

EDU-GATE

Educational University GATeway to enhance innovative E-learning capabilities, resilience and new best practices

2020-1-IT02-KA226-HE-095538

Output 1

Impact and diffusion of digital education in Higher Education Institutions: a research on innovative solutions, methods, skills and best practices to enhance the EU Digital Education Action Plan

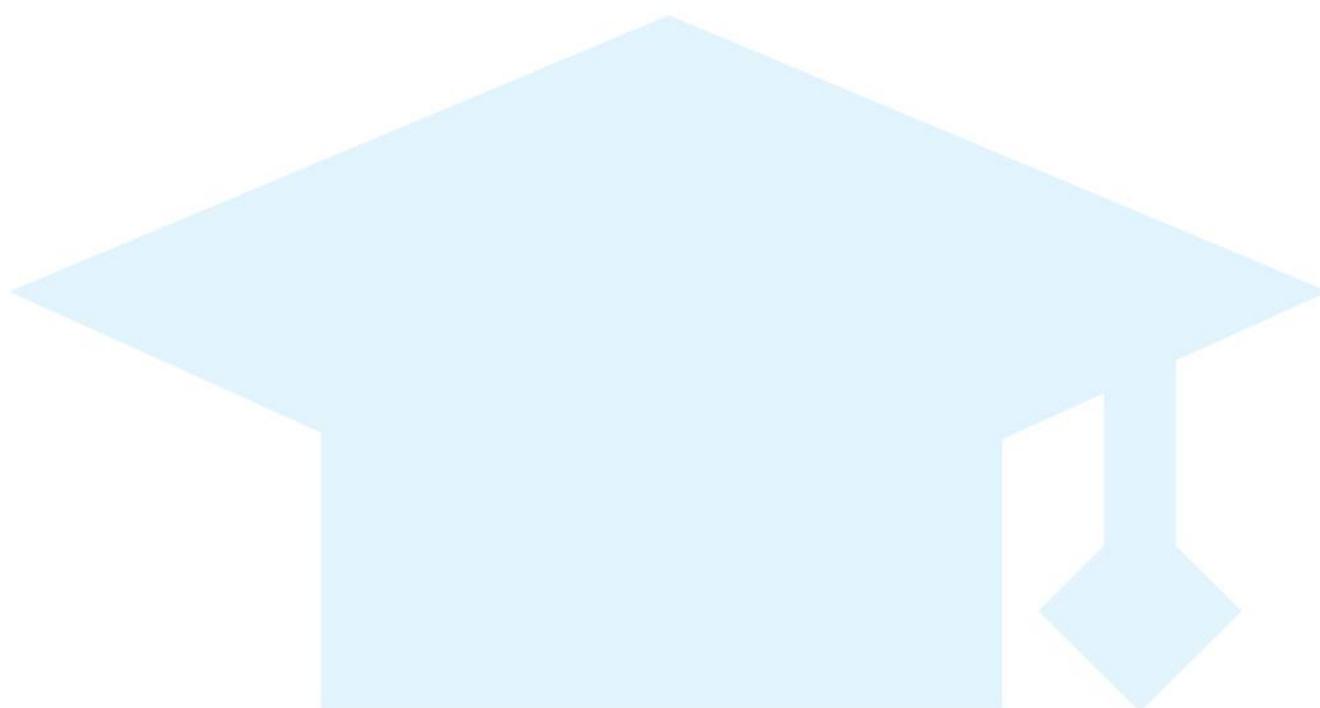
Research on National Policies and Practices BULGARIA

TABLE OF CONTENTS

TABLE OF CONTENTS	2
INTRODUCTION	4
1. STATISTICS ABOUT THE COUNTRY ANALYZED	5
Country and Population	5
Higher Education Institutions	5
Companies providing digital education services.....	8
2. REGULATORY, LEGAL FRAMEWORK AND MAIN ACTORS	10
Legislation on digital education services - brief description and essential references	10
National online education programmes	12
Involved institutional subjects	16
Guidelines and criteria for assessment of distance learning in a professional field	16
Data protection law in the country.....	20
3. ORGANIZATIONAL ASPECTS	22
HEIs response to COVID-19	22
Changes in the organizational structure as consequence of digital education programs and re-engineering of learning systems	24
Organizational challenges, advantages and issues of digital educational programs.....	26
4. TECHNOLOGICAL ASPECTS	28
Analysis of administrative information systems that meet digital education requirements	29
Adopted standards and technical rules for online teaching programs and supporting services	31
Open access and interoperability of developed online learning contents	34
Existing methodologies in the management of online platform and help desk services	36
Authentication tools for electronic identification of professors and students (smart cards, biometric access systems, digital IDs, etc.)	39
Digital expertise and other technical needs for professors	40
5. THE DIGITAL TRANSFORMATION OF LEARNING PROCESSES: NEEDS AND REQUIREMENTS	45
Analysis of digital skills and competences needed for professors.....	45
Analysis of digital skills and competences needed for technical staff.....	48
Analysis of digital skills and competences needed for administrative staff	50
New needed competencies for digital learning specialists.....	51
Requirements to ensure that effective digital learning programs.	51
New required multimedia technologies	56
New ways for learning data treatment.....	58
Suggestions for effective digital learning programs	60



6. BEST PRACTICES IN THE COUNTRY	75
Case study / Best practice #1.....	75
Case study / Best practice #2.....	79
Case study / Best practice #3.....	84
REFERENCES	95
LIST OF FIGURES	98
LIST OF TABLES	98



INTRODUCTION

This report focuses on identifying and summarizing the national legal base (strategic frameworks, laws, implementation regulations, etc.), specific requirements, case studies and best practices in the field of interoperability in Republic of Bulgaria represented in the partnership by two organisations – Burgas Free University /BFU/ and European Center for Quality Ltd. /ECQ/.

Relevant information and data on the main topics was collected and analyzed. These topics include digital skills and digital education in Bulgarian higher education institutions including strategic frameworks, laws, regulations, implementations, specific requirements, organizational aspects, technical aspects, case studies and best practices. The sources used are international, national and regional official reports, academic articles, national laws, information and statistics published by relevant governmental institutions and organizations.

Disclaimer

This document has been developed in the framework of the Project “EDucational University GATeway to enhance innovative E-learning capabilities, resilience and new best practices” /EDU-GATE/, Ref. No 2020-1-IT02-KA226-HE-095538.

In case you believe that this document harms in any way IPR held by you as a person or as a representative of an entity, please do notify us immediately.

The authors of this document have taken any available measure for its content to be accurate, consistent, and lawful. However, neither the project consortium as a whole nor the individual partners that implicitly or explicitly participated in the creation and publication of this document hold any sort of responsibility that might occur because of using its content.

1. STATISTICS ABOUT THE COUNTRY ANALYZED

Country and Population

The Republic of Bulgaria is a country in Southeast Europe. It lies on the eastern flank of the Balkans, and is bordered by Romania to the north, Serbia and North Macedonia to the west, Greece and Turkey to the south, and the Black Sea to the east. Bulgaria covers a territory of 110,994 square kilometres and is the sixteenth-largest country in Europe. Sofia is the nation's capital and largest city; other major cities are Plovdiv, Varna and Burgas. The population of Bulgaria is 7,364,570 people according to the 2011 national census. The majority of the population, 72.5%, reside in urban areas. As of 2019, Sofia is the most populated urban centre with 1,241,675 people, followed by Plovdiv (346,893), Varna (336,505), Burgas (202,434) and Ruse (142,902). Bulgarians are the main ethnic group and constitute 84.8% of the population. Turkish and Roma minorities account for 8.8 and 4.9%, respectively; some 40 smaller minorities account for 0.7%, and 0.8% do not self-identify with an ethnic group¹ (Bulgaria Demographics).

Higher Education Institutions

According to data from National Statistical Institute, the total number of higher education institutions for 2020/2021 academic year is 54. The types of higher education institutions are Universities, Colleges and Specialized Higher Schools. Universities, as in most countries worldwide, have three stages: Bachelor's (undergraduate), Master's (graduate), and Doctoral degrees. Undergraduate stage lasts for at least four years and graduate stage lasts for five years after completion of secondary education or one year after obtaining a bachelor's degree. The third stage of higher education results in obtaining a Ph.D. Degree. Specialized higher schools offer degrees in one or more areas of science, arts, sports, and defense. Usually, the names of these institutions indicate the area of specialization. Colleges are former semi-higher institutes. Some of them are part of universities and use their equipment and facilities.

The tables that follow provide statistical information on the type of higher schools, the teaching staff of higher schools, students by educational-qualification degree and narrow field of education.

¹ Source: <https://en.wikipedia.org/wiki/Bulgaria#Demographics>

Table 1 HIGHER SCHOOLS BY TYPE (National Statistical Institute)²

(Number)

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Total¹	54	54	54	54	54	54
Universities and equivalent higher schools	50	50	50	50	50	50
Colleges	22	21	21	21	21	21
Independent colleges	4	4	4	4	4	4
Colleges, at the universities and equivalent higher schools	18	17	17	17	17	17

¹ Includes universities, equivalent higher schools and independent colleges.

Table 1 Higher schools by type (Bulgaria)

Table 2 TEACHING STAFF BY TYPE OF HIGHER SCHOOL, POSITION, SEX³ (National Statistical Institute - Bulgaria)

(Number)

	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Total in public and private higher schools						
Total						
Total	22 604	22 223	21 914	21 756	20 894	20 716
of which: female	11 061	10 919	10 858	10 934	10 554	10 605
Professors	3 390	3 378	3 400	3 416	3 191	3 158
of which: female	1 151	1 236	1 299	1 356	1 271	1 303
Associate professors	6 469	6 312	6 283	6 187	5 878	5 775
of which: female	2 884	2 884	2 902	2 905	2 798	2 759
Assistants	8 705	8 674	8 616	8 548	7 995	7 972
of which: female	4 539	4 500	4 549	4 528	4 194	4 265
Lecturers	4 030	3 848	3 609	3 558	3 769	3 742
of which: female	2 479	2 290	2 104	2 120	2 253	2 247
Others	10	11	6	47	61	69
of which: female	8	9	4	25	38	31

Table 2 Teaching staff by type of higher school, position, sex

Table 3 STUDENTS BY EDUCATIONAL-QUALIFICATION DEGREE AND NARROW FIELD OF EDUCATION (ISCED-F)⁴ (National Statistical Institute - Bulgaria)

(Number)

Narrow fields of education	2020/21
----------------------------	---------

² Source: <https://www.nsi.bg>

³ Source: <https://www.nsi.bg/>

⁴ Source: <https://www.nsi.bg/>

	Professional bachelor	Bachelor	Master
Total	7 991	139 765	72 035
Education	444	16 209	7 853
Inter-disciplinary programmes and qualifications involving education	-	-	118
Arts	62	7 431	917
Humanities (except languages)	66	2 063	539
Languages	-	5 866	923
Inter-disciplinary programmes and qualifications involving arts and humanities	-	70	10
Social and behavioural sciences	-	12 615	4 060
Journalism and information	-	1 890	267
Business and administration	1 103	24 636	10 018
Law	-	-	7 816
Inter-disciplinary programmes and qualifications involving business, administration and law	59	707	376
Biological and related sciences	-	1 998	348
Environment	-	969	168
Physical sciences	-	1 707	474
Mathematics and statistics	-	584	104
Information and Communication Technologies (ICTs)	704	9 664	1 860
Engineering and engineering trades	1 457	20 126	4 358
Manufacturing and processing	71	2 371	461
Architecture and construction	-	1 079	3 669
Inter-disciplinary programmes and qualifications involving engineering, manufacturing and construction	-	718	748
Agriculture	24	2 675	489
Forestry	-	592	190
Fisheries	-	46	-
Veterinary	-	-	1 801
Health	2 542	5 594	21 290
Welfare	9	1 294	241
Personal services	1 343	4 981	634
Hygiene and occupational health services	107	108	247
Security services	-	5 969	1 664
Transport services	-	2 385	392
Field unknown ¹	-	5 418	-

¹ Incl. students in I and II grade enrolled by professional fields which do not corresponds to the defined narrow fields of education.

Table 3 Students by educational-qualification degree and narrow field of education (ISCED-F)

In March 2021 the government approved the National Program "Digital Qualification", which will train current and future teachers of disciplines and teachers of subjects and modules related to work in the digital environment, as well as business representatives who want to start teaching. The main goal is to retrain teachers in other disciplines through additional training and to train representatives from practice in order to be able to teach disciplines related to ICT and digitalization at different levels of the education system. The National Program "Digital Qualification" meets the need for targeted efforts and investments to ensure high quality training of pupils, students, teachers and lecturers with a view to the digital transformation of education. The program is aimed at providing

the system with staff with a high level of digital competence, with attitudes for improvement throughout their professional life and teaching their own experience and knowledge.

Companies providing digital education services

Human Resources Institute (<https://www.institute-hr.com>): Human Resources Institute is an organization for analysis, management, evaluation, development and training of human resources. As a training organization, the HRI is under registration with the Ministry of Education and Science and works to continuously improve the qualifications of Bulgarian teachers, principals and other pedagogical specialists, conducting practically oriented innovative training and qualification programs. The company offers a training programme for pedagogical specialists aimed at acquiring knowledge, skills and a better understanding of digital technologies, by developing solutions for personalized learning that will allow teachers to take action with more accurate and effective approaches to the individual learner and increase motivation by promoting self-study and self-assessment, including outside the classroom. The program provides ideas for interesting and stimulating education that uses the skills and activity of students on the Internet and develops their creativity, analytical thinking and opportunities for teamwork. Attention is paid to modern means of rapid exchange of information, such as social media, e.g. Facebook, Twitter, LinkedIn, Pinterest, blogs and many other modern tools which can be used for useful transfer of knowledge and skills in an educational environment. In the spring of 2020 when most of the teaching was done online due to the COVID-19 pandemic, Human Resources Institute offered free of charge online trainings in support of teachers. The free online trainings for teachers, principals and other pedagogical specialists were aimed at pedagogical specialists who experienced difficulty working in a digital environment or needed psychological support in the COVID-19 situation, although any other interested party could take part in them.

TeachMe (<https://teachme.bg/>): The mission of the organization is to inspire change in education by creating conditions for easy and quality teaching in an online environment. Teachers can register and create their profile on the platform, then they can create their training content and start online teaching. Some of the online courses that aim to develop digital competences of teachers are:

- **“Teachers in class”**: training for any teacher who wants to reach the next level in digital education, beyond the simple use of a camera and microphone. The training is entirely practical. It includes many examples and real situations typical of the online environment, which will help teachers learn how to create the most appropriate learning materials for online lessons, how to engage and hold the attention of the students, how to resolve conflict situations. Through specific steps and tips teachers will learn to plan both the entire training and each individual lesson in the subject you teach, adapted to the specifics of distance learning. This training is free of charge.
- **“Workshop for teaching materials”**: the training is focused on developing practical skills for creating quality digital learning content. The teachers will go through

the whole process of planning, adapting and developing learning materials. This training is paid.

➤ **“Digital skills for teachers”**: the training is suitable for complete beginners who want to acquire or improve their work in a digital environment. The training covers the most necessary skills and focuses on important topics such as basic computer components, working with Windows and setting it up. In addition, the trainees will be able to work more confidently and securely with the Internet and search engines, e-mail, social media. The various Google applications in the online environment are also examined.

Orak Academy (<http://teacheracademy.orakgroup.com/>): Orak Digital Teachers' Academy is an innovative training center for modern training of teachers, principals and pedagogical specialists. With a team of highly qualified IT specialists with pedagogical experience, Orak Academy provides an opportunity to acquire both digital teaching competencies and general improvement of the professional qualities of its students. The trainings offered by the ORAK Academy are intended for teachers, principals and pedagogical specialists with or without basic computer skills. The courses are made up of modules that aim to create, develop and improve their digital competencies. After completing the course, pedagogical specialists will have practical knowledge, skills and competencies to work with an interactive whiteboard, to use electronic resources, software programs and information technology in the classroom. They will also learn how to increase students' motivation to learn, what interactive methods can be used in class and how to make self-assessment and manage the quality of the learning process. Some of the training courses the companies offer are:

➤ **"DEVELOPMENT OF COMPUTER AND DIGITAL COMPETENCES"**: The program includes the following subtopics: creating and working with e-learning resources; creation of e-learning resources; work with platforms with ready e-learning resources; development of web applications with .NET Framework and ASP.NET; the basics of the C # language, the .NET Framework, databases and web application development with ASP.NET and AJAX technologies; development of web Front-End applications. The training provides knowledge of the basic concepts of web application development and skills for developing web front-end applications with HTML, CSS, JavaScript, as well as knowledge needed to work with popular CMS systems.

➤ **"CYBER SECURITY AND DIGITAL CITIZENSHIP FOR TEACHERS"**: The program includes the following modules: cybersecurity and digital citizenship for teachers; cybersecurity; network hazards; protection of personal data; basic concepts and programs in cybersecurity; ways to achieve better cyber security at school; school educational networks and the security of teachers and students in them; social networks and their role in school; digital citizenship; media and information literacy; ethics and empathy; presentation and communications; rights and responsibilities; confidentiality and security; consumer rights.

➤ **"DISTANCE FORMS OF LEARNING, LMS SYSTEMS FOR MANAGEMENT OF LEARNING CONTENT AND TESTING"**: The program includes the following modules: the formation of digital classes; the role of the teacher in the creation and distribution of

teaching materials; creating and sharing e-learning resources; the roles of students in the digital classroom; test systems for testing students; creating and modifying tests; virtual classroom, as well as the possibilities for management in it; ways to manage classes and groups in the remote system; creating diverse educational content; personalization of the content according to the individual learner; conducting exams through the remote system; the basic principles for effective use of virtual tools and boards; the peculiarities of the tasks and exercises in a digital environment.

➤ **"Augmented REALITY IN THE LEARNING PROCESS"**: the program includes: the use and creation of didactic materials with Augmented Reality; the use of Virtual Reality, as well as its application in the learning process; the use of tests and various extracurricular forms.

➤ **"HIGH-TECH PEDAGOGICAL TOOLS FOR LEARNING PROCESS AND USE OF ONLINE EDUCATIONAL CONTENT - FREE EDUCATIONAL RESOURCES"**: The program includes the following topics: how to search for online content; use of free electronic resources such as learning platforms, educational communities and educational pages on social networks; the role of the teacher in the creation and distribution of teaching materials; creation and sharing of e-learning resources; virtual classroom, as well as the possibilities for management in it; basic principles for effective use of virtual tools and boards; features of tasks and exercises in a digital environment; use of electronic encyclopaedias and reference books of a new type /Wolfram Alpha/; use of electronic libraries, resource banks and infographics; electronic and virtual museums. Using VR when viewing exposures.

2. REGULATORY, LEGAL FRAMEWORK AND MAIN ACTORS

Legislation on digital education services - brief description and essential references

The main legislation relating to higher education and digitalization can be summarized under the following points:

Higher Education Act (effective as of 27th December 1995, last update: 25th February 2020)

This law regulates the structure, functions, management and financing of higher education in the Republic of Bulgaria. The forms of higher education are full-time, part-time, evening and distance learning. The law stipulates that distance learning is carried out only by higher education institutions, which have received accreditation and are established under conditions and by order, determined by this law.

ORDINANCE on the state requirements for organizing distance learning in higher education

The ordinance regulates the state requirements for organizing the distance form of education in the higher schools of the Republic of Bulgaria.

Below are presented some of the most important articles of the ordinance:

Art. 1. (1) The ordinance shall regulate the state requirements for organization of the remote form of training in the higher schools of the Republic of Bulgaria.

(2) The distance form of education is a form for acquiring higher education, in which trainees, teachers and administrators may be divided by location, but not necessarily by time, as the created distance is compensated with technologies, methods and means of e-learning.

(3) In distance form the training shall be realized through digital technologies for management of the study process based on a system of different in type, location and time of use human, material and information activities and resources.

(4) In order to compensate for the distance, the higher schools shall model the respective educational and administrative ones activities such as information processes and carry them out through information and communication technologies.

Art. 2. (1) Distance learning shall be carried out only by higher schools, established under the conditions and under the Higher Education Act and having received relevant program accreditation from the National Evaluation and Accreditation Agency of a professional field, specialty of the regulated professions or in a professional field corresponding to a subject or module of school preparation.

(2) The higher schools shall organize and conduct distance form of education in specialties for acquisition of higher education for educational qualification degrees "bachelor" and "master", as well as for educational and scientific degree "doctor".

(3) The assessment of distance learning shall be carried out by the National Evaluation and Accreditation Agency in two stages - assessment of the level of the environment in the respective higher school and assessment of the possibilities for conducting distance learning in a specific professional field or specialty of the regulated professions.

(4) The assessment of distance learning shall be carried out according to criteria developed by The National Evaluation and Accreditation Agency by the order of art. 85, para. 1, item 1 of the Higher Education Act.

(5) The higher schools may organize a distance form of education and for raising of the qualification of specialists with higher education, as well as for continuing and additional training in professional field, specialty of the regulated professions or in a professional field corresponding to a subject or module of school preparation, for which they have received a program accreditation by the National Evaluation and Accreditation Agency.

As a result of the pandemic the ORDINANCE on the state requirements for organizing distance learning in higher education was updated and the introduced changes became effective as of 12th March 2021. The aim was to update the regulatory framework adopted in 2004 in view of the digital transformation of education and the COVID-19 pandemic. Until this date, higher education institutions could organize distance learning, both for obtaining a higher education degree and for raising the qualification of specialists. The changes allow for distance and additional training to be conducted in distance form.

The possibility for remote conducting of semester and state exams, as well as videoconference defence of diploma theses is also regulated. There is a new moment in the assessment in the distance form of education for higher schools. They must have systems for student identification and control of examinations and assessment, systems for establishing attempts for plagiarism and storage of examination data and student works in electronic archives for at least 5 years, etc. It is expected that the implementation of the Ordinance will improve the information and educational infrastructure in higher education, which will favour their connection in European and global networks for higher education.

The main institutional subjects that are involved in the process are the following:

Ministry of Education and Science: the Ministry has developed proposals for strategic documents for the development of education in the period 2021 – 2030. Among them are the Strategic framework for the development of education, training and learning in the Republic of Bulgaria and Strategy for the development of higher education in the Republic of Bulgaria for the period 2021-2030.

National online education programmes

The ***Strategy for the development of higher education in the Republic of Bulgaria***⁵ (Ministry of Education and Science) for the period 2021-2030 has listed some of the main challenges in front of higher education and many of them are relevant to the topics explored within the EDU-GATE project. One of these is the necessity to focus the educational process on the acquisition of analytical, digital and social competences. Another challenge is related to the need to constantly update the knowledge, skills and competences of the teaching staff. Particular emphasis is placed on the ***universal digitalization*** and development of educational systems that are alternative to classical higher education. The strategy takes into account the huge differences between today's generations of young people. After 1980, three different generations were defined - Y, Z and α , different so much so that they experience different educational needs and most of all have need for different learning technology, including teaching, learning, the achievement of knowledge and its application. Y identified have grown with computers, mobile phones and video games, while those belonging to Z generation are connecting

⁵ Source: <https://www.mon.bg/>



much more with tablets, smartphones and applications. For the representatives of generation Z and α the real and virtual world represent the same reality. The need for urgent digitalization of all education caused by the outbreak of the COVID-19 pandemic in 2020 only illustrates how urgent and changes in higher education and in all other spheres of life are important in this way. What seems to be imposed by an emergency today can prove to be the mass world standard in the next 2-3 years.

The strategy summarizes that in recent years digitalization has become a basic means of providing access to better quality HE for greater internationalization and of updating teaching methods in accordance with attitudes and interests of the younger generations. It is pointed out that digitalization can also address one of the most serious problems of modern higher education, namely to provide quality education at smaller costs that are within the capabilities of a much larger number of students of different social origin.

The Strategy identifies another challenge that needs to be addressed by higher education, namely, ***insufficient competitiveness*** in terms of rapid market development of educational services and lack of sufficient flexibility in the offered forms of training. The traditional model of higher education based on classroom classes is facing stiff competition from mass open online courses (MOOCs), as well as the educational programs and practice-oriented courses offered from different platforms and organizations.

Yet another major challenge that resonates with the EDU-GATE project is related to ***the lack of compliance with the needs of the digital generation*** and the competencies needed for successful realization in the conditions of technological revolution. This is a direct consequence of the following:

- 1) Education systems find it difficult to adapt to the rapid change in technology - not only in terms of how technology is used, but also in terms of the teaching of skills to work with them and the training of teachers.
- 2) Lack of methods for assessing digital skills.
- 3) The existing education system does not support (from an early age and throughout life) a well-balanced set of skills and competencies to guide citizens to useful interaction between the relevant digital and life skills, as well as key competences (in particular personal, social and entrepreneurial skills).
- 4) The digital transformation of production and service technologies is not accompanied by educational reform to allow citizens to make the transition to new professional and social roles.
- 5) Citizens are not prepared for lifelong learning in an increasingly fast-paced world that is changing and becoming more and more digital.
- 6) Broadband networks with very high capacity, cybersecurity and artificial intelligence is not yet the basis for future forms of education and training.



7) Massive lack of basic information protection skills to avoid the risk of fraud and fake news online and on social media.

After exploring the main challenges in front of higher education, the Strategy sets 10 priority areas with relevant objectives for the period 2021-2030.

Priority area 2 is related to the ***accelerated modernization and digitalization of educational approaches, methods and practices***. Connected to this area is **Objective 2. Introduction of modern, flexible and effective forms of education**. It will be achieved by the following activities and measures:

Activity 2.1 Introduction of standards for good training, guided by the European experience and traditions.

Measure 2.1.1 Establishment of university centers for training resources.

Measure 2.1.2 Training of teachers in information processing skills, visual literacy, problem solving and higher level thinking, ad hoc cooperation and a deep understanding of how technological tools can improve the learning process.

Measure 2.1.3 Organization of inter-university national and international conferences and seminars to present new teaching methods.

Measure 2.1.4 Update curricula by strengthening the role of students' independent creative activities such as preparation and presentation of critical analysis of a problem, preparation of course work, solving practical tasks, participation in research, etc., including using the summer period between two academic years.

Measure 2.1.5 Assessment of students' knowledge and skills is not based on reproduction of the memorized, and through skills for: debating, performing scientific experiments or theoretical modeling, solving real problems, digital creativity, presentation of information to specialized and non-specialized audience as well as ability: to understand the nature of the problem / topic, to use a variety of digital tools to effectively perform tasks in the real world, to evaluate messages in video forms, etc.

Activity 2.2 Creation of material and financial base, allowing the implementation of modern and flexible methods of teaching and research.

Measure 2.2.1 Establishment of university technological programs for providing materials and tools to support the digitalization of the learning process, field research, project activity, etc.

Measure 2.2.2 Intensive provision of equipment allowing interactive and digital teaching.

Measure 2.2.3 Binding of the accreditation criteria for academic space not only with areas in sq.m., due to one student, but also with filling in this space with equipment allowing the application of effective educational technologies.

Measure 2.2.4 Provision of support for content creation and for provision of technological resources for the development of quality distance learning, with interactive access and virtual classrooms, incl. attracting foreign students and Bulgarian youth from abroad to study in Bulgaria.

Measure 2.2.5 Support and stimulation of the preparation of distance learning courses (MOOCs) with open access by Bulgarian teachers in English.

Activity 2.3 Use of educational forms, methods and technologies compliant with the peculiarities of the respective generation of students.

Measure 2.3.1 Significant increase in distance learning programs, improvement and updating of curricula and platforms for e-distance learning, digitalization of content and creation of new interactive digital resources.

Measure 2.3.2 Providing systematic technological training to help university professors in the acquisition of basic and additional teaching and research technologies.

Measure 2.3.3 Digitization of the educational process.

Measure 2.3.4 Setting a predominant visualization of the study material. Significant reduction of text-based learning materials at the expense of visual and sound information to become the main means of transmitting information to students, as visual and audio information must precede textual.

Measure 2.3.5 Use of personal mobile phones as assistive technology tool in the audience along with the computer and tablet.

Measure 2.3.6 Widespread introduction of case study teaching as a means of intensive discussion by the students of the taught subject and development they have the skills for argumentation, verbal debate and decision making.

Measure 2.3.7 Combining the financial and intellectual efforts of universities and the state for the creation of online libraries and digital resources used at any time, including during classes.

Measure 2.3.8 Supporting and stimulating the process of expanding the role of the teacher from mainly a lecturer and a moderator who turns into knowledge pre-collected and analyzed by students information on a topic.

Measure 2.3.9 Increasing the participation of prominent practitioners in academic classes.

Measure 2.3.10 Implementation of project training, including a dynamic approach in audience, to acquire more in-depth knowledge through active study of challenges and problems in the real world, with a focus on what's new, active, useful and interesting.

Measure 2.3.11 Offering distance courses with open access for students from all over the world.

Involved institutional subjects

The main institutional subjects that are involved in the process are the following:

Ministry of Education and Science: the Ministry has developed proposals for strategic documents for the development of education in the period 2021 – 2030. Among them are the Strategic framework for the development of education, training and learning in the Republic of Bulgaria and Strategy for the development of higher education in the Republic of Bulgaria for the period 2021-2030.

National Evaluation and Accreditation Agency: The National Evaluation and Accreditation Agency is a statutory body for evaluation, accreditation and monitoring of the quality in higher education institutions and scientific organizations aiming at the enhancement of their teaching and research, as well as of their development as scientific, cultural, and innovative organizations. The Agency monitors the ability of institutions, their main units and branches to provide good quality of education and scientific research through an internal quality assurance system.

NEAA assists in improving the quality of higher education through periodic institutional and program evaluation and accreditation of higher education institutions in Bulgaria, through evaluation of projects for opening new higher education institutions and main units, as well as through post-accreditation monitoring and control

Guidelines and criteria for assessment of distance learning in a professional field

NEAA developed and adopted ***Guidelines and criteria for assessment of distance learning in a professional field***. The evaluation of distance learning (DL) in any professional field (PF) is performed in two stages.

I-st stage. Evaluation of the established organization and environment for conducting and maintaining distance learning.

Method of evaluation:

The overall evaluation on Section I is "YES" or "NO". A "YES" evaluation means that the organization and the environment are assessed as suitable for conducting DL.

To form an overall "YES" evaluation it is necessary that the implementation of each of the 1.2, 3.1, 4.1, 5.1, 6.1 criteria from the 7 criteria in the table below should be measured by a "YES" evaluation.

Criteria for evaluation⁶ (National Evaluation and Accreditation Agency, Bulgaria):

1. HEI has a well-documented, publicized, and reported policy with official status to ensure the quality of DL as part of the strategic management of the educational institution in the interest of public needs
2. HEI maintains an internal quality assurance system of education in DL and of the academic staff, which includes student opinion surveys.
3. HEI creates and implements procedures for development, adoption, monitoring and updating of academic documentation of the professional fields and of the relevant DLM (qualification characteristics, curricula, teaching programs, etc.) in collaboration with stakeholders.
4. HEI creates and implements procedures for development, adoption, monitoring and updating of academic documentation of the professional fields and of the relevant DLM (qualification characteristics, curricula, teaching programs, etc.) in collaboration with stakeholders.
5. Methodological standards for educational documentation (curricula and teaching programs) and a standard (a procedure) for changes in the academic documentation, associated with stimulating students' motivation and commitment to the learning process, have been officially accepted.
6. Structures have been built and internal regulations (rules, ordinances, instructions) for the operation of the DL system - from students' admission including to their career advancement, have been developed.
7. The HEI has outlined a policy for the development of the scientific and teaching staff, conducting DL, which is part of the development strategy of the institution.
8. The HEI provides and develops the material, technical and information facilities, necessary to conduct the training and teaching activities in DLM and an appropriate integrated system for DL (in accordance with Art. 9, para. of the Ordinance for DL).

II-nd stage. Checking the fulfilment of the criteria for evaluating distance learning in a major (DLM) of the relevant professional field.

Method of evaluation

⁶ Source: <https://www.neaa.government.bg/>



Each of the 3 criteria (2.1., 3.1 and 6.1.) of Section II is evaluated with "YES" or "NO". The overall assessment in Section II is "YES" or "NO". To form an overall "YES" assessment, it is necessary that the implementation of each of the 2.1, 3.1 and 6.1 criteria in the table below should be evaluated with a "YES" assessment. In case of a "NO" assessment in more than one parameter / pursuant to Article 79, para. 2 of the HEA / (among indicators "a", "b" or "c") of criterion 6.11, the overall assessment of performance in criterion 6.1 is "NO", regardless of the assessment of the remaining content of criterion 6.1.

When only one of the 3 parameters ("a", "b" or "c") of criterion 6.1 has not been fulfilled, but by no more than 10%, criterion 6.1 can be evaluated with "YES", depending on the evaluations of the remaining contents of criterion 6.1. It is mandatory to formulate recommendations to HEI aiming at achieving a "YES" assessment for the default parameter. In case of a "YES" assessment in all 3 parameters "a", "b" and "c" of criterion 6.1, it is recommended that the overall assessment of performance in criterion 6.1 should be "YES", provided that the remaining content in criterion 6.1 is fulfilled.

A "YES" assessment in Section II means that HEI can train students in DLM

Criteria for evaluation⁷

1. HEI conducts training in DLM by applying procedures for development, adoption, monitoring and updating of educational documentation (qualification characteristics, curricula, teaching programs, etc.) in cooperation with representatives of partner organizations, students and other stakeholders.
2. There is a system of rules and activities related to stimulating motivation and students' active position in the learning process of DLM.
3. Continually evolving financial, material and technical and information facilities, necessary for teaching in DLM, are also provided.

The Procedure for Institutional Accreditation issued by NEAA contains the following steps:

1. Self-assessment and filing request for accreditation. Applicants can be higher schools or the Minister of Education
2. Reviewing the request for opening of procedure:
 - 2.1. The Chairman of NEAA addresses the request to the respective standing committee in the field of higher education.
 - 2.2. The Standing commission (SC) in the field of higher education considers the received request and makes proposal to the Accreditation Council for disclosure of procedure or for refusal

⁷ Source: <https://www.neaa.government.bg/>



2.3. The Accreditation council after considering the proposal made by the SC adopts on of the following decision:

- to initiate the procedure;
- refusal to open the procedure;

2.4. The Standing commission (SC) proposes to the Chairman of the agency experts on the composition of the expert group and its task, in accordance with the type of the procedure.

2.5. The Chairman of NEAA shall submit to the Accreditation council proposal for the composition and tasks of the expert group

2.6. The Accreditation council considers the proposals of the SC and sets up expert groups, confirming their tasks in accordance with the stated procedures.

2.7. The Chairman of NEAA concludes contracts with the members of the expert group, according to the requirements of local legislation. If necessary, send members of the expert group, SC or experts from the Agency in the evaluated institutes.

3. Visit of assessed institution

3.1. Actions of the expert group the Expert group:

- systematize and analyze the received documents and information on the procedure;
- if necessary, request from the institution additional information and evidence material;
- visits the evaluated institution in accordance with predefined program that includes gaining information of the opinion of students and doctoral students for the quality of offered training;
- holds meetings with employees and users, establishes the authenticity of the submitted information;
- prepares and submits inspection report to the SC in the respective field;
- Prepares report for the SC about the results of the evaluation done according to the institutional procedure accreditation. The Standing Committee shall submit the report to the evaluated institution.

3.2. The Assessed institution is entitled to a two-week term to express their opinion on the report of the SC.

3.3. Actions of the Standing Committee: the Standing Committee takes note of the expert group report. If necessary, returns the report for revision. When the report is finalized the SC prepares and submits to the Accreditation Council a report on the procedure containing the proposal for motivated assessment and the opinion of the evaluated institution

4. Report and final decision issued by the Standing committee

4.1. Actions of the Chairman of NEAA:

- Files the report of the SC with the Council and includes it in the agenda of the next sitting;
 - Issues an order for payment to the members of the expert group.
- 4.2. Actions of the Accreditation Council:
- Return the report for revision when it finds that the evidence in the SC report is insufficient;
 - Adopt a decision on the basis of the SC report, which is given an assessment;
 - Refuses accreditation.
- 4.3. Actions of the President of NEAA:
- Notify the institution of the decision of The Accreditation Council;
 - Notifies the Minister of Education and Science of the solution.
- 4.4. Actions of the NEAA administration:
- Issues an accreditation certificate;
 - Update the list of accredited higher education institutions schools;
 - Stores the documentation in the archives of the Agency;
 - Publish the results of the evaluation and accreditation on the Agency's website.

Data protection law in the country

Personal Data Protection Act – in force as of 01.01.2002. This law regulates public relations related to the protection of the rights of individuals in processing of their personal data, insofar as they are not regulated in Regulation (EU) 2016/679 of European Parliament and of the Council of 27 April 2016 on the protection of individuals in relation to the processing of personal data and on the free movement of such data and for repealing Directive 95/46 / EC (General Data Protection Regulation).

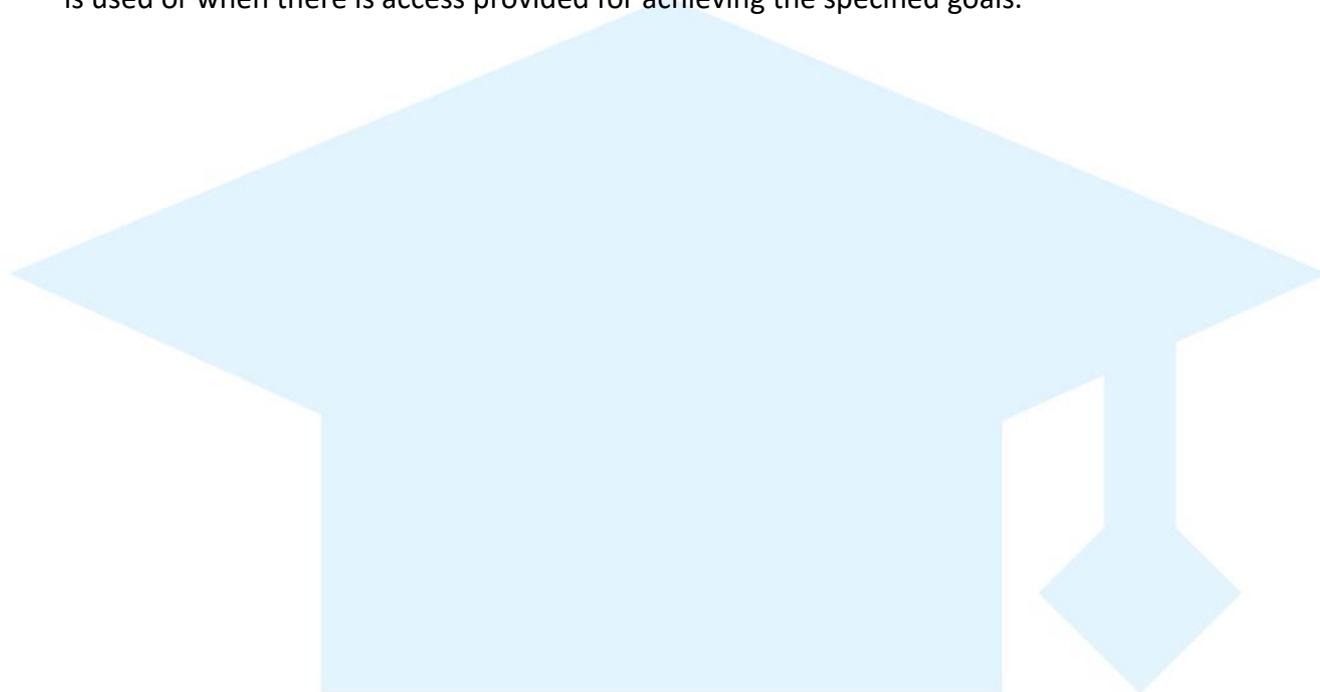
The purpose of the law is to ensure the protection of individuals in connection with the processing of personal data in accordance with Regulation (EU) 2016/679, as well as in connection with the processing of personal data by the competent authorities.

The law also regulates the activities of the Commission for Personal Data Protection. The Commission is a permanent independent supervisory body that carries out the protection of individuals with regard to the processing of their personal data and the implementation of access to this data, as well as control over compliance with Regulation (EU) 2016/679 and this law. The commission assists in conducting the state personal data protection policy.

The latest changes in the Personal Data Protection Act that were introduced after Regulation (EU) 2016/679 was issued refer to the processing of personal data for special

purposes. As of 02.03.2019 the act explicitly prohibits the copying of identity documents, driving license and residence documents, unless explicitly provided by law, as in carrying out actions under the Law on Measures against money laundering. This rule should lead to the abandonment of the widespread but illegal practice of maintaining copies of such documents, provided that this is not necessary and there is no legal obligation to do so.

With the latest changes the act introduces rules for the processing of personal data in several specific hypotheses, namely for journalistic, statistical, scientific purposes or for archiving purposes in the public interest. Special rules are introduced for creating videos and photos on public places, as well as on the filming of persons in the course of their public activity. The ultimate goal of the described rules is to introduce assessment criteria and establish legitimate restrictions on the rights of individuals when their personal data is used or when there is access provided for achieving the specified goals.



3. ORGANIZATIONAL ASPECTS

HEIs response to COVID-19

In the conditions of the COVID-19 pandemic both business and education started to function remotely - the lack of physical communication puts to the test a number of processes such as holding career forums, the active participation of business in the university training process, hiring new employees and conducting internships. The tendency is to take into account factors that were not of primary importance before, such as flexibility of the offered courses, hybrid training, and adequate response to crises.

There is a greater interest in the opportunities that are provided near home, as well as in security on campus. More and more young people and their parents expect to receive not only a smooth learning process, but also health care, counselling, connection with the business community to provide internships and career development. The universities had to invest in new technical equipment so that they could organize workshops, seminars and lectures accessible to a wider range of people. In this way, they managed to expand connectivity, blur geographical constraints and provide unlimited access to knowledge, advice and mutual assistance. The universities observe an increased interest in the specialties of the future related to digitalization of processes, big data analysis, leadership issues and sustainable development. In this sense, the coronavirus crisis is a catalyst for processes that have already begun.

In the period April – June 2020 a survey among nearly 25,000 students was conducted for the purposes of the Rating System of Higher Education Institutions in Bulgaria that aimed to measure the effectiveness of online education⁸. The results showed that one in five students was not satisfied with their online education in the second semester of the academic year 2019/20. 19% of the students indicated that their teachers did not conduct their lectures and exercises regularly, and 17% of them admitted that the students themselves were not regular in online classes. Unlike schools, which already have various studies on the effectiveness of distance learning, higher education institutions do not. In this sense, the findings of the study in question seem worrying, keeping in mind that the perspectives to continue with online classes in the new academic year. During the emergency related to the COVID-19 pandemic, in the spring of 2020, 95% of the students in the Bulgarian higher schools studied in specialties that passed to an online form of education. About 2/3 of them were satisfied with the created prerequisites for successful completion of the academic year. However, dissatisfaction with various aspects of online learning was expressed by between 14% and 21% of students participating in this form of learning. Only 1.2% of the surveyed students state that in the spring of 2020 they studied in specialties in which the present forms of education were not interrupted, and 3.8%

⁸ Source: <https://www.segabg.com/>



claim that there was no online form of education in their specialty, although attendance classes were interrupted.

The data from the survey show that 98.8% of the students who studied in online specialties had the necessary technical means to join the training. Only 1.2% of them did not participate in the online training due to the lack of a computer or other device with regular internet access. The vast majority - between 75% and 83% - of the surveyed students in the specialties who have switched to online training express full or partial satisfaction with the accessibility, regularity and quality of online classes.

At the same time, a significant proportion of respondents completely or partially disagree with the statement that all teachers regularly conducted lectures and exercises online - 18.7% said that this did not happen. 17% of the students answered negatively to the question whether the majority of students regularly participated in online classes, and 14% stated that good quality teaching was not ensured and that they did not have access to all necessary materials and resources for online learning. The participants in the survey indicated that the most significant problem in online training is the creation of appropriate conditions for teamwork. One in 5 of the surveyed students (21%) expresses complete or partial disagreement with the statement that within the online training were created appropriate conditions for teamwork with other students, while 70.5% of respondents partially or completely agree with this statement.

The majority of the surveyed students (76.8%) partially or completely share the opinion that within the online education during the pandemic in their university all prerequisites for successful completion of the school year have been created, while 18.4% express complete or partial disagreement with this statement. In 45 out of a total of 52 higher education institutions in Bulgaria, more than 2/3 of the surveyed students believe that all prerequisites for successful completion of the academic year have been created within the framework of the conducted online training. However, in 7 higher education institutions, the share of surveyed students sharing such an opinion is less than two thirds.

Among the universities in which the smallest share of students express satisfaction with the created conditions for successful completion of the academic year in the conditions of online learning are those that traditionally have the highest prestige among students and demonstrate the best performance in key indicators in rating. Nearly 63% of the surveyed students at Sofia University, the Medical University of Sofia and NATFA (National Academy of Theatre and Film Arts "Kr. Sarafov) are of the opinion that all prerequisites for successful completion of the academic year have been created within the framework of the online training. Such an opinion is shared by nearly 59% of the young people surveyed at the National Academy of Arts and the University of Forestry, as well as only 44% of the surveyed students at UACEG (University of Architecture, Civil Engineering and Geodesy).

In all other higher education institutions in the country, the share of the surveyed students, who believe that all the prerequisites for successful completion of the academic year have been created within the framework of the conducted online training, exceeds

two thirds. In all other higher education institutions in the country, the share of the surveyed students, who believe that all the prerequisites for successful completion of the academic year have been created within the framework of the conducted online training, exceeds two thirds.

Only in 7 out of a total of 52 professional fields in Bulgarian higher education the share of students who studied online during the period under review is below 90%. Among them is the field of "Medicine", in which 85.4% of students say that they studied online, 13.5% claim that there was no online form of education in their specialty, although the classes were interrupted and barely 1.1% say that for them the present forms of training were not interrupted.

The areas in which the smallest share of students studied in specialties that introduced online training during the pandemic are "Religion and Theology" (69%) and Animal Husbandry (64.4%). In the field of "Animal Husbandry" the largest share of students (17.8%) stated that the present form of education was not interrupted during the pandemic. The other fields in which less than 90% of the students have studied in specialties with introduced online education are "Theory and Management of Education" (82.2%), "Biological Sciences" (84.4%), "Chemical Technologies" (86.5%) and "Materials and materials science" (89.4%). In the remaining 45 professional fields, over 90% of the students state that they have studied in specialties with an online form of education introduced during the pandemic.

Changes in the organizational structure as consequence of digital education programs and re-engineering of learning systems

Several studies were conducted in order to investigate how the new digital environment has impacted and changed the higher education system and its organizational processes. In the research paper "COVID-19's Impact upon the Organization of the Educational Process in the National Security System"⁹ Dimov, P. and Dobрева, Hr. analyse how universities in Bulgaria used different e-learning platforms and programs and how they adapted their education system according to the new digital tools (Dimov & Dobрева). The starting point for the research was to gather information and the list of higher education institutions on the website of the National Agency for Assessment and Accreditation. It has been discovered that universities have been conducting distance or online education but there is not a uniform criterion for efficiency assessment as they rely upon different virtual platforms and instruments. Several main platforms stand out: Zoom, Moodle, Microsoft Teams, Classroom Google, Meet Google, BigBlueButton, Skype, Blackboard, E-learning.

Among the first that have introduced such type of learning, by an Order of March 9, 2020 are Georgi Rakovski National Defence College and the American University in

⁹ <https://aip.scitation.org/doi/pdf/10.1063/5.0041865>



Blagoevgrad, on March 13 - Angel Kanchev Ruse University, St. Kliment Ohridski Sofia University and Todor Kableshkov Higher Transportation School, on March 16 - Nikola Yonkov Vaptzarov Naval Academy in Varna and the University of National and World Economy, on March 19 - the Technical University in Varna, on March 20 - Varna Free University and Stara Zagora Trakia University, on March 25 - Paisii Hilendarski Plovdiv University, on March 30 - Luben Karavelov Higher Construction School, Sofia. With a letter 9104-47/14.04.2020 to all universities, the Minister of education and science recommended the exams and councils of the collective bodies to be conducted via electronically based platforms BigBlueButtons and Microsoft Office 365 with a videoconference connection option. In addition, many universities have introduced different systems for online application and submitting exam applications. Some of them are listed below:

- Zoom has been used by the Agrarian University.
- Moodle has been used by Burgas Free University, Todor Kableshkov Higher Transportation School, New Bulgarian University, St. Kliment Ohridski Sofia University, Stara Zagora Trakia University and others.
- Microsoft Teams has been used by Georgi Rakovski National Defence College, Burgas Free University, Angel Kanchev Ruse University in a combination with BigBlueButton, as well as by the University of National and World Economy.
- Classroom Google, Meet Google have been used by Chernorizetz Hrabar Varna Free University, Nikola Yonkov Vaptzarov Naval Academy, Varna.
- The Paisii Hilendarski Plovdiv University uses Google G Suite for Education.
- Blackboard has been used by Georgi Rakovski National Defence College - Sofia, and Neofit Rilski Southwest University, Blagoevgrad.
- E-learning has been used by Technical University Varna, and University of Architecture, Construction and Geodesy.

Broadly, the platforms may be divided in two types: for distance education and for online learning. The distance education usually works best with older students that have a constant access to technology at home and will work responsively by themselves. However, it needs a resource prepared in advance before the crisis as well as preliminary provision of all educational materials. That is why the online learning perfectly complements it and they should be both conducted together as a mix. The online learning has been built by systems for educational management called Learning Management Systems as both types of online learning: synchronous (happening at the same time for the teacher and the trained) and asynchronous (happening at any time and not necessarily in a group but with the feedback of a teacher) must complement each other. The online and the hybrid education present an opportunity for a more independent work, creativity and innovation.

Organizational challenges, advantages and issues of digital educational programs

At the universities that had officially introduced only a distance education system of the type of Moodle, Blackboard, E-learning, professors and lecturers were forced to start using additional communication systems and programs in order to support their online communication with the students. The choice of these systems such as Microsoft Teams and Zoom were at teachers' own discretions which had led to confusions and hindered the students.

According to the research several other challenges related to e-learning were identified. The main problem is the lack of planning in the system. Classes have been singularly planned by lecturers, because the scheduling and planning of the educational process continues to work in the old way and is not connected with the online and distance education systems. In perspective, it is necessary to develop the system in this direction and to integrate all digital platforms in a single place.

Also, some ethical problems in the feedback of lecturers to students also exist. It is difficult to track who is actively listening to the lecture. Some students record the lectures delivered by the professors without permission for that. That is why it is necessary for an ethical code and general rules of conduct with the respective legal sanctions to be introduced. Additionally, during the holding of academic councils and other collective meetings a secret voting cannot be performed. That has brought to the change in regulations of the faculties in the institute to include an item for their work during the state of emergency.

On the other hand, the issues and challenges that students faced during the shift from physical attendance of classes to online education at universities was suited and analysed by Getova, A. et al. in the research paper "Online education during pandemic, according to students from two Bulgarian universities" (Getova, Angelova-Igova, & Mileva, 2020). This study examines the major problems and challenges that students experienced in the process of online learning during the Pandemic of COVID-19. In the period April to May 2020 a team of researchers from the National Sports Academy "Vassil Levski", Sofia University "St. Kliment Ohridski", the University of National and World Economy and Bulgarian Academy of Science conducted a pilot study among students. 261 students from different faculties of the Sofia University "St. Kliment Ohridski" (Faculty of Philosophy, Faculty of Biology and others) and 166 students from the Faculty of Sport and the Faculty of Pedagogy at the National Sports Academy "Vassil Levski" were surveyed.

According to the survey the most popular platform used by the students from both universities is the "official" one, i.e. the one that is supported by the university. In Sofia University (SU) is used Moodle that is an open source free platform installed on the university servers. The National Sports Academy (NSA) uses its own platform developed specifically for the needs of the university distance learning. Apart from these platforms, other popular ones were used as well. Results show that platforms that are popular and

frequently used in the National Sports Academy are not popular in Sofia University and vice versa. In Sofia University 90.8% of student use Moodle.

The other most popular online platforms that were used in this university are Zoom, used by 59.2%, Skype used by 20.8% and Discord used by 11.2%. Other platforms were used by less than 10% of the surveyed students. In the National Sports Academy 87.8% marked NSA distance learning platform as the main e-learning platform, followed by Google Classroom used by 41.5%, Zoom used by 31.7%, Facebook Messenger marked by 18.9% and Google Hangouts used by 12.2% students. Other platforms such as Skype, MS Teams and others were selected by less than 10% of the students. Here it is important to mention that the choice of platform is not influenced by students. They are rather “the passive” side in this process because the type of platform used is decided mostly by the lecturers. Some of the options from which students could choose are not exactly specialized platforms for distance learning, but for online live communication such as Skype or Facebook Messenger.

The next part of the study focuses on the advantages and disadvantages of the main platforms used in each university. From the results of the survey it is concluded that the general opinion about main platforms in both universities is more positive than negative. Only 12% from the surveyed students in SU and less than 10% from those in NSA answered that there are no advantages in using the respective main platform. Although both platforms have different characteristics, the main advantages confirmed by the both groups of students are similar as it can be seen in Table 1 below.

Main advantages of the basic platform used	In SU	In NSA
Is easy to download resources	56.7%	53.8%
Is it in Bulgarian	48.1%	58.0%
The registration/login are easy and simple	35.2%	42.7%
It gives access to already recorded lections	34.8%	23.8%
It is user-friendly/ The orientation in the learning materials is easy	31.8%	40.6%
There are no advantages	12.0%	9.8%

Table 4 Main advantages of Moodle and the NSA platform for distance learning

The biggest and most important advantage for students in SU selected by 56.7% is that the platform allows to download resources easily. The most important benefit for the students in NSA (58%) is that the platform is in Bulgarian language. These 2 characteristics are the two main advantages selected by the students from both universities. The third main advantage is the easy registration and simplified login process.

According to the research students from both universities provided similar answers regarding the disadvantages of the e-learning platforms. The main disadvantage marked

by the majority of students is that the platforms work slowly and crash frequently (Table 5). This is serious problem as it practically does not allow the system to work properly. According to the students from NSA the second major issue is that the access to the system is uneasy.

The SU students selected the communication with lecturers as the second biggest challenge although the SU platform (Moodle) gives at least two options for chat (group and personal) that can be initialized by the part of the student. Therefore, it can be assumed that students do not know about these options, therefore they consider them as absent. In this aspect, a very important recommendation should be introducing more detailed training for students and lecturers how to work with the respective platform so they can use and take advantage of all functions effectively.

Main disadvantages of the basic platform used	In SU	In NSA
It works slowly/crashes frequently	56.8%	81.1%
The access to the system is uneasy	-	45.5%
The communication with lecturers is uneasy	35.6%	28.0%
The communication with other students is uneasy	34.3%	-
There are no disadvantages	14.4%	7.0%

Table 5 Main Disadvantages of Moodle and the NSA platform for distance learning

According to the same study the adaptation of online learning to the needs of students and specific educational environments was accompanied by difficulties of various kinds. Some of them were related to the adaptation of curricula and the development of electronic learning materials of different type. A serious problem of distance learning in the state of emergency was the technical provision of the types of online environments and electronic platforms used by the students. Many of them did not meet the quality criteria of online training and caused problems in the course of education.

4. TECHNOLOGICAL ASPECTS

Today the higher education system in Bulgaria is facing a double challenge: by one hand, to accelerate and complete the ongoing process of structural reforms, catching up with leading European countries; by other hand – to implement a successful process of strategic transformation of higher education: from an additional service area into a factor for making advantage in the European and global race for knowledge, skills, economic and material prosperity and spiritual progress.

Analysis of administrative information systems that meet digital education requirements

The increase in the volume of information produced, its active use in various fields of human activity, the creation of modern information and communication infrastructure have become the main factors for the emergence and development of the information society. The large-scale implementation of ICT in various spheres of human activity contributes to the emergence and development of the global process of informatization of society. In turn, this process gives impetus to the informatization of education and science in Bulgaria¹⁰.

The goals and priorities of the educational policy for expanding the access to higher education by introducing electronic forms for distance learning are set out in the National Strategy for Development of Higher Education in the Republic of Bulgaria for the period 2014 – 2020, adopted in 2015 (Ministry of Education and Science).

The analysis of the current state of HE in Bulgaria, related to the development of a Strategy for the development of higher education for the period 2021 - 2030, shows that currently in the country educational institutions have the necessary resources - computers, software, and Internet access to implement modern electronic systems to support their activities and processes. On the other hand, the provision of integrated electronic services is a priority. Practice shows that individual universities use information systems, fully tailored to their specifics.

As education is one of the most important areas in the public life of a country, the Ministry of Education and Science of the Republic of Bulgaria determines uniform policies and rules for the functioning of the educational sphere.

In this regard, the Ministry introduces general requirements for higher education institutions to bring their information systems in line with the general rules regarding the data stored in the registers for students and faculty and to provide the necessary information for the responsible institution. Some of the most important determinants and parameters are listed below:

- General information about the university:
 - History, traditions, achievements, etc.
 - Structure - branches, faculties, departments, units, programs, etc.
 - Information about the professional fields in which it offers training that is accredited.
 - News and useful information related to the university, HE and science, regulations, etc.
 - Links to Ministry of Education and Science, National Evaluation and Accreditation Agency, other HEIs, etc.
 - International cooperation.

¹⁰ https://www.mon.bg/upload/6537/STRATEGY_MS_29_09_2014.pdf



- Participation in projects.
- Communicativeness and accessibility
 - Use of mobile technologies.
 - Mobile user interface.
 - Display technologies (touch screen or multitouch screen).
 - Use of accessibility technologies for people with disabilities – students, lecturers, administrators.
- Services and resources for students
 - Discussion forums.
 - File sharing.
 - Internal mail.
 - Online diary / notes.
 - Real-time chat.
 - Video and audio services (including conferencing).
 - Electronic board.
 - Links.
 - Calendar / Training Plan / Learning Progress.
 - Orientation (navigation) / Help.
 - Search.
 - Autonomous work / Synchronization / offline.
 - References and reports.
 - Cooperation/ teamwork / Interest groups.
 - Individual profile.
- Services and resources for lecturers
 - References and reports.
 - Preparation and conducting of classes and lectures.
 - Preparing and conducting an exam.
 - Submission of grades and exam results.
 - Teamwork.
 - Individual profile.
- Services and resources for administrator in the education department and other institutions.
 - Entering and processing data for users.
 - Organization and management of the learning process.
 - Submission of data to the Ministry of Education and Science and other institutions.
 - Reports.
 - Issuance of documents (administrative services).
 - Teamwork.
 - Individual profile.
- User administration
 - Method of registration.
 - User roles.
 - Groups of students - belonging to a course or curriculum.
 - Groups of lecturers - belonging to a department or program.
 - User status control.



Adopted standards and technical rules for online teaching programs and supporting services

In the last two decades, higher education institutions in Bulgaria have gained significant experience in developing and organizing various courses and programs for distance learning. “Blended learning” has also become increasingly relevant and popular, which can be seen as a continuation of distance learning.

This process is largely supported by the adoption of official regulations in the country. A key document for the establishment of the distance learning in the system of higher education in Bulgaria is the Regulation on the State Requirements for Organizing Distance Learning in Higher Education (2004). According to article 1, paragraph 2, “distance learning is an organization of the learning process in which the student and the teacher are separated by location, but not necessarily by time, and the created distance is compensated by technological means”. The distance form of education is “equal to the regular form of education in terms of the content of the curriculum, the required number of credits for the respective specialty, the diploma for completed educational qualification degree and the professional qualification” (article 4).

Current trends in the field of digital technologies, in combination with strategic documents at national and European level, determine the need to update the regulatory framework for distance learning. Apart from these circumstances, there is another reason that requires updating the 2004 Ordinance - the pandemic caused by COVID-19 posed new challenges to education.

E-learning and e-government with remote access to e-learning activities and e-administrative services have been introduced in higher education. E-learning content, assessment and pedagogical communication are becoming more widespread. These changes impose the need for regulation. To ensure high quality of education, it is necessary to regulate the assessment of distance learning by the NEAA. It is also necessary to prescribe rules for the logistical provision of distance learning, as well as for the protection of personal data processed in accordance with the Personal Data Protection Act and Regulation (EU) 2016/679.

The Ordinance on the state requirements for organizing distance learning in higher education from 2021¹¹ (further referred as Ordinance) regulates the state requirements for organizing distance learning in higher education in the Republic of Bulgaria. (The Ordinance on the state requirements for organizing distance learning in higher education , 2021)

(2) The distance form of education is a form for acquiring higher education, in which trainees, teachers and administrators may be separated by location, but not necessarily

¹¹ The Ordinance on the state requirements for organizing distance learning in higher education from 2021 <https://www.neaa.government.bg/images/files/naredba-02.pdf>

by time, as the created distance is compensated with technologies, methods and means of e-learning. .

(3) In distance form the training shall be realized through digital technologies for management of the educational process, based on a system of different by type, place of location and time of use human, material and information activities and resources.

(4) In order to compensate for the distance, the higher schools shall model the respective educational and administrative activities as information processes and shall carry them out through information and communication technologies.

Art. 2. (1) Distance learning shall be carried out only by higher schools, established under the conditions and by the order of the Higher Education Act and having received respective program accreditation from the National Agency for assessment and accreditation of professional field, specialty of the regulated professions or professionally. direction corresponding to a subject or module of school preparation.

(2) The higher schools shall organize and conduct distance form of education in specialties for acquisition of higher education for educational-qualification degrees "bachelor" and "master", as well as for educational and scientific degree "doctor".

(3) The assessment of distance learning shall be performed by the National Agency for Assessment and Accreditation in two stages - assessment of the level of the environment in the respective higher school and assessment of the possibilities for conducting distance learning in a specific professional field or specialty of the regulated professions.

(4) The assessment of a distance form of education shall be carried out according to criteria, developed by the NEAA by the order of art. 85, para. 1, item 1 of the Higher Education Act.

(5) The higher schools may organize a distance form of education for raising the qualification of the specialists with higher education, as well as for continuing and additional training in a professional field, specialty of the regulated professions or in a professional field, corresponding to a subject or module of school preparation for which they have received program accreditation from the NEAA.

Art. 3. (1) The admission of students and doctoral students in distance form of education shall be carried out within the approved number by the order of art. 9, para. 3, item 6 and Art. 21, para. 1, item 9 of the Higher Education Act.

(2) The admission in distance form of education shall be carried out according to the state requirements for admission of students and doctoral students.

(3) The distance form of education is equal to the regular form of education in terms of the content of the curriculum, required number of credits for the respective specialty, diploma for acquired educational-qualification degree and professional qualification.

Art. 4. (1) The training in distance form shall be conducted according to educational documentation (qualification characteristic, curriculum, study programs, required number of credits for obtaining a diploma for acquired educational-qualification degree and professional qualification), developed based on the educational documentation for the respective specialty in full-time education.

(2) The learning process in the form of distance learning shall be carried out mainly by means of electronic learning and electronic management with remote access to:

1. individual and group e-learning activities, e-learning content, assessment and pedagogical communication;

2. electronic administrative services for accompanying the life cycle of the educational process, for providing information, for payments, for issuing documents, for settling a student situation, for fulfilling student obligations, etc.

(3) The higher schools shall build, maintain and develop their information infrastructure for the purpose of creation, storage, use and distribution of information and educational products - results from the activity of the higher school.

(4) The information infrastructure under par. 3 includes scientific-teaching, administrative and technical staff, managerial and organizational structure, normative base for conducting information activities, digitalized activities and resources, information and communication systems, software and hardware.

(5) The higher schools shall carry out distance form of education based on the respective environment for distance learning - part of their information infrastructure, which includes:

1. internal rules for organization, conducting and development of distance and e-learning;

2. scientific-teaching, administrative and technical staff with competencies in the field of distance and e-learning;

3. a service unit for distance learning specially created at the higher school;

4. standards and procedures for design, creation, registration and storage of e-learning activities and resources in accordance with a methodology specific to e-learning and distance learning, and in accordance with the Copyright and Related Rights Act;

5. electronic educational and administrative activities;

6. repository of electronic training courses, activities and resources, including electronic test units and tests;

7. systems for management of electronically based assessments and final tests with establishment of attempts for plagiarism and with storage of examination data and student works in electronic archive for at least 5 years;

8. system for identification of the students and control of the respective procedures - in the cases of electronic conducting of examinations and assessment;

9. software platforms for distance learning with opportunities for synchronous and asynchronous learning and remote authorized permanent access of students, teachers and administrators to activities, resources and systems under items 5, 6, 7 and 8.

Open access and interoperability of developed online learning contents

The term “adaptive learning” means the capability to modify any individual student’s learning experience as a function of information obtained through their performance on situated tasks or assessments¹²(Peng, Ma, & Spector, 2019). Adaptive learning, presenting the right material to the learner on demand, can be described and implemented using data representations from learning technology standards such as learner profiles, competency definitions, sequencing rules, learning objects, etc. To operate a VLE successfully, interoperability and reusability of the learning materials have to be ensured as well as various facilities, services and options must be offered^{13, 14, 15} (Wilson, Liber, & Johnson, 2006), (Monova-Zheleva & Zhelev, 2021), (Zhelev & Monova-Zheleva, 2021).

¹² Peng, H., Ma, S. & Spector, J.M. Personalized adaptive learning: an emerging pedagogical approach enabled by a smart learning environment. *Smart Learn. Environ.* 6, 9 (2019).

<https://doi.org/10.1186/s40561-019-0089-y>

¹³ Wilson S., Liber O. Johnson M., Beauvoir P., Sharples P., & Milligan C. (2006) Personal Learning Environments: Challenging the Dominant Design of Educational Systems. In E. Tomadaki & P. Scott (eds.) *Proceedings of the workshop Innovative Approaches for Learning and Knowledge Sharing at the EC-TEL 2006*, pp. 173-182 (2006)

¹⁴ Mariya Monova-Zheleva, Yanislav Zhelev (2021) *Provision of Technology-enhanced Learning in Universities – Key Factors and Critical Issues*; Chapter in: *Modernization of Higher Education through Integration of Contemporary ICT-Based Approaches and Tools in the University Curricula: SECOND EDITION*, (Reviewers) Prof Dr. R. Pavlov and Assoc. Prof D. Paneva - Institute of Mathematics and Informatics - Bulgarian Academy of Sciences, 2021, BFU, pp. 67-109; ISBN 978-619-7126-99-0 (pages 153)

¹⁵ Mariya Monova-Zheleva, Yanislav Zhelev (2021) *Models and Approaches for Setting up of Technology-enhanced Learning Solutions*; Chapter in: *Modernization of Higher Education through Integration of Contemporary ICT-Based Approaches and Tools in the University Curricula: SECOND EDITION*, (Reviewers) Prof Dr. R. Pavlov and Assoc. Prof D. Paneva - Institute of Mathematics and Informatics-Bulgarian Academy of Sciences, 2021, BFU, pp. (110-122); ISBN 978-619-7126-99-0; (pages 153)



Sharable Content Object Reference Model¹⁶ (SCORM, n.d.) is the most widely used eLearning standard available. It is designed to provide integration of existing popular learning resource specifications regarding learning resource metadata, aiming to fully describe a learning resource regardless of a specific learning context or educational purpose; learning content packaging, for moving whole instructional units; communication protocols between learning content and LMSs. According to SCORM several categories of learning content exist. Assets concern learning content in its most basic form that can be delivered in a Web client. Sharable Content Object (SCO) is a collection of one or more assets that can be launched by LMS. There are two kinds of sharable content objects – basic SCO and data enabled SCO. Basic SCO uses the API for minimal communication with the LMS. The system can track only the time between the launch and the termination of such an object. Data-enabled SCO can communicate with the LMS using Run Time Environment. In this way LMS can track down the learners' interactions with the learning content. Content Aggregation concerns a content structure that can be used to aggregate learning resources into cohesive instructional units based on structural and learning taxonomies. From the technical point of view architecture of any SCO can be represented through a set of layers. By separating functions into separate layers, layers can be maintained separately.

The IMS Simple Sequencing Specification¹⁷ (IMS SS, n.d.) primary goal is to present a model and mechanism to describe learning content that captures common structures of learning patterns, including conditional delivery, and branching. IMS SS provides a means to represent information needed to sequence learning activities in a variety of ways according to Tracking Model, and Activity State Model.

- Tracking Model is used to record information about the learner's interactions with activities, and the learner's record for objectives (e.g. completion, measure) to control the selection and sequencing of other activities.
- Activity State Model is used to record information about the status of learner's interactions with an activity and set of global attributes for activities. Sequencing Definition Model is an information model used to describe the desired sequencing behaviours.

The IMS Content Packaging Specification provides a ready structure for relating learning activities to content resources – item elements and its relationship to resource elements. Therefore, IMS SS maps the concept of learning activity to an item element or a collection of item elements within an organization element, and to an organization element itself, as defined by the Content Packaging Specification. Simple Sequencing recognizes only the role of the learner and does not define sequencing capabilities that utilize or are dependent on other actors. The specification includes a limited number of widely used

¹⁶ SCORM: <https://scorm.com/>

¹⁷ IMS SS: <http://www.imsglobal.org/simplesequencing/index.html>

sequencing behaviours. IMS SS does not address, but does not necessarily preclude, artificial intelligence-based sequencing, schedule-based sequencing, collaborative learning, or sequencing requiring data from multiple parallel learning activities.

SCORM and IMS Learning Resource Metadata Specifications (IMS LRM) both reference IEEE Learning Object Metadata¹⁸ (IEEE LOM, n.d.). These are the most significant specifications for metadata related to the concept of the package as a standardized way to exchange collections of digital resources between different authoring tools, content repositories, and LMSs.

The process of defining a specific sequence of learning activities begins with the creation of a learning strategy for the achievement of the determined pedagogical aim/s. Learning strategy specifies types of learning activities and their logical organization (the activity tree) as well as the prerequisites and expected results for each activity. The rules for managing the instructional flow are the other important part of the strategy.

Existing methodologies in the management of online platform and help desk services

The main methodological guidelines regarding the online platforms and services are provided by the Ministry of Education and Science in the Ordinance on the state requirements for organizing distance learning in higher education from 2021, more concretely in the second section of the document.

Section II the Organization of distance learning of the Ordinance

Art. 5. The organization and conducting of the distance form of education shall be regulated in regulations for the activity of the higher schools in accordance with the Law for the higher education and this ordinance.

Art. 6. (1) The distance form of training shall be carried out and maintained by a team, which shall include:

1. scientific-teaching staff with proven competencies in the field of e-learning, determined in accordance with the requirements of Art. 48 and 52 of the Higher Education Act and the Ordinance on the state requirements for acquiring higher education at the educational-qualification degrees "bachelor", "master" and "specialist", adopted by Decree № 162 of the Council of Ministers of 2002 (promulgated., SG No. 76/2002; amended, SG No. 85/2002; supplemented, SG No. 79/2003);
2. employees of the administration of the higher school, responsible for the logistical provision of the distance form of education, including for the operational functioning of the electronic administrative procedures and activities, as well as for the personal data

¹⁸ IEEE LOM: https://standards.ieee.org/standard/1484_12_1-2002.html



processed in accordance with the Personal Data Protection Act and Regulation) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of individuals with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46 / EC (General Data Protection Regulation) (published, OJ L 119, 4 May 2016);

3. technical team, responsible for the communication connectivity, the maintenance, the functioning and the information security of the used platform for distance learning.

(2) The higher schools shall provide opportunities for preparation and raising of the qualification in the field of the distance and electronic training of the scientific-teaching staff and of the administrative staff, participating in organizing and realization of distance form of education.

Art. 7. (1) The higher schools shall adopt and apply a system of rules for planning, formation and reporting of the workload of the academic and administrative staff, participating in the organization, conducting and providing of a distance form of education.

(2) The classroom employment of the academic staff in distance learning includes activities such as teaching in an auditorium and a virtual classroom, synchronously during the participation of teachers and students in e-learning activities according to the curriculum, work in e-learning environment to support students and PhD students, providing feedback, and extracurricular - design, development and updating of e-learning courses and resources, etc.

(3) The workload of the administrative staff in a distance form of education shall also reflect its involvement in the respective electronic administrative activities and shall be regulated in the regulations of the higher schools.

(4) The reporting of the workload of the academic and administrative staff in distance learning, as well as of the participation of trainees in electronic learning activities shall be based also on electronic means for archiving and intelligent analysis of the learning process.

Art. 8. (1) The educational-methodical provision of a specialty in distance form of education shall include preparation of educational documentation, development of electronic training courses and resources, as well as electronic administrative activities and shall be carried out by the main unit, which conducts the training.

(2) Higher schools, which carry out distance form of education according to art. 4, para. 5, create a specialized unit - Distance Learning Center.

(3) The distance learning center:

1. expand and develop the institutional environment for distance learning under Art. 4, para. 5 and its elements;
2. develop standards and procedures for design and creation of educational electronic resources under Art. 4, para. 5, item 4;
3. organize registration and storage of electronic learning activities and resources in accordance with the rules and standards under Art. 4, para. 5, items 1 and 4, as well as according to the requirements of the Copyright and Related Rights Act;
4. monitor compliance with the normative base of the internal rules under Art. 4, para. 5, item 1 and of the used electronic educational and administrative activities under Art. 4, para. 5, item 5;
5. provide technological and pedagogical functionality of the systems and platforms under Art. 4, para. 5, items 7 and 8;
6. carry out training and consultations of the academic staff for conducting electronic and distance learning;
7. perform periodic monitoring and assessment of the quality of the conducted training, including with the use of electronic means for intelligent analysis of the training process;
8. conduct research in the field of distance and e-learning;
9. systematize and popularize good practices in the field of e-distance learning;
10. cooperates with organizations and units that have a similar subject of activity.

The e-learning platforms developed in most of the Bulgarian Universities are based on the open-source software platform Moodle.

Moodle is a free, web based and open source LMS developed in PHP with MySQL as an underlying database. Benefits comprise ease of use, improvements on to suit the users' evolving needs, localization (about 95 language translations), customization to conform individual needs and a high level of data security. The flexible architecture of Moodle permits a high level of integration with different modules and systems. However as Moodle is highly customizable, this requires significant technical proficiency of PHP technology and a dedicated programmers' team to manage the back-end working environment. It is not easy to administrate Moodle only by yourself. The installation includes the creation of a Web site and Web interface to gain access to the system's capabilities. At the same time, the system needs powerful hardware to achieve better efficiency. As it concerns the maintenance, a large international group of users and developers supports Moodle.

In its standard installation, Moodle offers tools concerning:

- User management – registration, authentication, activity tracking, etc.
- Course delivery - test types, automatic test support, grading, course menu, course management, assignments, online gradebook, etc.



- Communications - discussion forum, file exchange, mobile access, blogs, lecture recording, etc.
- Content development - course templates, customization, instructional design tools, standards compliance, etc.
- Productivity - calendar, progress review, work offline, module page, etc.
- Student Involvement - group organizing, wikis, student portfolios, etc.

The help desk provides access to:

- information package (available to students and in electronic format), adopted by the Academic Council on the proposal of the main unit conducting the training, which includes:

1. the educational documentation under art. 39, para. 2 of the Higher Education Act;
2. list of the team of lecturers, administrators and technical staff under art. 6, para. 1;
3. instruction for access to the electronic resources and services;
4. description of the testing and evaluation systems;
5. manual for use of the respective platform for distance learning;
6. a guide for the student or doctoral student, preparing in a distance form.

- calendar and study schedule;
- effective system for personal assistance, facilitated and informed access to lecturers or administrators for obtaining explanations, advice and / or assistance (through university communication infrastructure, e-mail, forum, chat, telephone, etc.).
- electronic administrative services for monitoring the life cycle of the educational process, for providing information, for payments, for issuing documents, for settling student status, for fulfilling student obligations.

Authentication tools for electronic identification of professors and students (smart cards, biometric access systems, digital IDs, etc.)

All students enrolled in university courses receive individual secure login and passcodes to the learning management system (LMS). Faculty accounts are issued by Information Systems. Student accounts are usually automatically generated by Information Systems through the student portal and accounts are activated by students. Instructions for student login are included in the Information package which is accessible on the website (Help desk). Students can contact the Help Desk for assistance.

Students enrolled in electronic courses may be required to take proctored exams. The instructor is responsible for providing the details of the exam process to the students. Instructors should provide test dates and proctor requirements to the students in the course syllabus.

If a course is designed to end with an exam with physical proctoring, the Office of Distance Learning will provide procedures for securing and managing the examination process.

Hybrid and online students may be required to periodically turn on a microphone and 360-degree camera if noise or movement thresholds are reached or to have two cameras (front and back one).

Digital expertise and other technical needs for professors

The contemporary concept of digital expertise or digital competences incorporates aspects such as the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competencies related to cybersecurity), intellectual property related questions, problem-solving and critical thinking.

European Commission developed a Digital Competence Framework for Citizens to outline the key elements of digital competence and how to assess it.

The Digital Competence Framework for Citizens, also known by its acronym DigComp¹⁹ (Digital Competence Framework for Citizens, n.d.), was first published in 2013 and then revised and updated. Its latest version, DigComp 2.1, dates to 2017.

DigComp aimed to be a fundamental tool to tackle the challenge of the digital transformation, to improve citizens' digital competence, to help policymakers to formulate policies that support digital competence building, and to plan education and training initiatives to improve digital competence of specific target groups.

DigComp also provides a common language on how to identify and describe the key areas of digital competence and is the main reference in Europe today for the development and strategic planning of digital competence initiatives. Furthermore, new frameworks have been derived from DIGCOMP for new contexts where digital competence is needed. In collaboration with the Directorate-General for Justice and Consumers and the Joint Research Centre (JRC) additionally has been developed related competence frameworks in the fields of education and training, employment and lifelong learning. Examples of this work include the Digital Competence of Educators²⁰ (DigiCompEdu, n.d.) (Redecker & Punie, 2017)²¹, the Entrepreneurship Competence Framework²² (EntreComp, n.d.) and

¹⁹ <https://ec.europa.eu/jrc/en/digcomp>

²⁰ <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/european-framework-digital-competence-educators-digcompedu>

²¹ Redecker, C.; Punie, Y. Digital Competence of Educators DigCompEdu; Publications Office of the European Union: Luxembourg, 2017.

²² <https://ec.europa.eu/jrc/en/entrecomp/>

the European Framework for Digitally Competent Educational Organisations²³ (DigCompOrg, n.d.)

Since its inception, the DIGCOMP framework has been well received and taken up by various stakeholders. This versatile instrument is used for various purposes as follows:

- Policy formulation and support - is one of the purposes of DIGCOMP use at the national and regional level. To help policymakers to obtain a macro-level view of citizens' digital competence, the European Commission has developed a Digital Skills Index (DESI);
- Instructional planning for education, training and employment;
- Assessment and certification.

The latest version of the Digital Competence Framework for Citizens (version 2.1) is structured in five dimensions and five competence areas. The five dimensions are as follows:

Dimension 1: Areas identified to be part of the digital competence

Dimension 2: Competence that is pertinent to each area (21) with their title and descriptors.

Dimension 3: Eight Proficiency levels for each competence, that is; Foundation > Level 1 and Level 2; Intermediate > Level 3 and Level 4; Advanced > Level 5 and Level 6; Highly specialised > Level 7 and Level 8.

Dimension 4: Knowledge, skills and attitudes applicable to each competence

Dimension 5: Examples of use, on the applicability of the competence to different purposes.

Five Competence areas currently are identified to be part of digital competence:

- 1) Information and data literacy;
- 2) Communication and collaboration;
- 3) Digital content creation;
- 4) Safety;
- 5) Problem-solving.

The competence areas 1, 2 and 3 deal with competencies that can be retraced in terms of specific activities and uses. Competence areas 4 and 5 are "transversal" as they apply to

²³ <https://ec.europa.eu/jrc/en/digcomporg>

any type of activity carried out through digital means. Problem-solving elements, in particular, are present in all competence areas, but a specific area was defined to highlight the importance of this aspect for the appropriation of technology and digital practices. Digital expertise and other technical needs for technical staff.

- The next table presents all the five Competence areas of DigComp Referent Framework and the descriptions of the competences

Competence areas (Dimension 1)	Competences (Dimension 2)
1. Information and data literacy	<p>1.1 Browsing, searching and filtering data, information and digital content</p> <p><i>To articulate information needs, to search for data, information and content in digital environments, to access them and to navigate between them. To create and update personal search strategies.</i></p> <p>1.2 Evaluating data, information and digital content</p> <p><i>To analyse, compare and critically evaluate the credibility and reliability of sources of data, information and digital content. To analyse, interpret and critically evaluate the data, information and digital content.</i></p> <p>1.3 Managing data, information and digital content</p> <p><i>To organise, store and retrieve data, information and content in digital environments. To organise and process them in a structured environment.</i></p>
2. Communication and collaboration	<p>2.1 Interacting through digital technologies</p> <p><i>To interact through a variety of digital technologies and to understand appropriate digital communication means for a given context.</i></p> <p>2.2 Sharing through digital technologies</p> <p><i>To share data, information and digital content with others through appropriate digital technologies. To act as an intermediary, to know about referencing and attribution practices.</i></p> <p>2.3 Engaging in citizenship through digital technologies</p> <p><i>To participate in society through the use of public and private digital services. To seek opportunities for self-empowerment and participatory citizenship through appropriate digital technologies.</i></p> <p>2.4 Collaborating through digital technologies</p>

	<p><i>To use digital tools and technologies for collaborative processes, and co-construction and co-creation of resources and knowledge.</i></p> <p>2.5 Netiquette</p> <p><i>To be aware of behavioural norms and know-how while using digital technologies and interacting in digital environments. To adapt communication strategies to the specific audience and to be aware of cultural and generational diversity in digital environments.</i></p> <p>2.6 Managing digital identity</p> <p><i>To create and manage one or multiple digital identities, to be able to protect one's own reputation, to deal with the data that one produces through several digital tools, environments and services.</i></p>
<p>3. Digital content creation</p>	<p>3.1 Developing digital content</p> <p><i>To create and edit digital content in different formats, to express oneself through digital means.</i></p> <p>3.2 Integrating and re-elaborating digital content</p> <p><i>To modify, refine, improve, and integrate information and content into an existing body of knowledge to create new, original and relevant content and knowledge.</i></p> <p>3.3 Copyright and licenses</p> <p><i>To understand how copyright and licenses apply to data, information and digital content.</i></p> <p>3.4 Programming</p> <p><i>To plan and develop a sequence of understandable instructions for a computing system to solve a given problem or perform a specific task.</i></p>
<p>4. Safety</p>	<p>4.1 Protecting devices</p> <p><i>To protect devices and digital content, and to understand risks and threats in digital environments. To know about safety and security measures and to have due regard to reliability and privacy.</i></p> <p>4.2 Protecting personal data and privacy</p> <p><i>To protect personal data and privacy in digital environments. To understand how to use and share personally identifiable information while being able to protect oneself and others from damages. To understand that digital services use a "Privacy policy" to inform how personal data is used.</i></p> <p>4.3 Protecting health and well-being</p>

	<p><i>To be able to avoid health-risks and threats to physical and psychological well-being while using digital technologies. To be able to protect oneself and others from possible dangers in digital environments (e.g. cyberbullying). To be aware of digital technologies for social wellbeing and social inclusion.</i></p> <p>4.4 Protecting the environment</p> <p><i>To be aware of the environmental impact of digital technologies and their use.</i></p>
<p>5. Problem solving</p>	<p>5.1 Solving technical problems</p> <p><i>To identify technical problems when operating devices and using digital environments, and to solve them (from troubleshooting to solving more complex problems).</i></p> <p>5.2 Identifying needs and technological responses</p> <p><i>To assess needs and to identify, evaluate, select and use digital tools and possible technological responses to solve them. To adjust and customize digital environments to personal needs (e.g. accessibility).</i></p> <p>5.3 Creatively using digital technologies</p> <p><i>To use digital tools and technologies to create knowledge and to innovate processes and products. To engage individually and collectively in cognitive processing to understand and resolve conceptual problems and problem situations in digital environments.</i></p> <p>5.4 Identifying digital competence gaps</p> <p><i>To understand where one's own digital competence needs to be improved or updated. To be able to support others with their digital competence development. To seek opportunities for self-development and to keep up-to-date with the digital evolution.</i></p>

Table 6 DigiComp Conceptual Reference Model

- State of the art of national Learning Management Systems: open sources vs legacy solutions

Nearly 100% of Bulgarian Higher Education institutions use open-source solutions (more concretely Moodle) for their Learning management systems.

The main advantages of using open-source platforms could be summarized as follows:

- No license fee;
- The source code is open and developed by community;



- Ownership – owned by community;
- There is no risk of product discontinuation;
- Customization is not difficult to be done. It is performed by freelance skilled developers according to specific needs. Strong link with end-user groups/communities who suggest changes and modifications;
- Rapid release process.

In Moodle, assortment of “plug-ins” and “add-ons” extend the platform’s basic functionalities. A set of learner-centred tools facilitates collaborative learning and personalization thus making this infrastructure suitable both for face-to-face and distance forms. Meanwhile Moodle is far more intuitive and permits good housekeeping when the course tends to become disordered.

Moodle supports Social Constructionist pedagogy²⁴ (Moodle, n.d.) that stimulates collaboration, critical thinking, and task-based learning. Students create own profiles, and they can track colleagues who are also online. There are wiki’s and other tools that allow the production of collaborative objects.

5. THE DIGITAL TRANSFORMATION OF LEARNING PROCESSES: NEEDS AND REQUIREMENTS

Analysis of digital skills and competences needed for professors

The European Framework for the Digital Competence of Educators (DigCompEdu) is a scientifically sound framework describing what it means for educators to be digitally competent. It provides a general reference frame to support the development of educator-specific digital competences in Europe.

DigCompEdu is directed towards educators at all levels of education, from early childhood to higher and adult education, including general and vocational education and training, special needs education, and non-formal learning contexts. It aims to provide a general reference frame for developers of Digital Competence models, i.e. the Member States, regional governments, relevant national and regional agencies, educational organisations themselves, and public or private professional training providers.

DigCompEdu defines six different Competence areas with a total of 22 competences.

- Area 1 focuses on the professional environment;
- Area 2 on sourcing, creating and sharing digital resources;

²⁴ <https://docs.moodle.org/24/en/Pedagogy>

- Area 3 on managing and orchestrating the use of digital tools in teaching and learning;
- Area 4 on digital tools and strategies to enhance assessment;
- Area 5 on the use of digital tools to empower learners;
- Area 6 on facilitating learners' digital competence.

Areas 2 to 5 form the pedagogic core of the framework.

They detail the competencies educators need to possess to foster effective, inclusive and innovative learning strategies, using digital tools. Please see the next Figure.

To encourage take-up, it is proposed to refer to proficiency levels using motivating role descriptors.

These can, however, be mapped onto the proficiency levels used by the Common European Framework of Reference for Languages (CEFR), ranging from A1 (Newcomer) to C2 (Pioneer). In general, the following characterisations apply:

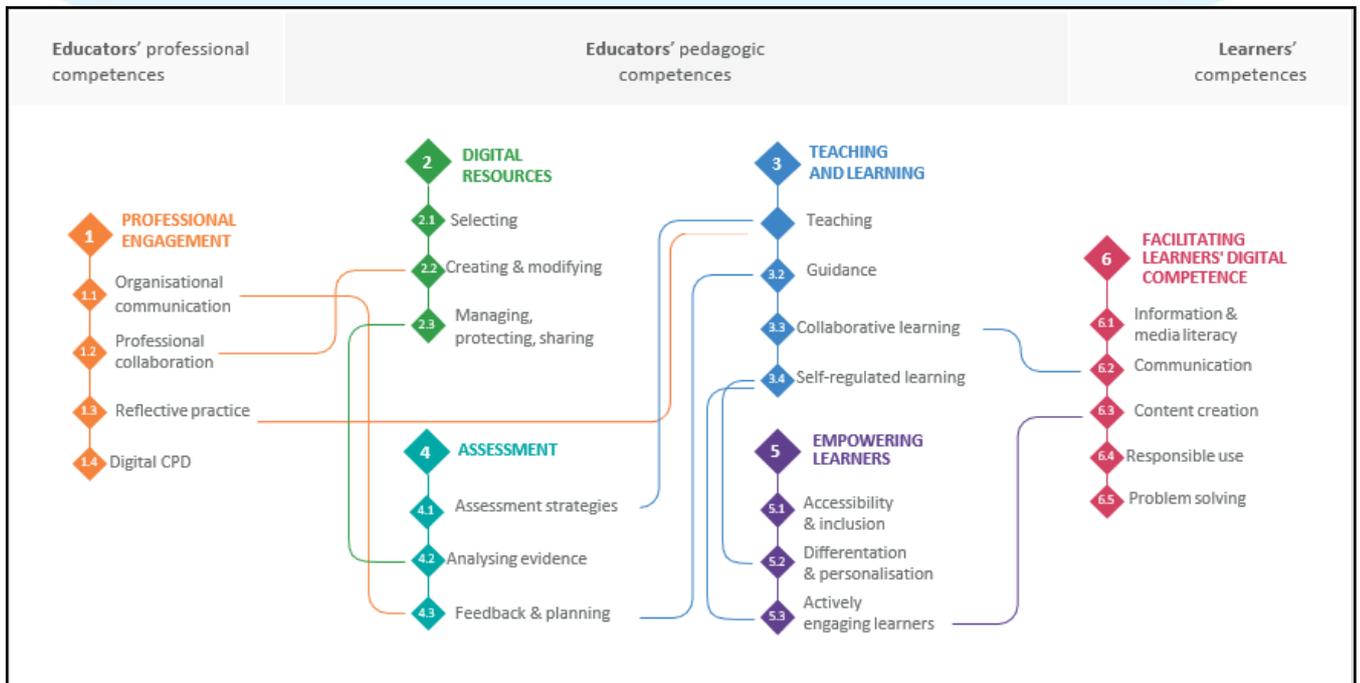


Figure 1 Competence areas defined in DigCompEdu²⁵ (DigCompEdu - Areas of competence, n.d.)

²⁵ <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/european-framework-digital-competence-educators-digcompedu>

- Newcomers (A1) little experience and contact with education technology. Need continuous guidance to improve his or her digital competence level.
- Explorers (A2) little contact with education technology. Have not developed specific strategies for including ICT in the classroom. Need external guidance to improve their digital competence level for lecturers.
- Integrators (B1) experiment with education technology and reflects on its adequacy for different educational contexts.
- Experts (B2) utilize a wide range of educational technologies critically and with confidence and creativity. Seek the continued improvement of teaching practices.
- Leaders (C1) rely on a broad repertoire of flexible, comprehensive, and effective digital strategies. They can adapt their needs to different resources, strategies, and knowledge within their reach. A source of inspiration for others.
- Pioneers (C2) question the adequacy of contemporary digital and pedagogical practices, of which they are experts. They lead the innovation of ICT and are a role model to follow for other educators.

The teaching professions face rapidly changing demands, which require a new, broader, and more sophisticated set of competences than before. The ubiquity of digital devices and applications, in particular, requires educators to develop their digital competence.

Education institutions are currently facing the challenge of seeking to innovate ways of conducting their education work, especially in the light of the recent technological, economic and social changes that are currently taking place, with the aim of training and educating new generations for an uncertain and disconcerting future.

Within the professional competences of the teacher, different authors allude to those skills or abilities related with the use of technological tools for conducting their professional activity in the classroom, which are different in many aspects to the use that could be given to them in the household environment.

The modern education requires the addition of technologies, which now are digital. This demands that the lecturers possess a significant digital competence for the mastery of the ICT and their integration into the teaching and learning processes (Hatlevik, Throndsen, Loi, & Gudmundsdottir, 2018)²⁶. This competence is understood as a set of capacities, abilities, knowledge, or skills that lecturers possess to solve educational problems by integrating ICT. At the same time, the mastery of the TDC empowers the

²⁶ Hatlevik, O.E.; Throndsen, I.; Loi, M.; Gudmundsdottir, G.B. Students' ICT self-efficacy and computer and information literacy: Determinants and relationships. *Computers & Education*, Vol. 118, March 2018, 107-119. Retrieved from: <https://www.sciencedirect.com/science/article/abs/pii/S0360131517302555?via%3Dihub>



teacher for the use of the ICT not only as support for their existing practices but also to transform them (Urez, Volman, & Kral, 2018)²⁷.

Some factors considered to be mobilizing variables of the TDC are described below:

- Training of the teacher: the teacher's work experience, initial training, and the degree of knowledge of the ICT tools are a fundamental factor for the development of TDC.
- Resources: quality of the infrastructure and availability of the digital devices and technologies necessary. Some lecturers assert their pre-disposition for integrating ICT resources into teaching-learning practices if they had the necessary means.
- Usage time: dedication to ICT usage in and out of the classroom as an element that favours the teacher's digital competence. Insufficient time available to prepare the Technology-enhanced learning (TEL) sessions through the is an opposing element.
- Attitude towards technology: the attitudes and beliefs the teacher has with respect to the TEL opportunities are critical variables that will determine the addition of the ICT to the teaching practice of the teacher, and not only their addiction but also how they are introduced, and the functions assigned to them. This attitude is perceived in the teacher's use of certain technologies such as social networks.

Analysis of digital skills and competences needed for technical staff

The technical staff must have competencies and skills that are directly related and ensure the smooth performance of the functions of the department, as follows:

- development, implementation, systematic administration and integration of specific, existing and new for the University information systems related to servicing the educational, scientific and administrative activities.
- research, implementation, and integration of information systems for activities for which they are applicable.
- experimental implementation and testing of information systems.
- installation and system administration of application information systems, management of virtual machines, configuration management, management of software

²⁷ Uerz, D.; Volman, M.; Kral, M. Teacher educators' competences in fostering student teachers' proficiency in teaching and learning with technology: An overview of relevant research literature. *Teaching and Teacher Education*, Vol. 70, February 2018, 12-23. Retrieved from:

<https://www.sciencedirect.com/science/article/abs/pii/S0742051X17304936?via%3Dihub>



distributions and updates, installation of operating systems, event monitoring, provides remote access services, manages hardware resources.

- assisting the academic community in applying for research projects involving the use of information and communication technologies.
- development of policies and rules for the development of information services at the University.
- assisting the administration in planning and delivery of computer and communication resources.

The e-Competence Framework (e-CF) is a common European framework for ICT Professionals in all sectors. To better understand the synergies between these two frameworks e-CF was also mapped with DIGCOMP. In this case, the main difference between the instruments is that one is for a general audience, i.e. DigComp for citizens, whereas the e-CF framework²⁸ is for professionals working in the ICT sector (e-CF Framework). The advantage of mapping the two is to show the continuity of certain skills when passing from competencies expected of citizens to those expected of ICT professionals. The next table presents the entire list of cross-references.

DigComp competence	Nature of cross-reference	e-CF competence
3.4 Programming	<i>could correspond with</i>	A.6 Application Design (EQF levels 3-6); B.1 Application Development (EQF levels 3- 8); B.6 Systems Engineering (EQF levels 6-7)
1.3 Storing and retrieving information	<i>higher levels could correspond with</i>	D.10 Information and Knowledge Management (EQF levels 6-8)
4.1 Protecting devices	<i>higher levels could correspond with</i>	D.1 Information Security Strategy Management (EQF levels 7-8); E.8 Information Security Management (EQF levels 5-7)
4.4 Protecting the environment	<i>higher levels could correspond with</i>	A.8 Sustainable Development (EQF levels 6-7)
5.1 Solving technical problems	<i>higher levels could correspond with</i>	C.4 Problem Management (EQF levels 4-7)

²⁸ A common European framework for ICT Professionals in all sectors, <https://www.ecompetences.eu/>

5.3 Innovating and creatively using technology	<i>higher levels could correspond with</i>	A.9 Innovating (EQF levels 7-8)
5.2 Identifying needs and technological responses	<i>higher levels could partially correspond with</i>	A.4 Product/Service Planning (EQF levels 4-7)
5.4 Identifying digital competence gaps	<i>higher levels could partially correspond with</i>	D.3 Education and Training Provision (EQF levels 4-6); D.9 Personnel Development (EQF levels 4-7)
2.6 Managing Digital Identity	<i>higher levels could partially correspond with</i>	E.3 Risk Management (EQF levels 4-7)
3.3 Copyright and Licences	<i>higher levels could partially correspond with</i>	D.8 Contract Management (EQF levels 4-7) Note: many others also mention IPR as a knowledge example

Table 7 Cross-reference between DigComp and e-CF

Analysis of digital skills and competences needed for administrative staff

According to the National Classification of Professions and Positions, the managerial and auxiliary administrative staff have the following responsibilities:

Administrative managers perform the following main tasks: formulate and administer policy, strategic and financial planning activities; establish and manage operational and administrative procedures; implement, monitor and evaluate policies and strategies; advise senior managers; manage the development of new products, marketing and advertising campaigns and public relations; define and manage sales activities, product mix, customer service standards; set prices and credit agreements; ensure compliance with applicable laws, regulations and standards; control the selection, training and work of staff; prepare budgets and coordinate financial operations; hold discussions with the executive director and with heads of other structural units or departments; control costs and ensure efficient use of resources; represent the enterprise or organization in negotiations at meetings, seminars, public forums.

The auxiliary administrative staff performs the following main tasks: stenography, work with typewriters and word processors, personal computers and other office equipment; enters data; performs secretarial duties; records and calculates numerical data; keeps accounting, commodity and transport documents; keeps documents related to passenger

and freight transport; performs auxiliary administrative work in libraries; file documents; performs work related to postal services; prepares and checks materials for printing; performs monetary operations; arranges trips; provides information at the request of clients and arranges business meetings; works with a telephone exchange. In some cases, their duties include tasks of controlling other employees.

Considering the above responsibilities is clear that for the digital competences could be used table represented in the previous section. (Please see Table 2. Cross-reference between DigComp and e-CF).

New needed competencies for digital learning specialists

The digital learning specialist should have the competences related to the following key areas of responsibility:

- Lead the construction of new online courses, working with a cross-disciplinary team of program staff, trainers, subject domain experts, designers and etc.
- Management of the maintenance, review and refreshing of existing online courses and related content
- Establishing standards (platforms, technologies) for delivery of distance education to the targeted audiences
- Support the development and delivery of hybrid in-person and online training programs
- Development and implementation of innovative ways of evaluating knowledge transfer to learners
- Facilitating live and recorded training (e.g. lectures)
- Implementation of training for the staff on how to use the LMS (building curricula, running reports, viewing learner transcripts)
- Implement reporting mechanisms that help HEI to evaluate the uptake, output and outcomes of its distance education programs
- Collaborate on surveying the needs from learners and sharing this feedback to be actioned as appropriate
- Analysis of the course enrolments and completion rates and implement strategies to increase both and monitor for learners progress and utilization
- Responsible for LMS platform and vendor relationship, maintaining awareness of the marketplace and new/emerging platforms
- Creation and support of various tools to assist the team with LMS development

Requirements to ensure that effective digital learning programs.

The National Evaluation and Accreditation Agency (NEAA) contributes to quality enhancement of Higher Education through cyclical institutional and programme evaluation and accreditation of higher education institutions in Bulgaria, through evaluation of projects for opening new higher education institutions and their basic units,

as well as through post-accreditation monitoring and control, providing independence and transparency of the procedures and high competence of the Bulgarian and foreign experts, participating in them. The criteria for institutional evaluation and accreditation are developed in accordance with the standards set in the Guidelines for QA in the Higher Education Act (HEA). Assessment under accreditation procedures is carried out on a four-grade evaluation scale comprising the following grades: Very Good, Good, Satisfactory, Unsatisfactory (Failed).

Accreditation has six-year validity when the grade received is “Very Good” or “Good”, and a validity of three years in case of a “Satisfactory” grade. Accreditation shall be denied in the event of an “Unsatisfactory” grade. Higher schools are disallowed to offer training in specialties from unaccredited professional areas or unaccredited specialties related to regulated professions and shall not confer diplomas. Unaccredited higher schools cannot receive state subsidies and shall not be financed by the state in any way whatsoever.

The HEIs develop and publish its rules and procedures, relating to examination and evaluation of achieved learning outcomes and granted credits.

The main principles of the system for evaluation of the students’ academic achievement, introduced in every higher educational institution are:

- Systematic approach of evaluation during the whole educational process;
- Objectivity in the evaluation of diverse academic achievements of each individual student both at theoretical and practical level;
- Transparency of the evaluation mechanism through criteria announced in advance, and indicating the importance of participation of each individual student in the study activity for the final grade on each separate subject;
- Correspondence of the result from the evaluation with the level of acquired competence according to current educational objectives for each subject;
- Educational achievements, comparable to those of other higher education institutions.

Different approaches are used for the inclusion of students in all stages of the evaluation process – in the preparation of the self-assessment report of the higher education institution, during the visit of the NEAA group, as well as participating as members of the expert group and of the Accreditation council. Students from all higher education institutions are given the opportunity to participate in the preparation of the self-assessment report and to talk to the members of the expert group.

The NEAA has developed its own pattern which achieves encouraging results. It gives the students the opportunity to become part of the expert groups but not their full members. A student is nominated through a special procedure and presents an independent report which the expert group gets before issuing its statement. This approach takes into consideration the fact that the student is competent in some respects like training (for example the training plans and programmes, quality of teaching, etc.), service

(administrative service, the condition of the library, information centers), social and cultural environment, etc.

Experts for external evaluation: The Accreditation Council (AC) within its authority imposed by the HEA sets up a team of experts for external evaluation selected on documents grounds, consisting of: Experts from Bulgaria; Experts-representatives of the students or PhD postgraduates; International experts. There is a file of documents including a professional CV for each expert, which facilitates the selection of experts for a certain procedure. The order and method for nominating and approving the experts and setting up the team, as well, are regulated by the Statute of NEAA and the following documents: Requirements for selection of experts for procedures in institutional accreditation and evaluation of a project; Rules for students' involvement in evaluation and accreditation procedure; Rules for international experts' involvement in evaluation and accreditation procedures; Information card for setting up an expert team.

The assessment and accreditation of distance learning in the specialty is carried out by NEAA on the basis of 12 criteria for accreditation of a professional field in accordance with ESG (Standards and guidelines for quality assurance in the European Higher Education Area) -part 1 of Table 2.

Criteria for evaluating the organization and the environment for conducting the training:

1. The HEI has a documented, publicly announced, with official status and accountability policy for ensuring the quality of the distance form of education (DFE) as part of the strategic management of the educational institution in the interest of public needs.
 - Official documents related to the strategy for development of HEIs and the Quality Management / Assurance System indicate policies and tasks for the development of DFE and DFE in Specialty (DFES).
 - Regulations for the organization and conduct of the DFE have been adopted.
 - Institutional policy for inclusion of groups / persons with special educational needs (or disadvantaged) in the form of DE.
2. The HEI maintains an internal system for the quality of education in the DFE and the academic staff, which includes a survey of student opinion.
 - There is an organization for management and improvement of the quality of the DFE and of the academic staff, in accordance with the peculiarities of the DFE.
 - Adequate feedback from students is used for effective management of the DFE.
3. The HEI develops and implements procedures for development, approval, monitoring and updating of the study documentation of the professional fields and of the respective DFES (qualification characteristics, curricula, and programs, etc.) with the assistance of stakeholders.

- An organization has been established for development, approval, periodic analysis and updating of the educational documentation for DFES, and the same is accepted by the academic council after a joint proposal of the main unit leading the training and by the Distance Learning Center.
 - Information is available for students for each program or specialty in the DFE, including technical, organizational, and pedagogical requirements and specifications.
 - Procedures for assessing the needs of participants in the DFE are carried out and good foreign and national practices of the DFE are followed.
4. Methodological standards for study documentation (curricula and programs) and a standard (procedure) for changes in the study documentation, which are related to stimulating the motivation and engagement of the student in the learning process, have been officially adopted.
- There are university standards for study documentation in DFES.
 - The HEI ensures the maintenance and protection of the confidentiality of personal information for students and teachers in the used software systems for management of the educational content and learning, the university information infrastructure, as well as for verification of the identity of the students in DFE (incl. identification in electronic forms of communication and in testing) to prevent fraud (use of false identities, plagiarism, etc.).
 - An effective system for personal assistance of students in the DFE has been created, incl. facilitated and informed access to lecturers or administrators for obtaining explanations, advice and / or assistance (through university communication infrastructure, e-mail, forum, chat, telephone, etc.).
5. Structures have been established and internal normative documents (regulations, provisions, instructions) for the functioning of the DFE system have been developed - from the admission of students, including their professional realization.
- A management and organizational structure have been established in the university, suitable for conducting DFO - Distance Learning Center (DLC).
 - The achievements of students in DFES are comparable to the results of students in full-time and part-time education.
6. The university has developed a policy for the development of research and teaching staff, providing DFE, which is part of the strategy for development of the institution.
- There is a research and teaching staff and consultants with competencies for conducting the SFD, with clearly defined roles and tasks.
 - Conditions have been created for raising the qualification of the teachers (special for introduction and use of methods and means for DFE) and for dissemination of good practices for improving the quality of DFES.



- A normative base and measures have been developed for the formation of academic workload and for stimulating the lecturers to participate in the DFE, for the design and development of virtual resources, etc.

- There is a system for qualification of the administrative and technical staff in the field of DE.

7. The HEI provides and develops the technical and information base necessary for conducting the teaching and learning activities in the DFES, as well as a suitable integrated system for DE.

- An information infrastructure and an integrated system for management and implementation of DFES have been created, which meets the modern requirements for interface, accessibility, reactivity and allows for training at the third and / or fourth technological level.

- Technical and communication tools are provided, which are used by students and teachers in the DFE.

- Tools are available (e.g., for online expert assistance; for visualization of elements of the process - learning paths, learning outcomes and achievements; for collaboration and communication, etc.), standards and good practices (for design, generation and dissemination of educational content, e-materials and e-courses), suitable for conducting DFES.

Criteria for evaluating DFOS:

1. HEI conducts training under DFES by applying procedures for development, approval, monitoring and updating of educational documentation (qualification characteristics, curricula, and programs, etc.) with the assistance of representatives of partner organizations, students and other stakeholders.

- There is a correspondence between the study documentation and the procedures of DFOS on the one hand, and the specific requirements and normative frameworks of the assessed university environment for conducting DFE - on the other.

2. There is a system of rules and activities related to stimulating the motivation and active position of students in the learning process of DFES.

- There is a system for control and transparency of the procedures for checking and assessment of students' knowledge, as the final grade of the studied disciplines is formed after conducting an examination procedure in units of the university or in units authorized by it.

- An effective system for personal support of students in the DFO during the time, manner of inclusion and access to virtual resources and activities through the university communication infrastructure, incl. for informed access to teachers and / or administrators to receive explanations, advice, and assistance in accordance with adopted rules.

- Teaching materials and resources, library and information sources and learning activities are offered for DFES, presented in an appropriate and understandable way in electronic and conventional format, and in accordance with the competence of potential students.
 - The educational content, information resources and activities in DFES are provided in a personalized way in various ways, ensuring the effective achievement of the educational goals by the students.
 - The study load and academic schedule are coordinated with the requirements and expectations of the students in DFES.
 - The methodological approaches used in the main unit to achieve the announced learning objectives, to develop learning materials and virtual resources and to maintain the DFES are justified and follow good practices.
3. There is a provided and constantly developing financial, technical and information base, necessary for the teaching activity in DFES.
- Sufficient (for students to achieve the announced goals of DFES) quantity and quality of virtual learning resources and activities that reflect modern knowledge and practices, are regularly analysed by experts, and use good practices for DE, namely:
 - relative share of the educational content, presented with educational materials and resources for conducting DE, in relation to the educational content of DFES not less than 75%;
 - relative share of teaching materials and resources for DFES, prepared at the 3rd and / or 4th technological level, in relation to their total number not less than 70%;
 - relative share of the attendance periods of DFES, conducted in main units in the structure of HEI up to 30%.
 - The curriculum and syllabi of DFES are up-to-date and equal to the regular form of education, as the relative share of the number of compulsory subjects prepared for conducting DFES, compared to their total number in the curriculum is not less than 75%.
 - The training process in DFES is carried out mainly using: methods for remote access; learning resources and activities (including Internet-based); technical and communication means provided by servers with guaranteed high-speed access.

New required multimedia technologies

Dependent on multimedia network learning, closely combining multimedia computer technology and network technology, with a variety of multimedia information processing technologies, human-machine communication ability, to achieve online multimedia transmission and resource sharing, forming the ideal multimedia network environment²⁹(Idrisova, Alikhadzhiev, & Alisultanova, 2021).

²⁹ Application of multimedia technologies in webeducation: https://www.shs-conferences.org/articles/shsconf/pdf/2021/12/shsconf_sahd2021_03052.pdf

Multimedia technology with its changed kinds - wiki, online journals, person to person communication destinations, for example, Facebook, twitter et cetera, video sharing destinations, for example, you tube; small scale websites are well-known among youngsters. These kinds of Multimedia technology are broadly utilized by understudies for learning process as a supplement for books and have initiated capacity of talk and basic reasoning among understudies³⁰ (R., 2018).

You Tube: An online video sharing webpage where recordings are transferred by clients and be seen unreservedly. Clients can leave remarks on the recordings.

Long range informal communication Sites: Social systems are the place clients set up a profile of themselves, make formal associations with individuals they know, impart, and share inclinations and interests. It permits the people to exhibit assortment of arrangements including recordings and writings. Facebook, MySpace, LinkedIn et cetera are the outstanding person to person communication locales among undergrads.

Web journals: Blogs are major intuitive device. An individual can make and refresh content and can likewise keep up standard sections of editorial, occasions or news. Blog destinations might be kept up by a solitary individual, a gathering of people, corporate body et cetera. In most of the blog locales, clients (normally eluded as bloggers) share a considerable measure of basic data scattered through sound, vivified illustrations, and video documents.

Wikis: Wiki is an instrument that guarantees a superior type of open area communication and group association. Wiki is accumulation of website pages and is created to oblige a wide cluster of substance and gets to.

Google: Google is the biggest web index on the web it handles a few inquiries through its different administrations. This web search tools give us a chance to discover different destinations on the online on catchphrase seeks.

The education is revamping itself as students are ardently using multimedia technology for the learning purpose. The conventional idea of enhancing knowledge in a classroom and libraries is seeing changes as students depend on Multimedia technology for better understanding, extra information, industrial knowledge, current affair and experiential learning.

³⁰ Kushwaha, R. (2018) Multimedia technology in higher education: New era outreach learning, International Journal of Academic Research and Development, Volume 3; Issue 2; March 2018; Page No. 1241-1244, ISSN: 2455-4197, www.academicjournal.com

New ways for learning data treatment

The distributed storage and parallel computing of Big Data provide robust solutions meeting the requirements of intensive processing, predictive analysis, and massive storage of learning data.

Many terms have been used to describe the mode of distance learning, including E-learning, online learning, CAT (Computer Assisted Teaching), ITS (Intelligent Tutorial Systems), Distance Education, Distance Training, WBT (Web-Based Training), M-learning (Mobile Learning), MOOC (Massive Open Online Courses), etc.

E-learning has many advantages such as flexibility, diversity, openness, etc., it becomes an essential way to acquire new knowledge and skills and to take lessons anytime, anywhere and from any device ³¹(Sh., 2011).

Specifically, big data can be divided into data science and big data technologies.

Data science is “the study of techniques covering the acquisition, conditioning, evaluation and exploitation of data”, while big data technologies are “systems, software libraries, tools, frameworks with their algorithms associates that allow distributed processing and analysis of big data problems between clusters of machines”³² (Sh., Improvement of Online Course Content using MapReduce Big Data Analytics, 2020).

Big data technologies require processing power, speed of execution and huge storage space.

The next Figure presents the 5V model describing the five characteristics of big data³³ (Dahdouh, Dakkak, Oughdir, & Ibriz, 2020).

³¹ Guri-Rosenblit S, Gros B. E-learning: Confusing terminology, research gaps and inherent challenges. International Journal of E-Learning & Distance Education/Revue Internationale Du e-Learning et La Formation à Distance. 2011;25(1). <http://www.ijede.ca/index.php/jde/article/view/729>

³² Siddique, Sh. (2020) Improvement of Online Course Content using MapReduce Big Data Analytics, International Research Journal of Engineering and Technology (IRJET), Volume: 07 Issue: 08, P.50-56, e-ISSN: 2395-0056

³³ Karim Dahdouh, Ahmed Dakkak, Lahcen Oughdir and Abdelali Ibriz (March 11th 2020). Improving Online Education Using Big Data Technologies, The Role of Technology in Education, Fahriye Altinay, IntechOpen. <https://www.intechopen.com/chapters/68814#B2>

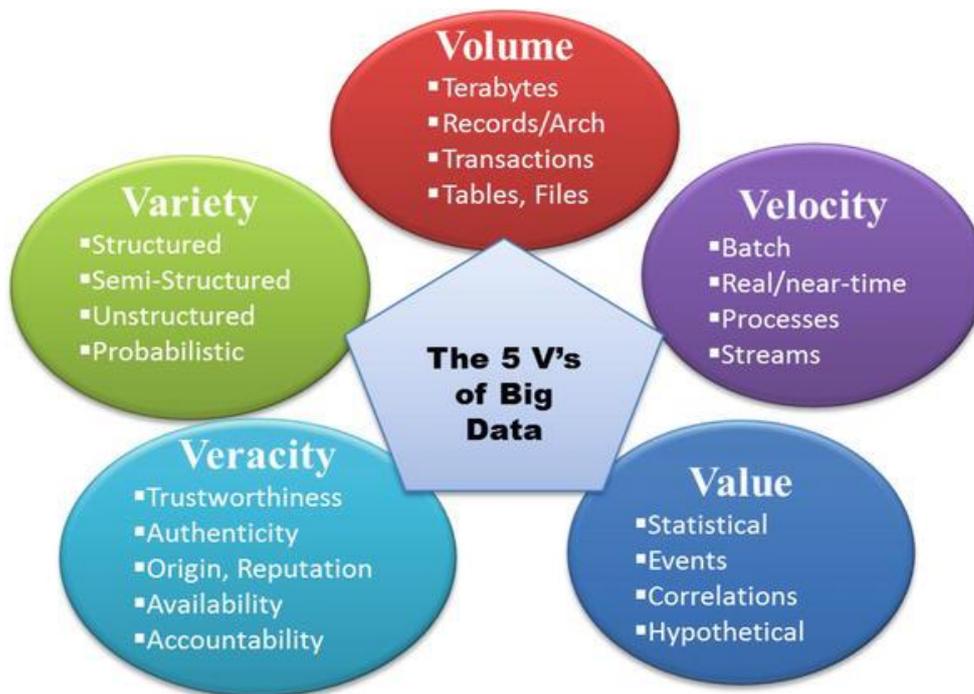


Figure 2 Characteristics of big data or 5V.

Big data and the cloud have become key components of any information system, including e-learning systems. The integration of big data and e-learning platforms is not possible to be discussed without considering the cloud computing.

The cloud gives the resources needed to deploy big data technologies and tools, as well as learning management systems (LMS). In addition, the cloud offers a preconfigured, ready-to-use environment that incorporates massive data processing technologies.

Identifying useful information from learning data is a big challenge, especially with the significant increase in the amount of data produced every day by online learning platforms.

To overcome this problem, big data ecosystem provides advanced technologies, methods, and techniques through machine learning algorithms in the form of software libraries (APIs, Frameworks, etc.) that are very powerful and easy to use. Such technologies make it possible to prepare and analyse, in a distributed manner, large amounts of data in order to make the best decision and to help e-learning professionals to be able to continuously enrich and enhance their strategies to be adapted to the interests and preferences of each learner.

The next Figure illustrates an approach for integration of LMS, big data and cloud computing³⁴ (Dahdouh, Oughdir, & Messaoudi, Big data for online systems, 2018).

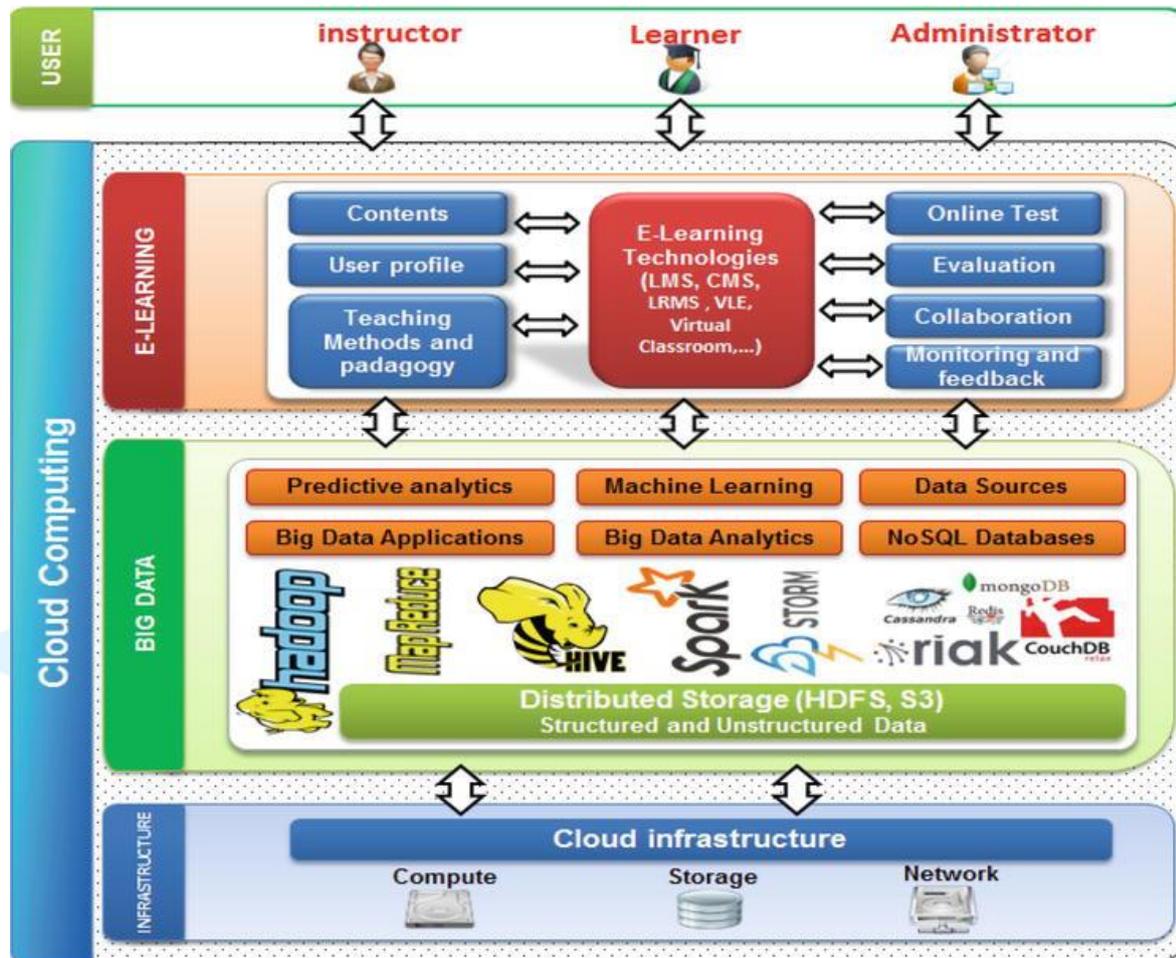


Figure 3 Integration of big data, online learning systems, and cloud computing.

Suggestions for effective digital learning programs

According to the Strategy for Development of Higher Education in the Republic of Bulgaria 2020-2030 and the main aims specified the following, activities are recommended.

Aim 1. Development of a sustainable mechanism for updating existing and creating new curricula.

- Activity 1. Establishing the competence approach as a priority in higher education.

³⁴ Dahdouh K, Dakkak A, Oughdir L, Messaoudi F. Big data for online learning systems. Education and Information Technologies. 2018;23(6):2783-2800. DOI: 10.1007/s10639-018-9741-3

For the successful completion of this first activity are specified the following measures:

- Development of the profiles of the competencies of each specialty from the point of view of the requirements for successful personal and professional realization in the conditions of digital transformation, mobile societies, and dynamic labor market.
 - Achieving a balance between the development of cognitive (including analytical and digital) and non-cognitive (including social and emotional) competencies.
 - Stimulating the development of key competences for lifelong learning, foreign language competence, civic and social competences, general digital competences.
 - Stimulating the development of functional competencies and skills for creative and critical thinking, communication, teamwork, leadership, creation and use of algorithms and coding.
- Activity 2. Strengthening the training in modern digital technologies and the interdisciplinary connections in the curricula.

Measures related to the second activity are as follows:

- Inclusion in all curricula of disciplines and practical training in new digital technologies such as artificial intelligence (AI), augmented reality (AR), artificial reality (VR), etc., as well as basic training to develop skills for algorithmic thinking and solving algorithmic problems.
 - Strengthening the interdisciplinary approach in the preparation of curricula, and introduction of hybrid disciplines, which include teachers from different scientific fields and professional fields.
 - Inclusion of several social and / or humanities disciplines (philosophy, sociology, political science, art, etc.) in the curricula of other professional fields, as well as introductory disciplines in the exact sciences (mathematics, informatics, natural sciences, etc.) in the humanitarian and social fields.
 - Providing appropriate material base and inclusion of obligatory sports classes in all curricula of HEIs, disputes their specifics.
- Activity 3. Strengthening the cooperation between HEIs, business and the state in the discussion of curricula, practical training, and career guidance of students.

For the successful completion of third activity related to this aim are specified the following measures:

- Ensuring enhanced practical training of students to acquire competencies and qualities sought in the labor market by including in the teaching of practitioners, dual training and providing student internships and internships.

- Encouraging the involvement of representatives of business and public administration in the discussion of curricula and study programs in certain disciplines.
- Stimulating (including financially) the construction and maintenance of scientific infrastructures in partnership with business for the priority specialties.
- Supporting the professional orientation of students through career centers.
- Providing mechanisms for monitoring the performance of graduates and maintaining clubs for graduates.

Aim 2. Introduction of modern, flexible and effective forms of education

- Activity 1. Introduction of standards for good learning guided from European experience and traditions.

The measures specified for successful completion of the activity are as follows:

- Establishment of university centers for training resources.
 - Training teachers in information processing skills, visual literacy, problem solving and higher level thinking, ad hoc cooperation and a deep understanding of how technological tools can improve the learning process.
 - Organizing inter-university national and international conferences and seminars to present new teaching methods.
 - Updating the curricula by strengthening the role of independent creative activities of students such as preparation and presentation of critical analysis of a problem, preparation of course work, solving practical problems, participation in research, etc. similar, including using the summer period between two academic years.
 - Assessing students' knowledge and skills not on the basis of reproducing what is memorized, but through skills for: debating, conducting scientific experiments or theoretical modeling, solving real problems, digital creativity, presenting information to specialized and non-specialized audiences, as well as ability: to understand the nature of the problem / topic, to use various digital tools for effective performance of tasks in the real world, to evaluate messages in video forms, etc.
- Activity 2. Creating a material and financial base, allowing the application of modern and flexible methods of teaching and research.

Regarding this activity the following measures are specified:

- Creation of university technological programs for providing materials and means to support the digitalization of the educational process, field research, project activities, etc.
- Intensive provision of equipment enabling interactive and digital teaching.

- Linking the accreditation criteria for academic space not only with areas per square meter per student, but also with the saturation of this space with equipment allowing the application of effective educational technologies.
 - Providing support (through operational programs for science and education or through a national program) for content creation and for providing technological resources for the development of quality distance learning, with interactive access and virtual audiences, including for attracting foreign students and Bulgarian youth from abroad to study in Bulgaria.
 - Support and stimulation of the preparation of distance learning courses (MOOCs) with open access by Bulgarian teachers in English.
- Activity 3. Use of educational forms, methods, and technologies in accordance with the peculiarities of the trained generation of students.

The measures specified in this regard are as follows:

- Significant increase of e-distance learning programs, improvement and updating of e-distance learning curricula and platforms, digitalization of content and creation of new interactive digital resources.
- Providing systematic technological training to assist university professors in mastering basic and additional technologies for teaching and research.
- Digitization of the educational process.
- Setting a predominant visualization of the study material. Significant reduction of text-based learning materials at the expense of visual and audio information, which should become the main means of transmitting information to students, as visual and audio information should precede textual.
- Use of personal mobile phones as an aid technological tool in the audience along with the computer and tablet.
- Wide introduction of teaching through case studies as a means for intensive discussion by the students of the taught subject and the development of their skills for argumentation, verbal debate and decision making.
- Combining the financial and intellectual efforts of universities to create online libraries and digital resources usable at any time, including in class.
- Supporting and stimulating the process of expanding the role of the teacher from mainly a lecturer and a moderator, who turns into knowledge the information on a given topic previously collected and analyzed by the students.
- Expanding the participation of prominent practitioners in academic classes.
- Applying project-based learning, including a dynamic audience approach, to gain more in-depth knowledge through active exploration of real-world challenges and problems, with a focus on what is new, active, useful and interesting.

- Offering distance learning courses with open access for students from all over the world.

Aim 3. Improving the quality of education in higher education

- Activity 1. Improving the efficiency of the internal quality management systems of education, research, and academic staff.

The measures related to this activity are the following:

- Establishment of the internal quality management system for description and analysis of the key processes and activities of the higher school and their interconnection and certification of QMS according to the ISO system.
- Overcoming the formal nature of the attestation of teachers in order to make it an effective incentive for professional development and academic growth.
- Ensuring that the internal quality management system is linked to the internal rules for the salary based on the quantity and quality of teaching and research work of the members of the academic staff and by introducing an incentive model for the formation of the salary of teachers, with special attention to young teachers.
- Implement a system of internal quality audits to identify weaknesses and monitor progress in quality assurance.
- Introduction of a mechanism for decision-making related to quality assurance, based on analyzed and systematized data obtained through various feedback channels from stakeholders - students, teachers, administrative staff, employers, business representatives and others external partners.
- Involvement of stakeholder representatives in decision-making to improve the quality of education.
- Introduction of an effective mechanism for regular student assessment of the quality of the learning process.

- Activity 2. Ensuring financially effective educational activity with high quality.

Regarding this activity the following measures are specified:

- Offering bachelor's and master's degrees with dynamic curricula, adapted to the needs of students and the labor market and providing up-to-date knowledge and personal skills in accordance with European quality standards and leading world standards.
- Ensuring real electives of subjects and teachers by students and real application of the credit system, including mobility. In this regard, revision of the rules that require and / or take into account only hours in compulsory courses, e.g. for announcing academic competitions.

- Introduction of modern means for prevention and control of plagiarism in the educational process, including through software for checking for plagiarism and regulation in the codes of ethics of HEIs.
- Evaluation and review of the financial efficiency of the specialties in the bachelor's and master's degrees.
- Reducing classroom employment and ensuring maximum flexibility of curricula, in line with the increased opportunities for students for extracurricular activities and self-preparation.
- Regular updating and optimization of educational documentation: annotations, qualification characteristics, curricula, and programs of academic disciplines in accordance with the development of scientific knowledge, the needs of society and for a more rational use of all resources.
- Stimulating the educational cooperation between the Bulgarian Academy of Sciences (BAS) and the University for the development of general master's and doctoral degrees, for example through the adoption of a national program in the field of higher education.
- Providing detailed and complete information and support to students from their reception, enrollment, and accommodation, through training, to the completion and issuance of the diploma.

Aim 4. Internationalization of higher education and inclusion in international educational and scientific networks

- Activity 1. Building real functioning networks between Bulgarian and foreign universities on the basis of jointly implemented activities.

The recommended measures are as follows:

- Encouraging higher education institutions to be involved and actively participate in the initiative to build European universities.
 - Expanding international cooperation and academic partnerships with foreign universities and participation in university and research networks.
 - Encourage and support international cooperation in the field of research and participation in international research projects and infrastructures.
 - Stimulating the publication of scientific articles in leading international academic publications and the inclusion of scientific journals published in the Republic of Bulgaria in international databases of scientific literature.
 - Stimulating and supporting participation in specializations and international forums and membership in international organizations.
- Activity 2. Internationalization of the social and educational environment in HEIs.



The suggested measures in this regard are the following:

- Increasing the readiness of the academic staff, the employees in the administration and the students for work in a multicultural and multilingual environment through qualification, especially in ICT and foreign language training.
 - Encouraging the preparation and publication of textbooks, teaching aids and monographs in foreign languages.
 - Opening of specialties and programs in a foreign language in all educational levels in order to attract a larger number of foreign students.
 - Establishing contacts with the Bulgarian diaspora and with Bulgarian schools abroad in order to attract students from Bulgarian communities.
 - Taking care of foreign students and students of Bulgarian origin who studied and lived in another country before enrolling in a Bulgarian university, from their reception, enrollment and accommodation, through training, to the completion and issuance of a diploma.
 - Harmonization of curricula with those of leading foreign universities teaching in similar professional fields.
 - Stimulating the creation and supporting the functioning of joint educational programs between Bulgarian and foreign universities, as well as new forms of educational exchange within the European cooperation such as double and joint educational degrees, and others.
 - Stimulation of the double scientific supervision of doctoral students with Bulgarian and foreign scientific supervisor.
 - Stimulating the attraction of foreign teachers in Bulgarian universities.
 - Support for the introduction of the electronic European Student Card.
- Activity 3. Encouraging the incoming and outgoing mobility of teachers, students and administration

The specified measures for successful completion of this activity are as follows:

- Increasing the participation of students and doctoral students in mobility, exchange and internships in foreign universities.
- Assisting students in choosing courses and programs before the start of mobility.
- Inclusion of academic mobility in curricula.
- Introduce transparent, consistent and reliable procedures and criteria for fair recognition of completed degrees and periods of study in foreign higher education institutions and increase the competence of the staff performing the recognition.
- Promoting the incoming and outgoing mobility of teachers, students and administrative staff.

- Activity 4. Improving the image of Bulgarian higher education abroad.

Regarding this activity as an important measure is pointed out the carrying out active marketing process for representation of the Bulgarian higher schools abroad and especially among the Bulgarian diaspora outside the political borders of the country.

Aim 5. Stimulating the participation of young lecturers

- Activity 1. Creating a better age match between teachers and students by encouraging more young people to take part in teacher competitions.

As for the successful completion of this activity the following set of measures is specified:

- Creating standards that guarantee the appointment of teachers with personal and professional knowledge and skills, ensuring high quality teaching and building mutual trust with students.
- Supporting young teachers to develop and habilitate in a short time while maintaining high academic requirements.
- Review and supplement the regulations of higher education institutions in order to ensure a combination of quality education with personal satisfaction with teaching and opportunities for academic growth.

- Activity 2. Creating conditions for increasing research initiatives and the research capacity of young teachers.

The specified measures for successful completion of this activity are as follows:

- Use of master's programs for preparation of future doctoral theses and transition to teaching work for outstanding students with research attitude and skills for communication with the audience.
- Unloading from excessive teaching or administrative activity and providing time and opportunities to expand teachers' knowledge, develop teaching skills, and prepare and lead research projects, including with the participation of students.
- Providing opportunities for qualification - foreign language training, ICT, research skills.
- Involvement in international projects and university networks for joint research and publication activities.
- Establishment of university funds for financial provision of participation in international scientific programs, conferences, symposia, and practices.

- Activity 3. Creating better working conditions and payment.

The measures specified for this activity are as follows:

- Providing a self-employed workplace equipped with high-tech equipment.
- Providing institutional support in each HEI to reduce the impact of demotivating factors such as: low motivation of some students, high levels of stress, unfavorable working conditions, including the technological environment and human relationships.
- The criteria for attestation of teachers should be related to the degree to which young teachers encourage and carry out in-depth learning of students to achieve lasting knowledge, and not superficial learning.
- Provision in the state budget of the possibility for introduction of remuneration of young teachers in a given professional field not less than the average salary of the realized students from the same field.

Aim 6. Activation of scientific activity in higher schools

- Activity 1. Stimulation of the research activity in HEIs.

The following set of measures are specified as crucial for the successful completion of this activity:

- Inclusion in the systems for accreditation and attestation of objective criteria for reporting the scientific and scientifically applied results during the reporting period: publications in refereed and indexed journals, attracted funds from scientific and scientific-applied contracts, ratio of lecturers / defended doctoral students, etc.
- Formulation of the subsidy for the research areas in two clearly separated parts - for the maintenance of the students' education and for scientific research. The amount of the research subsidy should be determined according to objective criteria for the scientific results noted in the previous period (publications, citations, registered patents, attracted funds from scientific and applied research contracts, etc.). The research grant will gradually increase until in 2025 it reaches at least 40% of the total research grant.
- Analysis of the reasons for dropping out of the doctoral students during the doctoral studies, for not completing the dissertation and for not reaching the defense and taking measures to prevent these phenomena.
- Regular update of the doctoral scholarships' amount, maintaining the level of at least 150% of the minimum wage. Introduction of a national system for reporting and control of the effective use of the funds allocated for the training of doctoral students.
- Regulation and resource provision of the activity of doctoral schools.
- Introduction of coefficients in the state subsidy granted for education in different educational degrees (e.g., 4 for doctoral student, 2 for master's degree and 1 for bachelor's degree), which should reflect the significant differences in the value of education in the respective degree.
- Regulation and resource provision of scientific specialization (postdoctoral studies).



- Activity 2. Improving the organization of research activities in higher education.

The most significant measures regarding this activity are:

- Defining rules for the use of the research subsidy for the implementation of targeted research programs at HEIs and for stimulating teachers with high scientific achievements.
- Stimulating the cooperation between HEIs, as well as HEIs with the institutes of BAS for the preparation and implementation of joint research projects and for joint training through joint master's and doctoral programs with shared human and material resources.
- Introduction of an effective, unified HE system for prevention and control of plagiarism in the publication of scientific papers and in competitions for academic growth.

Aim 7. Building an effective education-science-business relationship

- Activity 1. Creating a system for regular updating of the educational content in accordance with the latest achievements of science and technology.

The measures related to this activity are as follows:

- Updating the content of the curricula and programs, as well as the accompanying educational materials in all HEIs, so that they correspond to the modern scientific and technological knowledge.
- Inclusion of training by developing projects and solving practical tasks in all curricula, according to their specifics, to build the relevant competencies in students.
- Establishment in each HEI of a system for periodic review, assessment of topicality and formulation of proposals for improvement of the educational content by specialists external to HEIs (scientists and practitioners).
- Inclusion in the periodical attestation of the teachers of indicators, which objectively take into account the topicality of the taught material from the point of view of its scientific and technological level.

- Activity 2. Activation of the partnership of HEIs with the employers and the state in the educational activity and the lifelong learning.

As for the successful completion of the activity described above, the following set of measures is specified:

- Supporting the development of dual training in higher education and other forms of joint training (incubators, summer schools, career events, etc.) by HEIs and employers.

- Closer coordination between HEIs, employers and the state for the implementation of continuing education, training and retraining programs as a key tool for adapting to changing labor market requirements.
 - Stimulating the attraction of specialists with extensive practical experience as teachers in Bulgarian universities.
 - Stimulating the intersectoral career development from academic to practical realization and vice versa.
 - Establishment and support of the activity of lifelong learning centers at HEIs.
- Activity 3. Activation of the partnership of HEIs with business and the state in research.

The most important measures defined for this activity are described below as follows:

- Creating a legal opportunity and stimulating the development of doctoral programs with mixed funding from the state and business on topics of interest to business.
- Stimulation of applied research programs, including through mixed public-private funding, for development of innovations with potential for increasing the competitiveness of the Bulgarian economy.
- Inclusion of education in innovation and entrepreneurship in all academic plans and programs according to the specifics of the professional field and the educational degree.
- Supporting and stimulating the entrepreneurial activity of students and teachers through appropriate academic, organizational and financial measures.
- Stimulating the provision of consulting and educational services by HEIs for companies as well as for state, regional and other public structures.
- Inclusion of the activities in management and participation in scientific-applied projects in the criteria for academic growth and attestation of the academic staff.

Aim 8. Increasing the role of HEIs as an active factor for regional development

- Activity 1. Creation and use of a national map of higher education in the Republic of Bulgaria.

The following measures are specified regarding successful completion of the activity described above:

- Establishment of NKVORB, which identifies the needs for development of higher education by regions and the available resources of teachers and potential prospective students, taking into account the opportunities for attracting foreign students and Bulgarians living abroad.

- Use of the information from the National Map of Higher Education in the Republic of Bulgaria, employers and line ministries for further development of the system for state-controlled subsidized admission to state HEIs, in accordance with national and regional needs and projections for future market development of labor.
 - Regulating procedures through which the information from the National Map of Higher Education in the Republic of Bulgaria to be used for balanced development of the network of higher education institutions according to the needs of the regions and according to the real possibilities.
 - Establishment of a system for periodic review and updating of the National Map of Higher Education in the Republic of Bulgaria with the participation of representatives of the Council of Rectors, the Ministry of Regional Development and Public Works, the National Association of Municipalities and the nationally representative organizations of employers.
 - Systematic efforts at national and regional level to overcome existing real social and regional inequalities in access to HE, e.g. by supporting preparatory courses for prospective students among vulnerable groups and in specific regions.
- Activity 2. Enhancing the partnership of HEIs with regional authorities in terms of smart specialization and regional development.

The measures related to this activity are as follows:

- Supporting the preparation of joint strategic documents for the development of the individual regions with the participation of higher education institutions. Development of joint strategic goals in harmonized specific development plans of the regions and HEIs.
- Stimulating the participation of HEIs in solving problems identified as priorities by the regional authorities through targeted national and regional funding (project and program).
- Regulating and activating the role of the regional leaderships, through the boards of trustees and other appropriate forms, in the preparation, regular monitoring and reporting of the mandate programs of the rector's leaderships in relation to the needs of the region.
- Supporting and stimulating the development of training programs for postgraduate qualification and retraining (lifelong learning) that meet the needs of the region.
- In strong economic regions create regional funds for the development of research and innovation.

Aim 9. Improving the management of HEIs and the evaluation and accreditation system

- Activity 1. Guaranteeing the academic responsibility and the public interest in HEIs.

The most important measures related to the activity specified above are as follows:

- Clear legal regulation of the powers of the boards of trustees of HEIs.
 - Transformation of the contracts between the Minister of Education and Science and the elected rectors in the state higher schools into a guarantor of reforms and an instrument for responsible and effective management.
 - Linking the amount of the state subsidy with the implementation of the contract between the Minister of Education and Science and the Rector.
 - Appointment of employees for preliminary financial control under the Law on financial management and control in the public sector in HEIs by the Minister of Education and Science.
 - Stimulating the introduction of information systems in order to increase the transparency and mutual control of the rector's management and the heads of the main units.
- Activity 2. Transformation of accreditation into an objective tool of external evaluation.

Regarding the successful completion of this activities the following measures should be taken:

- Involvement of more foreign experts in the accreditation.
- Adoption of clear and objectively measurable indicators for the different types of accreditation procedures.
- Replacement of the self-assessment reports of HEIs with submission of specific data according to the objectively measurable criteria.
- Creation of a common for higher education institutions, National Center for Information and Documentation /NACID/, NEAA and MES electronic platform containing the data necessary for the accreditation procedures.
- Strengthening the analytical potential of NEAA, and the evaluations should be linked to the implementation of the vision and the program for development and HEIs.

Aim 10. Improving the structure and efficiency of Higher Education

- Activity 1. Developing connections between higher education institutions in the country and sharing common resources for training and research.

The successful completion of this activities is related with the following measures:

- Stimulation of a system for joint use of the material base (training laboratories, training bases, sports bases, etc.) by two or more higher schools in order to increase the quality and efficiency of the training.
 - Facilitate the exchange and shared use of teachers from two or more universities located in the same region, in basic disciplines such as mathematics, physics, chemistry, foreign language, sports, etc.
 - Stimulating the development of interdisciplinary curricula and hybrid specialties, combining disciplines from two or more professional fields, which are carried out by two or more higher schools.
 - Further development and enrichment of the system of national scientific programs for unification of the capacity and activities of higher schools and scientific organizations for solving socially significant scientific and scientific-applied problems.
 - Stimulating the development of regional and thematic clusters between several universities and companies for the joint development of innovation and intellectual property, giving a competitive advantage in global markets.
 - Encourage the unification of higher education institutions on a voluntary basis and the creation of consortia for higher education.
- Activity 2. Defining research, educational and vocational universities with clearly defined specifics.

Regarding this activity the following set of measures is specified:

- Defining HEIs and individual professional fields in HEIs as research on the basis of objective criteria, such as the number of publications in referenced and indexed publications (including patents), normalized to the number of lecturers. For example, a research university may be one in which all fields train masters and at least 75% of current students study in research fields.
- Defining educational higher education institutions that teach only bachelors and masters or in which the share of students enrolled in research areas is not high. For example, educational may be those HEIs in which the share of current students studying in research areas is lower than 75% of the total number of current students in a given HEI.
- Outline in the National Map of Higher Education in the Republic of Bulgaria the regional needs for colleges that train only professional bachelors.
- Introduction of specific criteria and separate rankings in the assessment of different types of higher education institutions through the Rating System.
- Legal regulation of the differences in terms of requirements, funding, accreditation, organization of training, research, management and other inherent activities of the respective types of higher education institutions.

- Defining objective criteria and procedure for transforming one type of higher education institution into another in the presence of public need and the necessary human and material resources (or in case of loss of necessity and / or resources).
- Activity 3. Introduction of a more flexible system for the duration of educational and qualification degrees "Bachelor" and "Master".

The following measures are specified regarding successful completion of the activity described above:

- To introduce a legislative possibility for full-time and distance learning in a bachelor's degree with a duration of 3 academic years, as the duration for a given professional field should be the same for all higher education institutions in the country.
- To provide state subsidies for full-time, distance and part-time training in the Master's degree with a duration of 2 years, if it upgrades 3-year training in the Bachelor's degree in the same professional field.
- To provide subsidies for additional qualification and / or retraining through national and / or operational programs, including through the completion of a Master's degree for persons who have acquired higher education more than 10 years ago (incl. and graduates of the Master's degree).

6. BEST PRACTICES IN THE COUNTRY

Case study / Best practice #1

Best practices for sustainable implementation of e-learning in New Bulgarian University (NBU) Website: <https://nbu.bg/en>

The NBU practices in conducting regular and distance training conform to the announced educational policy of the NBU in the context of the implemented e-learning platform. At the same time, they are the result of the specifics of the subject areas and the learning process. The optional presence of students during the regular classes and the fact that most of the courses are elective also influence curricula and the structure of learning content. However good learning environments support and encourage better practices – both for the instructor and the learner³⁵.

Moodle's single page unit based structure facilitates a modular design that permits to improve the overall functionality by adding new components. My Courses panel lists courses that you either teach or attend. Moodle presents the whole course on the same page split into units defined by the instructor. The organization of the learning material is by week or topic, like a regular class syllabus. This format permits the instructors to decide what activities to do week by week or unit by unit.

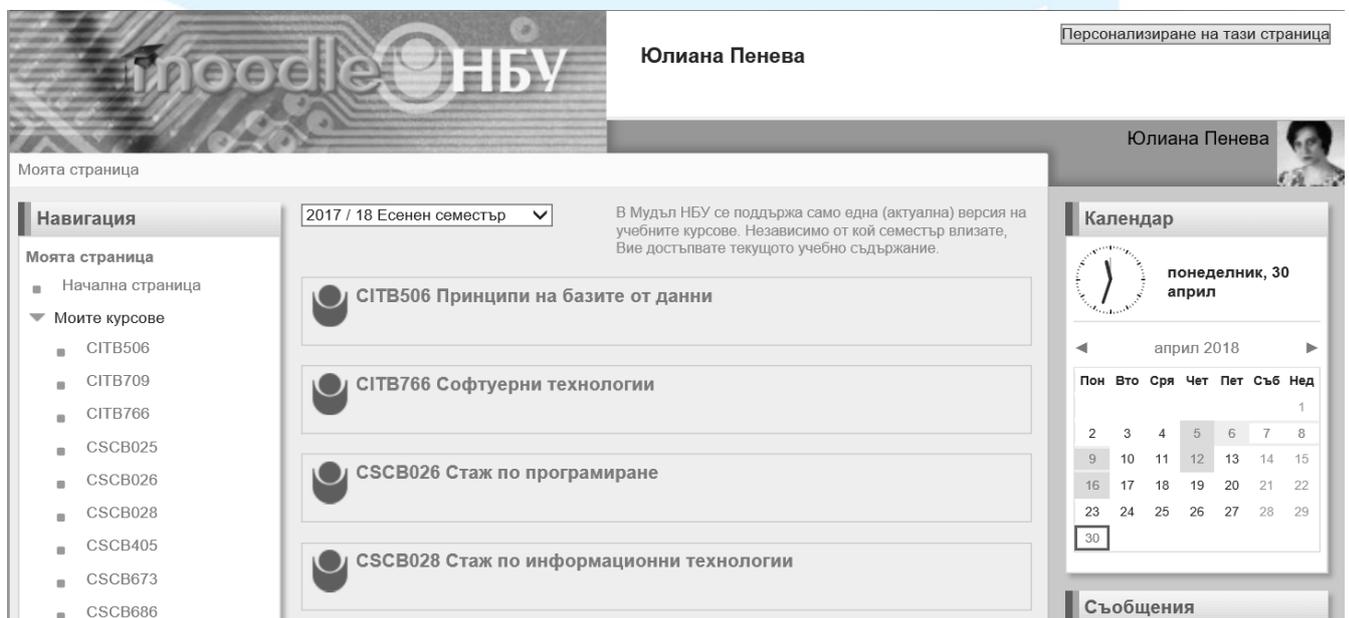


Figure 4 My Courses panel

³⁵ Dzhambazov V., J. Peneva, D. Keremedchiev (2018) Good practices for sustainable implementation of e-learning, VIIth NATIONAL CONFERENCE ON E-LEARNING IN HIGHER EDUCATION INSTITUTIONS, Sofia University Press <http://eprints.nbu.bg/3855/>

To administer e-learning at New Bulgarian University the open source learning management system Moodle has been implemented. The proprietary university integrated information system delivers the rest of activities concerning the overall learning process. The rationale behind the choice of Moodle conforms to the following system features: modular course design; interface in Bulgarian; applicability for in-class, online and blended course delivery models; use of social constructionist pedagogy that stimulates collaboration, critical thinking, and task-based learning; courses can be easily searched, etc. During the process of implementing the chosen solution, we arrived at some good practices, which ensure good results. We would like to share some of them:

- **Integrate Moodle with the proprietary information system** - When deciding to deliver a technology-enhanced learning process, most universities probably possess information system that gives basic information services. A good quantity of the needed information about courses, programs, lecturers, etc. is somewhere stored in and might be placed at Moodle disposal, as it is time consuming to reenter all these data. Integration between the information and learning management system is preferable. At NBU a close interoperability with the university information system has been established thus ensuring a strict control over the course enrolling.
- **User interface** - The user interface is among the most important aspects of an e-learning course. It includes many components: menus, buttons, images, color scheme, and the overall look of the page. User interface design is a complex task. Nevertheless, it might be hard to achieve, the interface has to be simple allowing quick and unambiguous access from one component to another. It is easy to complicate the course design e.g. to give several ways to advance on the learning content. The well-designed interface should provide a clear path forward and consistency across the course. As Jakob Neilson³⁶, usability expert states, “Users don’t care about design for its own sake; they just want to get things done and get out. Normal people do not love sitting at their computers. They would rather watch football, walk the dog—just about anything else. Using a computer probably rates above taking out the trash, though.”

Consider the various social networks – they permit the users to reach items they are interested in straightforward. Learners take care about their courses, assignment deadlines and other events concerning their training. Moodle provides tools to design a simple personalized entry page containing data about current online users, calendar of events, assignments and deadlines, attendance statistics, latest forum topics to name a few.

- **Right course design to fit delivery through LMS** - The policy of NBU is to deliver student-centered and diversified education. Courses at NBU are with a standard size of 30 hours that favor their delivery via e-learning environment. Because of the eligibility of the courses, some overlapping in the educational tasks of the individual courses is necessary in order to guarantee the competences stated by the programs. This, however, makes it possible to minimize the interdependence between their curriculum content.

³⁶ Nielsen J. Designing Web Usability, New Riders; first edition, 1999.

The standard size of 30 hours creates a good granulation of the curriculum to achieve limited and balanced educational goals. These goals can be realized through learning activities in which the trainee's own work is the leading role. Analyzing the audience and understanding their needs is very important for instructional design.

- **Suitable student-oriented course content** - The final objective of any educational program is to assure learners' proficiency and to develop further interest in the subject. Therefore, instructional designers have to develop course learning content. In fact, the main effort consists of e-learning content preparation and presentation. Probably there exists a set of materials for a specific subject e.g. lecture notes, presentations, images and graphs, case studies, etc. These training materials cannot be used directly by just making them available from a Web site. After the start of e-learning at NBU most of the lecturers offered plain text or scientific papers as course content. However, e-learning differs from face-to-face training and requires specific formats - video lectures, presentations, serious games, interactive simulations of real processes, collaborative work. It is necessary to adapt existing materials to the new learning environment.

Course development traditionally follows the product approach: instructors design the course according to their understanding of the course material. Curricula and courses' syllabi are available at the university site. Before the start of the academic year syllabi are revisited and if necessary updated. Students become aware about the learning objectives, topics to be covered, reference materials, course schedule and learning activities such as assignments, case studies, discussions, tests, etc. Content development conforms to the syllabus. The planning of suitable learning activities for trainee's self-dependent work with the available learning content is also essential. Multimedia and interactivity inherent to e-learning lead to temptation of focusing on the diversification of forms used to present the learning content.

According to the modular approach, we divide the learning content into units of instruction or themes. Each module consists of a unit overview, objectives, student directions – prerequisites, key words, theoretical concepts, lecture notes and presentations, readings, glossary, discussion questions and activities – tasks, inquires, test elements, problems for self-assessment, etc. Any task is composed of: competences acquired after finishing it, key words, definitions, a possible solution, implementation examples, supplementary resources - links to company's websites with tutorials if any, extra readings, etc. We also observe the principle of encapsulation, i.e. minimum references to other courses and facts outside the content thus reducing the dependency of a casually missing knowledge. Instead, short context related definitions and explanations can be included, if applicable. In this way, we try to achieve a maximal independence among the different courses and to make easy different configuration of curricula. The main didactical issue is to retain the unit volume in admissible size when the complexity grows. In addition, the content should influence trainees on an emotional level and deliver the right amount of complexity.

- **Interactivity** - Interactivity in e-learning makes for learners' engagement in the educational process and facilitates active learning. Providing quality content is the key step when designing interactive e-learning. Chris Pappas [9] defined it as the "dialogue between learners and e-learning tools through which learners become engaged and involved in the e-learning process."

Good interactivity makes the learner an active participant in the course as it can range from multiple-choice quizzes, tests, e-learning scenarios, simulations, animation videos etc. Interactivity facilitates the learning of the course content. In addition, it encourages reflection and promotes student motivation. There are four levels of interactivity:

- passive with little or no interaction e.g. simple images, videos, test questions used to introduce concepts;
- limited – offers the trainee some control over the advance of the learning process via navigable menus, animations, multimedia, interactive exercises; it is used for basic skill development;
- moderate – the trainee has much more control over the learning process via customized audio, simulations and branching; it is applied for teaching problem activities;
- full - the trainee has the highest degree of control over the learning process via complex animations, gaming technology etc.; it is applied when the learners are expected to apply their knowledge in real life situations.

Not all types of interactivities are equally effective. It depends on the subject, the audience type and the technical infrastructure.

- **Assessment** - Learners are assessed on the subject during the semester (current control) or at the end of the semester. It depends on the type of the audience. The final grade is based on at least two components (individual grades), and for each grade at least two forms of assessment (e.g. a written and practical part of a written test) are applied. Students can skip the final exam if they participate successfully in the current control. Most students benefit assessment during the semester. In this way, we achieve the active participation of the students in the training process. Students who prefer examinations at the end of the semester either work or have failed during the current control.

Moodle facilitates both current and final assessment as the system offers opportunities to test students' knowledge and competence via online testing. Online exams permit more scheduling flexibility for both students and faculty. Although setting up the question bank is a time consuming activity, test elements can be reused and students' exams are automatically graded. Furthermore, the immediate scoring of online exams permits students to receive a rapid feedback regarding their achievements. In addition self-assessment test becomes possible.

It is considered as especially useful the feature of Moodle to track the individual student's activity. Examining the registers, we have a reliable feedback about the students' actions. In addition, the uploaded students' assignments can be easily checked against plagiarism and other forms of scholastic dishonesty (Fig.2). In addition, for each course topic the possibility for assigning a weekly online activity: discussion, group project, peer feedback, etc. is highly productive. We ask students to make posts and to participate in different forums. The electronic evaluation of assignments permits the instructor to send personal comments to each student for better understanding.

- **Training of the lecturers** - Lecturers anyway need training, as they have to create learning content. Clearly, this will require special and extra effort. If this fact is ignored, the introduction of e-learning will fail. Lecturers appear in a new role namely as

scriptwriters and filmmakers. They build "story lines" on which learning content can be acquired. Competences have been defined explicitly to facilitate learners' navigation within the coursework and their choice of the learning path.

At NBU lecturers are trained on the features of Moodle that facilitate their work e.g. how easily to set up group or personal tasks and track their performance or how to deliver extra learning content. Common teaching techniques are applied with regard to the specifics of e-learning. For example, "exposition" can be varied with interactive exercises. The "active method", i.e. non-guided learning, can be implemented as performing different tasks working in groups or individually. When "demonstration" is implemented, the learners repeat the demonstrated activity, supported via instructions transmitted by communication devices.

- **All courses simultaneously available via Moodle** - NBU experts have been carried out a special investigation on students' readiness for e-learning. The results give reason to conclude with confidence that students are ready to take various courses delivered through LMS.

Moreover, students suppose that learning content for every course will be available via Moodle. They expect to find up-to-date information about the course schedule, assignments, learning content, etc. They would be disappointed if only some courses are offered via the LMS. For this reason, NBU gives the possibility all the lecturers to work with the LMS. For all curricula, a frame from blank courses is provided. Lecturers can fill in, modify the learning content, and prescribe convenient learning activities. Certainly, some instructors remain sceptical regarding the advantages of digital forms of learning and prefer traditional/conventional lecturing. The University provides various incentives to e-learning contributors.

Summarizing, e-learning is to be implemented fully for all programs offered by the university.

Case study / Best practice #2

Strategy for the Development of Electronic and Distance Education at Sofia University (SU) <https://www.uni-sofia.bg/eng>

In the developed Strategy the term "e-learning" will be used with two of its main meanings:

- 1) as "blended learning" - the above definition of e-learning in a broad sense with a diverse combination of traditional and electronic elements in it;
- 2) as "distance form of e-learning" or "distance e-learning" (for dominant online learning elements).

The e-learning strategy aims to define the direction of its development at Sofia University, to give specific guidelines for the work of management, academic and administrative staff involved in the design and implementation of this type of training, as well as in assessing and ensuring its quality.



The implementation of the Strategy will increase the prestige of Sofia University as an institution offering high quality educational services in line with the modern development of the theory of education and educational technologies, applying a scientifically based approach in the design of these new services based on research results and proven achievements in the practice of e-learning worldwide.

The strategy is based on the presumption that e-learning is about learning, not technology, and that it should be built on six key principles: permanent connectivity between learners and teachers; flexibility of learning and learning environment; interactivity; collaboration; motivation and commitment of students; individualization of the learning process. In this sense, the Strategy offers guidelines for action based on the needs and requirements of students and the quality of their learning.

Key goals for the development of e-learning and distance learning (EDL)

Within 5 years Sofia University will:

1. introduced e-learning, including in its distance form, as an integrated, recognized element of education and a factor for improving the quality of teaching and learning at Sofia University;
2. increase the quality and flexibility of the learning of the students and the academic staff;
3. has a well-developed and tested approach for creating, supporting, maintaining and recognizing modules and programs, which contain a significant share of electronically based and supported learning activities and content, including entirely distance learning;
4. develop and apply a scientifically substantiated and proven effective pedagogical model for realization, maintenance and assessment of quality e-learning, including in its distance form;
5. study, establish and meet the requirements for specific resource provision of e-learning, including in its distance form, and will adapt its existing system for resource provision and administration of training to these requirements;
6. will develop an investment strategy for the provision of reliable and adequate electronic educational services, support staff and infrastructure for their provision both to the university staff and the trainees, as well as to a wide range of external users of educational services.

Guidelines for achieving the objectives

Guideline 1. Electronic information and communication technologies in support of quality learning experience

1. Through its e-Learning and Distance Learning Strategy, Sofia University is committed to creating conditions and ensuring high-quality teaching and learning, supported by modern electronic information and communication technologies for students of all forms and levels of education, including the introduction of distance learning. of e-learning.

The University recognizes the potential benefits of e-learning in terms of:

- applying a student-oriented and personalized approach to learning;

- helping students to achieve higher levels of control in the organization of their own education.
2. The university aims to make available to students the opportunities for e-learning at all educational levels and in all programs, courses and modules, allowing them to develop information skills that are a key component of modern "education", supporting the formation of young people and professionals, able to live and work in a knowledge-based economy and increase their competitiveness in the labor market.
 3. The University is committed to supporting and facilitating the integration of e-learning in curricula. SU will support, motivate and stimulate innovation in e-learning, e-assessment, e-learning services for students and e-feedback and innovative pedagogical approaches related to them, facilitating the dissemination of good practices in these areas.
 4. The University recognizes the unique opportunity that technology offers to support students' independence in their studies while working at the university, at home or at work. E-learning will be used to support distance learning and a variety of pedagogical approaches to its implementation. SU undertakes to ensure the development of adequate mechanisms to support the development and approval of modules / programs for e-learning and distance learning.
 5. The University will continue to provide hardware and software support to facilitate access to the learning resources provided on campus (including the link between them), as well as to carry out web-based learning and communication between all members of the university community, no matter where they are.
 6. The University will assess the possibilities of virtual learning environments to improve the access and learning opportunities of students with special educational needs, as well as to adapt them, where possible, to their specific needs.
 7. The University will introduce and expand the use of plagiarism detection software and will use technology as a means of preventing this phenomenon.

Guideline 2. Information infrastructure

1. Basic principles underlying decisions to use e-learning environments:
 - accessibility of use by all potential users; interoperability and especially with the administrative system of SU;
 - sustainability
 - price.
2. The University will work to provide students with quick access to electronic resources with a minimum of effort, through the integration of internal systems and the application of technologies to facilitate external interactions.
3. With the creation of repositories suitable for the distribution of various types of digital learning resources, the university will make all necessary efforts to respect copyright.

Guideline 3. Qualification of the staff in the field of e-learning



1. The University is aware of the need to increase the qualification of the university staff - academic and administrative - in terms of knowledge, skills and competencies in the field of e-learning. SU is committed to providing appropriate training, support and resources for staff in the long term so as to ensure the development and support of e-learning.
2. The University will support the groups for professional communication and staff development.
3. Recognizing that improving the quality of education is also ensured by researching its status and making management decisions on this basis, SU will support research projects and communities aimed at studying the state and development of e-learning, as well as the capacity to provide academic and administrative staff.

Guideline 4. Evaluating and maintaining the quality of e-learning and distance learning

The University is obliged to provide high quality opportunities and resources for e-learning, comparable and compatible with the educational services it offers through other means. To achieve this, SU is committed to providing the following:

- continuous and in-depth process of verification, monitoring and support of the offered educational services, which aims to ensure the quality and standards of education in general and e-learning in particular;
- clear mechanisms for promoting and disseminating good practices in the use of e-learning to improve the quality of university education;
- organizing events such as seminars, round tables, conferences, etc. to acquaint the academic community, as well as for national and international presentation of the achievements and good practices of Sofia University in the field of research and application of e-learning.

Guideline 5. Administrative infrastructure

1. In order to carry out the activities under this Strategy, the following structures shall be established and / or reorganized:

- Strategic group of experts;
- University Center for Distance Learning;
- University Center for E-learning.

Their names, character, powers, position in the university structure and their coordination with other existing units will be defined in the Regulations for conducting the electronic and remote at Sofia University. The rules will be prepared by the Strategic Expert Group, taking into account the experience of the nominally existing Distance Learning Center.

2. The development, approbation, accreditation of electronic distance courses and programs for the three educational qualification degrees are carried out by the faculties of Sofia University with the scientific and logistical support of the university administrative structure / sector coordinating e-learning and distance learning.

3. A university administrative structure / sector coordinating e-learning and distance learning will be able to initiate the development of interdisciplinary programs and courses

with the participation of several faculties, as well as research projects aimed at e-learning, distance, mobile education and lifelong learning.

Level of implementation of the e-learning strategy

1. Creation of the university management infrastructure (University Center for e-learning and distance learning, SU Information Center, Faculty Centers - defining their structure, composition, powers, obligations, competencies), responsible for the implementation of the e-learning strategy.

2. Creation and maintenance of technical and technological infrastructure for conducting EDL (based on the existing and its upgrading), which will provide the computer / network provision of the electronic training courses / activities and the access of the students / staff to them - at university and at faculty level.

- Choice of e-learning platform (s). What is the balance between the central, faculty, individual control over the choice of electronic environment, electronic content, the publication of electronic materials and the support of electronic courses?

- Electronic integration of academic and administrative systems. To what extent and to what extent does the e-learning platform integrate (or allow integration) with other university software systems?

3. Teaching, learning and resources

- Who is involved in creating e-learning materials - teachers, software specialists, teams representing both groups? Establish mechanisms to ensure cooperation and exchange of e-learning materials within the university.

- How will the issue of intellectual property and the right of ownership over the developed e-learning materials be resolved?

- What help / guidance regarding learning in a virtual environment is offered to students - centrally, by faculties, by a specialized unit?

4. Qualification and support of the staff

- Study of the training needs of employees and teachers and administrative staff in the field of e-learning.

- Study of the competencies of the staff in the field of e-distance learning.

- Development of a system for acquainting the staff with e-learning.

- Development of a strategy for teacher qualification.

- What this system includes: courses, seminars, instruction, access to support services

- Technological, methodological and resource training and support of teachers who will teach electronically. Determining based on the Strategy and the normative documents developed on its basis, who, when and with what means will implement this preparation.

- Determining an annual budget for qualification and support of teachers in this field. Development of a policy to stimulate teachers to develop and implement e-courses.

5. Organization, management, control and stimulation of the activity of the teachers in the context of EDI

- Study of the workload of the academic staff engaged in e-learning courses. (Study the experience of other universities in this regard - control this employment in a legislative context, policy for financial remuneration of staff who create and teach in e-learning courses - in terms of course development, development of e-learning materials (according to their category), in terms of online employment and equating it with the workload in traditional training.
- Establishment of a system for promotion / recognition of the professional development and development of the staff in the field of e-learning. Recognition of achievements and employment in the field of e-learning in the attestation of teachers, resp. in the case of differentiated pay.
- Development of the policy for hiring employees of the university in the field of e-learning - designing courses and raising the qualification of the staff. Creating new jobs for ICT professionals (e.g. content designers, web professionals) so that they can ensure the seamless implementation of integrated e-learning (blended) and distance e-learning and support academic staff.

Case study / Best practice #3

Methodology and Workflow To Produce and Deliver e-learnig Solutions - Burgas Free University (BFU) <https://www.bfu.bg/en>

Technology is needed both to create interactive multimedia material and to make it accessible to geographically dispersed adult learners, busy with work or family commitments which do not allow them to attend courses on specific dates with a fixed schedule.

The building of effective training and performance support tools requires the usage of instructional design models to define the activities that will guide the development. Instructional design model allows the purpose and reason behind a strategy to be communicated. A framework gives the view of all the major components that have to be included in the course. ADDIE³⁷ is still one of the most broadly used design models. ADDIE stands for Analysis, Design, Develop, Implement, and Evaluate. Each phase of the model offers an opportunity for iterations and changes before moving to the next one.

The ADDIE model adaptation used by BFU, is presented with the Figure below.

³⁷ ADDIE. (n.d.). *ADDIE Model*. Retrieved from <http://www.instructionaldesign.org/models/addie/>





Figure 5 ADDIE design model

The development of any training solutions is done with special attention to the quality assurance and its enhancement. Below are listed some crucial factors in this regard:

- **Learner-centred content:** E-learning curricula should be relevant and specific to learners' needs, roles, and responsibilities in professional life. Skills, knowledge, and information should be provided to this end.
- **Granularity:** E-learning content should be segmented to facilitate assimilation of new knowledge and to allow flexible scheduling of time for learning.
- **Engaging content:** Instructional methods and techniques should be used creatively to develop an engaging and motivating learning experience.
- **Interactivity:** Frequent learner interaction is needed to sustain attention and promote learning.
- **Personalization:** Self-paced courses should be customizable to reflect learners' interests and needs; in instructor-led courses, tutors and facilitators should be able to follow the learners' progress and performance individually.

The next Figure presents a flowchart where the different steps for setting up a learning project are illustrated.

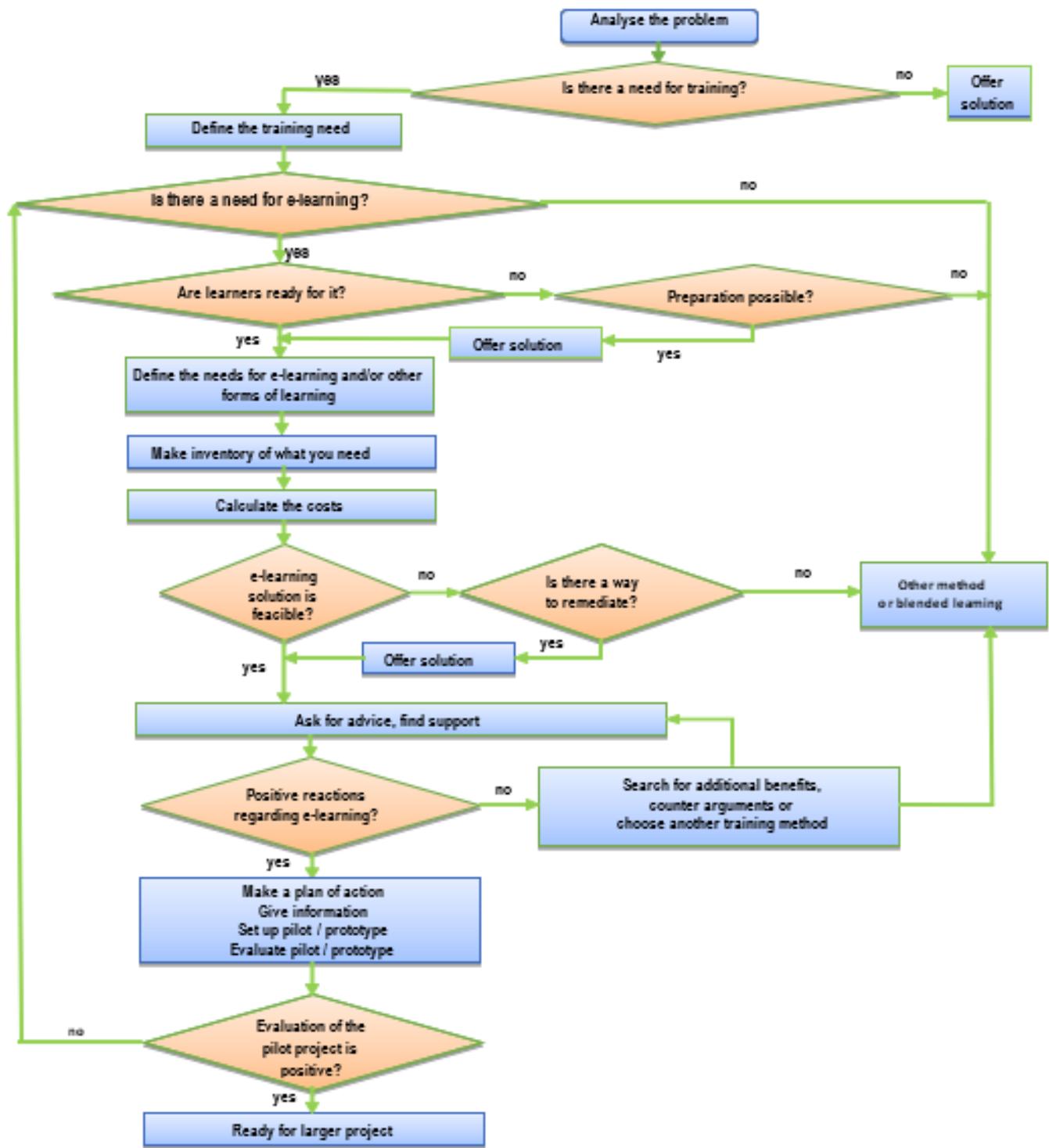


Figure 6 Development of e-learning solution – workflow

E-learning is a convenient option for organizations in certain situations (e.g. when there is a need to reach many geographically dispersed learners).

In a self-paced e-learning course, learners can study course materials at any time they wish. This requires that learners have access to a set of interactive and self-contained



materials. Facilitated or instructor-led e-learning takes place at a specific time and usually integrates self-study with collaborative activities such as discussions or teamwork. Facilitated and instructor-led e-learning courses use communication tools which allow learners to communicate with facilitators and other participants in synchronous and / or asynchronous mode.

Both facilitated and self-paced e-learning activities and content should conform to a set of quality standards to ensure the effectiveness of the learning programme.

TEL (often commonly used instead of e-learning) is defined as “teaching and learning- which may represent a part or the whole of the education model in which it is used – that makes use of electronic media and devices to facilitate access, promote evolution and improve the quality of education and training”³⁸. In a blended approach, e-learning sessions can be integrated with face-to-face traditional activities making use of all main advantages of this type of training as follows:

- Networking - Although e-learning course do have networking potential via chat rooms, messages and emails it simply is not as effective as having a real-life human interactions;
- Engagement and focus - during the face-to-face training, trainees are usually in a classroom with the instructor (facilitator) who is able to implement strategies to keep them involved and engaged as much as possible, which contributes to retaining the trainees’ attention and encourages better results.
- Adaptability - courses that operate face-to-face have the amazing option to be adapted to the learner’s needs when needed whereas e-learning simply just offers set options.
- Discussion and reflection – during the detailed face-to-face discussions and debates regarding subject topics the participants may even learn from other people and take in viewpoints that they haven’t considered yet.
- Instant feedback and problem solving - if a problem arises when trainees are in a face-to-face training session, they can simply ask the instructor (facilitator) to explain it better.

Development Team – roles and responsibilities

The following roles are generally required at different stages of the process: development leader; instructional designer (ID); subject domain expert (SDE); online administrator; instructor/facilitator; web developer; media editor; technical support specialists (IT staff).

Some of the roles described in the table below could be assigned to a single job profile.

³⁸ <http://elconcept.uoc.edu/>



Role	Responsibility
Development leader/s	Coordination of all activities and roles in the different stages of the process and evaluation of the degree of transfer on the job and the results. HR and course development (CD) management.
IDs	Responsible for the overall instructional strategy. They work with the leader/s regarding the training goal specification and communication. Collaborate with SDEs to define which skills and knowledge need to be covered in the course, choose the appropriate instructional strategy and support the team in defining delivery and evaluation strategies.
Subject Domain Expert(s) /SDEs/	SDEs are responsible for the course content development providing the knowledge and information required. They work in collaboration with IDs and IT staff to design and create learning objects (according to the templates provided) as well as define evaluation strategy. They can act as instructors and facilitators supporting on - and offline classroom activities. They can prepare and present learning material, assign tasks to the trainees and answer their questions.
Web developers and media designers	Web developers and media designer assemble course elements, develop media components, create the courseware, adapt the interface of a learning platform and install the courseware on a Web server.
Course administrator(s)	Manage learners' subscriptions and all activities related to the administration of the course.
Instructor / facilitator	Support participants' learning activities and motivate learners during the course; Create an environment that inspires participants' confidence in the learning process; Assure the flow of information among the different stakeholders. Motivate participation and facilitate and mediate participants' exchanges.
Technical support specialists	Technical support specialists are required to assist all participants in the training process (producers and users) at every stage of the process.

Table 8 Development team – roles and responsibilities

On the next figure are presented the areas of responsibility of the roles involved in the development process' stages defined by the instructional design methodology ADDIE (Quigley, 2019).

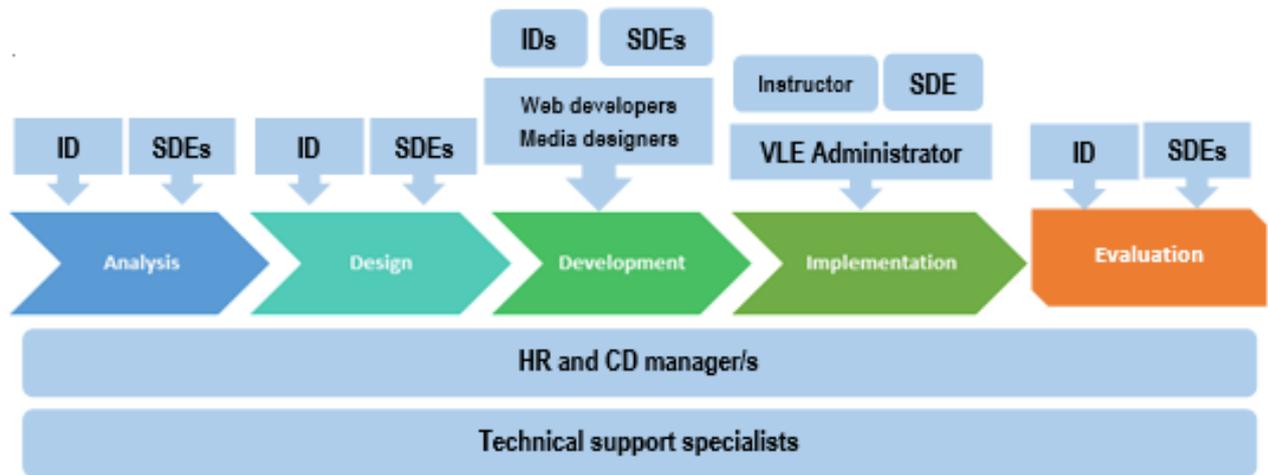


Figure 7 Areas of responsibility

Principles for Content Development from a Didactic Perspective

When creating digital educational content, irrespective of the resource format (i.e. PowerPoint, video, audio, worksheet, case study, etc.) the following concept about the content structure should be adhered to:

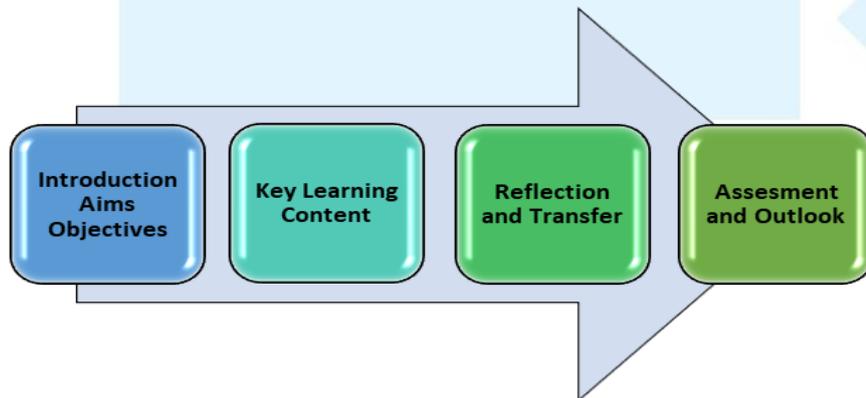


Figure 8 Concept about the learning content structure

This structure is based on common approaches used in teaching settings and is informed by didactical principles and learning theory. Following this structure will ensure that the curriculum content developed will be concise, relevant, and focused to ensure the value of the learning content in developing key knowledge, skills, and competences in the

subject domain. The concept presented above outlines the main steps of the content development process.

Step 1 – Introduction, Aims, and Objectives - The title of the unit/resource should be introduced together with a brief description of the unit/resource; the learning outcomes should be stated as well as the main content areas of the unit/resource should be outlined.

Step 2 – Key Learning Content - The actual learning content that targets a very specific topic or thematic issue related to developing competences in trainees must be communicated in this phase. Therefore, this phase is the core element of the unit/resource and will be the longest and most extensive phase of the content.

Step 3 – Conclusion - Reflection & Transfer - This phase should offer some questions or statements to help the learner reflect the content against the background of their own development.

Contextualizing the content in this way will foster the learning transfer and reaffirm what the learner has learned and will help to develop their confidence in their roles.

Step 4 – Assessment and Outlook - The assessment mechanisms and schemes, specific to the unit's content, should be clearly specified.

Following this structure helps to keep a high standard of quality, consistency and relevance throughout the entire Curriculum. It also facilitates the delivering focused learning content which is based on specific learning outcomes, and which requires the content creator to really think and plan the content of their module so that the outcomes are achieved. On the figure below is presented the content structure concept.

From a didactical perspective, the following should be adhered to:

- **Problem-orientation:** Theoretic models and content should be contextualized in a real-world setting to ensure that learning content is practical and relevant to the needs of trainees completing the training. Practical and contextualized content will help the trainees to understand the learning content and to apply it to their existing environment.
- **Learning Outcomes:** The project partner should be able to describe the learning outcomes or goals for a specific unit/resource. Use Blooms Taxonomy when defining learning outcomes.
- **Referenced:** It is necessary that acquired knowledge is not only reflected, but that it will be referenced, linked, and extended by offering trainees a series of resources on similar topics which they can access as part of their self-directed learning to allow them to undertake further learning in a given topic if required.
- **Practice:** To ensure the development of the practical skills in learners, examples and exercises provided through this curriculum should be contextualized to real-life, practical situations and scenarios. This will be also a good opportunity for learners to practice teamwork and networking.

Selection of authoring tools

The authoring tools to be integrated in the corresponding ICT infrastructure can be selected based on a classification of the e-learning methods where the following main classes are distinguished:

- Expositive methods - obtaining new information (e.g. presentations, case studies, worked examples, demos)
- Application methods - active processes learners use to perform procedural and principle-based tasks and build new knowledge (e.g. demonstration-practice methods, job aids, case-based exercises, role plays, simulations and serious games, guided research, project work)
- Collaborative methods – social dimensions of learning (e.g. online discussions, collaborative work, peer tutoring)
- Assessment methods - There are two main types of assessment: summative assessment and formative assessment. These are sometimes referred to as assessment of learning and assessment for learning, respectively.

There are many categories of authoring tools which differ by their features, level of complexity, installation site (i.e. desktop or web-based) or visual graphic interface. These tools range from very simple Microsoft PowerPoint converters to powerful toolboxes for rapid e-learning. These more complex authoring tools, referred to as self-contained toolboxes, do not rely on other tools; the entire e-learning course is created within just one integrated toolset. All authoring tools must have some key capabilities, including:

- interactivity and navigation – menu-driven content and ability to move throughout the content;
- editing – content publisher for easier changes/updates;
- visual programming – use of buttons, icons, drag-drop graphic;
- preview/playback – ability to see or test an ongoing project;
- cross-platform interoperability – able to run on all platforms;
- cross-browser interoperability – able to run on different browsers;
- integration – with leading e-learning applications and compliance models (Compliance with SCORM /Sharable Content Object Reference Model/ and AICC /Aviation Industry Computer-Based Training Committee/ standards for LMS delivery);
- the delivery of the learning content in multiple formats – able to use SCORM for LMS, Web, CD-ROM etc.

Expositive methods	Delivery formats	PROS	CONS
Presentations, case studies, worked examples, demos used to facilitate conceptual and factual knowledge acquisition, orientation, motivation, attitude change	Simple learning resources - documents and PPT presentations doc, pdf, ppt, jpg. etc.	Quick to develop via standard authoring apps	No interactivity (passive learning)
	Interactive multimedia lesson	Flexibility and use of different educational techniques	Needs good internet connection

	Webcasting (video lessons and podcasts)	Not difficult to develop	Passive and need available internet connection
	Webinars (video conference, audio conference, chat-based)	Interactive and need low efforts for converting materials	The lecturer should be prepared to teach online and use adequate supporting materials Available internet connection
	Virtual classroom		

Table 9 Expositive methods

Application methods	Delivery formats	PROS	CONS
Demonstration practice method	Combination of animation and operational simulation	Practical procedures illustrated – facilitate obtaining procedural knowledge and skills.	Needs to consider available learners' Internet connection.
	Virtual classroom (using application sharing)		
Job aids	Documents such as checklists, technical glossaries, templates, manuals etc.	Provision of just in time information and guidance.	Needs sophisticated online help and supporting system.
	Online help		
Case-based exercises	Interactive e-learning lesson	Provision of high interactivity level – facilitate obtaining of complex and rich educational and practical experience.	Need to consider available learners' internet connection Time-consuming to design. Costly to produce multimedia simulations through complex authoring systems. Needs support of an online tutor / instructor or facilitator.
	Electronic simulation based on branched scenarios		
	Individual tutored activity		
	Online group activity		

Role plays	Interactive e-learning lesson	Possibility for explorative learning, experiments and practice captivating virtual environment and real life-like situations. Participants in group activities make new links and connections in their knowledge and understanding.	Need to consider available learners' Internet connection. Time-consuming to design. Costly to produce multimedia simulations by use of complex authoring systems. Need support of an online facilitator.
	Electronic simulation based on branched scenarios		
	Online group activity		
Simulations and serious games	Symbolic simulations	Students apply their skills, knowledge and understanding in a real world setting and have an opportunity to reflect in context.	Time-consuming and costly to design and produce. Need to support online tutor (subject matter expert).
	Learning games		
Guided research	Discussion forum, e-mail, chat, audio, and video conference Wiki, blog, shared documents	Students are actively and critically engaged in: gathering and managing information; analysing and synthesizing information	Need support of an online facilitator for qualified help and feedback provision.
Project work	Discussion forum, e-mail, chat, audio, and video conference, Wiki, blog, shared documents	Students apply their knowledge and skills alone or together to create a piece of work / product.	Need to consider available learners' Internet connection. Need support of an online facilitator.

Table 10 Application methods

Collaborative methods	Formats of delivery	PROS	CONS
Online guided discussion	Discussion forum, e-mail, chat, audio, and video conference	Participants communicate, debate, discuss,	Need to consider available learners'

		argue and share information and experience.	Internet connection.
Collaborative work	Discussion forum, e-mail, wiki, blog, chat, audio and video conference, shared documents, shared environments	Opportunity for teamworking, problem-solving and critical thinking to create a common product/piece of work.	Need active support of an online facilitator to provide help and feedback.
Peer tutoring	Discussion forum, e-mail, wiki, blog, chat, audio and video conference, shared documents	Possibility to provide personalized training tailored to the concrete educational context.	

Table 11 Collaborative methods

REFERENCES

- Dahdouh, K., Dakkak, A., Oughdir, L., & Ibriz, A. (2020, March 11). *Improving Online Education Using Big Data Technologies*. Tratto da *The Role of Technology in Education*, Fahriye Altınay, IntechOpen: <https://www.intechopen.com/chapters/68814#B2>
- Dahdouh, K., Oughdir, L., & Messaoudi, F. (2018, 23(6)). *Big data for online systems*. Tratto da *Education and Information Technologies*: DOI: 10.1007/s10639-018-9741-3
- DigCompEdu - Areas of competence*. (s.d.). Tratto da <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/european-framework-digital-competence-educators-digcompedu>
- DigCompOrg*. (s.d.). Tratto da <https://ec.europa.eu/jrc/en/digcomporg>
- DigiCompEdu*. (s.d.). Tratto da <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/european-framework-digital-competence-educators-digcompedu>
- Digital Competence Framework for Citizens*. (s.d.). Tratto da <https://ec.europa.eu/jrc/en/digcomp>
- Dimov, P., & Dobрева, H. (2020). *COVID-19's Impact upon the Organization of the Educational Process in the National Security System*. Tratto da <https://aip.scitation.org/doi/pdf/10.1063/5.0041865>
- e-CF Framework. (s.d.). <https://www.ecompetences.eu/>
- EntreComp*. (s.d.). Tratto da <https://ec.europa.eu/jrc/en/entrecomp/>
- Getova, A., Angelova-Igova, B., & Mileva, E. (2020). ONLINE EDUCATION DURING PANDEMIC, ACCORDING TO STUDENTS FROM TWO BULGARIAN UNIVERSITIES. *Pedagogy, Volume 92, Number 7s*, pp. 211-219.
- Guri-Rossenbit, S., & Gros, B. (2011). *E-learning: Confusing terminology, research gaps and inherent challenges*. Tratto da *International Journal of E-Learning & Distance Education/Revue Internationale Du e-Learning et La Formation à Distance*. 2011;25(1): <http://www.ijede.ca/index.php/jde/article/view/72>
- Hatlevik, O., Throndsen, I., Loi, M., & Gudmundsdottir, G. (2018, March). *Students' ICT self-efficacy and computer and information literacy: Determinants and relationships* . Tratto da *Computers & Education*, Vol. 118, 107-119: <https://www.sciencedirect.com/science/article/abs/pii/S0360131517302555?via%3Dihub>
- Idrisova, J., Alikhadzhiev, S., & Alisultanova, E. (2021, April 26). *Application of multimedia technologies in webeducation*. Tratto da SAHD 2021 - 5th International Scientific and Practical Conference 2021 "Modern Science: Problems and Development Prospects (Social and Humanitarian Directions)": <https://doi.org/10.1051/shsconf/202110103052>
- IEEE LOM*. (s.d.). Tratto da https://standards.ieee.org/standard/1484_12_1-2002.html



IMS SS. (s.d.). Tratto da <http://www.imsglobal.org/simplesequencing/index.html>

Ministry of Education and Science. (s.d.). *National Strategy for Development of Higher Education in the Republic of Bulgaria for the period 2014-2020*. Tratto da https://www.mon.bg/upload/6537/STRATEGY_MS_29_09_2014.pdf

Ministry of Education and Science. (s.d.). *Strategy for the development of higher education in the Republic of Bulgaria*. Tratto da : <https://www.mon.bg/>

Monova-Zheleva , M., & Zhelev, Y. (2021). Provision of Technology-enhanced Learning in Universities – Key Factors and Critical Issues. In M. Monova-Zheleva, Y. Zhelev, J. Capilla, & N. Llobregat, *Modernization of Higher Education through Integration of Contemporary ICT-Based Approaches and Tools in the University Curricula: SECOND EDITION* (p. pp. 67-109). BFU, ISBN 978-619-7126-99-0 .

Moodle. (s.d.). Tratto da <https://docs.moodle.org/24/en/Pedagogy>

National Evaluation and Accreditation Agency. (s.d.). *Criteria for evaluation*. Tratto da <https://www.neaa.government.bg/>

National Evaluation and Accreditation Agency, Bulgaria. (s.d.). *Criteria for evaluation*. Tratto da <https://www.neaa.government.bg/>

National Statistical Institute - Bulgaria. (s.d.). *Higher Schools by type*. Tratto da <https://www.nsi.bg>

National Statistical Institute - Bulgaria. (s.d.). *Students by educational-qualification degree and narrow field of education*. Tratto da <https://www.nsi.bg>

National Statistical Institute - Bulgaria. (s.d.). *Teaching Staff of HEIs*. Tratto da <https://www.nsi.bg>

Peng, H., Ma, S., & Spector, J. (2019). Personalized adaptive learning: an emerging pedagogical approach enabled by a smart learning environment. *Smart Learn. Environ.* 6,9, p. <https://doi.org/10.1186/s40561-019-0089-y>.

Quigley, E. (2019, October 3). *ADDIE: 5 Steps To Effective Training*. Tratto da LearnUpon: <https://www.learnupon.com/blog/addie-5-steps/>

R., K. (2018, March). *Multimedia technology in higher education: New era outreach learning*. Tratto da International Journal of Academic Research and Development, Volume 3; Issue 2: www.academicjournal.com

Redecker, C., & Punie, Y. (2017). *Digital Competence of Educators*. Luxemburg: Publication Office of the European Union.

SCORM. (s.d.). Tratto da SCORM: <https://scorm.com/>

Sh., S. (2020, Volume: 07 Issue: 08). Improvement of Online Course Content using MapReduce Big Data Analytics. *International Research Journal of Engineering and Technology (IRJET)* , p. pp. 50-56.

Tratto da International Research Journal of Engineering and Technology (IRJET), Volume: 07 Issue: 08, P.50-56.

The Ordinance on the state requirements for organizing distance learning in higher education . (2021).

Tratto da <https://www.neaa.government.bg/images/files/naredba-02.pdf>

Urez, D., Volman, M., & Kral, M. (2018). Teacher educators' competences in fostering student teachers' proficiency in teaching and learning with technology: An overview of relevant research literature. *Teaching and Teacher Education, Vol. 70*, 12-23.

Wikipedia Org. (s.d.). *Bulgaria Demographics*. Tratto da <https://en.wikipedia.org/wiki/Bulgaria#Demographics>

Wilson, S., Liber, O., & Johnson, M. (2006). Personal Learning Environments: Challenging the Dominant Design of Educational Systems. *Proceedings of the workshop Innovative Approaches for Learning and Knowledge Sharing at the EC-TEL* , (p. pp. 173-182).

Zhelev, Y., & Monova-Zheleva, M. (2021). Models and Approaches for Setting up of Technology-enhanced Learning Solutions. In M. Monova-Zheleva, Y. Zhelev, J. Capilla, & N. Llobregat, *Modernization of Higher Education through Integration of Contemporary ICT-Based Approaches and Tools in the University Curricula: SECOND EDITION* (p. pp. 110-122). BFU, ISBN 978-619-7126-99-0.

LIST OF FIGURES

Figure 1 Competence areas defined in DigCompEdu (DigCompEdu - Areas of competence, n.d.)	46
Figure 2 Characteristics of big data or 5V.	59
Figure 3 Integration of big data, online learning systems, and cloud computing.....	60
Figure 4 My Courses panel	75
Figure 5 ADDIE design model	85
Figure 6 Development of e-learning solution – workflow	86
Figure 7 Areas of responsibility	89
Figure 8 Concept about the learning content structure.....	89

LIST OF TABLES

Table 1 Higher schools by type (Bulgaria).....	6
Table 2 Teaching staff by type of higher school, position, sex	6
Table 3 Students by educational-qualification degree and narrow field of education (ISCED-F)	7
Table 4 Main advantages of Moodle and the NSA platform for distance learning	27
Table 5 Main Disadvantages of Moodle and the NSA platform for distance learning.....	28
Table 6 DigiComp Conceptual Reference Model	44
Table 7 Cross-reference between DigComp and e-CF.....	50
Table 8 Development team – roles and responsibilities.....	88
Table 9 Expositive methods	92
Table 10 Application methods	93
Table 11 Collaborative methods	94

