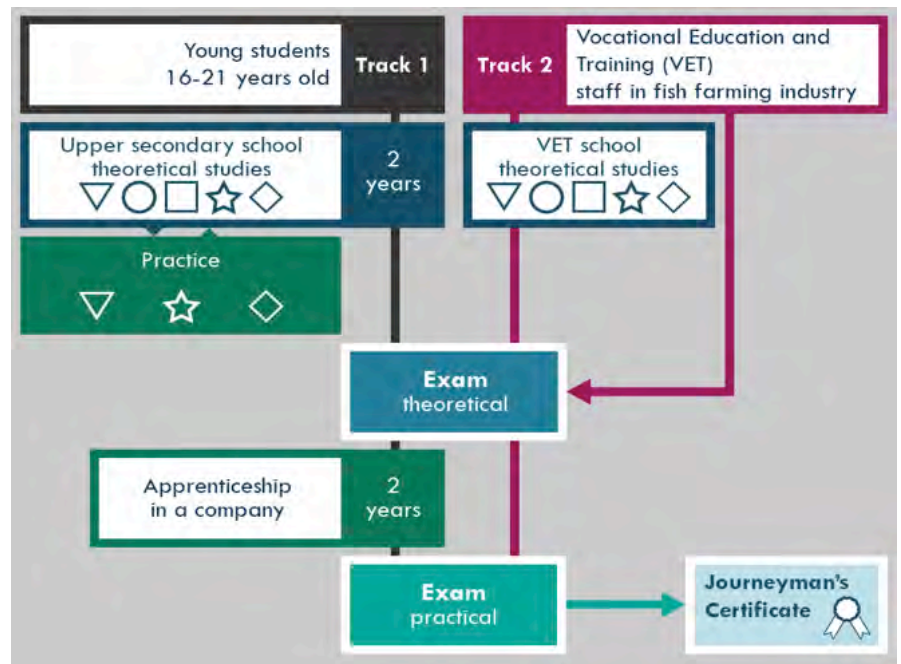
NORWEGIAN AQUACULTURE VET

To receive the recognised aquaculture NRQ in Norway (known as the Journeyman Certificate or “Fagbrev” in Norwegian) the candidates must pass a theoretical and practical exam. Both young and mature learners, including staff employed by the fish farming industry, sit the same exams, since the curriculum in aquaculture applies to all equally. Staff that are currently employed by fish farming companies have two options if they want to receive a Journeyman Certificate.

They may:

- Become an apprentice for 2 years (Track 1 in the figure), which is part of the ordinary

Norwegian VET pathways to NRQ completion:



study path for young students age 16-21, or

- Become candidate of practice (Track 2) after working full time in a relevant job in fish farming industry for 5 years.

For each option the candidates must pass a theoretical exam first, before they may take the final practical exam. The practical exam may take up to two days to complete.

Both options however, have some limitations making it less attractive for those who are already in full time employment and wish to gain the NRQ. To be an apprentice results in a loss of income, since the salaries are lower. To be a candidate of practice requires that you must wait for five years or longer once you have gained a full or part time position.

The downside of both options is that many do not have the personal motivation to work for a Journeyman Certificate. Thus, the fish farming industry in many cases supports their staff by engaging the existing VET schools to offer a bespoke course (Track 2) for their candidates. These courses can apply more flexible training solutions consisting of a combination of e-learning and on-site training, to make courses more accessible to candidates in full time aquaculture employment.

Since 2017, the Norwegian government has been preparing a third path "Fagbrev på Job" (a third track), whereby after one year of full-time employment in a company a person may apply for and sign a contract with their county and the employer to gain access to the guidance and training needed to complete the NRQ (Journeyman Certificate). This ensured that the candidate does not lose out financially due to a salary reduction. The contract will depend on an evaluation of

the individual's experience and expertise. Some may complete the training in under one year, whilst the maximum duration is four years.

NORWEGIAN FARMING INDUSTRY VET NEEDS

The fish farming industry has recruited many unqualified workers during recent years. In order to get more staff qualified, they consider that encouraging staff to prepare for the theoretical exam is of some value. They cannot change the rule that requires 5 years with relevant experience in order to take the last practical exam. Due to this, many companies encourage their staff to start on courses that prepare them for the theoretical exam.

As a result, aquaculture VET classes can include staff with many years of relevant experience mixed with students with little or even no relevant practical fish farming experience. Thus, the classes often consist of heterogenous group of students.

Fish farming industry in Norway foresee three main types of training activities that their staff should take part in:

- in company based training directly linked to the operation of machines and equipment. This typically involves the use of equipment that the VET schools cannot afford.
- Training leading to the NRQ and offered by the aquaculture schools

- Specialised training offered by external companies such as the technology supply companies that provide the industry with the advanced equipment.

Industry considers education and training offered by the aquaculture VET schools in Norway and leading to the NRQ to be the most important strategy for increasing workforce competence. The opinion surveys undertaken in mid Norway demonstrated that 2 out of 3 site managers held this opinion. It should be noted that 50% of the site managers responding, consider continuous staff development to be quite important and an integral part of the work activities. These opinions imply that education and training must be offered on a flexible basis, by combining accessible e-learning with on-site practical training activities. This will reduce the need for as much face to face course delivery and allow companies much greater flexibility to accommodate staff development without disruption to their work schedules.

Although the VET systems in Norway and Scotland share the same general mission and both consult industry and other stakeholders to inform VET design, they are very different regarding their assessment strategies. This is reflected in their aquaculture VET programmes.



THE SCOTTISH AQUACULTURE VET MODEL

Throughout the 1980's and 90's, a growing Scottish Industry was supplied many of its new entrants by three well-equipped Aquaculture Colleges. They provided new entrants with Scottish Qualifications Authority (SQA) qualifications at fish husbandry and site manager level, gained through full time attendance on Aquaculture VET courses. This provision has been lost.

Today, Inverness College and the North Atlantic Fisheries College (NAFC) Shetland, provide the work based Modern Apprenticeship (MA) in Aquaculture. This National Qualification is also provided by a Scottish private training provider, Polaris Learning Ltd, based in Aberdeen (North East Scotland). Increasingly the MA Level 2 (SCQF 5) is used as an entry qualification for school leavers after they have gained full time employment with a company. In addition, the salmon farming companies have developed their own in company training schemes aligned to company Standard Operating Procedures (SOPs).

THE SCOTTISH MODERN APPRENTICESHIP SYSTEM

The MA is a work-based qualification, requiring candidates to demonstrate their competence in a real

place of work as opposed to a simulated work place or training facility. The MA is funded by Skills Development Scotland who contract providers, who are subject to their rules and regulations, The Scottish Qualifications Authority (SQA) are responsible to the quality assurance of assessment within the delivery of Scottish MAs.

i) Age of entrants

New entrants can start a Modern Apprenticeship at level 2 (husbandry/operative) on leaving school at age 16 and can progress to level 3 following their promotion to supervisory level. Mature learners can complete the MA at any age and stage of their career, to gain a Nationally Recognised Qualification (NRQ).

ii) Entry requirements

There are no formal academic entry requirements to the MA at level 2. The learner must be employed by an aquaculture company willing to support them and co-operate with the training provider regarding practical training and assessment.

iii) Modern Apprenticeship structure and content

National Occupational Standards (NOS) devised by industry have been used to define the practical skills and knowledge assessed by the MA validated by the Scottish Qualifications Authority (SQA). It is composed of mandatory Core Units, in addition to a prescribed number of Optional Units, at each level, selected to suit the nature of the farm operation and the learners' and employers' needs.

iv) Individualised Learning

The 'core and options' structure provides the flexibility to facilitate individualised learning and assessment to suit the farm operation and learner. For example, a learner based on a freshwater smolt facility, would normally only elect those Optional Units relevant to the freshwater phase of salmon production.

It is possible to enhance an individual learners' development plan by adding Units additional to the minimum requirement. All Units achieved will appear on the learners final SQA certificate, as evidence of their 'specific' knowledge and skills.

v) MA delivery and assessment

The assessment of practical skills must be undertaken in the work place, through many methods, including, observation by a qualified assessor and witness testimony provided by an experience supervisor.

The assessment of knowledge can be undertaken in a college or other supervised learning centre. It can also be undertaken on a farm, if invigilated, supported by the VET provider.

The learning process often includes a combination of approaches: supported distance or e learning, college block attendance (1-2 weeks), short course attendance and practical skills training on farm.

COMPANY BASED TRAINING SCHEMES IN SCOTLAND

In response to the decline in full time college-based provision and the relatively low levels of MA funding available for 'mature' work-based learners, the Scottish aquaculture companies have become self-sufficient this century.

Company' training schemes has been developed and have become increasingly sophisticated, and include initial induction, comprehensive training schemes and supervised work experience. Their delivery and assessment are driven by company Standard Operating Procedures (SOPs). However, they do not lead to an NRQ, and are not subject to quality assurance by an approved VET provider or authority. Therefore, a relatively high proportion of the Scottish Aquaculture

workforce do not hold an NRQ relevant to their occupational role, despite having developed considerable skills and knowledge, in many cases.

ASSESSMENT METHODS

Scotland does not have a mandatory final examination as a part of its VET system, whereas this is the central pillar of the national VET assessment system for NRQs in Norway. The SQA philosophy is founded on continuous assessment. However, it would be possible and within the rules to include a final exam within a VET course assessment strategy. A minority of Scottish colleges have included final assessment, linked to their employer groups, to great effect. Recognition of the advantage of including this approach may lead to stronger assessment strategies in Scotland, particularly within Higher VET.

Likewise, whilst Norway does deploy continuous assessment, unlike Scotland, the teachers have complete control of the assessment methods, application and marking schemes. The SQA prescribe the continuous assessment process, including the nature of the assessment, assessment performance criteria and amount of assessment evidence of assessment. This is all enshrined within the SQA Units that compose the NRQ and is subject to both internal and external quality assurance.

The assessment of practical competence is not undertaken as a final practical exam within the Scottish system. The evidence of competence is gathered in several ways. Including

- Observation of a practical task by a qualified assessor (work or college based)
- Witness testimony provided by a qualified witness testimony provider (typically the supervisor of the learner) and recorded in a portfolio for validation by a qualified assessor and verifier
- Assessment of a final product against a product specification



QUALITY ASSURANCE IN SCOTLAND

Scotland's VET assessment process at all SCQF/EQF levels is based on the principle of the 'continuous assessment' of learners' knowledge, skills and competence throughout their course. Assessment opportunities should be made available when learners are ready for assessment of a learning outcome, and learners normally have the right to at least one reassessment opportunity. Continuous assessment and the removal of unfair barriers to achievement are both central to the SQA VET philosophy. Therefore, diverse methods of assessment are encouraged, as exemplified by the availability of oral assessment of knowledge for learners that have dyslexia.

Latterly, SQA have welcomed digital applications and ICT based applications within assessment strategies but insist that all assessment evidence is 'robust and reliable', and therefore, invigilation is essential for 'closed book' knowledge-based assessments. This includes the use of on-line-multiple choice assessments which are becoming used more widely. Invigilation would need to accompany any assessment process generating evidence contributing to the achievement of any SQA Unit Learning Outcome. This would be a condition for assessment, prescribed in the Unit standards.

Practical skills and competences are also assessed in various ways to determine whether the skill has been demonstrated and the level of competence defined in the standards achieved. This includes;

- Recorded observation of the activity being undertaken by a qualified assessor

- Recorded witness testimony by a qualified expert in the field, for the assessor to judge and moderate
- Recorded judgement of the quality of a final product
- Learners activity log and/or personal statement. This needs to be complemented and validated by another method, such as witness testimony.

The other central principle of the assessment of practical competence when using witness testimony is the risk assessment of the evidence by the qualified assessor. For example, if the witness testimony provider was relatively inexperienced, other methods such as direct observation may have to be applied on a sampling basis. The same would apply if the witness testimony provider was related to the learner, as this would be deemed to be 'high risk evidence' and potentially unreliable, in the absence of additional evidence. A qualified assessor can make these judgements competently.

Regarding the Modern Apprenticeship in Aquaculture, although the underpinning knowledge can be assessed in the same way as any other NQ using a diverse range of approaches, the assessment of skill-based learning outcomes must reflect real work practices and standards. Trainee competence must be developed in a commercial work place, often under the watchful eye of the trainee's company supervisor. They are often recording the evidence of competence as 'witness testimony' which a qualified assessor can then validate, allowing that evidence to then contribute towards the achievement of the Modern Apprenticeship qualification.

SCOTTISH VET ASSESSMENT PROCESS

Scotland's VET assessment process at all SCQF/EQF levels is based on the principle of the 'continuous assessment' of learners' knowledge, skills and competence throughout their course. Assessment opportunities should be made available when learners are ready for assessment of a learning outcome, and learners normally have the right to at least one reassessment opportunity. Continuous assessment and the removal of unfair barriers to achievement are both central to the SQA VET philosophy. Therefore, diverse methods of assessment are encouraged, as exemplified by the availability of oral assessment of knowledge for learners that have dyslexia.

Latterly, SQA have welcomed digital applications and ICT based applications within assessment strategies but insist that all assessment evidence is 'robust and reliable', and therefore, invigilation is essential for 'closed book' knowledge-based assessments. This includes the use of on-line-multiple choice assessments which are becoming used more widely. Invigilation would need to accompany any assessment process generating evidence contributing to the achievement of any SQA Unit Learning Outcome. This would be a condition for assessment, prescribed in the Unit standards.

COMPARING THE ASSESSMENT SYSTEMS IN NORWAY AND SCOTLAND

Scotland does not have a mandatory final examination as a part of its VET system, whereas this

is the central pillar of the national VET assessment system for NRQs in Norway. The SQA philosophy is founded on continuous assessment. However, it would be possible and within the rules to include a final exam within a VET course assessment strategy. A minority of Scottish colleges have included final assessment, linked to their employer groups, to great effect. Recognition of the advantage of including this approach may lead to stronger assessment strategies in Scotland, particularly within Higher VET.

Likewise, whilst Norway does deploy continuous assessment, unlike Scotland, the teachers have complete control of the assessment methods, application and marking schemes. The SQA prescribe the continuous assessment process, including the nature of the assessment, assessment performance criteria and amount of assessment evidence of assessment. This is all enshrined within the SQA Units that compose the NRQ and is subject to both internal and external quality assurance.

The assessment of practical competence is not undertaken as a final practical exam within the Scottish system. The evidence of competence is gathered in several ways. Including:

- Observation of a practical task by a qualified assessor (work or college based)
- Witness testimony provided by a qualified witness testimony provider (typically the supervisor of the learner) and recorded in a portfolio for validation by a qualified assessor and verifier
- Assessment of a final product against a product specification



SUMMARY

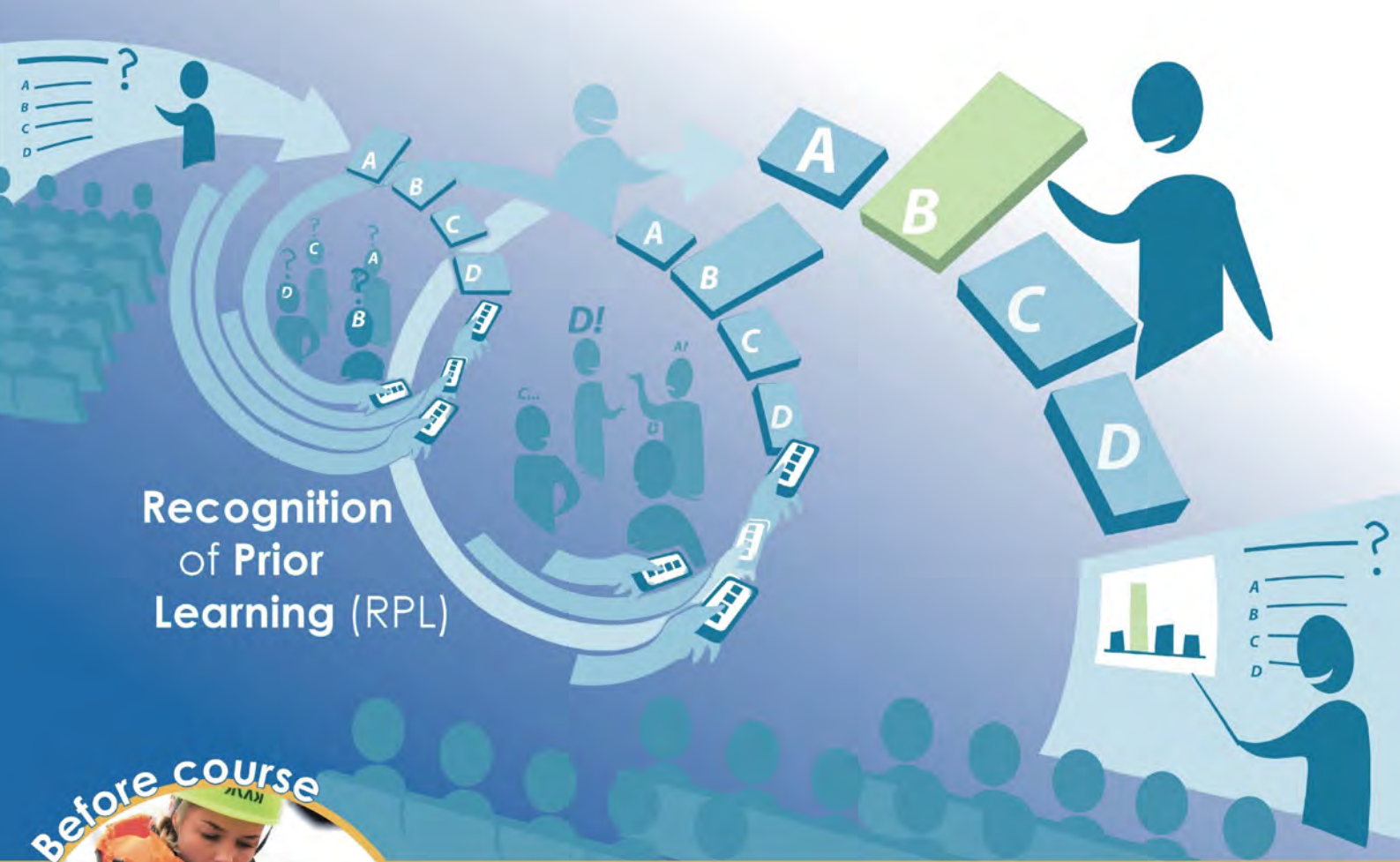
The aquaculture VET systems currently operating in each country have significant differences in delivery modes and assessment processes.

Norway's mainstream aquaculture VET is founded on 2 years of school-based VET delivery prior to progression to a 2-year apprenticeship. Whilst Scotland currently relies on non-formal in company VET and the Modern Apprenticeship system for both school leavers (16 years old and above) and mature learners.

However, despite the different regimes in operation, both countries share a strong interest in the application of e learning to improve access to Nationally Recognised Qualifications (NRQs) and to help learners

develop the knowledge required to complete their respective NRQ. Norway is heavily dependent on the final examination within a fixed curriculum, as opposed to Scotland's reliance on quality assured 'continuous assessment' of a flexible curriculum, delivered entirely through work-based learning.

Whilst awareness of Recognition of Prior Learning (RPL) applications and their benefits was relatively low in both countries, a shared interest revealed by industry in 'e learning development' within blended learning programs. This indicated that RPL must be developed and presented as an integral and beneficial component of future school (facility) and work-based learning aquaculture VET delivery systems, to better serve the diverse interests of a very mixed group of learners.



Recognition of Prior Learning (RPL)

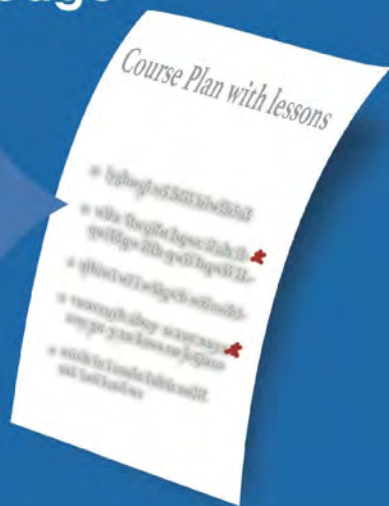
Before course



During course

Optimized Effect of Training

Pre-testing of knowledge



Students' advantage of giving feedback to the teacher

- All students participate and use their mobile device to give nearly instant feedback
- Experienced students may help less experienced students
- Better support various types of learning styles
- Create improved mastering experiences

Teachers' advantage of providing feedback to class

- Analyze feedback
- Adjust course plan
- Optimize the lesson(s)
- May be used in onsite training or distance learning settings





ADDITIONAL INFORMATION :

Dag Willmann

email: dagwi@trondelagfylke.no

Martyn Haines

email: martynhaines@outlook.com



Co-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.