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**The Digital Blue Carrier for a Post-Carbon Future - Curriculum Innovations in Aquaculture [DiBluCa]”**

2023-1-LT01-KA220-HED-000154247

**WP2A3-** Development of Curriculum and training modules  
for Aquaculture Higher Education against global warming  
and overfishing

*Elaborated by UNIDU, Croatia*

*co- UTH, Greece*



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## **1. INTRODUCTION**

The DiBluCa project aims to create an innovative guide and competitive curriculum for higher education in aquaculture and to show how aquaculture can grow in the face of global warming and overfishing.

The Curriculum framework aims to outline the nature and purpose of the degree programmes and focuses on mapping content to learning objectives and learning outcomes, e.g. knowledge, skills and competence, and creates clear and actionable learning outcomes for six modules:

1. Effects of global warming on water quality and impact on aquaculture, VDU, LT
2. Global warming and breeding, biotechnology in aquaculture, ONUT, UA
3. What should change feed and feeding in aquaculture due to global warming, BAUN, TR
4. System selection against global warming in aquaculture, UTH, GR
5. Environmental impacts of aquaculture from global warming perspective, UNIDU, HR
6. Effects of global warming on diseases in aquaculture and protective applications, VDU, LT

## **2. ROLE OF THE CURRICULUM GUIDE**

The subject and the main objective of the project is the preservation of sustainable aquaculture farming against global warming in Europe. The activities of the DiBluCa project aim to reduce the negative impact of global warming on the sustainability of aquaculture production and the environment by empowering participating organisations and participants to advocate for improvements on the topic of climatic change and sustainable aquaculture farming.

The purpose of is to outline the nature and purpose of the study courses for the curriculum on six main topics:

- know the effects of global warming on water quality and the impact on aquaculture
- teach about global warming and farming, biotechnology in aquaculture



- what should feed and feeding in aquaculture change due to global warming?
- how to make system choices against global warming in aquaculture
- teach about the environmental impact of aquaculture with regard to global warming
- what are the effects of global warming on diseases in aquaculture and what protective measures are needed?

In a theoretical sense, the curriculum refers to what is offered in the DiBluCa learning materials and courses. In a broader sense, it encompasses the knowledge, skills and competences that are taught or inculcated in a student.

The curriculum of the course follows the European Qualifications Framework (EQF), which serves as a translation tool between the different national qualifications frameworks and creates transparency and mutual trust in the qualifications landscape in Europe<sup>1</sup>.

## 2.1 DEFINITIONS

„*Learning outcomes*“ are statements of what a learner knows, understands and is able to do when they have completed a learning process; they are defined in terms of knowledge, skills, responsibility and autonomy.

„*Knowledge*“ is the result of acquiring information through learning. Knowledge is the totality of facts, principles, theories and practises relating to a field of work or study. In the context of the EQF, knowledge is described as theoretical and/or factual knowledge.

„*Skills*“ are the ability to apply knowledge and know-how to complete tasks and solve problems. In the context of the EQF, skills are described as cognitive (involving logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments).

„*Competence*“ means the proven ability to apply knowledge, skills and personal, social and/or methodological abilities in work or study situations and in professional and personal development.

<sup>1</sup> Additional reading:

<https://europa.eu/europass/en/european-qualifications-framework-eqf>



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The learning outcomes are relevant for levels 5-6 according to the EQF, whereby the learning outcomes are relevant for qualifications:<sup>2</sup>

- advanced knowledge in a field of work or study involving a critical understanding of theories and principles
- advanced skills demonstrating mastery and innovation required to solve complex and unpredictable problems in a specialised field of work or study
- managing complex technical or professional activities or projects, taking responsibility for decision making in unpredictable work or study contexts, taking responsibility for the professional development of individuals and groups

<sup>2</sup> Additional reading:

[https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32017H0615\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32017H0615(01)&from=EN)



### 3. CURRICULUM DEVELOPMENT OF METHODOLOGY

It is crucial to choose the structure and methodology that is most effective for curriculum development to describe, utilise and apply learning outcomes. The aim is to increase the transparency, understanding and comparability of the qualifications for each of the six modules.

This template serves as a guide for the development of the content of the DiBluCa learning materials. In a theoretical sense, the curriculum refers to what is offered in the DiBluCa learning materials and courses, and in a broader sense it encompasses the knowledge, attitude, behaviour, manner, performance and skills imparted or taught to a student. This includes the teaching methods, lessons, assignments, exercises, learning materials, tutorials, presentations, learning objectives, etc.

**Module description:** Explain succinctly what the module is about and how the module as a whole will support student learning. In this part of the syllabus, you can detail the background to the module and its general aims, as well as the prior knowledge that students should have. You can also provide information on how the module relates to the other modules/lectures.

The following questions may help you with this section:

- What is the module about?
- Why is it relevant, interesting or significant?
- What questions does the module answer?
- What is the main argument of the module?

**Learning outcomes:** Specifically, state what you want students to achieve or learn by the end of the module. Using Bloom's taxonomy, you can find verbs that describe student learning<sup>3</sup>. Examples of key words to describe learning outcomes that should be used are:

- Knowledge/Remember: define, duplicate, list, memorise, recall
- Comprehension/Understand: describe, discuss, explain, identify, locate, recognise
- Application/Apply: execute, implement, solve, use, demonstrate, interpret

<sup>3</sup> Additional reading:

<https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/>



- Analysis/Analyse: differentiate, organise, relate, compare, distinguish, experiment
- Evaluation/Evaluating: appraise, argue, defend, judge, select, support, value
- Synthesis/Creating: design, assemble, construct, develop, formulate, investigate.

**Module syllabus:** Highlight the key points of each topic/subject so that students understand what will and will not be covered in the module. The following elements are important:

- What will students learn in the module (i.e., knowledge, skills, attitudes, as opposed to topics)?
- Why is it important for students to learn this?
- How will the module help students develop as scholars, learners and professionals?
- What experiences will students have in the module (e.g. assignments, activities, etc.)?
- What are the teaching methods and how will they support student learning?

**Learning activities:** List the components of the module here (e.g. blended learning, face-to-face, e-learning and work-integrated learning, interactive/3D learning materials, textbooks, experiments, videos, etc.).

Educational activities do not only consist of studying theoretical learning sources. Students must spend a substantial part of the educational activities on practical exercises. Please plan the activities on the topic/subject so that not only the theoretical but also the interactive assessments are covered.





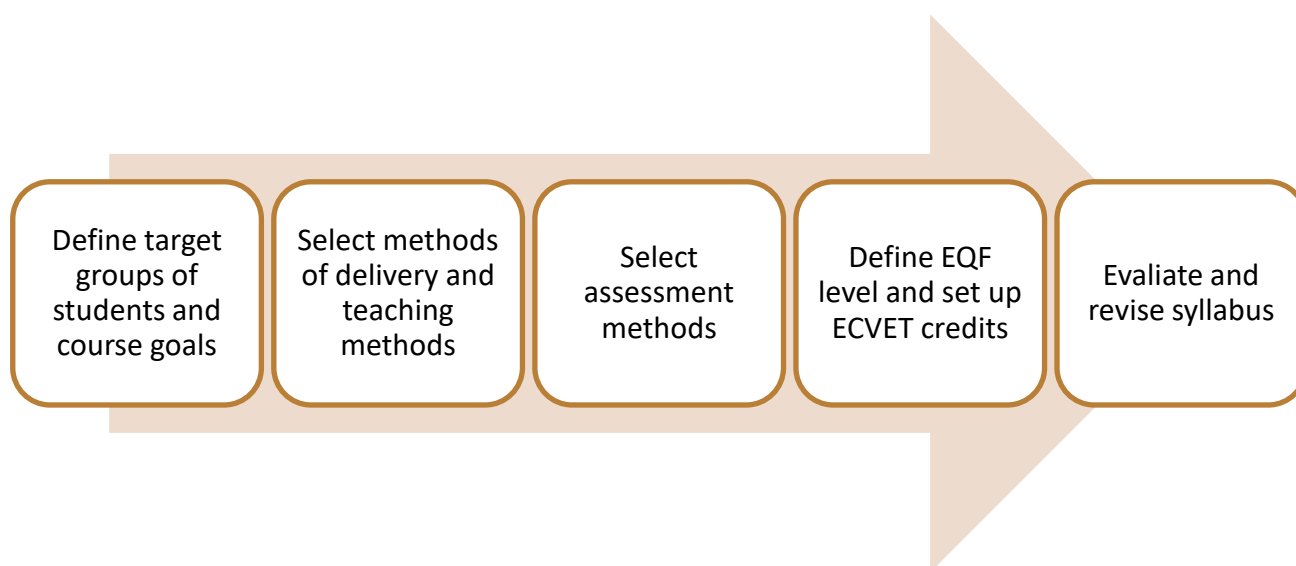
## 4. SYLLABUS DEVELOPMENT

The syllabus is a specific set of module contents and a list of topics covered in the six main modules of the DiBluCa project:

- Effects of global warming on water quality and impact on aquaculture
- Global warming and breeding, biotechnology in aquaculture
- What should change feed and feeding in aquaculture due to global warming
- System selection against global warming in aquaculture
- Environmental impacts of aquaculture from global warming perspective
- Effects of global warming on diseases in aquaculture and protective applications

The syllabus follows the structure and methodology considering factors such as module descriptions, prerequisites, assigned credits, knowledge criteria, learning outcomes and competences or skills.

### 4.1 PROCESS OF SYLLABUS DEVELOPMENT







### ***EQF level***

The EQF aims to link the national qualifications systems of different countries to a common European reference framework. Individuals and employers can use the EQF to better understand and compare the qualification levels of different countries and different education and training systems. Since 2012, all new qualifications issued in Europe include a reference to a corresponding EQF level.

### ***Assessment methods***

The choice of appropriate assessment methods depends on factors such as the intended learning outcomes, the level of study, the target groups of learners and their skills, knowledge and subject areas, the resources available, the way in which the module is delivered, etc. Examples of assessment methods:

- Case studies
- Examination
- Multiple choice tests
- Practical project
- Self-assessment

### ***Learning outcomes of the module***

Learning outcomes describe an intended or observed state, e.g. what students will learn or what students have learnt.

The objective of the program		
Description of the learning outcomes of the study cycle	Expected learning outcomes of the program	Modules
Knowledge and its application (the learner has knowledge:)	1.	
	N	
	N	
Skills and their application (the learner has skills that enable him to:)	N	
	N	
	N	
Competences and its application (the learner has competence of:)	N	



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Specific skills	N	
Social skills	N	
Personal competences	N	

***Module content***

List of topics/subjects with short content/main points

***Recommended or required reading***

List of recommended or required reading

***Language of the module***

Insert language that the course will be taught in and available online in.

***Names of the lectures***

Names of specific lessons that will be covered.

***Supervisor***

Name of supervisor

***Notes***

Any additional or important notes for the syllabus.



### 4.3 STRUCTURE FOR THE MODULE SYLLABUS DEVELOPMENT

MODULE DESCRIPTION				
Title of the module				
Teaching hours				
ECTS				
EQF level				
Mode of delivery				
Short course annotation (up to 500 characters)				
Prerequisites for entering the course				
Module aim				
Links among study programme outcomes, course outcomes, content, study and assessment methods				
Study program outcomes	Module outcomes	Content (topics)	Study methods	Assessment methods
Criteria of learning achievement evaluation				
1.				
N				
Distribution of workload for students (contact and individual work hours)				
Study forms	Hours in face-to-face studies	Hours in online studies		
Lectures	N hours	N hours		
Seminars	N hours	N hours		
Laboratory work	N hours	N hours		
Practical assignments	N hours	N hours		
Consultations	N hours	N hours		
Contact work hours in total	N hours			
Individual students work	N hours			
Total:	N hours			
Structure of cumulative score and value of its constituent parts				
Recommended reference materials				
Compulsory reading				
1.				
2.				
3.				
Optional reading				



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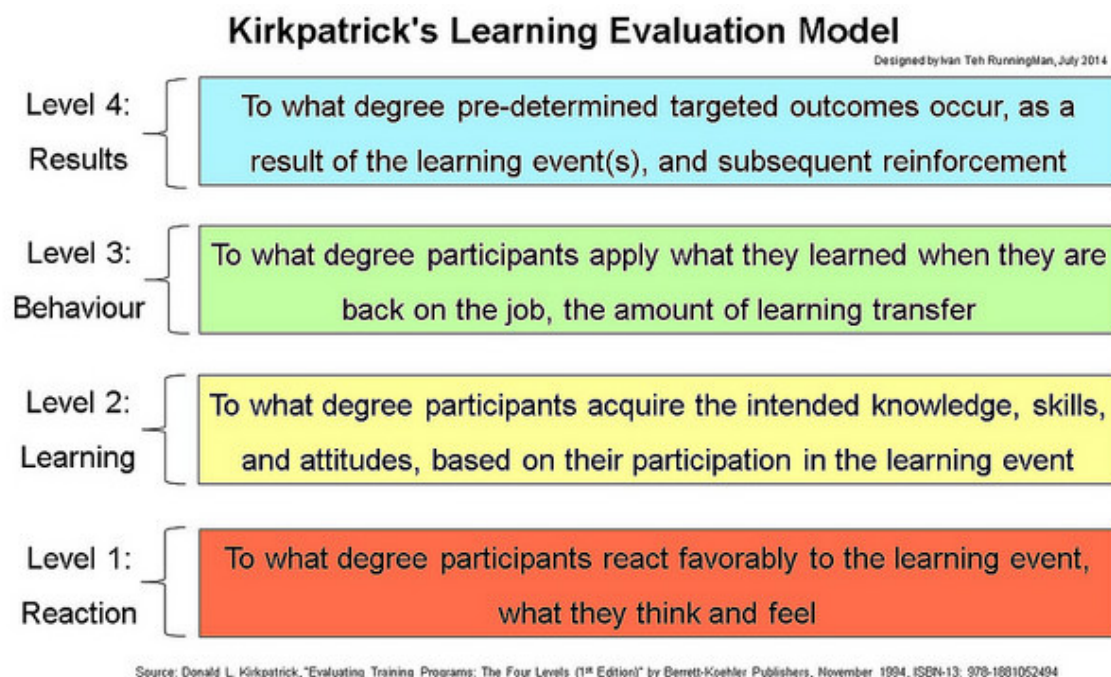
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1.	
2.	
3.	

## **5. SUCCESS INDICATOR**



In the evaluation process, we will follow Donald L. Kirkpatrick's model for assessing training - the four levels of learning evaluation. This task involves defining the evaluation criteria and the way in which the success of the training will be measured.



An assessment questionnaire with multiple-choice questions will be developed to evaluate the knowledge acquired in the course and the overall performance of the participants. The assessment will take place at the end of each module in the online environment.

A special user satisfaction questionnaire will also be used to assess the understanding gained by participants. This will be particularly useful during the pilot phase and the first editions of the course in order to make necessary adjustments and reorganisations depending on the feedback received.



Evaluation level and type	Evaluation description and characteristics	Examples of evaluations tools and methods	Relevance and practicability
<b>1. Reaction</b>	<p>Reaction evaluation is how the delegates felt, and their personal reactions to the training or learning experience, for example:</p> <p>Did the trainees like and enjoy the training?</p> <p>Did they consider the training relevant?</p> <p>Was it a good use of their time?</p> <p>Level of effort required to make the most of the learning.</p> <p>Perceived practicability and potential for applying the learning.</p>	<p>Typically, 'happy sheets'.</p> <p>Feedback forms based on subjective personal reaction to the training experience.</p> <p>Post-training surveys or questionnaires.</p> <p>Online evaluation or grading by delegates.</p>	<p>Can be done immediately the training ends.</p> <p>Very easy to obtain reaction feedback</p> <p>Important to know that people were not upset or disappointed.</p> <p>Important that people give a positive impression when relating their experience to others who might be deciding whether to experience same.</p>
<b>2. Learning</b>	<p>Learning evaluation is the measurement of the increase in knowledge or intellectual capability from before to after the learning experience:</p> <p>Did the trainees learn what intended to be taught?</p> <p>Did the trainee experience what was intended for them to experience?</p> <p>What is the extent of advancement or change in the trainees after the training, in the direction or area that was</p>	<p>Typically, assessments or tests before and after the training.</p> <p>Methods of assessment need to be closely related to the aims of the learning.</p> <p>Measurement and analysis are possible and easy on a group scale.</p> <p>Reliable, clear scoring and measurements need to be established, so as to limit the risk of inconsistent assessment.</p>	<p>Relatively simple to set up, but more investment and thought required than reaction evaluation.</p> <p>Highly relevant and clear-cut for certain training such as quantifiable or technical skills.</p> <p>Less easy for more complex learning such as attitudinal development, this is famously difficult to assess.</p>





	intended?		
<b>3. Behaviour</b>	<p>Behaviour evaluation is the extent to which the trainees applied the learning and changed their behaviour, and this can be immediately and several months after the training, depending on the situation:</p> <p>Did the trainees put their learning into effect when back on the job?</p> <p>Were the relevant skills and knowledge used</p> <p>Was there noticeable and measurable change in the activity and performance of the trainees when back in their roles?</p> <p>Was the change in behaviour and new level of knowledge sustained?</p> <p>Would the trainee be able to transfer their learning to another person?</p> <p>Is the trainee aware of their change in behaviour, knowledge, skill level?</p>	<p>Observation and interview over time are required to assess change, relevance of change, and sustainability of change.</p> <p>Assessments need to be subtle and ongoing, and then transferred to a suitable analysis tool.</p> <p>Assessments need to be designed to reduce subjective judgment of the observer or interviewer, which is a variable factor that can affect reliability and consistency of measurements.</p> <p>The opinion of the trainee, which is a relevant indicator, is also subjective and unreliable, and so needs to be measured in a consistent defined way.</p> <p>Assessments can be designed around relevant performance scenarios, and specific key performance indicators or criteria.</p>	<p>Measurement of behaviour change is less easy to quantify and interpret than reaction and learning evaluation.</p> <p>Simple quick response systems unlikely to be adequate.</p> <p>Management and analysis of ongoing subtle assessments are difficult, and virtually impossible without a well-designed system from the beginning.</p> <p>Evaluation of implementation and application is an extremely important assessment - there is little point in a good reaction and good increase in capability if nothing changes back in the job, therefore evaluation in this area is vital, albeit challenging.</p> <p>behaviour change evaluation is possible given good support and involvement from line managers or trainees, so it is helpful to involve them from the start, and to identify benefits for them, which links to the level 3 evaluations below.</p>
<b>4. Results</b>	<p>Results evaluation is the effect on the business or environment resulting from the improved performance of the trainee - it is the acid test.</p> <p>Measures would typically be</p>	<p>It is possible that many of these measures are already in place via normal management systems and reporting.</p> <p>The challenge is to identify which and how relate to the</p>	<p>Individually, results evaluation is not particularly difficult; across an entire organization it becomes very much more challenging, not least because of the reliance on online-management, and the</p>



business or organizational key performance indicators, such as:

Volumes, values, percentages, timescales, return on investment, and other quantifiable aspects of organizational performance, for instance; numbers of complaints, staff turnover, attrition, failures, wastage, non-compliance, quality ratings, achievement of standards and accreditations, growth, retention, etc.

trainee's input and influence.

Therefore, it is important to identify and agree accountability and relevance with the trainee at the start of the training, so they understand what is to be measured.

This process overlays normal good management practice - it simply needs linking to the training input.

frequency and scale of changing structures, responsibilities and roles, which complicates the process of attributing clear accountability.

Also, external factors greatly affect organizational and business performance, which cloud the true cause of good or poor results.