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education



**Digital University Aula in Nanotechnology Education to
Fight COVID-19**

**Nano-Code
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Nano-Code project

“Emergency preparedness is a team sport.”

Eric Whitaker

The new Industrial 4.0 strategy for Europe considers the investigation of Nanotechnology as very promising due to its potential for development of therapeutics, vaccines, means for diagnostic purposes, and strategies to lessen the healthcare overload. The nanoparticles possess unique characteristics, such as small size, improved solubility, better target reachability, enhanced half-life, diminished side-effects, and surface adaptability. Hence, they are being utilized to show up a desired clinical transformation directly targeting viruses. Currently, the science is looking into Nanotechnology for developing better-quality assays and nano sensor-based diagnostic tools, improved delivery of drugs and prolongation of their circulation time. Thus, Nanotechnology seems to have a potential to offer innovative effective alternatives to combat viruses.

The researchers identify current gaps in the circular economy and COVID 19 topics and encourage the application of text tools to stimulate the research process and assist in communicating with the public. This proposes a new insight into the circular economy following the analysis of the most prominent issues related to COVID 19, the government responses to the crisis, and life sustainability. The global emergency of the COVID 19 pandemic requires a response through science and technology means, wherein Nanotechnology approaches may contribute with advanced solutions. They can address the many clinical and healthcare challenges that have arisen from the coronavirus activity, the fight against the disease, and the ongoing mitigation strategies. The COVID 19 crisis has accelerated as well the need to digitally transform education and training systems. In Higher Education (HE), there is a need for strengthening the Education 4.0 perspectives to provide high-quality, inclusive digital education and to realize an immediate impact of the new knowledge for combating the coronavirus pandemic.

To address these needs, the project **“Digital University Aula in Nanotechnology education to fight COVID 19 – Nano-Code”** develops an innovative educational programme addressing a theme of particular EC interest: Nanotechnology *vs.* COVID 19. It is based on ICT and EQF/NQFs/HE strategic system for organization of an education process and is foreseen to improve the professional performance of HE tutors/graduates and encourage implementation of relevant quality standards in nanotech area. The innovative digitally enhanced curriculum in “Nanotechnology to fight COVID 19” creates prospects for targets-focused impact. Its structuring and operation within the established Digital University Aula through a Learning Outcomes-based model contributes to the introduction of a competence-grounded approach to teaching/learning and assessment. In this way the project promotes HEIs capacity to support and build up employability, mobilizing education, science and technology to realize positive effect in COVID 19 combat.



The circular economy brings a transformative COVID-19 recovery strategy. It helps the transition to a future that delivers economic, environmental, and societal benefits, while weakening the risk of upcoming crises.

In the last year and a half, **the global health emergency posed by COVID-19** has not only changed the world-wide economy and trade, movement patterns, job market and employment opportunities but **has deeply transformed the ways we think about the present and plan for the future**. The deep economic and social effects and geopolitical repercussions observed strongly influence **healthcare and science** which **are further implicated into the changes in society and education** which, in their turn, would bring the much needed transformation in economy and culture.

On the one hand, **the pandemic required response through science and technology** wherein Nanotechnology has come into play since SARS-CoV-2 has nanometric dimensions. The nanotech approaches can address the numerous clinical and public healthcare challenges that have arisen from COVID-19, the fight against it, and the ongoing mitigation strategies.

On the other hand, **the COVID-19 crisis has significantly accelerated the need to digitally transform the education** and the training systems. Higher education experienced an emergency to strengthen its capacity to provide high-quality, inclusive digital education and with an immediate impact of the new knowledge for combating the coronavirus pandemic.

HOWEVER, HOW TO DO IT BY DISTANCE?



The 21st century is the century of digital communications with innovations emerging at an increasingly faster pace. Innovative and engaging learning environments are among the forerunners of digitisation. New technologies help learners to expand their personal and collaborative intellectual resources in a way that makes knowledge creation feasible.

The digitisation of higher education requires strengthening of tutors and graduates' capacity to implement online, mixed and distance teaching and learning methods. In order to prepare for the emerging innovation-driven knowledge society, university teachers and graduates need to unify their efforts in a knowledge-creating community with a focus on advancement and shared knowledge.

The challenge of the digital era is to make well-informed decisions, and to develop insight into people's motivation to make the most of the technologies in the first place. Thus, three groups of focus technologies emerged whose use may result in efficient cooperative knowledge: Open Educational Resources, one-to-one computing environments, and computer data systems. The use of digital learning technologies and Open Educational Resources encourages:

Graduates:

- ❖ to grasp concepts more quickly and fully
- ❖ to connect theory and application more skillfully
- ❖ to engage in learning more readily

and Tutors:

- ❖ to improve their instructional techniques
- ❖ to control instruction time
- ❖ to facilitate the sharing of knowledge

Therefore, the 2030 Agenda for Sustainable Development has new paradigms of education that reflect the new understanding of knowledge and creates novel possibilities for its full capacity exploitation. BUT how to successfully integrate the digital technologies in formal education to answer the fast-changing requirements for flexibility and personalization of training and learning practices?



The use of Nanotechnology offers promising opportunities for the development of novel strategies to prevent, diagnose and treat COVID-19. And here comes **the Nano-Code** with its mission of linking digital technology and Nanotechnology applications used in the fight against COVID-19, **by introducing specialised digitally enhanced blended learning curriculum.**

To successfully adapt educational and training systems to novel needs, the Nano-Code initiative:

- ❖ Develops **new educational tools and online learning paths.**
- ❖ Offers **novel cost-reduced forms** of teaching and learning **accessible** to learners.
- ❖ Promotes higher education learning using digitally-based teaching and learning methods: **e-learning** and **blended learning.**
- ❖ Encourages the **transition** from managing the jobs to **managing the skills** with the assistance of **digital tools.**

The Nano-Code educational curriculum:

- ❖ Introduces modern applications of Nanotechnology to academic professionals and BSc/MSc students to **bring the knowledge and insights needed for shaping a better and healthier future**.
- ❖ Uses a Digital University Aula with the help of information and communication technologies to accommodate case studies, presentations, videos, visualizations, 3D-educational images, etc., and **to support the change in the curriculum design, academic practice, infrastructure and the modes of higher education in the digital age**.

The Nano-Code emphasizes **the role of higher education tutors who:**

- ❖ Act not only as learning providers, but also as **problem-settlers, masters, consultants, and analysts** of the education system.
- ❖ Are key actors in **transforming** the traditional higher education **into sustainable investment** with a focus on the quality and efficiency of education.
- ❖ Assess graduates' performance and diagnose their learning needs, **mediating learner's experiences** through the creation, discovery or adaptation of training content.

The Nano-Code tackles the graduates' and tutors' **need for advanced digital skills** through:

- ❖ Introduction of the **concept of digital competence** through mapping advanced digital skills and knowledge.
- ❖ Review of the existing **good examples** for application of digital technologies in the universities.
- ❖ A guideline focused on the **best pedagogical and ICT-based practices** in higher education.

The Nano-Code graduates:

- ❖ Are **actively engaged** in the learning process as learners, collaborators and team members.
- ❖ Have increased capabilities to **learn more effectively** in accordance with their **personal pace** of learning after mastering the learning process.

The Nano-Code assists the graduates by:

- ❖ Creating a **software tool for teaching/learning on demand**, i.e. a digital training organizer offering a sequence of activities to organised an e-learning process on demand by end-users.
- ❖ Introducing an approach to learning which is **independent of space and time limits**.
- ❖ Offering **high-quality specialised education**.
- ❖ Promoting the creation of **inclusive higher education systems**.



The Nano-Code increases higher education prospects for integrated policies in Bulgaria, Germany, Greece, and Turkey to bring together Nano- and digital technologies in building an innovative educational programme to answer the need for better public participation in shaping the future research and innovation strategies for combating COVID-19.

These objectives are also in the core actions outlined in the **Sustainable Europe 2030**, which facilitate the economy development and sustainable growth. **The EU Centers of Nanotechnology Information recognize a gap in the links between Nanotechnology and other science areas and the ICT that needs to be addressed.** This gap necessitates **an improvement of the higher education opportunities** of academic professionals and BSc/MSc graduates **to work with digital tools**.

To tackle these opportunities, the Nano-Code initiative introduces an innovative digitally designed and accessible university educational programme “**NANOTECHNOLOGY TO FIGHT COVID 19**” which is

- ❖ Oriented towards the need for specialised education in Nanotechnology.
- ❖ Giving access to innovative content through high-quality digital resources and tools.
- ❖ Based on ICT and EQF/NQF/HE strategic systems for organization of the educational process.
- ❖ Aimed at improving the professional performance of graduates.
- ❖ Encouraging implementation of relevant quality standards in the Nanotech area.

The **innovative training model and content** offered by the Nano-Code team reflects the partner countries’ needs to:

- ❖ Conduct an in-depth study of the specific resources and define the applications of digital technologies in teaching/learning Nanotechnology.

- ❖ Create a virtual space (the Digital University Aula) and educational content that offer individual solutions adapted to challenges and real situations at local level.
- ❖ Apply EQF/NQF/HE principles for competence development of the target groups.
- ❖ Demonstrate the innovative capacity of Nanotechnology and its impact on the fight against COVID-19 through digital education.

To address these needs, the Nano-Code partnership:

- ❖ Produces tangible products, amalgamating Nano- and digital technologies for a significant social and economic impact.
- ❖ Gives a big advantage to employability and economic improvement in the partner countries.
- ❖ Creates transnational cooperation and supports the best educational practices to raise the job opportunities and educational flexibility and to increase the effect for a fight against COVID-19.
- ❖ Develops a strategic partnership to enhance the quality of higher education in the Nanotech sector.
- ❖ Outlines prospects for future learning and career paths of the Nano-Code graduates at national and European level.

To achieve its ultimate effect, the Nano-Code initiative:

Brings together six partner organisations:

- ❖ Sofia University St Kliment Ohridski (Bulgaria)
- ❖ R&D Center "Biointech" (Bulgaria)
- ❖ SID-97 PAVLOV Ltd. (Bulgaria)
- ❖ Institut für Sozialforschung und Kommunikation (SOKO) (Germany)
- ❖ European Institute for Evolution and Integration (EIEO) (Greece)
- ❖ Aksaray University (Turkey)

Organises two transnational project meetings and four multiplier events:

- ❖ *Nanotechnology vs. COVID-19: Applicability of Nano-Code digitally enhanced curriculum* (in Greece)

- ❖ *Nano-Code innovative model for digital higher education: promoting the remote gaining of knowledge (in Turkey)*
- ❖ *Nano-Code Digital University Aula - contribution to inclusive blended learning based on EQF/NQFs and ECTS principles (in Bulgaria)*
- ❖ *Implementation of the digital competence concept in teaching/learning process (in Germany)*

and

Produces five intellectual outputs:

O1: *Nano-Code Digital University Aula*

O2: *Digital competence concept: mapping advanced digital skills and knowledge*

O3: *Nano-Code innovative model for digital higher education*

O4: *Nano-Code digitally enhanced curriculum Teachers/Trainers/Researchers/Youth workers*

O5: *Fast Digital Organizer for teaching/learning on demand of HE tutors/graduates*



O1: NANO-CODE DIGITAL UNIVERSITY AULA

Leader: Sofia University St Kliment Ohridski

Targets: higher education tutors and graduates; wider public

Type: e-Learning platform

Media: Internet

Languages: Bulgarian, English, German, Greek, Turkish

Background

A preliminary analysis of the results of an e-survey among the potential users regarding the content, functionality and use of the Nano-Code platform revealed demand for:

- ❖ A **dedicated virtual space** which would allow remote access to teaching/learning content.
- ❖ An **IT-based educational platform** to host various blended teaching/learning modules and methods and enhance the capacity of tutors and graduates for their application.

Content

The Nano-Code Digital University Aula hosts:

- ❖ Simulation of a **flexible environment** to fit different teaching/learning needs.
- ❖ **Interactive, distributed and IT-based content** to be fed into a novel e-system for organisation of an innovative educational curriculum.
- ❖ A **space for impact** through dissemination and utilisation activities.

The Nano-Code Digital University Aula has the following **subpanels**:

1. **Information about the project:** its aims, objectives and progress and applicable materials
2. **The NANOC-Code digital teaching/learning panel** which:
 - ❖ Hosts the innovative e-educational curriculum created using Content Management System (CMS).
 - ❖ Follows a multilingual approach for the interactive presentation of the content.
 - ❖ Boosts the educational e-system which offers blended opportunities with online and offline access.
 - ❖ Gives opportunities to trainees to choose links and supports them to find specific competency-based Learning Pathways (LPs).
 - ❖ Allows for final tests covering dynamic questions for (self)-evaluation.
 - ❖ Facilitates trainees' choice regarding the type of learning.
 - ❖ Supports the partnership in maintaining, updating and rationalizing the Nano-Code educational programme.
3. **Nano-Code e-resources:** a meta-database of:
 - ❖ Records of useful links, legislative documents, studies, reports, etc., pertinent to the EU and national practices in higher education.
 - ❖ National and EU information in Nanotechnology against COVID-19 and related sectors.
4. **Nano-Code open forum for dissemination and utilisation:** the project deliverables offered to a large audience of end-users and target groups.

Where is the innovation?

The Nano-Code Digital University Aula possesses:

- ❖ Multilinguality and multifunctionality character
- ❖ Accessibility
- ❖ Flexibility

What is the impact?

The Nano-Code Digital University Aula is a dedicated virtual space to be maintained after the end of the project.

Transferability potential

The Nano-Code Digital University Aula transfers:

- ❖ The best practices in e-teaching/learning and information provision on Nanotechnology to fight COVID 19.
- ❖ Categorized information and knowledge in Nanotechnology and digital education.
- ❖ A specialised mode of content organisation which can be transferred to other contexts and subjects.

O2: DIGITAL COMPETENCE CONCEPT: MAPPING ADVANCED DIGITAL SKILLS AND KNOWLEDGE

Leader: Aksaray University

Targets: higher education tutors and graduates; wider public

Type: Methodologies / guidelines

Media: Internet

Languages: English

Background

A preliminary analysis of the results of an e-survey among users regarding the need for advanced digital skills and knowledge for the purposes of teaching and learning revealed:

- ❖ A **lack of direct link** between advanced digital competence and the ability to use ICT tools.
- ❖ **Challenges for the advanced digital skills** and knowledge development for both tutors and graduates.
- ❖ **Insufficient critical attitude in content creation and use**, incl. awareness of IPR of online materials, privacy and security, ethical and legal use of online resources.
- ❖ A need for mastering the abilities to **use information selectively and responsibly**.

- ❖ A demand for a **structured and consistent approach** to respond to the challenges related to distance/online education.

Content

The Nano-Code Digital competence concept contains **methodologies and guidelines** to developing innovative teaching and learning methods through learner-centered approaches, and connecting universities. The core topics are:

- ❖ **Teaching through digital technology covering:**
 - the use of ICT as a **learning tool** for teaching a subject;
 - the confident and **critical use** of digital tools for online collaboration;
 - the use of **social computing tools** and development of skills for **collaboration, sharing, and reflection**;
 - the competence to **identify, retrieve, store, organize, and analyze digital information** and **evaluate its relevance**;
 - the use of digital technology to provide learners with online access to **better teaching opportunities**;
 - the **selection** and **presentation** of learning content;
 - the support of learning in **online and blended spaces**;
 - the provision of multiple means of **representation, expression, and engagement**.
- ❖ **Learning through digital technology** covering:
 - digital technology as a tool that can improve and enhance learning through **personalized approach** and **project-based learning**;
 - transformative learning opportunities available to all (**equity to learning**);
 - support for the creation of **interdisciplinary learning paths**.
- ❖ **Assessment through digital technology** covering:
 - **measuring learning** through digital technology and **use assessment data** to improve learning;
 - **technology-enabled assessment** for more accessible and **valid evaluation, reduction** in the time, resources, and disruption of learning, and **real-time feedback**;
 - assessments through digital technology as a tool that supports teacher's evaluation and **coaching**;
 - types of digital assessments and **assessment data retrieval**;

- use of technology in **measuring knowledge** and **skills** and the focus on **autonomy** and **responsibility**;
- a special emphasis put on the ways of providing **accredited teaching certificates and promotion** (incl. the use of **teaching portfolios**).

Where is the innovation?

The Nano-Code Digital competence concept provides:

- ❖ Deeper **understanding of the challenges** in teaching, learning and assessing.
- ❖ Summary of the **modern, most effective methodologies** for digital teaching/learning and assessment.
- ❖ The focus on the **necessity for implementation of digital technologies** in higher education systems.

What is the impact?

The Nano-Code Digital competence concept offers:

- ❖ Guidelines on how to implement the concept to raise the quality and competence during teaching.
- ❖ Qualitative methodological approach for teaching/learning/assessment which identifies key issues around the modernization in the higher education institutions.

Transferability potential

The Nano-Code digital competence concept transfers contemporary methodological approach in higher education with a focus on:

- ❖ The **shift from teaching to learning**.
- ❖ A **learner-centered approach**.
- ❖ **Self-organized** and **self-directed** learning.
- ❖ Interactive and **collaborative learning**.

O3: NANO-CODE INNOVATIVE MODEL FOR DIGITAL HIGHER EDUCATION

Leader: R&D Center “Biointech”

Targets: higher education tutors and graduates; wider public

Type: Course / curriculum – Training scheme

Media: Internet

Languages: Bulgarian, English, German, Greek, Turkish

Background

A preliminary analysis of the results of a survey among the participants indicated demand for:

- ❖ High-quality inclusive digital education.
- ❖ **Quick application** of the knowledge to combat the coronavirus pandemic in Europe.
- ❖ **Mitigation and impute of efforts** to support and facilitate the continuity of education through remote learning.
- ❖ An educational model equipped with a **concise set of instructions** for its exploitation.

As a result, the Nano-Code innovative model for digital higher education had to be careful about the **structural implementation** of the digital teaching/learning process, its key features and **all necessary steps** to be followed in order for participants to benefit from the specific content.

Content

The Nano-Code innovative model for digital higher education works out a **flexible innovative training arrangement** for university tutors and graduates within a digital environment, operating in interactive mode. It covers:

Part A: Model structuring

An **algorithm** for presentation of elaborated learning content in **Units of Learning Outcomes (ULOs)** as basic components of a qualification

10 Learning Pathways in Higher Education (HE-LPs) corresponding to particular ULOs designed to match EQF levels 6, 7 and 8

Use of **ECTS** for knowledge assessment and teaching methodology validation;

Part B: Model exploitation

User guide for model operation

Implementation of the guide within the HE-LPs to maximize the use of the digital educational curriculum

The Nano-Code blended learning is **offered within the Nano-Code Digital University Aula** taking into account the advanced digital skills and knowledge mapped and transformed in a digital and open learning model, comprising:

- ❖ **Learning Outcomes in Nanotechnology** to fight COVID-19 with specific content.

- ❖ **Online, mixed and distance teaching and learning tools** for specific content presentation incl. (self)-assessment, and structural arrangement of optimal training options on-demand to meet target groups' needs.
- ❖ **ULOs** for qualification evaluation implementing EQF, ECTS, EUROPASS instruments.
- ❖ LOs featuring the key elements: **knowledge, skills, and the focus on autonomy and responsibility**.
- ❖ HE-LPs designed to fit the **variety of the requirements** of the target groups.
- ❖ A **practical guide** to the exploitation of the Nano-Code model for digital higher education: **step-by-step instructions** of how tutors and graduates can use the online and offline options of the Nano-Code blended-teaching/learning programme.
- ❖ Outline of **evaluation process** and criteria for success.

Where is the innovation?

The Nano-Code innovative model for digital higher education provides:

- ❖ A **teaching/learning model in Nanotechnology**, contributing to the fight against COVID-19.
- ❖ Integration of university **philosophy into practice** through design of a digital environment bringing defined knowledge, skills, and a focus on autonomy and responsibility.
- ❖ **Optimal** online/offline teaching/learning **approaches**.
- ❖ Application of ECTS validation instruments to facilitate **recognition of competences** adopted through personalized learning arrangements fitting the end-user's demands.

What is the impact?

The Nano-Code innovative model for digital higher education supports the Nanotechnology applications in fighting COVID-19 to **empower** university tutors and graduates with e-training technology and **impact European educational strategies**.

Transferability potential

The Nano-Code innovative model for digital higher education transfers:

- ❖ Internet-based applications and digital teaching/learning tools and communication devices to **support the flow of information and ideas** by creating a **personal hub** to **shared** current and updated concepts.
- ❖ Digital format and operation to be exploited easily for dissemination and use to popularize the Nano-Code model for acquisition of knowledge, skills, and attitude.

O4: Nano-Code digitally enhanced curriculum

Leader: R&D Center “Biointech”

Targets: higher education tutors and graduates; wider public

Type: Course / curriculum

Media: Internet

Languages: Bulgarian, English, German, Greek, Turkish

Background

The preliminary analysis of a survey among university graduates regarding the knowledge and skills related to application of Nanotechnology to fight COVID-19 showed demand for:

- ❖ Skills related to working with advanced tools using Nanotechnology to **help the medical, technical, and scientific communities** to fight the pandemic (incl. detection, sanitation, therapies, and vaccines).
- ❖ Skills, knowledge and competences to **put the knowledge into practice in the community** to support effective teaching/learning and education policies and initiatives.

Content

The Nano-Code educational curriculum “Nanotechnology to fight COVID 19” is:

- ❖ Organised as **Learning Outcomes** in accordance with the Nano-Code innovative model for digital higher education to improve the accessibility to learning opportunities for university tutors and graduates.
- ❖ Based on EQF principles.
- ❖ Covering training content organised to **fit the trainees’ educational background and demands**.
- ❖ Offered as **modules**, consisting of **training units**, presented as Learning Outcomes (LOs) constituted of knowledge, skills and the focus on autonomy and responsibility.

The Nano-Code Learning Outcomes are:

- ❖ Structured as **Learning Pathways** in all partners’ languages.
- ❖ Promoted as innovative content covering various aspects of Nanotechnology fundamentals and their application in **different aspects** of the fight against COVID-19.
- ❖ Organised in **6 modules**, each containing **2 training units**, as follows:

Module 1: Fundamentals of viral particles interaction with solids

Viral particles and functional Nanomaterials crossing point

Nanotechnology-enabled personal protection equipment

Module 2: Nanotechnology for antiviral disinfection

Improved and virus-disabling air filtration systems

Inanimate surfaces and disinfection methods

Module 3: Strategies for SARS-CoV-2 detection and disease diagnosis

Nanomaterials in design and application of SARS-CoV-2 detection methods

Nanotechnology in diagnostic techniques for SARS-CoV-2

Module 4: Nanotechnology and therapeutic solutions for COVID 19

COVID-19 therapeutics: Nanotechnology in antiviral treatments and vaccines

New platforms to control viral infections: Nano-scale carriers and drug delivery systems

Module 5: Nanotechnology in Food: emerging COVID 19 risks

Food and COVID-19

Transmission of COVID-19 by food and food packaging

Module 6: Ethical, legal and social aspects of Nanotechnology vs. COVID 19

Integration of social and ethical studies into Nanotechnology developments

Law and Nanoscience interface: legal doctrines relevant to Nanotechnology

Where is the innovation?

The Nano-Code educational curriculum “Nanotechnology to fight COVID 19”:

- ❖ Contributes to the innovative tendencies of using **Nanotechnology against COVID-19**.
- ❖ Encourages the technological revolution of using **Nanotechnology for solving global health problems**.
- ❖ Supports the transfer of knowledge and skills in **Nanotechnology to support the European future**.

What is the impact?

The Nano-Code educational curriculum “Nanotechnology to fight COVID 19” strives for:

- ❖ **Enrichment, updating, re-skilling** of the target groups’ knowledge and practical attitudes in Nanotechnology.
- ❖ Contributing to the establishment and support of Nanotechnology practical application by **empowering university tutors and graduates** to use the digital teaching and learning technology.

- ❖ Supporting Learning Pathways to **motivate the users** to gain Nano-Code knowledge and practical skills.

Transferability potential

The Nano-Code educational curriculum “Nanotechnology to fight COVID 19” transfers:

- ❖ experience in transnational cooperation
- ❖ reinforcement in the knowledge and skills in Nanotechnology to fight COVID-19
- ❖ educational tools to support the effective teaching/learning of university tutors and graduates in Nanotechnology

O5: FAST DIGITAL ORGANIZER FOR TEACHING/LEARNING ON DEMAND OF HE TUTORS AND GRADUATES

Leader: Sofia University St Kliment Ohridski

Targets: higher education tutors and graduates; wider public

Type: Services

Media: Internet

Languages: Bulgarian, English, German, Greek, Turkish

Background:

The preliminary analysis of a survey among users revealed demand for:

- ❖ Organised **mobile training along personal schedules**.
- ❖ Battling the effect of the national closures on over half of the world's learners.
- ❖ Addressing the educational disruption with **alternative flexible solutions** that exploit distance and online learning.
- ❖ **Personalized approach** to education.
- ❖ A **digital training organizer** operating as a sequence of activities that lead to an e-learning process provided **on demand** to the end-users.

Content

The Nano-Code Fast Digital Organizer provides a learning management software to create custom micro-learning content walkthroughs which is:

- ❖ Based on the **specific needs** of its end-users

- ❖ Executed with application software that allows deploying in a **cross-platform computing** environment
- ❖ Linked to the Nano-Code Digital University Aula
- ❖ Comprising instructing activities on knowledge and skills and the ways to deliver the **right learning activity to the right individual at the right time.**

As a result, the e-training process via the Nano-Code Fast Digital Organizer is:

- ❖ Structured in **hierarchy of steps**;
- ❖ Allowing the **fastest and shortest route** to a tailored digital training process.
- ❖ Applicable at institutional level to facilitate the customized e-teaching/learning offered as an **alternative.**

The software offered by the Nano-Code Fast Digital Organizer considers:

- ❖ The indicators: The **university offerings match the trainees' profiles** using tools of the blended-training process: **EU validation instruments** such as EQF, NQFs, ECTS, EUROPASS.
- ❖ The process: The programme allows **combinations on-demand** from a **pool of learning objects** using **filters** with predefined **criteria** in respect to trainees' profiles (**core competences**) and individual **demands.**
- ❖ Expected outcomes: The **up/re-skilling** has to be achieved during the blended-training process.

The Fast Digital Training Organizer on demand:

- ❖ **Combines the training elements** that are relevant and useful for the future qualification.
- ❖ **Connects university's goals with the trainees' performance** data utilizing mobile and web training delivery, social and communication tools, interactive elements, etc.
- ❖ Empowers the trainees to learn in the flow of their work duties with an **on-demand bite-sized learning model.**

Where is the innovation?

The Fast Digital Training Organizer offers:

- ❖ A tool for **training on-demand** through digital channels that connect higher education providers and trainees.

- ❖ A way to integrate knowledge and expand skills of a trainee in the most **personalized way**.

What is the impact?

The Fast Digital Training Organizer contributes with:

- ❖ Providing an **insight into how** digital teaching/learning can be **personalized**;
- ❖ Changing the face of the educational process by **allowing the trainees** to browse through **learning objects** that are uniquely **tailored to their interests, behaviors, and goals**;
- ❖ Efficient **upskilling** of their competence;
- ❖ **Sharing** knowledge and reinforcing best practices.

Transferability potential

The Fast Digital Training Organizer transfers:

- ❖ The upgraded capacity of the NANO-CODE educational model that is applicable to various training subjects and trainee profiles.
- ❖ The potential of dissemination and utilisation measures to further strengthen its potential to be transferred to other processes in higher education.



The Nano-Code team sustains **active working relations** to a variety of partners in a plethora of sectors: industry, education, science. The shift of the Nano-Code results and the utilization of ECTS-based project outcomes is guaranteed by:

- ❖ **Adapting of the resources** to meet the teaching and learning needs in different sectors;
- ❖ **Organisation of dissemination and training events** - workshops, testing sessions and guides aimed at the staff in the partner institutions;
- ❖ **Expanding the reach** of higher education and its quality enhancement in respect to the sectoral and national needs;
- ❖ **Linking the related sectors** in order to improve the long-term relations between universities and companies in the industry.

Locally and regionally:

The Nano-Code supports the organizations' **capacity to network** across sectors and society.

The Nano-Code boots the courage of stakeholders to seek **support for educational purposes**.

The Nano-Code improves the users' **chances for digital distance learning**.

The Nano-Code enlarges the framework of ECTS/EQF **blended learning**.

The Nano-Code raises the interest in educational programmes that offer **new professional knowledge** and **skills**, and a focus on **autonomy** and **responsibility**.

Nationally and Europe-wide:

The Nano-Code promotes diverse initiatives (seminars, evaluation events, workshops, promotional media, etc.) to **increase the interest in digital scientific education**.

The Nano-Code influences the partnership **capacity** and **ability to transfer** important technological information to their staff members and partners.

The Nano-Code contributes to building the **European knowledge-based economy**.

The Nano-Code assists in shaping innovative approaches for **solving emergency health problems** within the EU.

Internationally:

The Nano-Code develops an internationally approved model for digitization of higher education through:

- ❖ Exploiting **tools for validation and recognition** of university trainees' learning, performed remotely in virtual spaces;
- ❖ Application of a **credit system (ECTS)** for weighting, transfer and recognition of Learning Outcomes gained individually;
- ❖ Using (**EUROPASS**) **documents** that record an individual's qualifications, credits and Learning Outcomes.

Thus, the Nano-Code supports the ongoing trans-European process for **smooth transition from education to work and to further education**.

The Nano-Code boosts the chances of its graduates for a **professional career** in the international market.

NANOCODE Ensuring sustainability

The Nano-Code partnership will **maintain the core activities and results** after the end of the project. Further beneficiaries may use:

- ❖ ERASMUS+ Results Platform and project websites: the Nano-Code Digital University Aula will be maintained with a permanent input of the rational innovations and relevant information;
- ❖ Meetings and visits to key stakeholders;
- ❖ Dedicated discussions on information sessions, workshops, seminars, training courses, exhibitions, demonstrations or peer-reviews with the participation of the Nano-Code partners;
- ❖ Targeted materials (reports, articles in the press, newsletters, press releases, leaflets or brochures);
- ❖ Audio-visual media and products;
- ❖ New dissemination measures: production and allocation of specific information (dissemination materials).

The Nano-Code sustainability relies heavily on the **changes that the partnership hopes to have stimulated with the Nano-Code philosophy** and the **new initiatives inspired by the Nano-Code ideas**. There are, however, some specific measures to be undertaken:

- ❖ Enlargement of the partnership through association of additional organizations on sectoral and cross-sectoral level.
- ❖ Establishment of a trust of organizations to maintain the operation of the Nano-Code model for maintenance of LOs-based modes of blended-teaching/learning in Nanotechnology.
- ❖ Organisation of common initiatives and projects within other EU programmes.

NANOCODE The consortium

Sofia University St. Kliment Ohridski (SU) is the oldest university in Bulgaria and the national leading center for higher education and research in fundamental and applied sciences. It is the largest university in Bulgaria with 102 degree programmes in all major areas of sciences and humanities offered by 16 faculties. Research is an integral part of the teaching process for keeping

pace with the most recent developments in the respective areas. International relations are an integral part of Sofia University's strategy to stimulate research and support and improve the quality of teaching. Sofia University is the national leader in terms of the number of participants in the ERASMUS mobilities and the implementation of the idea of European space in university education. Sofia University contributes significantly to the Bulgarian participation in the global strive for science and education. Its main goal is to provide education that constantly meets the EU quality standards (ENQA) and follows the applicable transferability schemes (EQF/ECTS) to facilitate the planning, delivery, evaluation, recognition and validation of qualifications and students' mobility.

Sofia University "St. Kliment Ohridski" is the Nano-Code beneficiary and is responsible for the organization and management of all financial and subject-specific activities. The University is the leader of the Project Management Committee and monitors the overall management and coordination activities. It is the leader of O1 "Nano-Code Digital University Aula design and establishment" and O5 "Fast Digital Organiser for teaching/learning on demand of HE tutors/graduates", and is responsible for the elaboration of Module 1 "Fundamentals of viral particles interaction with solids". With its partner network of more than 80 universities in different countries, the Sofia University supports the dissemination and use activities and contributes to the sustainable implementation of the project achievements, incl. within the follow-up phase, dissemination and use, popularisation of the project objectives, networking, organizing and participating in the project piloting and the post-project life.

R&D Center "Biotech" brings together the efforts of numerous professionals who are highly experienced in tuition, research, development and popularization activities in the field of biotechnology, environment protection, healthcare and their economic and legal aspects. It supports the collaboration of different training settings dealing with higher and continuous education through the use of Information and Communication Technologies (ICT). To facilitate the cooperation between higher education and the labor market, "Biotech" has established contacts with employers and has introduced a system for feedback from trainees. Staff members of the R&D Center "Biotech" are experienced in teaching, textbook writing, quality assurance, curriculum development, new IT-based training methods and design of higher education curricula. The R&D Center "Biotech" offers its expertise and competence in the introduction of the instruments of the European and national Qualification Frameworks. It has expertise in production, application and economic planning in the area of industrial and green bio/Nanotechnology and especially sustainable environment, as well as in design and implementation of microbial fermentation processes for production of biologically active compounds. Among its partners are biotech companies, environmental scientists, planners, hazardous waste technicians, engineers, and other environmental professionals.

The R&D Center "Biotech" arranges the smooth progress of tasks. It is responsible for O3 "Nano-Code innovative model for digital higher education" and O4 "Nano-Code digitally enhanced curriculum" and for Module 4 "Nanotechnology and therapeutic solutions for COVID-19". It takes part in the data collection and the final analysis on the Nano-Code impact. Its active role in the dissemination & use initiatives is due to its international net of educational/research

partners and other bodies which can support the project activities, thus assuring the post-project longevity.

SID-97 PAVLOV Ltd. is an engineering company that has been working on the Bulgarian food-processing market since 1997. Its mission is focused on environmentally-friendly activities that support the development of the green economy at national scale. Its main activities are in the field of food industry, biotechnology, pharmaceutical industry and chemical industry. The company manages technological projects, supplies equipment and spare parts, assembles automated units, provides full process automation, installation and after-sales service. Its staff comprises qualified engineers, economists, technologists, managers with professional expertise in design and application of new bio/Nano-medical, electronic, aerospace and information technology devices and systems to construct prototypes of new designs.

SID-95 Ltd. is the co-leader of O5 “Fast Digital Organizer for teaching/learning on demand of HE tutors/graduates” and is responsible for Module 5 “Nanotechnology in Food: emerging COVID risks”. The company is an active participant in the project management. SID-95 Ltd. also participates in the Nano-Code dissemination activities by popularizing the project objectives and goals, results and products through its network of business partners, research and production units and industrial organizations in Bulgaria and abroad.

The SOKO Institute GmbH is an owner-managed company based in Bielefeld. The SOKO Institute was founded in 1991 as a medium-sized social research institute to carry out empirical studies on behalf of ministries, universities and other institutions. It deals with quantitative and qualitative research with a main focus on the labor market and social policy, educational policy and renewable energy. The SOKO Institute conducts evaluation studies on various measures (commissioned by the Institute for Ecological Economy Research, the Federal Ministry for the Environment and Reactor Safety or the Federal Centre for Health Education), while also developing and assessing educational curricula. Staff members have vast expertise in sustainable development of educational practices and fruitful working connections with the academic world. The Institute works with CELLS (Centre for Ethics and Law in the Life Sciences) at the Leibniz University of Hannover (LUH) and with the IALS (International Academy of Life Sciences) at the Hannover Medical School (MHH).

The SOKO Institute is the leader of the local management body in Germany. It is the co-leader for O4 “Nano-Code digitally enhanced curriculum”, and is responsible for Module 6 “Ethical, legal and social aspects of Nanotechnology vs. COVID-19”. The SOKO Institute brings a substantial added value shaping the way to merge the principles of higher education with the concept of inclusive, digitally enhanced teaching/learning in Nanotechnology to fight COVID-19. It is also a key player in the project dissemination and use, approbation and post-project popularization measures.

The European Institute for Evolution and Integration (EIEO) was founded in July 2013 and is based in Chalandri - Athens, Greece. The Institute has expertise in education and VET training, law, agricultural research and financial consulting and has been leader and partner of numerous European projects along ERASMUS+. The “Skills for Future Farmer (SKIFF)” e-

learning platform built under an Erasmus+ KA2 VET project, allowed over 2,500 students to complete the training course and get a certificate. Today, more than 4,000 students have received a certificate of accomplishment for both courses developed by the Institute. The EIEO team consists of professionals with strong expertise in agricultural economics and agricultural research.

The EIEO works to ensure the successful project performance in Greece. The Institute is the co-leader of O2 “Digital competence concept: mapping advanced digital skills and knowledge” and is responsible for Module 3 “Strategies for SARS-CoV-2 detection and disease diagnosis”. It participates in the project dissemination and use, approbation and post-project popularization.

Aksaray University (ASU) is a state university established in 2006 which has grown rapidly in line with the goals of the slogan “Thinking Universally, Acting Locally”. The Aksaray University has 12 faculties, 3 institutes, 1 training and research Hospital, 1 vocational language school, 6 vocational schools and 17 research centers. As of 2020, 25,000 national and 2,000 international students from 45 different countries are enrolled in its associate, undergraduate and graduate programmes. Education, research and scientific activities are carried out by experienced, dynamic and competent 800 researchers (supported by 317 administrative staff). Internationalization is among the main objectives of ASU, so since its establishment ASU has paid much attention to Erasmus+ and other EU programmes. ASU has international, practical and administrative experience in KA205 Strategic Partnership Projects. The University has Biotechnology and Molecular Biology and Biology departments and a distance education unit, which has introduced innovative technological devices to transform education.

Aksaray University is responsible for the management and progress of the project in Turkey. It is the leader of O2 “Digital competence concept: mapping advanced digital skills and knowledge” and is responsible for development of Module 2 “Nanotechnology for antiviral disinfection”. It is also a participant in the dissemination and use activities and the post-project life measures.

<http://bio-nanocode.eu/>



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