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Project Title

Curriculum Development for Sustainable Seafood and Nutrition Security

Project Acronym

SSNS

Deliverable 1.2: Identification of similar curricula and best practices in Europe

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1. Introduction and project aims

This interim report covering WP 1.2 "*Identification of similar curricula and best practice in Europe"* and is based on desktop research to identify existing Higher education institutions (HEI) programs in Europe on aquaculture and fisheries, food security, and other related topics.

European HEIs offering a wide selection of relevant MSc curricula as well as relevant best practices that can be taken into account when developing the SSNS MSc program. It is however important to include cultural differences in education between Europe and Asia when defining "best practices". In addition, educational differences in Europe have to be discussed.

The overall aim of the project is to find best practice to develop a new MSc curriculum focusing on sustainable seafood and nutrition security that should be offered at nine different universities located in Thailand, Vietnam and Indonesia (3 in each country). The wider and long-term objective of the project is to make a viable contribution towards achieving sustainable seafood nutrition security in the project region. More specifically the project will have a long-term impact in securing the sufficient, safe, as well as environmentally, social and economically sustainable production of seafood in three of the region´s biggest aquaculture and capture fisheries producing countries.

2. Background

2.1 A changing world demands chances in higher education

Climatic, demographic and technological developments are changing people's living conditions all around the world. Universities are especially qualified and obligated to solve these global challenges and to contribute to achieve the 17 UN sustainable development goals, which the world has agreed upon. The Council of Europe (2007) has outlined four main objectives concerning higher education in the European region: preparation for sustainable employment, preparation for life as active citizens in democratic societies, personal development, the development and maintenance, through teaching, learning and research, of a broad, advanced knowledge base.
According to the report "The Future of Jobs", the majority of occupations in 2020 will require expertise that is not considered crucial in today's world (World Economic Forum, 2016). In a labour market that is increasingly characterized by higher competence levels and more complex working tasks, there is a need for professionals capable of problem-solving, critical thinking and collaborating across geographical, academic and cultural boundaries. Education must therefore put an emphasis on learning activities that stimulates such generic skills (Norwegian Ministry of Education and Research, 2017) (Figure 1).

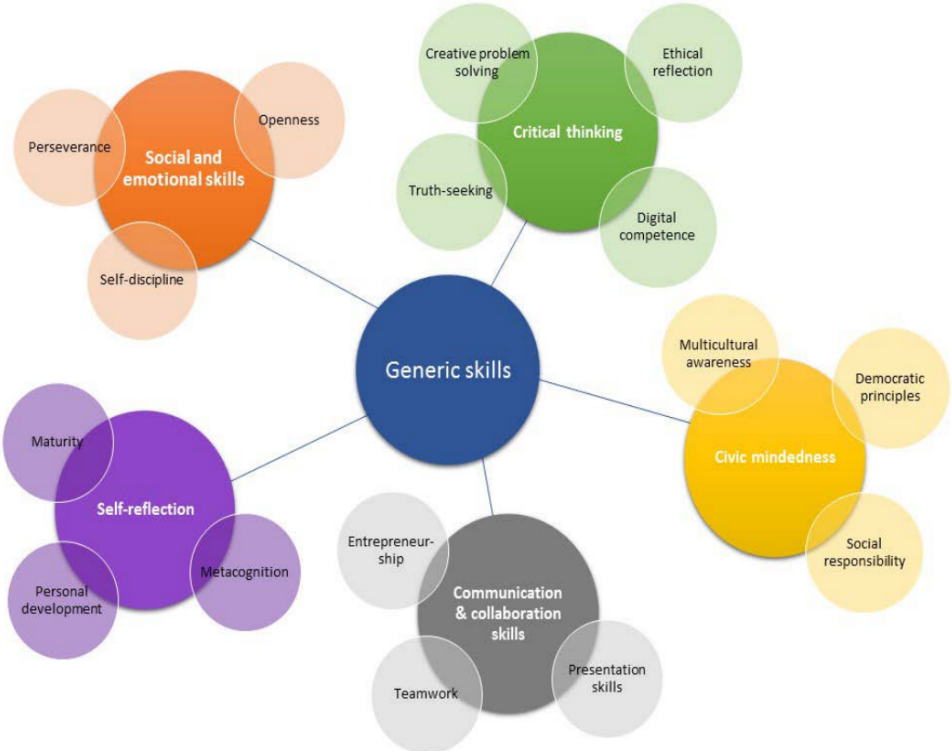


Figure 1. Generic skills (Norwegian Ministry of Education and Research, 2017).

2.2 "Best practice" in higher education

Quality or "best practice" in education is not a trivial matter. Different stakeholders have different views on the quality of higher education. A variety of definitions and understandings exist for the term "quality". Harvey and Green (1993) pointed out five concepts of quality: exceptional, perfection, fitness for purpose, value for money and transformation. Quality is about meeting demands, expectations and standards on one hand, but also encompass excellence, diversity, relevance, and efficiency. The Harvey and Green paper is widely cited, used as a "golden" standard for the definition of quality in higher education. However, Van Kemenade, et al. (2008) describe quality as a concept with four constituents: object, standard, subject and values. They argue that the key questions regarding quality to be answered are to/for whom, by which standard, by whom, and against which values.

European Union has established specific organizations, mechanisms, standards and guidelines in order to harmonize and to assure the quality in higher education throughout Europe. The European Association for Quality Assurance in Higher Education (ENQA) is an umbrella organisation that represents quality assurance organisations from the European Higher Education Area (EHEA) member states. ENQA promotes European co-operation in the field of quality assurance in higher education and disseminates information and expertise among its members and towards stakeholders in order to develop and share good practice and to foster the European dimension of quality assurance (European Association for Quality Assurance in Higher Education, 2018).

The ENQA in co-operation with the European Students' Union (ESU), the European Association of Institutions in Higher Education (EURASHE) and the European University Association (EUA), prepared a proposal ''The *Standards and guidelines for quality assurance in the European Higher Education Area* (ESG)'' which was adopted by the Ministers responsible for higher education in 2005. Since 2005, considerable progress has been made in quality assurance and in 2015 a revised ESG has been developed in order to improve its clarity, applicability and usefulness. A key goal of the revised ESG is to contribute to the common understanding of quality assurance for learning and teaching across borders and among all stakeholders. They have played and will continue to play an important role in the development of national and institutional quality assurance systems across the EHEA and cross-border cooperation. Engagement with quality assurance processes, particularly the external ones, allows European higher education systems to demonstrate quality and increase transparency, thus helping to build mutual trust and better recognition of their qualifications, programmes and other provision. The focus of the ESG is on quality assurance related to learning and teaching in higher education, including the learning environment and relevant links to research and innovation. In particular, the ESG have the following purposes:

- They set a common framework for quality assurance systems for learning and teaching at European, national and institutional level.
- They enable the assurance and improvement of quality of higher education in the European higher education area.
- They support mutual trust, thus facilitating recognition and mobility within and across national borders.
- They provide information on quality assurance in the EHEA.

The standards for quality assurance have been divided into three parts: 1. Internal quality assurance, 2. External quality assurance, and 3. Quality assurance agencies.
These three parts are intrinsically interlinked and together form the basis for a European quality assurance framework. External quality assurance in Part 2 recognises the standards for internal quality assurance in Part 1 thus ensuring that the internal work undertaken by institutions is directly relevant to any external quality assurance that they undergo. In the same way Part 3 refers to Part 2. Thus, these three parts work on a complementary basis in higher education institutions as well as in agencies and also work on the understanding that other stakeholders contribute to the framework. As a consequence, the three parts should be read as a whole (The Standards and guidelines for quality assurance in the European Higher Education Area (ESG), 2018).

2.2.1 "Best practice" in Scandinavia

Quality involves setting ambitious goals and working continuously and effectively to achieve them. In Norway, the Government expect that high-quality education will lay the groundwork for the students to achieve the best possible learning outcomes and personal development, to have access to the relevant education to prepare them sufficiently for active participation in a democratic and diverse society, and for a future professional career and to complete their education as efficiently as possible (Norwegian Ministry of Education and Research, 2017).

Figure 2 illustrates some factors influencing the student's success in achieving the best possible learning outcomes and personal development, and to meet relevance in their study programs.

Figure 2. Factors affecting quality in higher education (Norwegian Ministry of Education and Research, 2017).

Student engagement, time spent on studies and good learning activities are the most important factors determining the student's success (Norwegian Ministry of Education and Research, 2017). The study programs have responsibilities to facilitate these activities. Furthermore, the government of the Scandinavian countries expects clear strategic and collegiate responsibility at every level in higher education institutions towards education quality. The Norwegian Government has outlined four principal approaches to reinforce a culture for quality in higher education (Norwegian Ministry of Education and Research, 2017):

- The higher education institutions should develop pedagogical merit systems to encourage more teaching initiatives and to reward important development work. One of the main goals is to raise the status of educational activity.
- The Government expects peer review and peer mentoring of teaching and education to be used to a greater extent.
- The Government will set up a national competitive arena for quality in education by assembling a portfolio of tools in order to encourage knowledge, competence and innovative work in developing education.

The Ministry of Education and Research will set up a quality portal to collect indicators and relevant knowledge sources in one place. This will make it easier to find information on activities and results at the program of study level at higher education institutions.

The Ministry of Education and Research in Norway has also initiated a national student survey named Studiebarometere (Studiebarometeret.no). The survey is sent to more than 60.000 students every autumn. The survey asks for the students' perceptions of educational quality in their study programs. The purpose the survey is to strengthen the quality work in higher education and give useful information about educational quality. The portal is useful for applicants, students, institutions and members of staff and others with an interest in higher education. The portal gives information about the student's evaluation of their study program, it's possible to compare results from different study programs, and to see the development over time for each study program.

2.2.2 "Best practice" in UK

In UK the "Higher Education Academy" (HEA) is the national body that champions teaching excellence and it is committed to promote world-class teaching in higher education. One of the objectives of HEA is to facilitate professional development increasing the professional standing of all staff in higher education. This is achieved by providing a range of services such as fellowships and training events. Universities in the UK are increasingly committed to demonstrate professionalism in learning and teaching at institution level and therefore different schemes are available locally to assist teaching staff to apply for a HEA Fellowship. The Fellowship (four categories from Associate to Principal) provides individuals with recognition of their practice, impact and leadership of teaching and learning. It has been stated that being a Fellow of HEA is increasingly sought by employers across the education sector as a condition of appointment and promotion as it is an indicator that institutions are fully aligned with UK Professional Standards Framework practice (UKPSF) (Figure 3).

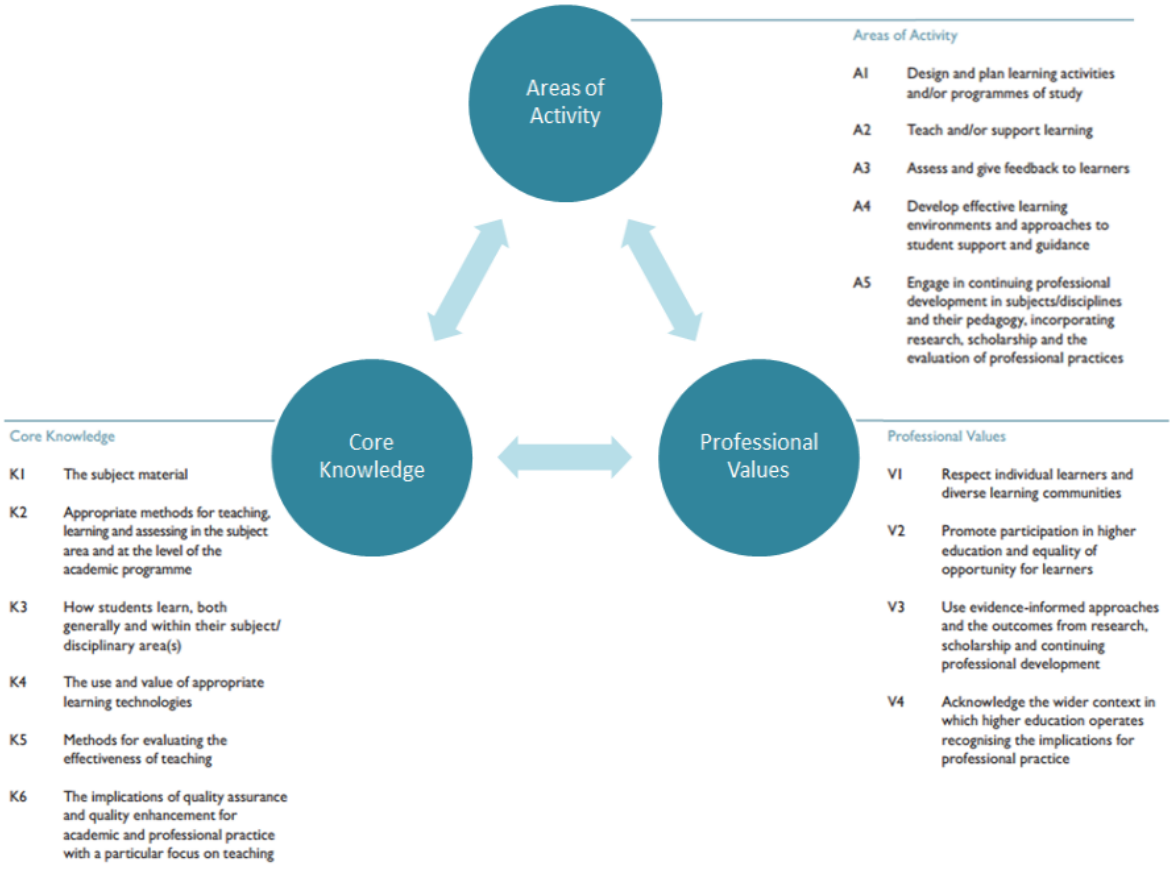


Figure 3. Visual representation of the UK Professional Standards Framework (UKPSF) for teaching and supporting learning in higher education (Higher Education Academy, 2011).

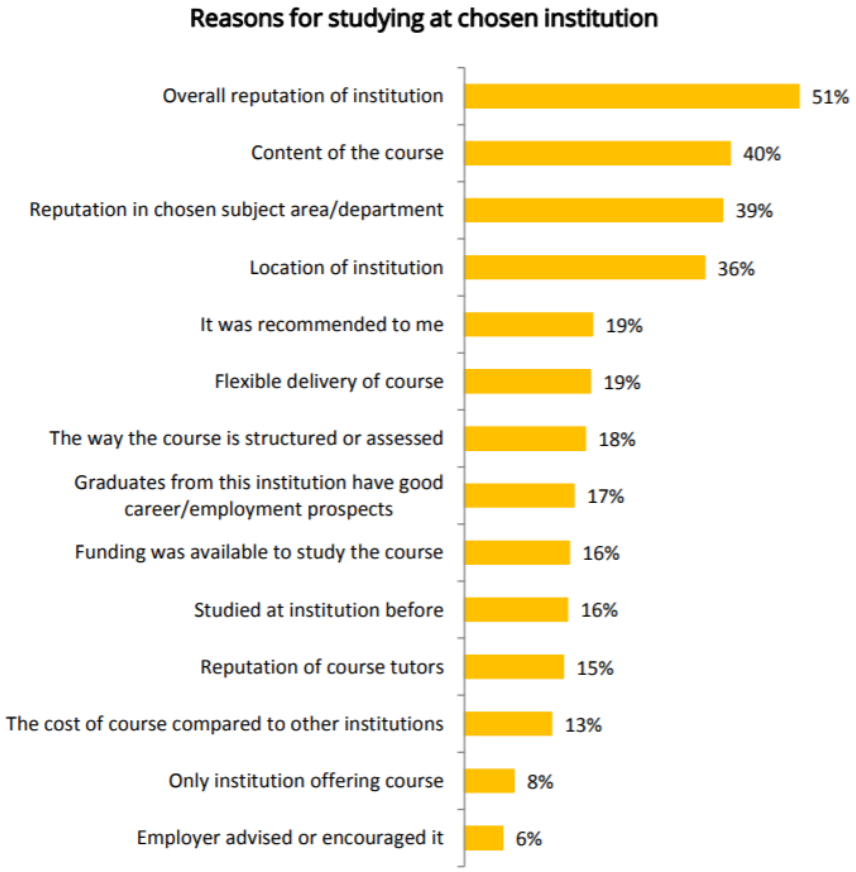
From this UKPSF it is interesting to note how the core knowledge or subject material needs to be aligned with the areas of activity (i.e. designing and plan learning activities and/or programs of study) and the professional values (i.e. promoting participation and equality of

opportunities for learners). These values are very much engrained in UK Universities when developing both programs and specific modules within programs.

Success of the different postgraduates programs in the UK is evaluated through different mechanisms one of which is the 'Postgraduate Taught Experience Survey' (PTES) which allows institutions to gather important information about the experience of any taught postgraduate students on a Masters, Postgraduate Certificate of Diploma course. Interestingly, PTES also considers students' motivations for taking a particular program and where relevant the students' experience of undertaking a dissertation or major project. In 2017, PTES ran from February to June 2017, with institutions choosing when to do the survey within this window.

In 2017, over 84,500 students completed the survey. Results from this survey indicated that 82% of the participants agreed that they were satisfied with the overall quality of their course. Main issue highlighted in the survey (lowest scoring items) were both workload and insufficient contact time and suggest that a sizeable minority of students may benefit from additional support with their studies (Bredley, 2017). The main reason reporting for studying at a chosen institution were the overall reputation of the institution, the content of the course, the reputation in chosen subject area and the location of the institution while other considerations such as the cost of the course compared to other institutions or being the only institution offering the course did not play such as important role (Figure 4).

Figure 4. Visual representation showing the motivations for studying at a particular chosen institution, taken from PTES 2017 National Report (Bredley, 2017).



Once of the main findings of the survey was that the information provided about the course prior to course choice is an extremely important factor and something to bear in mind when designing and promoting new courses. It was also apparent from the survey that those who agreed they were happy with the support for learning they received on their course, 94% were satisfied with the overall quality of their course. The second strongest positive correlation was the relationship between the students' feeling the course was well organized and running smoothly and overall satisfaction with the quality of the course. Therefore, from results from PTES run in the UK in 2017 indicate that information given to prospective students is very important, as it is the support received for learning and the organization of the course. This information could be useful to Asian partners when developing and marketing the new courses and also designing how student feedback can be captured.

2.2.3 "Quality Assurance" in Greece

As Greece is a Member – State of the European Union, ''The *Standards and guidelines for quality assurance in the European Higher Education Area* (ESG)'', as described in the section 2.2., was adopted by the Greek government, in order to best meet the needs of society and the expectations society places on Institutions of Higher Education. As a result, the Hellenic Quality Assurance & Accreditation Agency (HQA) has been established which nowadays is the supervisory and coordinating authority of the Quality Assurance system. The main aim of the HQA is the development and implementation of a unified framework of Quality Assurance teaching and research in institutions of higher education at the national and international level, with a view to the national interest but also to the further development and continuous improvement of the European Higher Education Area (EHEA). As part of its mission, the HQA "guarantees the transparency of the evaluation procedures and its mission is to support higher education institutes in implementing procedures aiming at the assurance and continuous improvement of quality in higher education, informing the state and higher education institutions of the latest international developments and trends in related issues and the production of research in this field". Among its goals is to create and implement a unified quality assurance system as a reference point for the achievements and work of the Higher Education Institutions (Hellenic Quality Assurance and Accreditation Agency, 2018).
The HQA also collects and codifies the crucial information that will guide the State in effectively strengthening higher education in the country. Therefore, all the academic units (Schools and Departments), which constitute the higher education institutes, are subject to evaluation, and, through them, every higher education Institute as a whole. The evaluation of each higher education institute is done on the basis of the evaluation of its constituent academic units, of which it is comprised and the evaluation of the operations of the Institute as a whole, which are based upon the internal evaluation report that each academic unit prepares on the basis of the principles and criteria established and/or specialised by the HQA, and on the external evaluation report, which is prepared by foreign experts, faculty members of foreign universities or researchers, who come to Greece, on the choice, initiative and responsibility of the HQA and who also work on the basis of the principles and criteria established and/or specialised by the HQA. Based on the results of the external evaluation, the academic institutions and the State take the necessary measures to ensure the improvement

and quality of the work performed by the higher education institutes as part of their mission to provide high quality higher education.

The HQA, among others, has completed the procedures for the internal and external evaluation of 380 academic units of Greek HEIs and coordinated the visits of over 1580 foreign experts, faculty members of foreign HEIs (search for experts according to discipline on the websites of foreign universities, registration on the Register of Foreign Experts of the HQA, efforts to create five-member committees on dates acceptable to all, monitoring potential conflicts of interest, monitoring the External Evaluation Reports, etc.)

- Completed the compilation of the HQA's Foreign Experts Register, which today includes 4867 foreign academics (professors, researchers, etc.).
- Its Documentation and Research Department has been active in collating and analysing qualitative and quantitative data, in establishing quality indices for higher education, as well as in preparing studies on the basis of the Internal Evaluation Reports of the academic units, and the Institute reports prepared by the QAUs, as well as the External Evaluation Reports.
- Studied and prepared restructuring criteria for the map of higher education in Greece.

2.3 Employability

Employability is influenced by many factors and is not simply getting a job or a set of skills that can be taught to the students. Several definitions exists in the literature. An investigation undertaken for the U.K. Department of Education and Employment led to the development of a definition and framework to operationalize employability: "Employability is the capability to move self-sufficiently within the labour market to realise potential through sustainable employment. For the individual, employability depends on the knowledge, skills and attitudes they possess, the way they use those assets and present them to employers and the context (personal circumstances and labour market environment) within which they seek work" (Hillage and Pollard, 1998). Small, et al. (2018) defined employability "as the capacity to be self-reliant in navigating the labour market, utilising knowledge, individual skills and attributes, and adapting them to the employment context, showcasing them to employers, while taking into account external and other constraints". Pool and Sewell (2007) developed a CareeEDGE model of graduate employability, each component crucial to success (Figure 5).

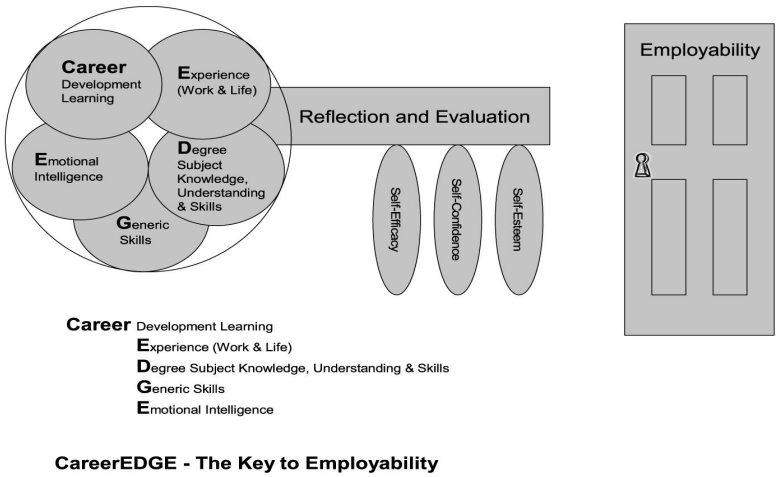


Figure 5. The CareerEDGE model of graduate employability (Pool and Sewell, 2007).

2.4 Active learning versus passive learning methods

Active learning is a teaching method that engages students in the process of learning through activities and discussions in class, as opposed to passively listening to an expert as in traditional lectures (Freeman, et al., 2014; Prince, 2004). Several studies have demonstrated that active learning leads to better student's attitudes and motivation for studies, but also improve student's scientific performance and development of thinking and communication skills (Freeman, et al., 2014; Mathias, 2014; Prince, 2004). Active learning moves the classroom from a teacher-oriented to a more student-oriented model. An active learning method often includes group work, case studies, problem-based learning, flipped classroom and use of digital, e.g. games, simulations tools etc.

3. Methodology to identify similar curricula and "best practices"

3.1 Initial study – identification of relevant MSc programs for the SSNS MSc curricula

Similar curricula and best practice was identified among European countries by desktop research after dividing Europe into three different regions. Region 1 covered Scandinavia and Eastern Europe (herby donated as **R1**), whereas region 2 and region 3 covered UK and Western Europe (herby donated as **R2**), and Balkans and the Mediterranean countries (herby donated as **R3**), respectively.

Relevant curriculums were identified by using the academic network of each partner in combination with searching the internet (Norwegian University of Science and Technology, NTNU was responsible for **R1**, whereas University of Sterling, UStir was responsible for **R2** and University of Thessaly, UTH for **R3**, respectively). The identification step started with a broad approach to search for HEIs offering MSc curriculums in aquatic biology, aquaculture, fisheries, food science, food technology, food security and sustainability. In some cases, "blue" biotechnology was as well included. Relevant curricula was thereafter sorted based on region, country and topic. To find the specific relevance of each curricula, all courses was listed and sorted related to the specific subject covered by the course. The lists from all identified MSc programs where thereafter combined to identify repeatedly subjects that could serve as core subjects in the new SSNS curricula.

3.2 Survey to find "best practice" for the new SSNS MSc curricula

Based on the initial mapping, a questionnaire was developed and distributed among academic staff and coordinators of relevant MSc curriculums in Europe (identified in the initial study, n=115) and to Asian partners (n=15). Due to a poor response with less than 30 respondents from the initial chosen group, the survey was expanded to also include academic staff from the Asian region (n>100).
The questionnaire consisted of questions related to teaching experience, teaching subjects, relevant subjects for the SSNS curricula, teaching methodology, learning outcome, employability, skills, strategies and student assessment methodology. For more details about the questionnaire, see Appendix I.

The survey was prepared by using the EyeQuestion® software (The Netherlands) and distributed as an internet link to a predefined list of academics. The survey was active for 4 weeks, and a gently reminder was sent two and three weeks after the link was activated.

3.3 Statistics

Data from the initial study was analyzed by frequency analyses using the SPSS statistics software (release 24, IBM Corporation, USA). To analyze data from the questionnaire, frequency analyses and descriptive statistics was performed using the EyeQuestion® software.

4. Results

4.1 Initial study – identification of relevant MSc programs for the SSNS MSc curricula

Relevant MSc curricula were identified in all three regions within Europe, where 56 HEIs offering 71 relevant MSc curricula was identified (Table 1). Sorted by country, the number of HEIs offering relevant MSc programs can be related to the cost-line, and to the size of the fisheries and aquaculture production in the specific country.

Table 1. Number of HEIs in each region and country identified to offer MSc curricula relevant for the project

Region [1)]	Country	Number of identified HEIs	Number of relevant MSc programs
R1	Norway	5	8
	Denmark	5	7
	Sweden	4	7
	Island	1	2
	Finland	1	1
	Latvia	1	3
	Estonia	1	1
	Lithuania	1	1
	Polen	1	2
R2	United Kingdom	10	11
	France	3	3
	Germany	2	2
	Ireland	1	1
	Belgium	1	1
	The Netherlands	1	1
R3[2)]	Greece	4	5
	Spain	3	3
	Croatia	3	2
	Bulgaria	2	2
	Turkey	4	6
	Portugal	1	1
	Israel	1	1

[1)] **R1**: Scandinavia and Eastern Europe, **R2**: UK and Western Europe, and **R3**: Balkans and the Mediterranean countries

[2)] It is moreover collected information about related research and education in Albania, Montenegro, Slovenia, Cyprus and Egypt but it seems difficult to find information on MSc courses offered about the topic in English.

Sorting identified MSc programs (n=71) based on topics, we found that the relevant MSc programs identified was distributed between 16 different topics. The most dominant topic was *"aquaculture"* with a relative frequency of 26.8% followed by *"aquatic biology"* and *"fisheries"* (12.7 % and 12.7 % respectively). The relative frequency of identified topics are presented in Figure 6.

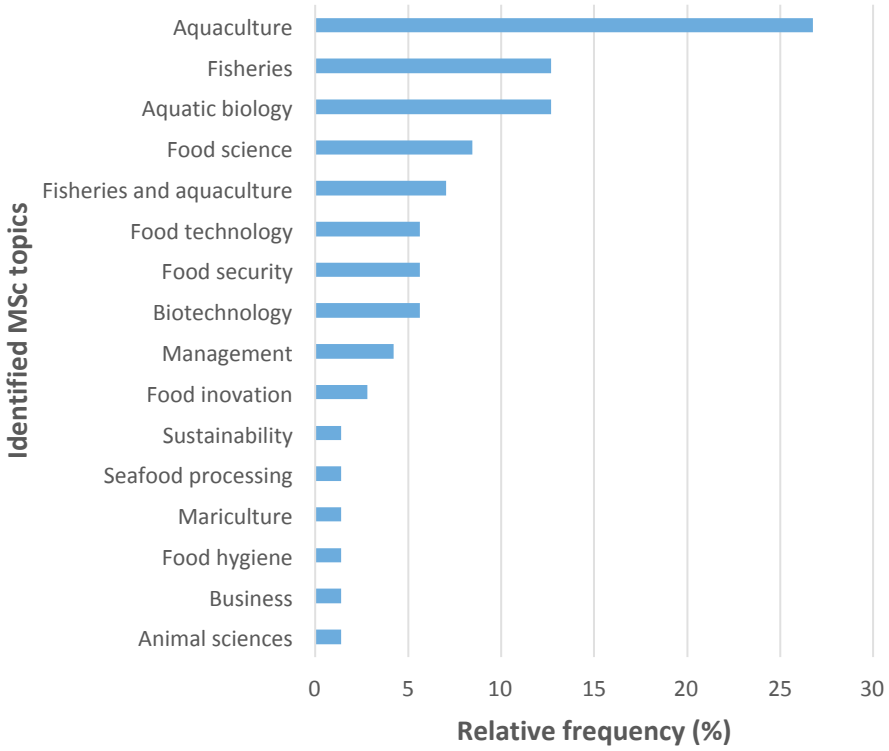


Figure 6. Relative frequency (%) of identified MSc topics in the initial study (n=71)

Among the 71 different MSc programs, we identified more than 600 specific courses. It was however difficult to identify all courses due to limited information available on the webpages of 17 of the 56 identified HEIs. By grouping identified courses into specific subjects, we found 148 different teaching subjects where 76 were given at more than one university, 49 at more than 2 universities and 33 subjects at more than 3 universities. Among all subjects, "aquaculture" had the highest relative frequency with 39.2% followed by management and ecology with a relative frequency of 21.6 and 16.9%, respectively (Figure 7). A list of subjects given by one, two or three different universities are presented in Table 2.

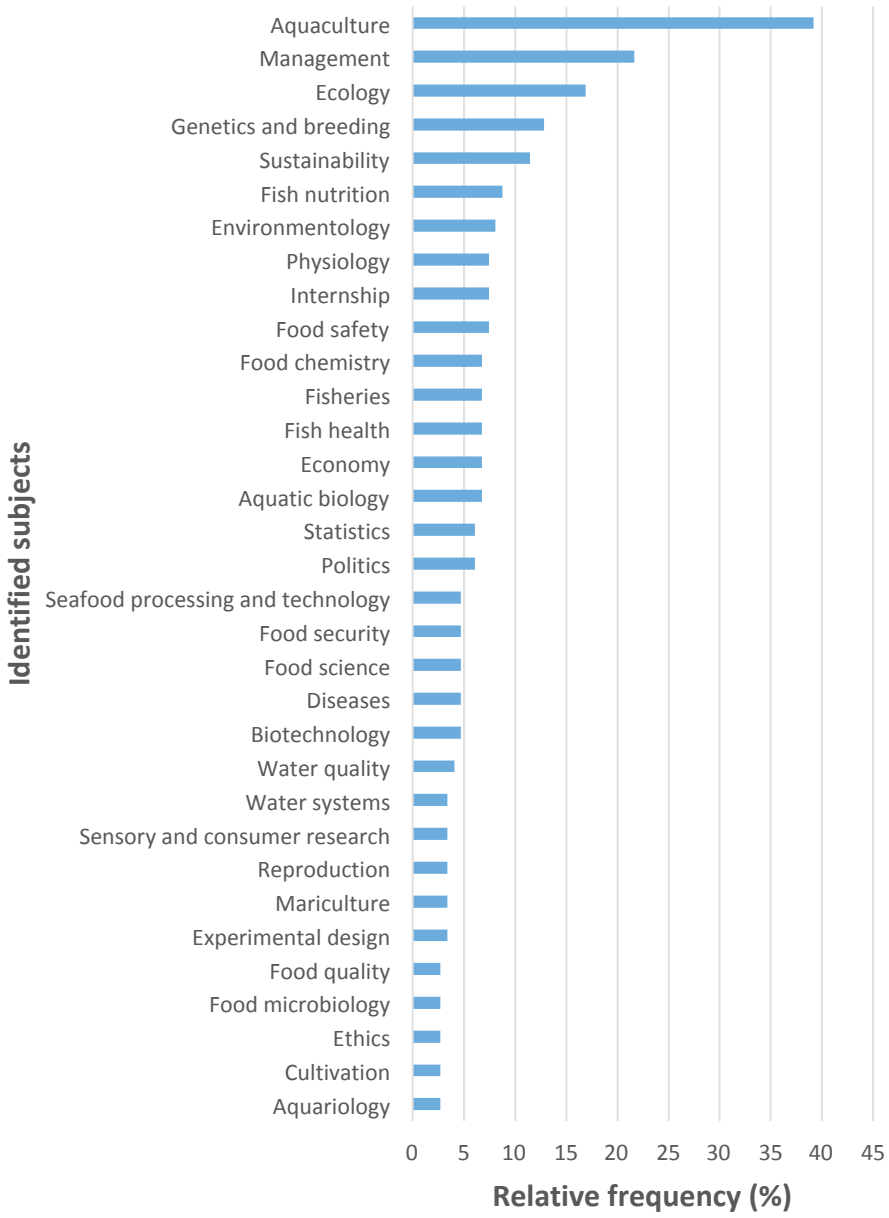


Figure 7. Identified subjects given by three or more universities (n=148)

Table 2. Identified subjects given by one, two or three of the investigated universities

Frequency	List of identified subjects
3	algae; biodiversity; crustacean; fish welfare; food engineering; ichthyology; laboratory activity; language; larviculture; marketing; microbiology; modelling; pathology; recirculation systems in aquaculture; seafood science; toxicology
2	anatomy; angling; catching technology; cephalopod; digitalisation; employability; entrepreneurship; food production; food security and sustainability; food systems; food technology; freshwater aquaculture; freshwater fisheries; GIS; immunology; industrial framework; microbial ecology; oceanography; organic aquaculture; processing technology; seafood quality; tropical aquaculture; unit operations; water chemistry
1	analyses of biological data; analytical methods; animal science; aquaponics; aquatic chemistry; aquatic invertebrates; aquatic plants; aquatic resources; artemia; bioactive food components; biology; biomass detection methodology; biomedicine; bioreactors;

bioresources; careers; cell biology; census techniques; clam culture technology; conservation biology; costal planning; crab culture; dissertation; ecotoxicology; embryology; enzyme technology; epidemiology; ethology; evolution; feed supplements; feeding; fermentation; food supply chain; fresh water monitoring; freshwater cultivation; green chemistry and biotechnology; health, safety and environment; histopathology; human nutrition; hygiene; landscaping; life science; limnology; malacology; marine invertebrate; marine planning; mechanics; media; metabolic systems; molecular biology; molecular nutrition; natural products; omics; packaging; paper writing; plankton; pollution; probiotics; process engineering; product design; product development; productivity; quality management; shellfish farming; sociology; soil science; surface and colloid chemistry; systematics; teamwork; technology transfer; theoretical skills in marine science

4.2 Survey to find "best practice" for the new SSNS MSc curricula

The survey was based on 49 respondents (39% females and 61% males) with 17 different nationalities represented (9 from Europe and 8 from Asia), where 30 of the respondents worked in Europe and five practice their work in a foreign country. The age distribution among the participants was; less than 30 years old (10%), 31-40 years old (14%), 41-50 years old (31%), 51-60 years old (31%) and more than 60 years old (14%). 88% of the participants have a PhD degree, and 10 and 2% have MSc and BSc degrees, respectively. All academic positions was represented among the panelists, and the distribution was; Lecturer (18%), Senior lecturer (4%), Assistant professor (16%), Associate professor (29%), Professor (18%) and Emiritus professor (2%).

4.2.1 Teaching experience

The responsibility within teaching perspective, and years in the respective position is presented in Table 3. For participants who stated themselves as course directors the average number of years in that position was 17. Among the teaching staff, it was lower with an average of 13 years.

Table 3. Responsibility within teaching perspectives and years in the respective position

	%	0 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	>30
Course Directors	39	16%	4%	25%	13%	8%	0%	4%
Taching staff	61	15%	18%	28%	26%	0%	8%	5%

4.2.2 Use of time

The respondents differs in how they are ballancing their time between research and teaching with an average distribution of 53 and 47%, respectively. Among the panelists, the time used for teaching was found to be between 10 and 100%. The participants did moreover report that they use 50, 25 and 18% of their time used for teaching on the BSc, MSc and PhD level, respectively. The last 7% of the available time was reported to be used to teach professional development courses.

4.2.3 Frequently taught subjects among the participants

The most frequently taught subjects by the respondents was "aquaculture", "seafood production and seafood science" together with "sustainable management of resources". The frequency of subjects that the participants are involved in, are presented in Figure 8.

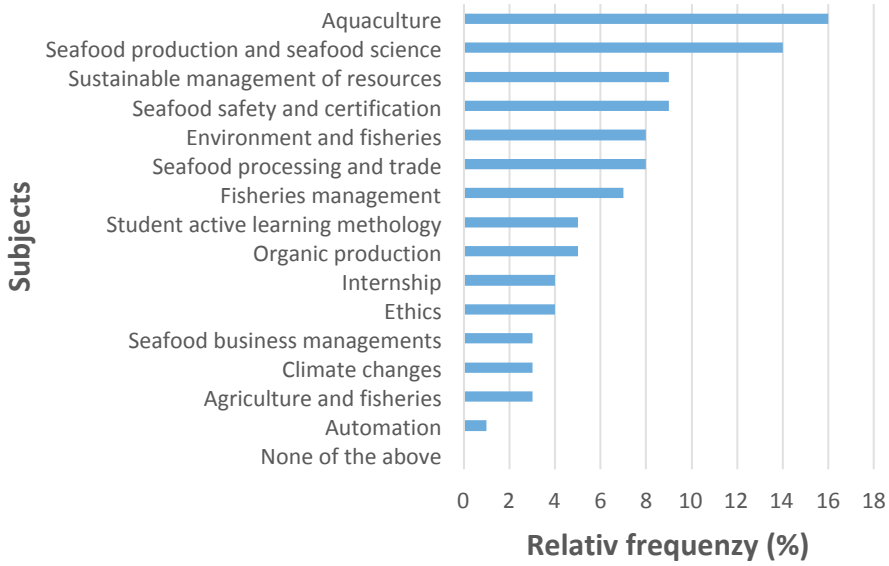


Figure 8. Subjects that the participants are involved in (n=49)

4.2.4 Potential subjects for the SSNS MSc curricula listed by the respondents

Among the potential subjects presented in the survey, the 15 highest ranked subjects are listed in Table 4. For the full list se Appendix II. The three highest ranked subject was found to be "food safety", "seafood quality" and "food security". This indicate the importance of good quality seafood that is safe for the consumers. It is moreover important to utilize marine resources in a sustainable manner to produce food.

Table 4. Thematic subjects (top 15) that is chosen as relevant for the SSNS MSc curriculum (presented in decreased order, all values are presented in %, n=49). For the complete list se Appendix II.

Subjects	To a high degree		Average		To a low degree	Not relevant
Food safety	73	7	7	9	5	0
Seafood quality	66	14	7	7	7	0
Food security	52	20	11	11	5	0
Aquatic animal Health control	50	20	14	7	9	0
Seafood certification	50	20	14	7	9	0
Food sustainability	50	20	9	9	11	0
Aquatic Production systems	48	23	14	9	5	2
Fish nutrition	45	20	16	11	5	2

Food processing	43	25	11	9	9	2
Food technology	39	23	11	16	9	2
Fish farm management	39	20	14	9	16	2
Feed formulation and feed resources	36	14	20	16	11	2
Food microbiology	34	23	20	9	9	5
Food chemistry	32	23	16	9	14	7
Food engineering	32	16	18	18	11	5

4.2.5 Teaching methodology to increase employability and student learning

The panellists selected “Dissertation research project in collaboration with industry”, “Case studies” and “Laboratory work” to be most important in an employability perspective (Table 5). In a learning perspective (Table 6) both “Dissertation research project in collaboration with industry” and “Laboratory work” were listed among the top three teaching methods. In addition, the panellist listed “Problem - based learning, PBL” as a relevant teaching method. On the opposite end of the list “Flipped classroom” and “On-line learning” were found to be poor teaching methods to increase the employability whereas “Flipped classroom”, “On-line training” and “Spontaneous examination” was found to be poor methods regarding the learning outcome.

Table 5. Teaching methods in higher education identified to be effective from an employability perspective (presented in decreased order, all values are presented in %, n=49)

Teaching methods	**To a high degree**		**Average**		**To a low degree**	**Not relevant**
Dissertation research project in collaboration with industry	86	10	0	5	0	0
Case studies	62	19	12	7	0	0
Laboratory work	55	29	10	5	2	0
Visits to industrial facilities	55	24	12	7	2	0
Problem - based learning, PBL	50	24	17	10	0	0
Internship	55	26	7	5	5	2
Fieldwork	45	31	12	7	2	2
Lectures by academic staff	31	21	31	5	12	0
Self-learning and presentation	26	36	10	10	14	5
Take home - group work	17	36	21	14	12	0
Take home - individual work	17	26	31	14	10	2
Flipped classroom	10	24	45	7	5	10
On-line learning	17	24	24	14	17	5
Other methods	5	7	10	0	5	74

Table 6. Teaching methods in higher education identified to be effective from an learning perspective (presented in decreased order, all values are presented in %, n=49)

Teaching methods	To a high degree		Average		To a low degree	Not relevant
Dissertation research project in collaboration with industry	81	12	2	5	0	0
Problem - based learning, PBL	57	29	10	5	0	0
Laboratory work	64	21	7	2	5	0
Case studies	64	17	10	10	0	0
Visits to industrial facilities	55	24	10	10	2	0
Fieldwork	55	26	10	5	2	2
Internship	50	19	17	7	5	2
Lectures by academic staff	36	21	31	2	10	0
Giving weekly assignments	26	26	31	5	10	2
Flipped classroom	14	33	29	5	10	10
On-line training	17	26	24	17	17	0
Spontaneous examination	10	26	26	7	26	5
Other methods	5	2	12	2	0	79

4.2.6 Digital tools to increase student learning

Digital tools in higher education are a priority area in the HEI sector and can be used to increase the learning outcome. The panellists listed the use of software and video to be of most importance to increase learning in higher education (Table 7). In the opposite end, “VR technology”, “Moodle” and “Social media groups” were listed.

Table 7. Relevance of digital tools in higher education (presented in decreased order, all values are presented in %, n=49)

Subjects	To a high degree		Average		To a low degree	Not relevant
Software (e.g. design and statistical tools)	31	36	19	12	2	0
Use of videos from the industry	29	38	21	5	5	2
Use of videos from academia	29	24	36	7	5	0
Innovative learning facilities/spaces	31	36	19	2	5	7
Simulation tools	24	45	14	5	5	7
Learning platforms (e.g. It`s learning, Blackboard, Fronter)	21	26	29	5	12	7
Virtual learning environment (VLE)	21	38	10	10	10	12
VR technology	17	29	19	10	7	19
Moodle	21	17	21	17	7	17
Social media Groups	12	12	29	21	14	12
Other methods	7	7	7	2	0	76

4.2.7 Important skills and examination of students in higher education

To succeed in higher education the students need some specific skills. As presented in Table 8, "Willingness to learn", "Problem solving" and "Creative thinking" was listed to be important skills to succeed. It will moreover be important to function well in teamwork and have good initiative and proactive skills. To have computer literacy, or to be ethical or political sensitive seems however to be less important.

Table 8. Important generic skills for graduates to be successful in their occupation (presented in decreased order, all values are presented in %, n=49)

Subjects	To a high degree		Average		To a low degree	Not relevant
Willingness to learn	74	14	7	5	0	0
Problem solving	67	26	2	5	0	0
Creative thinking	67	24	5	5	0	0
Teamwork skills	69	21	5	2	2	0
Initiative / proactive	64	24	7	5	0	0
Critical thinking	67	21	5	7	0	0
Ability to work under pressure	52	29	12	2	5	0
Oral Communication	45	29	21	2	2	0
Independence	40	40	12	0	7	0
Written communication	33	43	14	7	2	0
Self-awareness	43	24	19	12	2	0
Negotiating	31	40	17	12	0	0
Emotional intelligence	31	36	21	7	5	0
Reflectiveness	26	50	12	7	0	5
Computer literacy	21	40	31	7	0	0
Ethical sensitivity	29	31	19	12	10	0
Political sensitivity	5	24	29	26	14	2
Others	2	7	12	0	0	79

Examination and assessment of student is important to evaluate the learning outcome. The panellist in the presented survey listed "Written assignment / thesis / paper", "Presentation followed by questions and answers" and "Evaluation of practical work", to be the best methods to assess the students learning of a subject (Table 9).

Table 9. Best practice to assess the students learning of a subject (presented in decreased order, all values are presented in %, n=49)

Subjects	To a high degree		Average		To a low degree	Not relevant
Written assignment / thesis / paper	57	24	14	5	0	0
Presentation followed by questions and answers	43	31	14	7	5	0
Evaluation of practical work	36	40	14	5	5	0
Written examination	29	31	26	7	7	0

Portfolio assessment	31	33	17	10	5	5
Oral examination	17	29	33	17	5	0
It depends on the topic	36	17	14	10	7	17
Formative assessment	14	36	21	10	7	12
Open book examination	24	19	24	12	14	7

5. Discussion

European HEIs offer a broad selection of relevant MSc programs that can be used to identify core subjects and relevant teaching methodology for the SSNS MSc curricula. The presented study was performed in two parts where the first part was an initial study to identify relevant MSc programs and subjects offered in Europe. The second part was a survey based on a pre-made questionnaire set up to identify "best practice" in teaching and examination methodology and to increase the learning outcome and employability in higher education. In addition, we asked for relevant subjects that could fit the new SSNS MSc curricula.

5.1 Initial study – identification of relevant MSc programs for the SSNS MSc curricula

The initial study identified 56 different HEIs offering relevant MSc programs. The correct number is probably however higher. Three different partners (NTNU, **R1**; UStir, **R2** and UTH, **R3**) performed the study, where all partners seem to have a different approach to the term "relevant MSc programs". This resulted in a more diverse distribution, related to topics, of MSc programs in **R1** compared to **R2** and **R3** (data not shown). The diversity in **R2** was moreover higher than for **R3** where the focus seems to be on MSc programs directly related to aquaculture and fisheries. Despite of regional differences, caused by the different approach to the term "relevant MSc programs", we decided to use all collected data in this study. As presented, MSc programs in aquaculture, fisheries and aquatic biology are predominant (Figure 6), which indicated that the selection of MSc programs in the initial study was highly relevant for the SSNS project.

The broad variety of courses (n>600) offered by the different MSc programs (n=71) gave challenges related to subject clustering. By clustering the different courses, we ended up with 148 different subjects where five subjects have a relative frequency of 10% or higher (Figure 7). These subjects were aquaculture, management, ecology, genetics and breeding, and sustainability. All these subjects seem therefor to be of interest for the SSNS MSc curricula, but other aspects as well has to be considered. It is however several interesting subjects with a relatively low frequency in this study. That can probably be explained by the diversity in MSc programs included in this study and the clustering process. Several MSc programs offer highly specific courses that is difficult to cluster together with comparable subjects.

5.2 Survey to find "best practice" for the new SSNS MSc curricula

The result in this survey indicated an uneven gender distribution among the participants, where males were found to be dominant (61%). The gender distribution was however found to be normal for the sector (Eurostat, 2017). The age of the participants was normally distributed within the expected range. The majority of the participants was between 41-60 years old

(62%) which reflected the experience of the participants as course directors and teaching staff (17 and 13 years, respectively).

5.2.1 Potential subjects for the SSNS MSc curricula

The SSNS MSc curricula aim to increase the knowledge of sustainable seafood and nutrition security. An increasing population and a growing demand for food has put additional pressure on natural resources. Mitigation through more inclusive approaches is needed to enhance food security, and promote the sustainable management of natural resources, with fisheries and aquaculture playing an important role (FAO, 2012). The worldwide production from marine capture fisheries has during the last decades remained stable. Increasing demand has therefore been met by a robust growth in aquaculture production (FAO, 2010; Nadarajah and Flaaten, 2017). In spite of that, to meet the increased demand for seafood, it will be important for the SSNS MSc curricula to focus on subjects that support growth in aquaculture. The list presented in Table 4 includes several critical subjects that is important to support growth in aquaculture. Some subjects to be mentioned are; aquatic animal health control, food sustainability, aquatic production systems, fish nutrition, fish farm management, and feed formulation and feed resources. It will moreover be important to increase the knowledge of food safety and food security. Utilization of the raw material is a key to succeed in production of sustainable seafood. Since 2000, the use of wild fish inputs in the production of farm raised fish outputs, also known as the Fish In: Fish Out (FI:FO) ratio, has been a primary concern of the sustainability dialogue surrounding aquaculture production. Far less attention has been placed on the sustainability of downstream processing, including how by-products are managed (Stevens, et al., 2018). Supporting the movement towards the full utilization of by-products, the paper by Stevens, et al. (2018) goes a step further by emphasizing the need to maximize their use in human consumption and select animal feeds, highlighting the economic, food security, and environmental benefits of doing so. The utilization of by-products was by a mistake not listed as a subject in the survey. Utilization of by-products will however be highly relevant to meet the consumers demand for food security and sustainability of the sector. Among the topics listed in Table 4, several topics related to downstream processing were ranked as important for the SSNS MSc curricula. The highest ranked subjects related to downstream processing was food safety, food processing, food technology and food engineering.

5.2.2 Teaching methodology to increase employability and student learning

In general, the survey gave a clear guideline to define “best practice” regarding teaching methods to increase employability and learning. Active teaching methods were in generally regarded as the best practice. Regarding active learning, Freeman, et al. (2014) performed a meta analysis of 225 studies, comparing student performance in undergraduate science, technology, engineering, and mathematics (STEM) courses under traditional lecturing versus active learning. They found that average examination scores were improved by about 6% in active learning sections. They also reported that students in classes with traditional lecturing were 1.5 times more likely to fail than among students in classes with active learning.
The respondents of the survey ranged “dissertation research project in collaboration with industry” as the best teaching methodology to increase learning and employability. This is in

agreement with Kilgo, et al. (2015). They found that undergraduate research had positive effects on student's capability of critical thinking, investigation and lifelong learning. Toland (2011) pointed out that Teaching outbreak investigation to undergraduate Food technologists the number of academic instructors with experience from industry is declining, and one way to handle this gap is through tight collaboration with industry. Toland further advised to bring industrialist and business people into teaching at the university. Karlsen, et al. (2015) used this approach teaching outbreak investigation to undergraduate food technologists. The external lecturer brought first-hand realism into the classroom and a majority of the students believed that what they have learned in this module would be useful in a future work situation.

Surprisingly, only 50% of the panellist scored "Internship" as a method that to "a high degree" contribute as an effective teaching method to increase learning and employability. According to the CareeEDGE model of Pool and Sewell (2007) work-related experience enhance the graduates level of employability.

"Flipped classroom" and "on-line training" was found to be poor methods regarding employability and learning outcome. "Flipped classroom" is a method that reverses the traditional learning environment by delivering instructional content, often online, outside of the classroom. It normally moves activities, into the classroom. In this survey, the teaching methods "case studies" or "problem based learning" are identified as methods to enhance learning and employability. Hence, the result may be a consequence of different interpretation among the panellists. Strayer (2012) stated that students in the flipped classroom were less satisfied with how the classroom structure oriented them to the learning tasks in the course, but they became more open to cooperative learning and innovative teaching methods. The method require highly self-regulated students as it is expected that they are prepared before the joint activities, and motivated for active participation in activities. However, according to O'Flaherty and Phillips (2015) flipped class has the capacity for building lifelong learning skills .

5.2.3 Digital tools to increase student learning

The primary factors behind using online learning and digital tools are not only to improve access to education and training, and quality of learning, but also to reduce the cost and improve the cost-effectiveness of education (Bates, 1997). In this report however, online learning and digital tools are only discussed based on quality of learning.
Haelermans (2017) stated that Information and Communications Technology (ICT) in education can be effective, although the effectiveness of ICT in education is primarily dependent on the way ICT is implemented, how ICT is used, and on the types of learning for which ICT in education is used (the easier to automatize skills). Therefore, when ICT is used in schools, it is not only important to ensure that ICT is used at all, and that school leaders and teachers see the need of ICT and feel confident in using it, but also that it is used in an effective way. Simply having access to ICT in education will not necessarily lead to an effective use of ICT in education (Haelermans, 2017). It is also important to see ICT as a tool, and not as a goal in itself.

Results from the survey did not give any clear guidelines to define “best practice” regarding the use of digital tools in higher education. The use of specific software or video from both industry and academia was however listed on top whereas VR technology, Moodle, and Social media groups were found to have less impact. Since the survey did not state any clear trends, we have to include relevant literature to find “best practice”. Both Innovative learning facilities/spaces and Virtual learning environment (VLE) are known to increase the learning outcome (Komulainen, et al., 2015; Panigrahi, et al., 2018). Findings in a study by Wells, et al. (2008) do state that students openly embraced the VLE and support its adoption in higher education. The students may however appear unwilling to actively participate in two□way online activities (Wells, et al., 2008). Lack of a two-way participation in online activities is often stated as a challenge due to lack of gesturing. The effect of gesturing was in a meta-analysis by Davis (2018) found to be significant and should not be underestimated. In the mentioned study, gesturing was fond to have a small-to-medium impact on near transfer of knowledge and on the retention of learning.

The learning outcome as effected by online learning is reviewed by Panigrahi, et al. (2018). They concluded that both personal and environmental factors in online-training affect the learning outcome. Student engagement was found to be one of the key antecedents that predicts learning outcome, and factors such as motivation, type of focus and design interventions do affect the student engagement. Students engagement was also mentioned by Norwegian Ministry of Education and Research (2017) to be important for students to succeed. These factors should therefore be considered by the stakeholders to foster engagement while focusing on the learning outcome. When students learn over the internet in an online learning medium, the virtual competency plays an essential role in determining the learning effectiveness. In addition to this, the team collaboration, team cohesion, and team technology used, define the performance of each individual in a team (Panigrahi, et al., 2018).

To define “best practice” it is important to keep in mind that the use of digital tools in higher education has rapidly being accepted, and information technology have in a revolutionizing way, changed the possibilities for how educators do teaching and how students learn. The key to succeed will however be affected by the specific digital tool used, the virtual knowledge of the educator, and the digital interaction between the educator and the student, or the student group (Haelermans, 2017). Understanding the antecedents of e-learning adoption, continuance, and learning outcomes in online platforms, are essential in ensuring the successful implementation of technology in learning and achieving the maximum benefits.

5.2.4 Important skills and examination of students in higher education

The survey identified several important skills that the participants found to be important for students to be successful in their occupation. Willingness to learn is close related to the term “engagement” and was highest listed among the skills. A student engagement primarily focuses on the time and effort put by the students on the educational activities to achieve the desired learning outcomes and is considered as a proxy for learning outcomes (Pye, et al., 2015). Creative and critical thinking (listed number three and six, respectively) is a way to problem solving that was ranked as the second most important skill. It is however important to stimulate both creative and critical thinking in an educational context to be successful in

their occupation (Wechsler, et al., 2018). Another important skill is teamwork that demands interpersonal interactions that is essential for an effective cooperation (Panigrahi, et al., 2018). Several methods can be used to assess the students learning outcome. As presented in chapter 4.2.7 written assignment, presentation followed by questions and answers, and evaluation of practical work was listed as number one, two, and three, respectively. By using these methods, the educator has the opportunity to perform a broad assessment of the students based on the learning outcome by evaluating both soft and more technical skills. Formative assessments and open book examination was listed lowest in the survey. By using these methods, it is more difficult to assess the learning outcome due to limited freedom and too much information available, respectively. Based on the results, it seems like written examination/assignment or a kind of presentation or evaluation of practical work can be defined as "best practice" for the SSNS MSc curricula. In addition, the use of digital examination has to be considered. This was however not listed as an option in the survey.

6. Conclusion

Based on the initial study we can conclude that European HEIs offer a broad selection of relevant MSc programs that can be used as inspiration to develop the new SSNS MSc curricula in Asia. The most frequently taught subjects among the identified MSc programs were; aquaculture, management, ecology, genetics and breeding, and sustainability.

Based on the survey and review of literature we concluded that it would be relevant to choose subjects that support sustainable growth in aquaculture. Some specific subjects to be mentioned are; aquatic animal health control, food sustainability, aquatic production systems, fish nutrition, fish farm management, and feed formulation using local feed resources. In addition, several topics related to downstream processing is important. The highest ranked subjects related to downstream processing were food safety, food processing, food technology and food engineering.

It is moreover concluded that active learning methods increase student's employability and the specific learning outcome. It is however difficult to state, "best practice" regarding the use of digital tools. It is therefore necessary to do more research or search relevant literature to make a trustable conclusion regarding the subject. To achieve learning several personal skills are important. Based on the present study we concluded that the willingness to learn was stated as the most important skill. Willingness to learn is close related to the term "engagement" that is familiar with terms such as motivation and personal focus. In addition, active learning methods increase student motivation and engagement.

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Appendix

Appendix I Questionnaire to find “best practice” for the new SSNS MSc curricula

Appendix II Thematic subjects (full list) that is chosen as relevant for the SSNS MSc curriculum

Appendix I

All Questions

This survey is a part of the Erasmus+ project 585924 Curriculum Development for Sustainable Seafood and Nutrition Security / SSNS and all data given will be handled confidential. The survey takes approximately 10-15 min.

The aim of the project is to find best practice to develop a new MSc curriculum focusing on sustainable seafood and nutrition security that should be offered at nine different universities located in Thailand, Vietnam and Indonesia (three in each country). The wider and long-term objective of the project is to make a viable contribution towards achieving sustainable seafood nutrition security in the project region. More specifically the project will have a long-term impact in securing the sufficient, safe, as well as environmentally, social and economically sustainable production of seafood in three of the region´s biggest aquaculture and capture fisheries producing countries.

By answering this survey, you will help us to find the right solution for the new curriculum and to find best practice according to teaching subjects, teaching methodology, important skills, and assessments.

On behalf of the project,
Best regards
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Gender

1 Male
2 Female

What is you age?

1 <30
2 31-40
3 41-50
4 51-60
5 >60

What is you academic position?

1 Emeritus Professor
2 Professor
3 Associate professor
4 Assistant professor
5 Senior lecturer
6 Lecturer
7 Other

If chosen "other", please explain

What is your highest level of education?

1 BSc
2 MSc
3 PhD

What is your country of birth?

In which country are you employed?

What is your responsibility within teaching perspective (please tick both if necessary)?

1 Course director
2 Teaching staff

If you have answered “course director”, what is your number of years in that position?

1 0-5
2 6-10
3 11-15
4 16-20
5 21-25
6 26-30
7 >30

If you have answered “teaching staff”, what is your number of years in that position?

1 0-5
2 6-10
3 11-15
4 16-20
5 21-25
6 26-30

7 >30

How do you balance your time between research and teaching?
(100% teaching means 0% research)
simple slider true 100 Research Teaching 0
On what level do you practice teaching? Please add a percentage indicating on how much of <u>your teaching</u> time that is dedicated to each category?
(The sum should not exceed 100%)

Professional development courses (0-100%)
simple slider true 100
BSc (0-100%)
simple slider true 100
MSc (0-100%)
simple slider true 100
PhD (0-100%)
simple slider true 100

Does any of the courses/subjects you are involved in include (chose as many as required):

1 Seafood production and seafood science
2 Seafood processing and trade
3 Seafood safety and certification
4 Fisheries management
5 Aquaculture
6 Agriculture and fisheries
7 Environment and fisheries
8 Sustainable management of resources
9 Automation
10 Climate changes
11 Seafood business managements
12 Ethics
13 Organic production
14 Internship
15 Student active learning methodology
16 None of the above

Which thematic subjects and technical skills do you think is relevant in a MSc curriculum (120 ECTS credits) focusing on Sustainable Seafood and Nutrition Security?

	Not relevant	To a low degree		Average		To a high degree
Aquatic Production systems	varlabel 6	1	2	3	4	5
Fisheries	varlabel 6	1	2	3	4	5
Larviculture &/ live feeds	varlabel 6	1	2	3	4	5
Fish nutrition	varlabel 6	1	2	3	4	5
Feed formulation and feed resources	varlabel 6	1	2	3	4	5
Fish biology	varlabel 6	1	2	3	4	5
Fish pathology	varlabel 6	1	2	3	4	5
Aquatic animal Health control	varlabel 6	1	2	3	4	5
Aquatic animal welfare	varlabel 6	1	2	3	4	5
Genetics and broodstock management	varlabel 6	1	2	3	4	5
Epidemiology	varlabel 6	1	2	3	4	5
Aquaponics	varlabel 6	1	2	3	4	5
Re-circulation aquaculture systems (RAS)	varlabel 6	1	2	3	4	5
Resources management and biodiversity	varlabel 6	1	2	3	4	5
Ecotoxicology	varlabel 6	1	2	3	4	5
Business management	varlabel 6	1	2	3	4	5
Fish farm management	varlabel 6	1	2	3	4	5
Digital tools for fish farm managements	varlabel 6	1	2	3	4	5
Oceanography	varlabel 6	1	2	3	4	5
Aquatic ecology	varlabel 6	1	2	3	4	5
Food chemistry	varlabel 6	1	2	3	4	5
Food microbiology	varlabel 6	1	2	3	4	5
Food engineering	varlabel 6	1	2	3	4	5
Food technology	varlabel 6	1	2	3	4	5
Food processing	varlabel 6	1	2	3	4	5
Seafood quality	varlabel 6	1	2	3	4	5
Food safety	varlabel 6	1	2	3	4	5
Food security	varlabel 6	1	2	3	4	5
Seafood certification	varlabel 6	1	2	3	4	5
Food sustainability	varlabel 6	1	2	3	4	5
Food chains	varlabel 6	1	2	3	4	5
Entrepreneurship	varlabel 6	1	2	3	4	5
Ethics	varlabel 6	1	2	3	4	5
Consumer research	varlabel 6	1	2	3	4	5
Experimental design	varlabel 6	1	2	3	4	5
Marketing	varlabel 6	1	2	3	4	5
Statistics	varlabel 6	1	2	3	4	5
Politics	varlabel 6	1	2	3	4	5
Internship (with credits)	varlabel 6	1	2	3	4	5
Seminar courses	varlabel 6	1	2	3	4	5
other suggestions	varlabel 6	1	2	3	4	5

If chosen "other suggestions", please explain

According to your expertise, what teaching methods in higher education are most effective from a employability perspective?

	Do not know/not relevant	To a low degree		Average		To a high degree
Lectures by academic staff	1	2	3	4	5	6
Problem - based learning, PBL	1	2	3	4	5	6
Case studies	1	2	3	4	5	6
Flipped classroom	1	2	3	4	5	6
Visits to industrial facilities	1	2	3	4	5	6
Internship	1	2	3	4	5	6
On-line learning & training	1	2	3	4	5	6

Self-learning and presentation	1	2	3	4	5	6
Fieldwork	1	2	3	4	5	6
Take home - individual work	1	2	3	4	5	6
Take home - group work	1	2	3	4	5	6
Laboratory work	1	2	3	4	5	6
Dissertation research project in collaboration with industry	1	2	3	4	5	6
Other methods	1	2	3	4	5	6

If chosen "other methods", please explain

According to your expertise, what teaching methods in higher education are most effective from a learning perspective?

	Do not know/not relevant	**To a low degree**		**Average**		**To a high degree**
Lectures by academic staff	1	2	3	4	5	6
Problem - based learning, PBL	1	2	3	4	5	6
Case studies	1	2	3	4	5	6
Flipped classroom	1	2	3	4	5	6
Visits to industrial facilities	1	2	3	4	5	6
Internship	1	2	3	4	5	6
On-line training	1	2	3	4	5	6
Fieldwork	1	2	3	4	5	6
Laboratory work	1	2	3	4	5	6
Dissertation research project in collaboration with industry	1	2	3	4	5	6
Giving weekly assignments	1	2	3	4	5	6
Spontaneous examination	1	2	3	4	5	6
Other methods	1	2	3	4	5	6

If chosen "other methods", please explain

According to your expertise, to what extent are the digital tools listed below effective for learning in higher education?

	Do not know/not relevant	**To a low degree**		**Average**		**To a high degree**
Use of videos from the industry	1	2	3	4	5	6
Use of videos from academia	1	2	3	4	5	6
VR technology	1	2	3	4	5	6
Simulation tools	1	2	3	4	5	6
Learning platforms (e.g. It`s learning, Blackboard, Fronter etc.)	1	2	3	4	5	6
Software (e.g. design and statistical tools)	1	2	3	4	5	6
Innovative learning facilities/spaces	1	2	3	4	5	6
Virtual learning environment (VLE)	1	2	3	4	5	6
Social media Groups	1	2	3	4	5	6
Moodle	1	2	3	4	5	6
Other methods	1	2	3	4	5	6

If chosen "other methods", please give examples

According to your expertise, what do you think should be the balance between gaining soft versus technical skills in higher education programmes?

(100% technical skills means 0 % soft skills)
simple slider true 100 Soft skills Technical skills

According to your expertise, to what extent are the generic skills listed below important for graduates to be successful in their occupation?

	Do not know/not relevant	To a low degree		Average		To a high degree
Independence	1	2	3	4	5	6
Emotional intelligence	1	2	3	4	5	6
Ability to work under pressure	1	2	3	4	5	6
Initiative / proactive	1	2	3	4	5	6
Willingness to learn	1	2	3	4	5	6
Reflectiveness	1	2	3	4	5	6
Creative thinking	1	2	3	4	5	6
Oral Communication	1	2	3	4	5	6
Written communication	1	2	3	4	5	6
Critical thinking	1	2	3	4	5	6
Teamwork skills	1	2	3	4	5	6
Problem solving	1	2	3	4	5	6
Negotiating	1	2	3	4	5	6
Computer literacy	1	2	3	4	5	6
Ethical sensitivity	1	2	3	4	5	6
Political sensitivity	1	2	3	4	5	6
Self-awareness	1	2	3	4	5	6
Others	1	2	3	4	5	6

If chosen "others", please describe

According to your expertise, what method of assessment is best practise to assess the students learning of a subject?

	Do not know/not relevant	To a low degree		Average		To a high degree
Oral examination	1	2	3	4	5	6
Written examination	1	2	3	4	5	6
Written assignment / thesis / paper	1	2	3	4	5	6
Portfolio assessment	1	2	3	4	5	6
Formative assessment	1	2	3	4	5	6
Multiple choice	1	2	3	4	5	6
It depends on the topic	1	2	3	4	5	6
Presentation followed by questions and answers	1	2	3	4	5	6
Open book examination	1	2	3	4	5	6
Evaluation of practical work (e.g. lab analysis, field work & etc.	1	2	3	4	5	6
Spontaneous examination	1	2	3	4	5	6
Other methods	1	2	3	4	5	6

If chosen "other methods", please explain

To what extent are teaching methodology (e.g. student active learning methodology) in the country you are employed implemented in the educational strategy on the...

	Do not know/not	To a low	Average	To a high

	relevant degree					degree
National level (Government strategy)	1	2	3	4	5	6
State / provincial level	1	2	3	4	5	6
University level (main strategy)	1	2	3	4	5	6
Department level (department strategy)	1	2	3	4	5	6

What is the age of your institution/university?

1 <10
2 11-20
3 21-40
4 >40

What is the size of your institution/university (approximately number of staff members)?

1 >100
2 101-200
3 201-400
4 >400

What is the size of your department (approximately number of staff members)?

1 <30
2 31-60
3 61-100
4 >100

Thank you for your contribution!

Appendix II

Thematic subjects (full list) that is chosen as relevant for the SSNS MSc curriculum (presented in decreased order, all values are presented in %, n=49)

Subjects	To a high degree		Average		To a low degree	Not relevant
Food safety	73	7	7	9	5	0
Seafood quality	66	14	7	7	7	0
Food security	52	20	11	11	5	0
Aquatic animal Health control	50	20	14	7	9	0
Seafood certification	50	20	14	7	9	0
Food sustainability	50	20	9	9	11	0
Aquatic Production systems	48	23	14	9	5	2
Fish nutrition	45	20	16	11	5	2
Food processing	43	25	11	9	9	2
Food technology	39	23	11	16	9	2
Fish farm management	39	20	14	9	16	2
Feed formulation and feed resources	36	14	20	16	11	2
Food microbiology	34	23	20	9	9	5
Food chemistry	32	23	16	9	14	7
Food enginering	32	16	18	18	11	5
Fisheries	32	14	18	18	11	7
Seminar courses	30	36	11	9	11	2
Internship (with credits)	30	27	16	11	11	5
Re-circulation aquaculture systems (RAS)	30	16	25	9	9	11
Fish pathology	27	25	20	16	9	2
Aquatic animal welfare	27	25	16	7	20	5
Resources management and biodiversity	27	18	20	20	9	5
Consumer research	25	32	16	11	14	2
Genetics and broodstock management	25	25	23	14	9	5
Statistics	25	25	20	16	11	2
Entrepreneurship	25	20	18	20	11	5
Larviculture / live feeds	25	18	16	18	18	5
Marketing	23	27	23	14	11	2
Ethics	23	16	25	14	18	5
Experimental design	18	23	25	16	16	2
Epidemiology	18	23	18	18	14	9
Business management	18	23	16	18	20	5
Fish biology	18	14	23	18	20	7
Food chains	16	39	18	14	11	2
Ecotoxicology	16	30	14	11	18	7
Digital tools for fish farm managements	16	23	18	14	25	5
Aquaponics	9	25	23	16	14	14
Aquatic ecology	9	23	18	14	23	14
Politics	9	14	27	11	16	23
Oceanography	7	14	9	14	39	18
other suggestions	7	14	5	7	5	64