

## **Erasmus + Project App\_Healthy\_Fish: An Application for Innovative Tools (App for Mobiles and Tablets) That Qualifies the Staff on Health and Welfare of Fish in the Aquaculture Farms**

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**Abstract:** The app HEALTHY\_FISH is an ERASMUS+ project led by the Spanish Marine Fish Farming Association (APROMAR) in collaboration with four partners: SGS Tecnos (Spain), the Italian Aquaculture Association API (Associazione Piscicoltori Italiani), (Dokuz Eylül University, Institute of Marine Sciences and Technology (DEU-IMST) and the Croatian Chamber of Economy (CCE). The objective of this project is to develop an education program for the aquaculture industry that is standardized at the European level and designed for cell phones and tablets. Therefore, this project signifies an important innovation from a technological point of view. Before designing the training program, each partner conducted a survey to determine the training and skills needed for adequate management. Each partner of the project tested the “Application Prototype” with the professionals in the aquaculture industry in their country, setting out the deficiencies and improvements in terms of innovation, training and usability. *This project is supported by the European Union's Erasmus + program.*

**Key words:** Aquaculture, training, fish welfare, mobile application

### **Erasmus + Projesi App\_Healthy\_Fish: Balık Çiftliklerinde Balık Sağlığı ve Refahı için Çiftlik Personelinin Beceri ve Deneyimlerini Yükseltmek Amaçlı İnovatif Ürünler (Cep Telefonu ve Tabletler) için Yeni Uygulamalar**

**Özet:** App\_HEALTHY\_FISH, İspanyol Deniz Balık Çiftliği Birliği (APROMAR) liderliğinde ve diğer dört ortağın katıldığı ERASMUS + programı kapsamında yürütülmekte olan bir projedir. Proje ortakları SGS Tecnos (İspanya), İtalyan Su Ürünleri Birliği API (Associazione Piscicoltori Italiani), Dokuz Eylül Deniz Bilimleri ve Teknolojisi Enstitüsü (DBTE) ve Hırvatistan Ekonomi Odası (CCE)'dir. Projenin amacı, su ürünleri yetiştiriciliği sektörüne yönelik cep telefonu ve tabletler için tasarlanmış, Avrupa düzeyinde standartlaştırılmış bir Eğitim Programı geliştirilmesidir. Bu yüzden bu proje teknolojik bakış açısıyla önemli bir yenilik sunmaktadır. Eğitim programını geliştirmeden önce her bir ortak, akuakültür çiftliklerinde yeterli yönetim için ihtiyaç duyulan eğitimler ve yetenekleri tespit etmeye yönelik anket çalışması gerçekleştirmişlerdir. Yürütülmekte olan bu projenin her ortağı bu 'Aplikasyon prototipi'ni, kendi ülkelerindeki akuakültür sektöründeki profesyoneller ile birlikte test ederek inovasyon, eğitim ve kullanılabilirlik açısından eksiklikleri ve

iyileştirmeleri belirlemiştir. *Bu proje Avrupa Birliği Erasmus +programı kapsamında desteklenmiştir.*

**Anahtar kelimeler:** Akuakültür, eğitim, balık refahı, mobil uygulama

## 1. Introduction

Knowledge has obviously constituted the cornerstone for all development efforts within aquaculture in Asia and elsewhere, past and present. Today's digital natives, a term often used to describe the present generation, are technology savvy with instant access to information and knowledge through the internet and various digital devices such as personal computers (pc), mobile phones, tablets etc. Aquaculture, as with all sciences, cannot escape this new digital age. In order to improve the way that knowledge and information are managed and shared in Europe, communication between the different actors within and affecting the aquaculture sector is very important (Subasinghe et al, 2010). In the field of aquaculture, innovation in research and technological developments (R&D) fall under one of the following four categories:

- R&D achieved in institutes and universities
- R&D achieved in corporate structures
- R&D achieved on a farm
- R&D originating from another field but suitable for application within aquaculture (Subasinghe et al, 2010).

Over time, fish farming in Europe has greatly benefitted from R&D. Examples include; husbandry of a larger selection of fish species, improvements in cage and tank design, better water recirculation technology, more efficient feed distribution systems and farm management software enhanced with system technology. R&D generated knowledge has traditionally been disseminated through networks such as; scientific journals, scientific meetings, conferences, workshops, seminars, association meetings, and industry-organized workshops (Subasinghe et al, 2010). However, in today's digital age there is a need to spread the knowledge through different media as well as update the previously shared knowledge through learning activities. The evolution of Information and Communication Technologies (ICT) provides a good platform from which new approaches for qualified education can be attempted. The Internet is increasingly becoming one of the most important mediums in the world both for learners and educators. Learning resources are continuously made available online in a digital format and these online learning resources may include all kinds of resources including lessons, books and presentations. They may cover any topic including computing, business, art, engineering, technology and agriculture. Various types of organizations may offer digital learning resources in different languages aimed at different learning settings. In summary, the potential of digital resources that can be used to facilitate learning and training, and which are available online, is rapidly increasing (Moises, et al. 2010).

Although there is a lot of knowledge about aquaculture in Turkey and although Turkey boasts an extensive research capacity, there is definitely room for a more sophisticated organization of the efforts put forth, particularly in regard to implementation. In addition, closer interaction with beneficiaries is also sorely needed. R&D activities in aquaculture in Turkey is mostly carried out by University fisheries faculties and the research institutes of the Republic of Turkey Ministry of Food, Agriculture and Livestock. There are 17 fisheries faculties that offer undergraduate and graduate education in aquaculture and aquatic sciences. The Universities also offer MSc and PhD research programs. The Turkish marine aquaculture sector is a very flexible sector with a great desire to be a part of a dynamic and competitive

knowledge-based economy together with Europe. It is felt that such cooperation would bring sustainable economic growth and better job opportunities (Subasinghe et al, 2010).

In this project, 4 countries (Spain, Croatia, Italia and Turkey) aim to create an education program especially designed for aquaculture employees, standardized at the European level and mainly focusing on the common needs for the participating countries. Once developed, it is hoped that the educational program will result in a more professional sector, greater mobility for the staff and also enhanced competitiveness. The use of ICT will surely improve the educational quality of the program and facilitate its access from anywhere.

The overall objective of this project is to develop a “Training Program standardized at the European level for the aquaculture industry”, which includes training modules for the qualification of the professionals. Making use of new technologies, the application (app) was designed on an Open Access Moodle Platform and this app is a support tool for training professionals. The app is compatible with mobile devices (IOS and Android) and is available in English (EN), Turkish (TK), Croatian (HR), Italian (IT) and Spanish (ES). Users may freely access the different modules, participate in a course forum, exchange messages and receive notifications.

## **2. Material Method**

The project consists of 4 work packages (WP)

**WP1:** Management, coordination and evaluation of the project.

**WP2:** Analysis for the development of the European training in the thematic: health and welfare of fish of aquaculture farms.

**WP3:** Development of the “European training program” and creating the “app\_healthy\_fish”.

**WP4:** Dissemination and exploitation of the project and its results.

### **Developing Training Programs:**

The first step in the process was to have all of the partners analyze the training currently provided from the sector, identify needs and evaluate the training requirements required to qualify professionals in health and welfare skills and on physical- chemical controls in their own countries. Based on the conclusions drawn, the partners developed the “Training Program” and an “App Prototype”. Each partner prepared a database of stakeholders and end users for the promotion, dissemination and exploitation of the program and the app. The project will be shared both on within each of the countries and on the European level. To facilitate proper management and further development of the project, five transnational meetings have been planned.

A kick off meeting in Valencia (Spain)

A second transnational meeting in Izmir (Turkey)

A third transnational meeting in Verona (Italy)

A fourth transnational meeting in Zagreb (Croatia)

A fifth transnational meeting in Cadiz (Spain)

During the transnational meetings, the partners, in addition to analyzing, planning and evaluating the project, will go on field visits to aquaculture facilities in the area.

The app\_HEALTHY\_FISH project commenced with the task of analyzing the current status of knowledge and education on aquaculture in each of the partner countries. A “Quantitative Study” was therefore conducted by each of the 4 participating countries. This study aimed to analyze the following items; training given at present in aquaculture farms, typology (classroom, theoretical, practical ...), duration, forming entities (authorized ....) and teacher profiles. The needs of the sector were also sought determined through this study (the

well-being and health of the fish, physicochemical variables to analyze, terms of sampling and measurement parameters, developing protocols for physical and chemical analysis, determination of correctives measures, development of Health Programs for farms, diagnosis of common diseases, veterinary treatments). In addition, the characteristics, particularities and difficulties identified for each country were studied. The template for the “Quantitative Study” is shown in Figure 1.

TEMPLATE:				
QUANTITATIVE STUDY TO ANALYZE THE KNOWLEDGE NEEDED TO QUALIFY THE AQUACULTURE FARMS STAFF				
Country (please, write it in the row)				
Aquaculture sector (please, write it in the row)				
Profile (please, select with a "X" when corresponding and/or describe it in the row)	Aquaculture Farm employees: ...	Aquaculture Farm Company: ...	Training Entity: ...	Other (specify which): .....
Training (please, select with a "X" when corresponding and/or describe it in the row)	Formal Training (Official): ...		Official Body that regulates this training: .....	
	Non Formal Training Entities description: .....			
	Non Formal Training:		Non Formal Training Entities description: .....	
Trainer's Profile (please, describe it in the row)	REQUIREMENTS DESCRIPTION			
	Academic experience:	.....		
	Professional experience:	.....		
	Other capacities/knowledge:	.....		

Figure 1: Template of the “Quantitative Study”

Table 1 shows the methodology for developing the training program.

According to the Quantitative study, a report was prepared by each of the partner countries. This paper summarizes all the answers collected from the reports as well as an analysis of the current education level of each country. While preparing this paper, required training contents was identified and partner countries created a complete training program composed of 11 training modules. The distribution of the training modules was agreed upon by all of the partners. Together it was decided that some new content should also be included such as biosecurity and certain health and welfare aspects. The training program is available in paper format at <http://www.apromar.es/healthyfish>. It is available in 5 languages: ES, IT, TK, HR and EN. The APP was designed on an Open Access Moodle Platform using evaluation questionnaires existing within the Moodle modules. The evaluation questionnaires were designed to conform to the following criteria;

- Multiple choice questions (4 options with one correct answer).
- A minimum of 30 questions per module (out of which 10 will randomly be asked randomly for each attempt)
- Only text based questions –no images-
- The questions should cover all the different sections of the module equally.

Table 1: Methodology of developing training program

Tasks	Outputs	Reports
Analysis of the knowledge needed to	Individual conclusion report	R1

adequately manage the health and welfare of the fish in aquaculture farms	Final joint report	R2
Study to improve current training contents with new and updated contents	Individual conclusion report	R3
	Final joint report	R4
Routing sheet for the development of the training tool at the European level: "Healthy_fish"	Final IO report	R5

### Assuring quality:

The quality will be checked by way of Pilot Testing of the prototype. Each partner will organize a presentation/training session for 10 students in the project target group. The students are then expected to give feedback about the APP. Each partner will compile this feedback and develop an evaluation report to reflect the results. The project partners will then analyze the reports and apply any corrective measures.

### 3. Results

The app\_HEALTHY\_FISH was designed, developed, tested, implemented and disseminated by the project partners together in the hopes of creating an innovative training program for the digital age. The partners put together a complete training program composed of 11 training modules. From the app, users have access to the different modules, can get on the course forum, write messages and receive notifications. Contents can also be linked to and shared on social networks. Also from the project web site, users can access the education program <http://apromar.es/healthyfishapp/>. Responsible partners are shown in Figure 2. In Figure 3 and Figure 4 shows the Moodle application and web page screen, respectively.

Figure 2: Modules and responsible partners

#	TRAINING MODULE	RESPONSIBLE PARTNER	PARTNER COUNTRIES
1	Technologies and production management of auxiliary cultures	CCE	Croatia
2	Analytical technologies and methods of sanitary control in fish farming	CCE	Croatia
3	Technologies and production management of mollusks	API&APROMAR	Italy&Spain
4	Technologies and production management of crustaceans	APROMAR	Spain
5	Facilities, innovation and systems of automation in fish farming	API	Italy
6	Environmental management of the aquaculture processes	DOKUZ	Turkey
7	Ornamental aquaculture	API&APROMAR	Italy&Spain
8	Project of implementation of a center of aquaculture production	API	Italy
9	Risk management: Chemical and biological hazards	APROMAR	Spain

10	Aquaculture products. Processing trade and Public health	API	Italy
11	Best practices in aquaculture farms	API&APROMAR	Italy&Spain

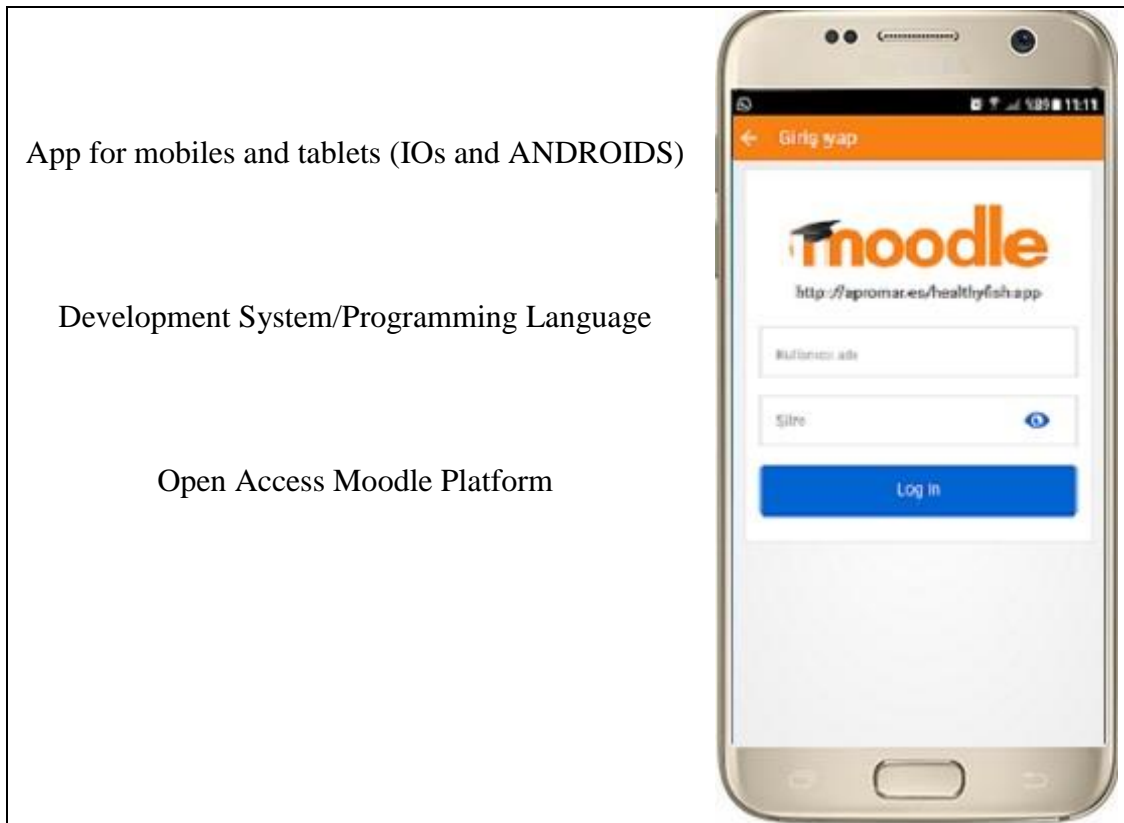


Figure 3: Detailed summary of App for mobiles and tablets

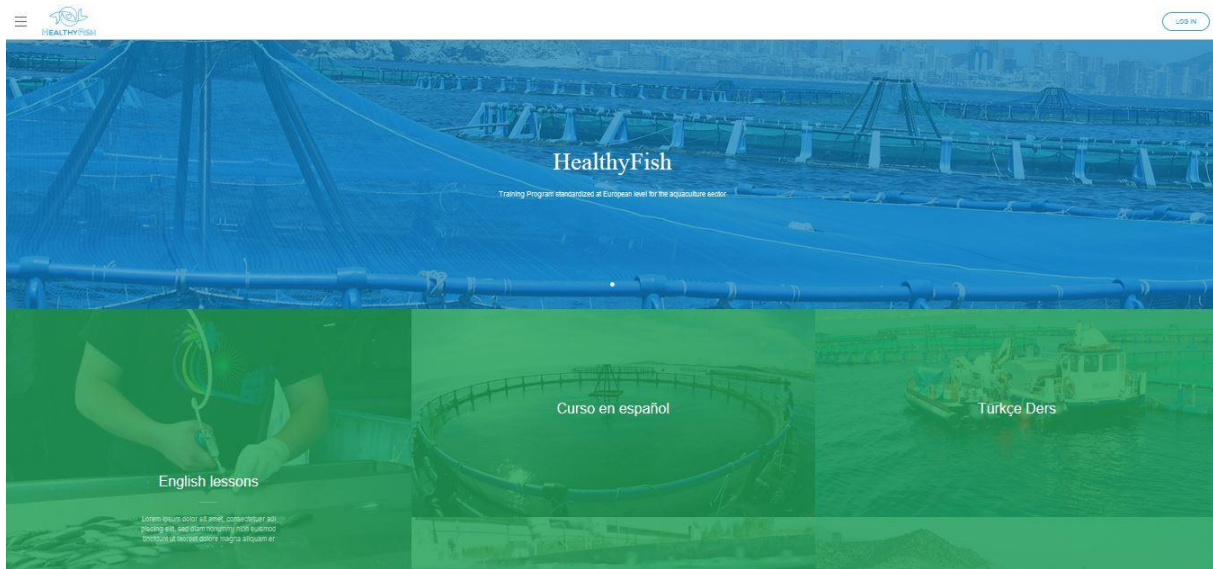


Figure 4: Web site view of the education program.

#### 4. Discussion and Suggestions

Development of new technologies and globalization have affected worldwide industries and economy, therefore there is an increased demand for highly skilled employees (Wang 2012). According to the FAO (UN Food and Agricultural Organization), aquaculture has a great potential to grow and furthermore worldwide aquaculture production must be increased (FAO 2011). For achieving this goal globally, many attempts have to be started, which are mostly related with education and learning systems in response to the demands for human resources in the international aquaculture economy. If the goal is to improve the productivity of aquaculture, the best way to achieve this is the education which will enhance the skills of the farmers and employees in aquaculture sector (Seixaz et al, 2015).

In general aquaculture companies are built away from the centers of the cities. This impedes the mobility of aquaculture personnel because travel to education centers takes time thus, affects the loss of work power. Using asynchronous instruments for training aquaculture personnel will allow employees to study and work at the same time. Electronic learning (E-learning) is the most convenient training method for aquaculture personnel. E-learning is a form of distance learning and gives the users flexibility of choosing how and when to learn, an exceptionally useful opportunity for workers in fish farms located in remote areas.

There are numerous examples in many different countries that are using e-learning technologies for aquaculture sector. For instance, e-learning course for Master's degree in the context of Marine Resources Management by the Open University of Portugal, where the Moodle Learning Management Systems is used as the platform. The other example is e-learning course in Scotland for cold water aquaculture activities, such as rearing salmon. The open source Moodle platform is also used there (Seixaz et al, 2015).

E-learning technologies have removed both physical and geographical barriers by means of Skype meeting, messages and e-mails. Students can now easily reach the instructors. On the other hand, compared to face to face conventional classroom education, on-line interaction is a delayed process. This may cause students to lose some interest or fail to focus in the process. However, aquaculture is a wide range activity around the whole globe and needs new

techniques for dissemination of practical and theoretical knowledge. More rapid and efficient methods of training employees are of great importance. Hence, e-learning offers a good opportunity for this sector.

Traditionally, training within the aquaculture section is given through customary channels of learning in all the partner countries. This fact, as well as the wide geographical dispersion of aquaculture farms (usually located in remote places to boot), impedes the training of the staff. By developing this training program, a solution has been proposed to mediate these weaknesses. The easy access via mobile devices and the user-friendly web sites present a very good opportunity for workers in the aquaculture sector to educate themselves. E-learning is flexible and the information and content can easily and quickly be updated, changed and improved over time. These are some of the reasons why e-learning is often preferred. This education program, which was developed with the aid of ITC, can function as a good example of digital learning within the aquaculture sector for each country.

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