BioS

DIGITAL SKILLS ON COMPUTATIONAL BIOLOGY FOR HEALTH PROFESSIONALS

Project No: 591945-EPP-1-2017-1-DE-EPPKA2-SSA

R6.2 EQAVET Framework

WP6: Quality Assurance

Responsible Partner: P12 EPRALIMA

Co-funded by the Erasmus+ Programme of the European Union

Project information

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Executive Summary

The Report 6.2 (R6.2) – *EQAVET Framework* – describes all methods and procedures to implement the four stages of the quality assurance of EQAVET system in BioS project.

This guide provides guidance on how to establish the evaluation and quality assurance of the BioS training programme.

R6.2 EQAVET Framework contains the following information:

- how to apply the quality assurance and improvement cycle;
- which indicative descriptors will be used to assess the effectiveness of current practices and to identify what more can be achieved;
- which indicators will be used to support the evaluation and quality assurance of the training programme;
- which performance indicators will be used to support the evaluation and quality assurance of the training programme;
- presenting a proactive planning of the intervention throughout the four phases of the quality cycle for BioS implementation;
- who are the relevant stakeholders, for what and when will they be involved;
- description of the procedures for each one of the quality assurance stages.

Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including Commission services and project reviewers)	
CO	Confidential, only for members of the consortium (including EACEA and Commission services and project reviewers)	

Table of Contents

List of Figures

List of Tables

Chapter 1: Introduction to BioS Project

1. Project *BioS*

BioS is the acronym of the Project ***Digital Skills on Computational Biology for Health Professionals***, co-funded by the Education, Audio-visual and Culture Executive Agency of the Erasmus+ Programme of the European Union, from 01-01-2018 till 31-12-2020, with agreement number 591945-EPP-1-2017-1-DE-EPPKA2-SSA.

1.1 Project BioS – aims and activities

BioS aims at advancing the digital skills of medical doctors through the design, development and delivery of new modular vocational curricula on Computational Biology, as well as transversal skills, directly responding to skills needs identified by existing research evidence. Its ultimate purpose is to provide medical doctors with knowledge, skills and competencies, which will allow them to tackle effectively concurrent challenges in EU healthcare systems, services, and policies, in benefit of the health of EU citizens.

During the project implementation, the following activities will be carried out:

1. Develop innovative modular curricula that integrate the latest advancements in Computational Biology for the Healthcare sector and transversal skills that can be immediately applied by medical doctors in clinical context;
2. Develop the aforementioned modular curricula according to the EQF, ECVET and EQAVET frameworks;
3. Develop a virtual learning environment to bring together medical doctors, bioinformatics experts, educators and researchers, as well policy-makers from across Europe. The platform is going to be developed as a “virtual world” that enables users to interact with each other. In this platform, users can exchange experiences and follow virtual lessons;
4. Deliver the *BioS* training programme as a VOOC underpinned by EQAVET;
5. Provide participants with hands-on experience through work-based learning periods;
6. Produce Policy Briefs and Recommendations to contribute to relevant national and EU policy agenda;
7. Disseminate the project outcomes giving emphasis in creating exploitation plans for continuing the project work after the end of the project’s funding period.

1.2 Project BioS – list of partners

BioS is being carried out by a set of thirteen (13) partners from eight different countries, and the project is led by P1 – Steinbeis University Berlin (SHB).

Table 1: *List of partners.*

No.	Partner Organization	Country
P1	Steinbeis University Berlin (SHB)	Germany
P2	Enios Applications Idiotiki KefalaiouchikiEtaireia (e-NIOS)	Greece
P3	Olympic Training and Consulting LTD (OT)	Greece
P4	Skybridge Partners	Greece
P5	Bioinformatics Barcelona Association (BIB)	Spain
P6	University of Patras (UPAT)	Greece
P7	European Medical Association (EMA)	Belgium
P8	European Recreation and Health Valley (EUREHVA)	Germany
P9	BG KlinikumMurnaugGmbH (BGU Murnau)	Germany
P10	FOR SRL	Italy
P11	HiDucator Ltd (HiDucator)	Finland
P12	Vocational Training School of Alto Lima, C.I.P.R.L. (EPRALIMA)	Portugal
P13	German Oncology Centre (GOC)	Cyprus

1.3 Project BioS – Work-Packages

Project activities and processes are organized in nine (9) work-packages:

WP1 Management and Coordination
WP2 BioS Curricula Design
WP3 Development of the BioS Curricula Syllabi and Educational Material (OER)
WP4 Development of the BioS Virtual Learning Environment (VLE)
WP5 Course Delivery and WBL
WP6: Quality Assurance
WP7: Evaluation
WP8: Dissemination
WP9: Exploitation

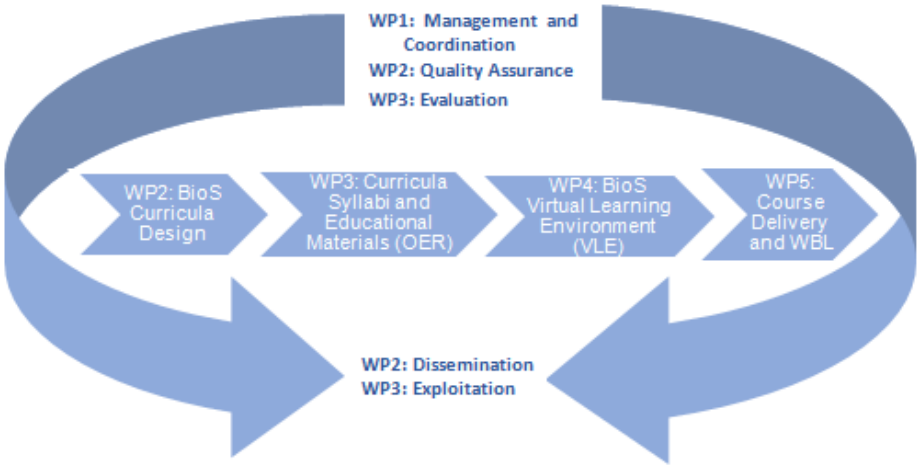
Four (4) of the whole work-packages are directly related with the main focus of the Project – the BioS training programme.

BioS follows a waterfall methodology for the preparation, design and delivery of the training programme. The work-plan can be schematically described as follows.

Figure 1: *Work-packages directly related with the training programme.*

The other five (5) horizontal work-packages are implemented throughout the project's lifespan (36 months) and have the purpose to ensure the projects' transversal processes of management and coordination, quality assurance, evaluation, dissemination and exploitation.

Figure 2: *BioS work-packages.*



1.4 Project BioS – Work-Packages leaders

Each one of the work-packages is led by one partner and receives inputs from all other partners.

Each work-package has a Leader (WL) who is in charge of the timely achievement of the work-package goals and the successful completion of the deliverables. Leaders are assigned to work-package tasks as well, thus ensuring a clearer distribution of responsibilities and workload. A task dedicated to decision making and conflict resolution will ensure the smooth implementation of all actions. A task dedicated to risk management and contingency planning is also crucial for the successful implementation of the project goals.

Table 2: *Leaders per work-package.*

WP1	Management and Coordination	P1
WP2	BioS Curricula design	P11
WP3	Development of the BioS Curricula Syllabi and Educational material (OER)	P5
WP4	Development of the BioS Virtual Learning Environment (VLE)	P4
WP5	BioS VOOC delivery and WBL	P6
WP6	Quality Assurance	P12
WP7	Evaluation	P6
WP8	Dissemination	P7
WP9	Exploitation	P7

2. Work-Packages covered by the EQAVET Framework

The quality assurance for the development and delivery of the training content (WP3 and WP5) will be based on European Quality Assurance for Vocational Education and Training (EQAVET):

- WP3 Development of the BioS Curricula Syllabi and Educational Material (OER);
- WP5 Course Delivery and WBL.

Chapter 2: EQAVET Framework for BioS Training Programme

1. Implementation of a Quality Assurance System in Line with EQAVET

The BioS Project promotes a policy of quality assurance and improvement through procedures and practices associated with the four phases of the quality cycle, EQAVET quality criteria and indicative descriptors. Quality procedures and practices are articulated with the strategic management mechanisms with a view to a continuous improvement.

1.1 Application of the quality assurance and improvement cycle

The quality assurance and improvement cycle, consisting of four interdependent and interrelated phases of learning and continuous improvement (planning, implementation, evaluation and review) is applied cyclically and continuously towards total quality.

The quality assurance for the development and delivery of the training content (WP3 and WP5) is based on European Quality Assurance for Vocational Education and Training (EQAVET), following the four stages of the quality assurance and improvement cycle[1]:

Stage 1: Planning – Set up clear, appropriate and measurable goals and objectives in terms of policies, procedures, tasks and human resources.

Stage 2: Implementation – Establish procedures to ensure the achievement of the defined goals and objectives (e.g., development of partnerships, involvement of stakeholders, allocation of resources and organizational and operational procedures).

Stage 3: Evaluation – Designing mechanisms for the evaluation of achievements and outcomes, collecting and processing data to make informed assessments/evaluation of the expected results.

Stage 4: Review – Develop procedures in order to achieve the targeted outcomes and results not yet achieved and/or establish new objectives based on the generated evidence, to ensure the introduction of necessary improvements and/or to devise procedures for change.

[1] https://www.eqavet.eu/

Figure 3: *The four phases of the quality assurance cycle.*

Source: adapted from https://www.eqavet.eu/EU-Quality-Assurance/For-VET-System.

These four stages of the quality assurance cycle are addressed in a holistically process, throughout the project implementation.

1.2 EQAVET indicative descriptors

EQAVET indicative descriptors[2] are outlined in accordance with each stage of the quality cycle.

EQAVET indicative descriptors for stage 1 – Planning:

- ► Explicit goals/objectives and targets are set and monitored, and the training programme is designed to meet them.
- ► *Ongoing* consultation with social partners and all other relevant stakeholders takes place to identify specific local/ individual needs.
- ► VET providers plan cooperative initiatives involving the relevant stakeholders.

EQAVET indicative descriptors for stage 2 – Implementation:

- ► Relevant and inclusive partnerships, including those between teachers and trainers, are explicitly supported to implement the actions planned.
- ► VET providers' programmes enable learners to meet the expected learning outcomes and become involved in the learning process.
- ► VET providers respond to the learning needs of individuals by using approaches to pedagogy and assessment which enable learners to achieve the expected learning outcomes.
- ► VET providers use valid, accurate and reliable methods to assess individuals' learning

[2] https://www.eqavet.eu/

outcomes.

EQAVET indicative descriptors for stage 3 – Evaluation:

► Evaluation and review the collection and use of data, and adequate and effective mechanisms to involve internal and external stakeholders.

EQAVET indicative descriptors for stage 4 – Review:

► Learners' feedback is gathered on their individual learning experience and on the learning and teaching environment. Together with the feedback of teachers, trainers and all other relevant stakeholders is used to inform further actions.

► Procedures on feedback and review are part of a strategic learning process in the organization, support the development of a high' s quality provision, and improve opportunities for learners.

1.3 EQAVET indicators

Whereas the target group of the BioS training programme are health care professionals attending to a VET programme in a perspective of lifelong learning, the following EQAVET indicators[3] for VET providers were chosen to monitor the quality assurance of the BioS training programme:

Indicator no 4
Completion rate in VET programmes:

- number of persons having successfully completed/abandoned VET programmes, according to the type of programme and the individual criteria.

Indicator no 6
Utilization of acquired skills at the workplace:

(a) information on occupation obtained by individuals after completion of training, according to type of training and individual criteria;
(b) satisfaction rate of individuals and employers with acquired skills/competences.

The EQAVET indicators identified above are applied in accordance with the specificities of the BioS project.

[3] https://www.eqavet.eu/

Chapter 3: Planning the Application of the Quality Assurance and Improvement Cycle

This section describes the quality procedures planned for the implementation of the training programme. It allows evidence-based quality management practices, according to the EQAVET framework, to be implemented for each phase of the quality cycle.

The quality cycle is applied in a systemic and systematically way for the development and delivery of the training programme (WP3 and WP5), fully applying the quality cycle: planning, setting goals, applying indicators, preparing professionals to carry out the training programme, evaluating results, introducing the necessary improvement.

The quality cycle is applied twice, one per each round of the training programme.

1. Involvement of Stakeholders

Internal and external stakeholders are involved and actively participate in all phases of the quality cycle for the management and implementation of the training programme. The VET providers work in partnership with other relevant internal and external stakeholders, with a view to the success of the training results:

- Internal and external stakeholders actively participate in the planning of the contents of the training programme and in the design of the training materials, in the implementation of the training, in the evaluation of the results achieved and revision and proposal of improvement;
- Protocols are established with other external stakeholders with a view to the success of the training: to create the External Advisory Board; to carry out the Focus-Groups; to reach in a more focused way the skills gaps of the target group; to recruit trainees for the course; to implement and to evaluate the training programme; to get the accreditation of the training programme.

Throughout the four phases of the quality cycle are involved:

- all partners of the consortium;

- members of the Management Board;

- members of the Quality Assurance Committee;

- members of the External Advisory Board;

- members of the Focus-Group (constituted by project's ends users);

- target group of the training programme (health professionals who participate in the training programme);

- other external stakeholders.

2. Defining a Proactive Planning Stage

A coherent and structured strategy is set up to implement in the medium and short term, including a prospective dimension, taking in account predictions on the state of the art on healthcare provision and the consequent needs for qualification and skill development at European / international levels. Both internal and external stakeholders are involved in this process.

The strategy for the implementation is defined in the short and medium term, measurable targets and indicators are established, activities, responsibilities, schedule and monitoring and evaluation strategies are defined.

The training programme considers studies on skills gaps, anticipation of needs and competencies to be developed at European / international level.

Figure 4: *Planning the intervention throughout the four phases of the quality cycle.*

3. PLANNING STAGE

3.1 Quality criteria

► Planning reflects a strategic vision shared by stakeholders and includes the goals / objectives, the actions to carry out and appropriate indicators.

3.2 Indicative descriptors

► Explicit goals/objectives and targets are set and monitored, and the training programme is designed to meet them.

► *Ongoing* consultation with social partners and all other relevant stakeholders takes place to identify specific local/ individual needs.

► VET providers plan cooperative initiatives involving the relevant stakeholders.

3.3 Setting goals/objectives and targets

BioS project aims at advancing the skills of European medical doctors and other health professionals through the design and delivery of new modular vocational curricula on computational biology, as well as transversal skills, straightforwardly responding to the skills gaps identified by existing research evidence.

Quality standards and performance indicators to evaluate WP3:

Table 3: *Quality standards and performance indicators defined for WP3.*

Quality standards	Performance indicators
Development of *BioS* training material	• Minimum 10 open e-resources (sites) used as reference; • Minimum 70% flexible learning methods; • Minimum 30% multimedia resources used per unit; • More than 80% quality of the teaching material, as assessed by the focus group; • Minimum 80% suitability of the teaching methods to the target group's needs, as assessed by the focus group.
Development of *BioS* assessment exams	• 4 self-assessment tests; • 20 peer-assessment assignments; • 1 final exam for the four training modules; • More than 95% relevance of the assessment criteria with learning objectives as assessed by the Expert Advisory Board.

Quality standards and performance indicators to evaluate WP5:

Table 4: *Quality standards and performance indicators defined for WP5.*

Quality standards	Performance indicators
***BioS* VOOC delivery**	• Minimum of 800 medical doctors will be trained; • The project will promote the equal participation of women and men (maximum divergence 65%-35%); • 100% of the programme will be accessible to people with special needs; • 98% trainee satisfaction from the curriculum delivery.
Work based learning periods	• Minimum of 80 participants (medical doctors and other health professionals) will participate in the WBL activities; • 90% of learner satisfaction from the WBL periods.

3.4 Involvement of relevant stakeholders

The relevant stakeholders – both internal and external – are involved since the planning stage, through their auscultation to provide inputs for the preparation of the training programme (WP2), the development of the training materials (WP3), the preparation of the learning environment (WP4).

The results of these work-packages will be carried out with the involvement of the relevant stakeholders:

1) Internal stakeholders – members of the Quality Assurance Committee – whose members will supervise, evaluate and validate the results/outcomes of the work-packages that are being produced, in accordance with the procedures described in R6.1 and R7.1.

2) External stakeholders:
   2.1) the end users – healthcare professionals: mainly medical doctors and nurses as a second option – through a Focus Group;
   2.2) the experts in each field – healthcare experts, bioinformatics experts, educational experts – through the creation of an External Advisory Board, whose members will participate in the evaluation and validation of the results/outcomes that are being produced, in accordance with the procedures described in R6.1 and R7.1.

3.5 Planning the policies, procedures, tasks and resources

The description of the planning policies, procedures, tasks and human resources is support by a variety of documental evidence:

- Project proposal;
- Gantt diagram with the schedule of activities and expected results;
- Stakeholders analysis (R8.1);
- Targeting policy makers (R8.2);
- Consortium Agreement (R1.1);
- Guide on EQF/ECVET/EQAVET application (R2.1);
- Quality Assurance Plan (R6.1);
- Project evaluation compendium (R7.1);
- EQAVET Framework (R6.2);
- Dissemination plan (R8.3);
- BioS policy briefs (R8.6).

4. Implementation Stage

4.1 Quality criteria

► Action plans, designed in consultation with stakeholders, flow from the goals/objectives to be achieved and are supported by diverse partnerships.

4.2 Indicative descriptors

► Relevant and inclusive partnerships, including those between teachers and trainers, are explicitly supported to implement the actions planned.

► VET providers' programmes enable learners to meet the expected learning outcomes and become involved in the learning process.

► VET providers respond to the learning needs of individuals by using approaches to pedagogy and assessment which enable learners to achieve the expected learning outcomes.

► VET providers use valid, accurate and reliable methods to assess individuals' learning outcomes.

4.3 Procedures to ensure the achievement of the defined goals and objectives

A number of procedures are envisaged to ensure the proper design and implementation of the training programme:

- Action plans per WP – each WP leader is responsible for the elaboration of one action plan for the respective WP, providing a detailed description and schedule of the activities and sub-activities to carry out;
- Planning on the allocation of human resources needed for the implementation of the actions and to carry out the planned activities and results, per partner organization (planning, contracts, timesheets);
- Planning on the allocation of materials, equipment and other resources and organizational and operational procedures for the implementation of the actions and to carry out the planned activities and results, per partner organization;
- Development of formal and informal partnerships to ensure relevant inputs for the good quality of the deliveries and the results of the project;
- Involvement of internal and external stakeholders, in accordance to what is explained in issue 3.4 of this Chapter.

4.4 Description of the implementation – WP3 and WP5

Description of **WP3 – Development of the BioS Curricula Syllabi and Educational Material (OER)**:

Description:
WP3 focuses the development of:
- Bios Curricula syllabi and training material;
- Teaching methodologies;
- BioS assessment exams;

The main aim of WP3 is for the educational material and assessment exams and all supporting documentation designed in WP2 to be developed and up-loaded in the BioS VLE. After WP3, as well as of WP4 “Development of the BioS Virtual Learning Environment (VLE)”, which run in parallel and both ends at M18, will start the delivery of the BioS VOOC in WP5.

Tasks:
Task 3.1: Development of BioS training material (M9–M15); Task Leader: P5 - BIB
The educational material, assessment exams and all supporting documentation will be developed in this WP.
For the BioS VOOC "Computational Biology for medical doctors", the following modules, as defined in WP2, will be developed:
Module 1: Introduction to Bioinformatics: 4 weeks, expected workload 7 to 10 hours per week.
Module 2: Computational Statistics for clinical doctors: 4 weeks, expected workload 7 to 10

hours per week.

Module 3: Commercial personalised genomics services in patient care: 4 weeks, expected workload 7 to 10 hours per week.

Module 4: Quality Improvement in Healthcare: 2 weeks, expected workload 1 to 5 hours per week.

BioS training material will include video tutorials (one-hour long for each module), wrap-up videos (10 minutes long for each module) and modern learning material (media, internet and/or audio resources, PowerPoint or "articulate" presentations, etc.). Also, the training handbooks for both trainers and trainees will be developed.

All training material will be available in the all consortium languages and English. Specific care will be given for them being accessible. Subtitles will be used for the video tutorials.

All partners contribute to the development of the training material content, led by P5 - BIB.

Task 3.2: Development of BioS assessment exams (M15–M17); Task Leader: P11 - HiDucator

This guide will include four (4) self-assessment tests, twenty (20) peer- assessment assignments and one (1) final exam for the four training modules. The assessment material will be available in the all consortium languages and English. The guide's content will be restricted as it will also provide the correct answers to the exam's questions. Assessment tests, assignments and exams will be prepared by all partners under the coordination of P11 - HiDucator.

Task 3.3: BioS Virtual Library (M17–M18); Task Leader: P5 - BIB

The "BioS Virtual Library" will be actually an OER Database, which will be a freely accessible and will include material relevant with the BioS Course's scientific foci. It can include courses syllabi, textbooks, journal articles, policy papers and analyses, conference presentations, video and audio material, maps, images, links to journals and other related initiatives, relevant EU best practices and case studies etc. All partners participate in/contribute to the development of the Task 3.3, led by P5 - BIB. The e-library will include resources in all consortium languages and English.

Task 3.4: Monitoring and evaluation of WP3 (M9–M18); Task Leader: P5 - BIB

Milestone of WP3: BioS training material (M15).
Start Date: 01/09/2018 (M9)
End Date: 30/06/2019 (M18)
Lead Organisation: P5-BIB
Organisations: All

Expected Results (outputs or outcomes)

R3.1 – BioS training material (Training material)

Description R3.1 will consist of training material for the four (4) different modules, available in English and all consortium languages. Its choice and development will be performed with care and attention to the target groups' needs, as learning material influences the content and the procedures of learning. It will be based on the results of the previous WP2. BioS training material will include video tutorials (one-hour long for each module), wrap-up videos (10 minutes long for each module) and modern learning material (media, internet and/or audio resources, PowerPoint or "articulate" presentations, etc.). The training material will integrate WBL components through real working-life video which will be recorded, stored, annotated, and subsequently placed in the VLE.

Due date M15

Language(s) EN, GR, PT, IT, ES, DE, FR, FI

Media(s) Electronic, published online

Dissemination level: Public

R3.2 – BioS assessment exams

Description This guide will include four (4) self-assessment tests, twenty (20) peer-assessment assignments and one (1) final exam for the four training modules. The assessment material will be available in the all consortium languages and English. The guide's content will be restricted as it will also provide the correct answers to the exam's questions. Assessment tests, assignments and exam will be prepared by all partners under the coordination of P11-HiDucator.

Due date M17

Language(s) EN, GR, PT, IT, ES, DE, FR, FI

Media(s) Electronic, published online

Dissemination level: Restricted to other programme participants (including Commission services and project reviewers)

R3.3 – BioS trainer's handbook

Description R3.3 will be a trainer's compendium to the course, available in all consortium languages plus English. It will include practical information about the modules, their relationship with the learning outcomes and how trainers can make the most out of the teaching material.

Due date M18

Language(s) EN, GR, PT, IT, ES, DE, FR, FI

Media(s) Electronic, published online

Dissemination level: Public

R3.4 – BioS trainees handbook (Handbook)

Description Similarly, to the trainer's guide above, the trainees' guide will provide target-group-trainees all the necessary practical information for the successful completion of the programme.

Due date M18

Language(s) EN, GR, PT, IT, ES, DE, FR, FI

Media(s) Electronic, published online

Dissemination level: Public

R3.5 – BioS virtual library

Description R3.5 will be an OER Database, including material relevant for the BioS Course's scientific foci: e-books, courses syllabi, journal articles, policy papers and analyses, conference presentations, video and audio material, maps, images, links to journals and other initiatives, relevant EU best practices, case studies and other reading material and resources.

Due date M18

Language(s) EN, GR, PT, IT, ES, DE, FR, FI

Media(s) Electronic, published online

Dissemination level: Public

Description of **WP5 – Course Delivery and WBL**:

Description:

The main objectives of WP5 are the delivery, pilot-testing, assessment and review of the BioS training programme in all participating countries, using the educational material designed in WP2 and developed in WP3, through the BioS VLE and the developed in WP4. The BioS VOOC delivery will first be pilot-tested and then take place in two rounds, with pre-scheduled intervals of assessment, evaluation and improvement, in order to maximize efficiency and participation. It is expected that at least **800 medical doctors** from all partner countries and beyond, in total, will attend the BioS VOOC.

Additionally, the delivery of the **WBL component of the BioS training programme** will take place in this WP. At least **80 medical doctors** from all partner countries will participate in WBL activities.

Tasks:

Task 5.1: BioS VOOC delivery (M19–M28); Task Leader: P6 - UPAT

The BioS course will be delivered twice, in two periods of four-months-long seminars: M19-M22 and M24-M27. In the meantime (M23) and afterwards (M28) an assessment and

review of the programme delivery will take place (feedback loops). The assessment will include:

a) the BioS training material;

b) the BioS MOOC functionality.

All VET partners (P1, P3, P5, P6, P10, P11, P12) have extensive experience in e-learning. Partners will define a) administrators and/or b) trainers and **c)** trainees. Trainers will be experienced in Bioinformatics. Before the beginning of the training they will be supplied with guidelines on how to perform the training sessions using the training material.

At least 800 medical doctors will attend the open, BioS VOOC during project lifetime. This is a realistic target, as at least 50 medical doctors per partner country per delivery round are expected to participate. More clinical doctors are expected to participate in the course through own-paced learning. This could mount to at least 200 in all EU countries. Besides the European network of doctors, which is represented in the BioS consortium by P7-EMA, will be informed. A large dissemination effort from all partners will ensure the largest possible number of participants.

The BioS modules will be delivered during both synchronous and asynchronous sessions. Synchronous sessions will include wrap-up videos (one for each module) and forum and chat discussions; asynchronous sessions will include learning material and video tutorials. Video tutorials will be one-hour-long for each module. Learning material can include media, internet and/or audio resources, power-point or “articulate” presentations. Both video tutorials and learning material will be available in all consortium languages and English.

After each session the trainees will have the opportunity to self-assess their newly acquired knowledge through tests. In addition, in each session trainees will be asked to perform group assignments that will be assessed through peer- assessment. A final exam will assess the overall knowledge and skills of the participants and determine if they fulfil the criteria for becoming holders of the **BioS certificate**.

All partners contribute to the BioS course delivery, led by P6- UPAT.

Task 5.2: Work-based learning periods (M19–M35); Task Leader: P2 - e-NIOS

Work-based learning will be integrated into the BioS training content, including opportunities to apply knowledge in practical "real life" workplace situations. Specifically, a total of 80 medical doctors from all partner countries will participate. Depending on the results of the assessment, 80 trained and certified medical doctors will put to practice their acquired knowledge and skills on Bioinformatics in practical "working life" situations through:

- **Real case studies from real working environments**. This will be conducted using the training material developed in WP3.

Real case studies from real working environments for WBL will be implemented within the

following partners: a) **bioinformatics company** e-NIOS (P2), b) **private clinic** BGU Murnau (P9) and c) the **private clinic-Oncology Centre** GOC (P13).

- e-NIOS - The training material of unit 1 will be used. Medical doctors will gain working experience and hands-on experience on a) how to find and retrieve DNA and protein sequences from primary databases, b) how to perform various analyses and comparisons; c) how to construct multiple sequence alignments, discover protein motifs in sequences and run various other analyses using publicly available, web-based tools.
- P13-GOC - The training material of unit 2 will be used. Medical doctors will gain working experience and hands-on experience on a) basic statistical techniques, and b) the programming language R for statistical computing and graphics.
- BGU Murnau - The training material of unit 3 will be used. Medical doctors will gain working experience and hands-on experience on how to interpret results from commercial personalised genomics services (like 23andMe, de CODE, Gene by Gen).

The **virtual learning environment**, which will provide a rich set of features to facilitate work-based learning based on real multimedia cases (case-based learning). Real working-life video on a) how to work with and understand big "medical" data and b) the use of multimedia techniques and open bioinformatics sources such as Galaxy or Taverna will be recorded, stored, annotated, and subsequently placed in a repository. Video will be intelligently drawn from this repository to allow learners to practice through observation and interaction. The environment will support collaboration between users who work on the same content and will maximize collaboration opportunities by creating tutoring sequences that can be shared among trainees.

BioS work-based learning experience will provide opportunities for both trainers and learners to follow developments in workplace practices, processes, equipment, and technology. Furthermore, the impact of the structural changes due to the evolution of the computational biology will be analysed and evaluated in relation to the direct access for trainers and learners to the latest technology and equipment.

Task 5.3: Evaluation and improvement of the BioS course (M19–M36); Task Leader: P6-UPAT

Milestones of WP5: BioS second round course delivery report (M28).
Start Date: 01/07/2019 (M19)
End Date: 31/12/2020 (M36)
Lead Organisation: P6-UPAT
Organisations: All

Expected Results (outputs or outcomes)

R5.1 – Toolkit for the evaluation of BioS training and deployment (Report)

Description The toolkit will contain different types of evaluation techniques (e.g. questionnaires, interviews and observation) and templates in order to assess the delivery of the training courses by trainers and trainees. It will be developed by the Quality Assurance Committee. Its findings will inform both the VOOC and WBL reports on programme delivery and the subsequent programme revision as well as the project evaluation report.

Due date M20

Language(s) EN, GR, PT, IT, ES, DE, FR, FI

Media(s) Electronic, published online

Dissemination level: Restricted to other programme participants (including Commission services and project reviewers).

R5.2 – VOOC delivery reports (Report)

Description Two (2) reports will be produced after the completion of each round of VOOC delivery. Reports will analyse and present the findings of the evaluation of the toolkit for the 1st period of the programme delivery (M19- M22) and for the 2nd period of the programme delivery (M24-M27). The 1st report will be delivered at M23 and it will include specific recommendations for the improvement of the programme in the second period of programme delivery. The 2nd report will be delivered at M28 and it will analyse/ present the findings of the evaluation toolkit for the second period of the programme delivery, concerning both the virtual courses and the VLE. Its findings will feed into the final project evaluation report (WP7).

Due date M23 and M28

Language(s) EN

Media(s) Electronic, published online

Dissemination level: Restricted to other programme participants (including Commission services and project reviewers).

R5.3 – WBL reports (Report)

Description Three (3) reports will be produced analysing and presenting the findings of the evaluation toolkit for the WBL component of the BioS training course. The 1st report will be delivered at M32 and it will present/analyse the findings of the evaluation toolkit, concerning the practical skill and hands on experience obtained by medical doctors during the 1st WBL activity. The 2nd report will be delivered at M34 and it will present/analyse the findings of the evaluation toolkit, concerning the

practical skills obtained by medical doctors during the 2nd WBL activity. The 3rd report will be delivered at M36 and it will present/analyse the findings of the evaluation toolkit, concerning the practical skills obtained by medical doctors during the 3rd WBL activity. The findings of the WBL reports will feed into the final project evaluation report.

Due date M32, M34 and M35

Language(s) EN

Media(s) Electronic, published online

Dissemination level: Restricted to other programme participants (including Commission services and project reviewers).

4.5 Involvement of stakeholders and pilot testing

During the implementation stage, relevant internal and external stakeholders are involved for the development of the training materials (WP3) and the preparation of the learning environment (WP4).

These stakeholders have a crucial role in the first evaluation, pre-testing and reformulation of the materials produced.

Involved stakeholders:

- members of the Quality Assurance Committee (internal stakeholders). Those members will supervise and evaluate the BioS modular curricula, BioS course catalogue, training materials, learning assessment materials, BioS virtual library, BioS trainer's handbook, BioS trainee's handbook, meetings for user acceptance testing and BioS virtual learning environment concerning its: pedagogical quality; scientific quality in health care field; scientific quality in bioinformatics field. Each partner evaluates the referred results in accordance with the respective expertise.

- members of the External Advisory Board (external stakeholders). Those members will supervise and evaluate the BioS modular curricula, BioS course catalogue, training materials, BioS virtual library, BioS trainer's handbook, BioS trainee's handbook, meetings for user acceptance testing and BioS virtual learning environment concerning its: pedagogical quality; scientific quality in health care field; scientific quality in bioinformatics field. Each expert evaluates the result in terms of the respective expertise field.

- sample of end users – through the realization of Focus Groups (external stakeholders). Those members will evaluate the BioS modular curricula, BioS course catalogue,

training materials, learning assessment materials, meetings for user acceptance testing and BioS virtual learning environment, from the point of view of the interested target in the training programme.

The results of the internal and external evaluation and pilot testing will be integrated in the reformulation of the training programme, the training materials and the VLE.

5. Evaluation Stage

5.1 Quality criteria

► The evaluation of results and processes regularly carried out allows to identify the necessary improvements.

5.2 Indicative descriptors

► Evaluation and review the collection and use of data, and adequate and effective mechanisms to involve internal and external stakeholders.

5.3 EQAVET indicators and performance indicators

For each one of the EQAVET indicators chosen, quality performance indicators are being defined by the Quality Assurance Committee as goals to achieve.

Table 5: *EQAVET and performance indicators for the delivery of the BioS course.*

EQAVET and performance indicators for the delivery of the BioS course

EQAVET indicators	**Performance indicators for the delivery of the course**	**Schedule for Assessment**
Indicator no 4 – Completion rate in VET programmes:		
No. of persons having successfully completed the course	400 participants per round conclude the training – 800 participants in the total	1st round: M23 (Nov. 2019) 2nd round: M28 (April 2020)
Indicator no 6 – Utilization of acquired skills at the workplace:		
(a) information on occupation obtained by individuals after completion of training	75% of the trainees apply the acquired skills/competence in their work/profession	6 months after the course delivery
(b) satisfaction rate* of individuals with acquired skills/competences	90% of the participants are satisfied with the training course	1st round: M23 (Nov. 2019) 2nd round: M28 (April 2020)

Legend:

- Indicators related to the reactions assessment level
- Indicators related to the learning assessment level
- Indicators related to the behavioural assessment level
- Indicators related to the impact assessment level

* Satisfaction rate is measured using an ascending graduation scale with 4 levels. Satisfaction is considered for level 3 and level 4 of the scale.

Table 6: *EQAVET and performance indicators for work based learning periods.*

EQAVET and performance indicators for work based learning periods		
EQAVET indicators	**Performance indicators to achieve for work based learning periods**	**Schedule for Assessment**
Indicator no 4 – Completion rate in VET programmes:		
No. of persons having successfully completed the work based learning activities	80 participants conclude the WBL activities	M35 (Nov. 2020)

Legend:

- Indicators related to the reactions assessment level
- Indicators related to the learning assessment level
- Indicators related to the behavioural assessment level
- Indicators related to the impact assessment level

* Satisfaction rate is measured using an ascending graduation scale with 4 levels. Satisfaction is considered for level 3 and level 4 of the scale.

5.4 Evaluation methodology

The methodology for the evaluation of the training programme follows the typology of four levels of evaluation conceived by Kirkpatrick (1994).

The monitoring and evaluation of the training programme is implemented as a systematic and continuous process, to determine the extent to which the objectives outlined are achieved, to verify the effectiveness and efficiency of the methods used, the relation between the action and the objectives and assessing the satisfaction of the trainees, the achievement of the learning outcomes and the application of the acquired skills and knowledge.

On practical, the four levels of Kirkpatrick's evaluation model are evaluated as follows:

Level 1 – **Reaction** – what participants thought and felt about the training programme; the degree to which participants are satisfied and find the training favourable and relevant for their daily work.

Level 2 – **Learning** – the resulting increase in knowledge, skills and competencies; the degree to which participants acquire the intended knowledge, skills, competencies. This assessment is carried out during the training in the form of either a knowledge demonstration or test.

Level 3 – **Behaviour** – the transfer of knowledge, skills, and/or competencies from training environment to the job (change in job behaviour due to the training programme); the degree to which participants apply what they learned during the training when they are in their real work environment. This evaluation should be performed 3–6 months post training while the trainee is performing the job.

Level 4 – **Results** – the results achieved in consequence of the attendance and participation in the training programme.

Therefore, EQAVET and performance indicators designed to monitor and evaluate the quality assurance of the training programme provide **indicators related to each of one of these four levels of evaluation:**

- Indicators related to the reaction assessment level;
- Indicators related to the learning assessment level;
- Indicators related to the behavioural assessment level;
- Indicators related to the impact assessment level.

5.4 Evaluation procedures

Description of the evaluation procedures for WP3 – Development of the BioS Curricula Syllabi and Educational Material (OER)

Task 3.4: Monitoring and evaluation of WP3 (M9–M18); Task Leader: P5 - BIB

WP3 leader will monitor and report on the following performance indicators:

Task/Goal:	Performance indicators
Development of BioS training material	• Minimum 10 open e-resources (sites) used as reference; • Minimum 70% flexible learning methods; • Minimum 30% multimedia resources used per unit; • More than 80% quality of the teaching material, as assessed by the focus group; • Minimum 80% suitability of the teaching methods to the target group's needs, as assessed by the focus group;
Development of BioS assessment exams	• 4 self-assessment tests; • 20 peer-assessment assignments; • 1 final exam for the four training modules; • More than 95% relevance of the assessment criteria with learning objectives as assessed by the EAB.

The following evaluation activities are planned for this WP:

- Evaluation of the training material by the focus group and the EAB and possible revision.
- Evaluation of the relevance of the assessment criteria with learning objectives as assessed by the EAB and possible revision.

Description of the evaluation procedures for WP5 – Course Delivery and WBL:

Task 5.3: Evaluation and improvement of the BioS course (M19–M36);

Task Leader: P6-UPAT

Evaluation of the BioS VOOC delivery and work-based learning periods will be attained through the development of an evaluation form that will be designed for this purpose by P6-UPAT. The feedback will be carefully analysed in an evaluation report, prepared by P6-UPAT, which will recommend specific changes, if needed.

The same process will take place after each round of BioS Course delivery (*feedback loops*). P6-UPAT will make sure that pilot-testing and delivery are being implemented in accordance with EQAVET, as the latter will have been tailored to the project needs and embodied in the BioS training programme. P6- UPAT will make sure that the evaluation form to be used will pose all necessary questions to end- users, and will take all measures required, so that accordance with EQAVET through pilot-testing and delivery is

guaranteed. Following each round of delivery, an evaluation report - like the one following the pilot-testing, will also be produced by P6-UPAT, outlining potential shortages or pitfalls and suggesting remedial actions or improvements, if needed.
P6-UPAT will monitor and report on the following performance indicators:

Task/Goal:	**Performance indicators**
BioS VOOC Delivery	• 800 medical doctors will be trained (an average of 400 per round); • The project will promote the equal participation of women and men (maximum divergence 65%-35%); • 100% of the programme will be accessible to people with special needs; • 90% trainees are satisfied with the course delivery;
Work-based learning periods	• 4 self-assessment tests; • 20 peer-assessment assignments; • 1 final exam for the four training modules • More than 95% relevance of the assessment criteria with learning objectives as assessed by the EAB

Evaluation tools:

The evaluation will be carried out through using the following tools for the collection of data:
- online questionnaires to health professionals who participated in the VOOC delivery and WBL;

- online questionnaires to VET professionals involved in the VOOc delivery and WBL.

5.5 Involvement of stakeholders, evaluation and results consensus

During the evaluation stage, relevant stakeholders are asked to evaluate the BioS VOOC delivery and the Work Based Learning (WBL).

The evaluation process includes the articulation with the internal and the external stakeholders.

The stakeholders to involve in the above-mentioned evaluation are:

- all health professionals who participated in VOOC delivery and WBL;
- all VET professionals involved in the VOOC delivery and WBL: course delivery coordinators/supervisors/monitors; trainers; other relevant VET and educational professionals involved.

The evaluation of the training results is carried out in accordance with the planned monitoring and evaluation procedures, accomplishing the quality cycle. At the end of each round of implementation of the training programme, takes place an evaluation procedure, which is carry out by reference to EQAVET indicators identified in this document and by reference to the evaluation procedures defined in the quality assurance plan.

The evaluation process includes the articulation with the internal and the external stakeholders.

The results of the evaluation will be reported in a proper evaluation document and should allow to the identification of the necessary improvement. Therefore, the objectives, activities and actions included in the action plans derive from this evaluation.

6. Review Stage

6.1 Quality criteria

► The results of the evaluation are used to develop action plans appropriate to the review of existing practices.

6.2 Indicative descriptors

► Learners' feedback is gathered on their individual learning experience and on the learning and teaching environment. Together with teachers', trainers' and all other relevant stakeholders' feedback this is used to inform further actions.

► Procedures on feedback and review are part of a strategic learning process in the organization, support the development of high quality provision, and improve opportunities for learners.

6.3 Review stage procedures

Based on the results of the evaluation, the following reports will be elaborated by P6 – UPAT:

R5.2 – VOOC delivery reports

Two (2) reports will be produced after the completion of each round of VOOC delivery. Reports will analyse and present the findings of the evaluation of the toolkit for the 1st round of the course delivery (M19-M22) and for the 2nd round of the course delivery (M24-M27).

The 1st report will be delivered at M23 and it will include specific recommendations for the improvement of the programme in the second period of programme delivery.

The 2nd report will be delivered at M28 and it will analyse and present the findings of the evaluation toolkit for the second period of the programme delivery, concerning both the virtual courses and the VLE. Its findings will feed into the final project evaluation report (WP7).

R5.3 – WBL reports

Three (3) reports will be produced analysing and presenting the findings of the evaluation toolkit for the WBL component of the BioS training course.

The 1st report will be delivered at M32 and it will present and analyse the findings of the evaluation toolkit, concerning the practical skills obtained by medical doctors during the 1st WBL activity.

The 2nd report will be delivered at M34 and it will present and analyse the findings of the evaluation toolkit, concerning the practical skills obtained by medical doctors during the 2nd WBL activity.

The 3rd report will be delivered at M36 and it will present and analyse the findings of the evaluation toolkit, concerning the practical skills obtained by medical doctors during the 3rd WBL activity.

The findings of the WBL reports will feed into the final project evaluation report.

It is intended that an evaluation report register a critical reflection on the execution of the planned actions, the mechanisms of decision-making and planning, the implementation of the work plans. It requires that the evaluation analyse the actual validity of the defined objectives, to assess whether they have been properly pursued and achieved. Each evaluation report should contain recommendations for the next step of the implementation of the training programme.

Management Board should make an auto-evaluation and take decisions on the targeted outcomes and results not yet achieved and/or establish new objectives based on the generated evidence, to ensure the introduction of necessary improvements and/or to devise procedures for change.

Depending on the results of the evaluation, the project coordinator with the Management Board should elaborate an Improvement Plan to reorient the intervention in direction to the desired objectives and goals.

Actions Plans should be elaborated by the project coordinator to guarantee the necessary improvement actions. Each WP leader may also have to develop action plans at the request of the project coordinator.

The relevant stakeholders also should be involved in the elaboration of the Action Plans (e.g., EACEA).

6.4 Implementation of a culture of continuous quality improvement

The quality assurance and improvement cycle is applied to each round of the implementation of the training programme. This procedure allows an intermediate assessment of the targets pursued and a timely review of what was planned. In this way, a continuous quality improvement is being promoted.

Also, a continuous quality culture is being adopted with annual monitoring cycles (R6.1). Monitoring reports are produced every six months by WP leaders, and reports on the evaluation of the project implementation are elaborated annually. Reports are prepared based on the selected EQAVET indicators and other defined management indicators, systematically evaluating the results achieved.

Table 7: *Auto-evaluation grid for each stage of the QA cycle and identification of the evidence.*

EQAVET Principles	**Stage 1 – Planning** **Quality criteria** Planning reflects a strategic vision shared by stakeholders and includes the goals/objectives, the actions to carry out and appropriate indicators. Grid for the auto-evaluation of the training management practices and identification of the evidence. **Indicative descriptors** - European and national policy goals/objectives are reflected in BioS training programme goals/objectives. - Explicit goals/objectives are set and monitored. - A permanent consultation with stakeholders is organized in order to identify specific needs. - Responsibilities for quality management and development are explicitly defined. - Project staff participates from the beginning in the planning process, in particular with regard to quality development. - VET providers plan cooperation initiatives with other VET providers. - Stakeholders participate in the process of analysing the training needs. - VET providers have an explicit and transparent quality assurance system.		
	Training management – Practices	**Auto-evaluation: S- Yes; N- No; P- Partially**	**Identification of evidences**
Strategic vision and visibility of the processes and results of the training management	P1 - The established goals/objectives are in line with European and national policies.		
	P2 - The actions outlined reflect the strategic vision shared by internal and external stakeholders.		
	P3 - There is an explicit relation between the established goals/objectives and its monitoring through indicators.		
	P4 - The allocation of responsibilities for quality assurance is explicit.		
	P5 - Partnerships and cooperation initiatives with other VET providers are planned.		
	P6 - The quality assurance system in use is explicit and known by internal and external stakeholders.		
Involvement of internal and external stakeholders	P7 - Professionals participate from the outset in the training planning, including in the quality assurance process.		
	P8 - Internal and external stakeholders are consulted on the identification and analysis of training needs, and their opinion is taken into account in the design of the training plan.		
Continuous improvement of training using selected indicators	P9 - The action plans contain the necessary changes based on the information produced by the selected indicators.		
	P10 - The process of auto-evaluation, consensual with internal and external stakeholders, is based on the information produced by the selected indicators.		

EQAVET Principles	Stage 2 – Implementation Quality criteria **Action plans, designed in consultation with stakeholders, flow from the goals/objectives to be achieved and are supported by diverse partnerships.** Indicative descriptors **- Resources are appropriately allocated internally to achieve the objectives outlined in the action plans.** **- Relevant and comprehensive partnerships are created to carry out the actions envisaged.**		
	Training management – Practices	**Auto-evaluation: S- Yes; N- No; P- Partially**	**Identification of evidences**
Strategic vision and visibility of the processes and results of the training management	I1 – Human, material and financial resources are allocated in order to achieve the objectives outlined in the action plans.		
Involvement of internal and external stakeholders	I2 - Established partnerships are used to support the implementation of the action plans.		
Continuous improvement of training using selected indicators	I3 - Changes are introduced in accordance with defined improvement action plans.		
	I4 - Data collection tools and procedures, agreed with internal and external stakeholders, are applied within the framework of the auto-evaluation process defined.		
EQAVET Principles	Stage 3 – Evaluation Quality criteria **The evaluation of results and processes regularly carried out allows to identify the necessary improvements.** Indicative descriptors **- Auto-evaluation is carried out periodically according to the defined criteria and indicators.** **- The evaluation and review cover the processes and results of training.** **- Evaluation and review include appropriate and effective mechanisms to involve internal and external stakeholders.** **- Early warning systems are in place.**		
	Training management – Practices	**Auto-evaluation: S- Yes; N- No; P- Partially**	**Identification of evidences**
Strategic vision and visibility of the processes and results	E1 – Early warning mechanisms to anticipate departures from planned objectives are established.		

of the training management			
Involvement of internal and external stakeholders	E2 - Mechanisms are in place to ensure the involvement of internal and external stakeholders in the evaluation.		
	E3 - The results of the evaluation are discussed with internal and external stakeholders.		
Continuous improvement of training using selected indicators	E4 - The periodic auto-evaluation uses a consensual reference with the internal and external stakeholders and identifies the improvements to be introduced, depending on the analysis of the information produced.		
	E5 - Improvements to process and results take into account the satisfaction of internal and external stakeholders.		
EQAVET Principles	Stage 4 – Review Quality criteria **The results of the evaluation are used to develop action plans appropriate to the review of existing practices.** Indicative descriptors **- The trainees' opinions are collected on their individual learning experiences and the learning environment. Opinions are used to improve new actions.** **- Feedback and review procedures are part of a strategic management process.** **- The results of the evaluation process are discussed with stakeholders and appropriate action plans are drawn up.**		
	Training management – Practices	**Auto-evaluation: S- Yes; N- No; P- Partially**	**Identification of evidences**
Strategic vision and visibility of the processes and results of the training management	R1 – Revisions are planned and inform the regular updating of practices.		
Involvement of internal and external stakeholders	R2 - Feedback from internal and external stakeholders is taken into account in reviewing existing practices.		
Continuous improvement of training using selected indicators	R3 - The results of the evaluation and the changes to be introduced underpin the development of appropriate action plans.		

Chapter 4: Conclusions

A policy of quality assurance and improvement is promoted in BioS Project. With a view to promote a high quality in the design, development and delivery of the BioS training programme, a policy quality based in EQAVET is being followed. The same VET quality criteria are being promoted across European countries, increasing transparency and contributing to highly skilled workers.

A set of quality procedures and practices associated with the four phases of the quality cycle are being pursued for the design and delivery of the BioS training programme:

- Planning stage – planning reflects a strategic vision shared by stakeholders and includes the goals / objectives, the actions to carry out and appropriate indicators.

- Implementation stage – action plans, designed in consultation with stakeholders, flow from the goals/objectives to be achieved and are supported by diverse partnerships.

- Evaluation stage – the evaluation of results and processes regularly carried out allows to identify the necessary improvements.

- Review phase – the results of the evaluation are used to develop action plans appropriate to the review of existing practices.

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