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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

Funded by the European Union

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DOCUMENT INFO	
PROJECT	The Digital Blue Carrier for a Post-Carbon Future - Curriculum Innovations in Aquaculture [DiBluCa]"
PROJECT ACTIVITY	WP2A3 Development of Curriculum and training modules for Aquaculture Higher Education against global warming and overfishing
Language	English, Lithuanian, Turkish, Ukrainian, Greek, Croatian
Result media	Text file
Start/End Date	01.08. - 31.10.2024
STATUS	Draft version 4/6/2024
STATUS	Final version 31/10/ 2024

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1. INTRODUCTION

The DiBluCa project aims to develop an innovative guide and competitive curriculum for higher education in aquaculture, showcasing how aquaculture can thrive 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. Environmental impacts of aquaculture from a global warming perspective, UNIDU, HR
3. Global warming and breeding, biotechnology in aquaculture, ONUT, UA
4. What should change feed and feeding in aquaculture due to global warming, BAUN, TR
5. Effects of global warming on diseases in aquaculture and protective applications, VDU, LT
6. System selection against global warming in aquaculture, UTH, GR

2. ROLE OF THE CURRICULUM GUIDE

The subject and main objective of the project are the preservation of sustainable aquaculture farming in Europe against the effects of global warming. 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 climate change and sustainable aquaculture farming.

The purpose of this 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 regarding 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[1].

2.1. DEFINITIONS

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

[1] Additional reading: https://europa.eu/europass/en/european-qualifications-framework-eqf

„*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.
The learning outcomes are relevant for levels 5-6 according to the EQF, whereby the learning outcomes are relevant for qualifications[2]:

- 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.

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

3. CURRICULUM DEVELOPMENT 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 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[3]. 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
- Analysis/Analyse: differentiate, organise, relate, compare, distinguish, experiment

[3] Additional reading:https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

- 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 consist only 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.

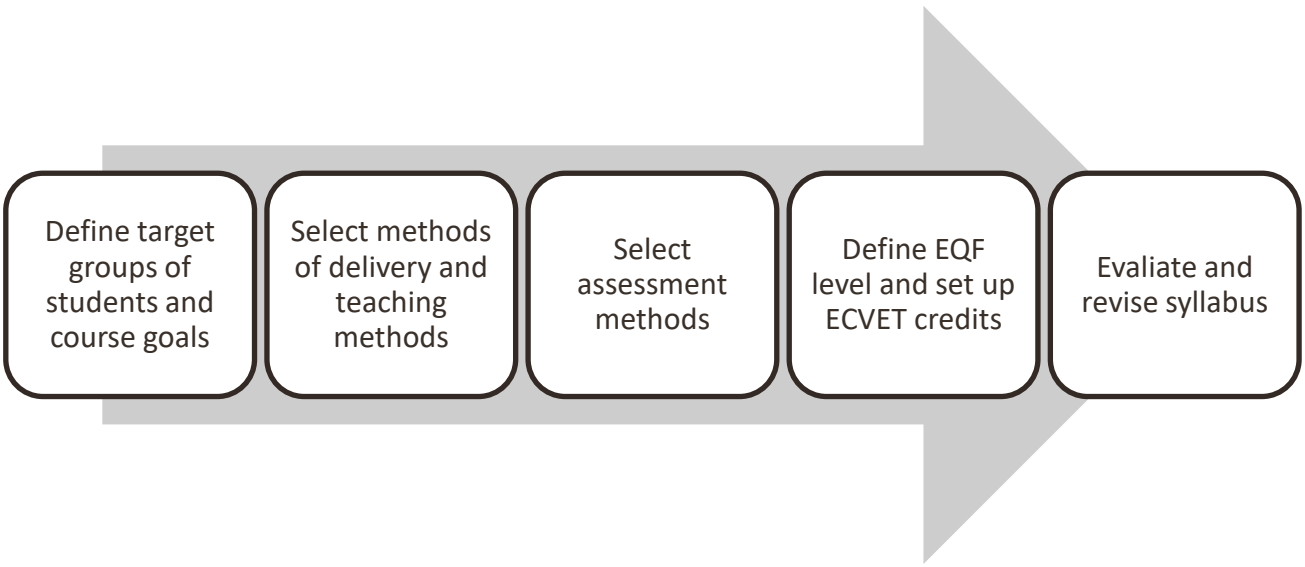
4. SYLLABUS DEVELOPMENT

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

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



4.2. SYLLABUS TEMPLATE

The syllabus template follows the structure and methodology of the key factors above. The following template can be used for curriculum planning. Please use the grey text as a guide for completing each section.

Title of the course

The name of the course.

Planned formats, learning activities and teaching methods

In a distance, face-to-face or blended course: questioning, concept mapping, participatory learning in action techniques, drill and practise, formative quizzes, tutorials, games, storytelling, simulations, role plays, discussions, small group activities or social media activities (YouTube, etc.).

Teaching hours

The number of hours the course is expected to take. It is very important to consider the time needed for active learning and for learners to complete important assignments and prepare for exams.

Mode of delivery

Blended learning (combining different methods, including online and face-to-face teaching and use of online and physical resources) and online e-learning (courses delivered online and containing relevant content, assessments and self-tests; fully open courses; open educational resources that can act as support materials for teaching and learning) are two prescribed forms of delivery. However, these can be customize for each course.

Mode of completion and ECVET credits allocated

Please see: European credit system for vocational education and training (ECVET) | CEDEFOP (europa.eu)

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	
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**	

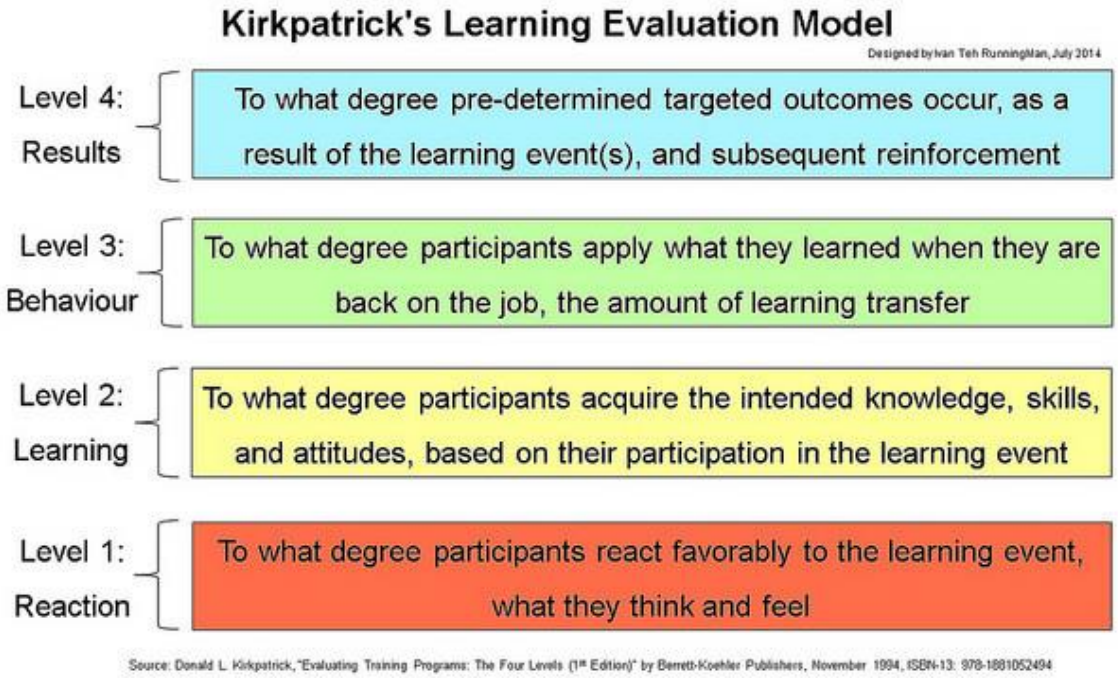
Structure of cumulative score and value of its constituent parts

Recommended reference materials	
Compulsory reading	
1.	
2.	
3.	

Optional reading	
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 evaluation tools and methods	Relevance and practicability
1. Reaction	Reaction evaluation is how the delegates felt, and their reactions to the training or	Typically, 'happy sheets'.	It can be done immediately after the training ends.

	learning experience, for example: Did the trainees like and enjoy the training? Did they consider the training relevant? Was it a good use of their time? The level of effort required to make the most of the learning. Perceived practicability and potential for applying the learning.	Feedback forms are based on subjective personal reactions to the training experience. Post-training surveys or questionnaires. Online evaluation or grading by delegates.	Very easy to obtain reaction feedback Important to know that people were not upset or disappointed. Important that people give a positive impression when relating their experience to others who might be deciding whether to experience the same.
2. Learning	Learning evaluation is the measurement of the increase in knowledge or intellectual capability from before to after the learning experience: Did the trainees learn what was intended to be taught? Did the trainee experience what was intended for them to experience? What is the extent of advancement or change in the trainees after the training, in the direction or area that was intended?	Typically, assessments or tests are conducted before and after the training. Methods of assessment need to be closely related to the aims of the learning. Measurement and analysis are possible and easy on a group scale. Reliable, clear scoring and measurements need to be established to limit the risk of inconsistent assessment.	Relatively simple to set up, but more investment and thought are required than reaction evaluation. Highly relevant and clear-cut for certain training, such as quantifiable or technical skills. Less easy for more complex learning, such as attitudinal development, this is famously difficult to assess.
3. Behaviour	Behaviour evaluation is the extent to which the trainees applied the learning and changed their behaviour, and this can be assessed immediately and several months after the training, depending on the situation: Did the trainees put their learning into effect when back on the job? Were the relevant skills and knowledge used? Was there a noticeable and measurable change in the activity and performance of the trainees when back in their roles? Was the change in behaviour and new level of knowledge sustained?	Observation and interview over time are required to assess change, the relevance of change, and the sustainability of change. Assessments need to be subtle and ongoing, and then transferred to a suitable analysis tool. Assessments need to be designed to reduce subjective judgment of the observer or interviewer, which is a variable factor that can affect the reliability and consistency of measurements. The opinion of the trainee, which is a relevant indicator, is also subjective and unreliable, and so needs to be	Measurement of behaviour change is less easy to quantify and interpret than reaction and learning evaluation. Simple, quick response systems are unlikely to be adequate. Management and analysis of ongoing subtle assessments are difficult and virtually impossible without a well-designed system from the beginning. 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

	Would the trainee be able to transfer their learning to another person? Is the trainee aware of their change in behaviour, knowledge, and skill level?	measured in a consistent, defined way. Assessments can be designed around relevant performance scenarios and specific key performance indicators or criteria.	this area is vital, albeit challenging. 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.
4. Results	Results evaluation is the effect on the business or environment resulting from the improved performance of the trainee - it is the acid test. Measures would typically be business or organizational key performance indicators, such as: Volumes, values, percentages, timescales, return on investment, and other quantifiable aspects of organisational performance, for instance, numbers of complaints, staff turnover, attrition, failures, wastage, non-compliance, quality ratings, achievement of standards and accreditations, growth, retention, etc.	It is possible that many of these measures are already in place via normal management systems and reporting. The challenge is to identify which and how relate to the trainee's input and influence. Therefore, it is important to identify and agree on 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.	Individually, results evaluation is not particularly difficult; across an entire organization it becomes very much more challenging, not least because of the reliance online-management, and the frequency and scale of changing structures, responsibilities and roles, which complicates the process of attributing clear accountability. Also, external factors greatly affect organisational and business performance, which clouds the true cause of good or poor results.