FOSTERING TECHNOLOGY-ENHANCED LEARNING AND DIGITAL INNOVATIONS IN SCHOOLS – KEY FACTORS AND CHALLENGES

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The use of technologies to support teaching and to maximize the learning experience is a key driver for significant changes in the educational landscape. The COVID-19 emergency created several problems and challenges for schools, forcing them quickly to learn the different methods of conducting Technology-Enhanced Learning (TEL). The TEL has become a common feature of education today and issues related to its quality are more than ever in the educational agenda. Considering the heterogeneity of TEL applications as well as the complexity of the processes related to the integration of the digital technologies in education it is crucial and essential to identify relevant TEL models and Quality Assurance (QA) strategies with a special focus on development, availability, and use of e-learning solutions and digital educational resources in terms of their application at different levels and in different educational contexts. This article describes some key factors and challenges in terms of improving access to and use of TEL solutions and digital innovations in secondary and upper secondary education in Bulgaria.

Introduction. The continuous and increasing digitalisation in society, as well as changes in technology itself, results in significant changes in school strategies and policies. Nowadays, the delivery of high-quality TEL is a guarantee that students will obtain knowledge, skills, and competences relevant to the labour market, which is a very basic condition for active citizenship, employment, and social cohesion [2]. The usage of relevant TEL concepts, models as well as Quality Assurance (QA) strategies and systems are of key importance. The outbreak of COVID-19 further exacerbated this urgent need. According to UNESCO, in April 2020, schools and higher education institutions were closed in 185 countries, affecting at about 89.4% of all enrolled students. European countries need to continually review and develop new strategic policies and measures to meet the new demands for high-quality digital education [1].

The next sections of this paper briefly present the main concepts, key factors and the challenges related to the implementation and improvement of TEL at lower secondary and upper secondary schools – International Standard Classification of Education (ISCED) levels 2 and 3.

1. School-system quality assurance strategy. The concept of TEL quality is complex and with a variety of stakeholders. According to Nordkvelle, Fossland & Nettleland (2013), as cited in [7], the quality could be reviewed from the three levels:

macro level meaning national general dimensions, *meso level* – institutional matters, and finally, *micro level* – concrete learning course. At a macro level the QA strategy comprises policies and practical arrangements which govern the way the countries go about systematically gathering and deploying evidence to monitor, evaluate and generate further improvement in the quality of their school education systems [2]. That includes consideration of quantitative and qualitative evidence collected and the processes of generating, analysing, and deploying them, with the aim of maximising the development of quality across the system. Considering especially the European dimension, a particular emphasis is placed on how such strategies can contribute to promoting balanced learner development. Taking into account the current situation, it is of great importance that some special policies, arrangements, standards, and indicators related to TEL (resources, processes, competences, methodologies, etc.) be integrated into the school-system QA strategy together with mechanisms assuring that qualitative and quantitative data are blended appropriately to avoid their isolated usage or relying purely on one type of data and evidence to the exclusion of the other. Investments in building capacity of key actors to generate, interpret and use TEL related data, are crucial. Providing relevant schools' 'benchmark' data derived from national collections of attainment will enable the schools to see how their own development and outcomes compare to other schools serving learners in similar socio-economic circumstances.

The established QA system should fulfil the following fundamental principles: 1) Reliability – relevant approaches for gathering and interpreting data (guaranteeing that the results are accurate and not misleading) should be selected; 2) Transparency – the QA system should allow for independent observation and analysis; 3) Validity – QA system should be focused on the measuring a balanced understanding of learner development – mutual recognition of diplomas and mobility of learners across Europe; 4) Trust – there should be trust and respect between and among internal and external parties acting in the evaluation processes; 5) Support of innovation – schools' leaders and teachers should have opportunities to take considered risks to innovate and develop. In the European context, the fulfilment of these main principles would contribute to the strengthening of the trust between school systems.

An important prerequisite for the implementation of efficient and high-quality TEL is the appropriate digital infrastructure comprising virtual learning environment (VLE) and collaborative tools to be established in school. According to the comprehensive survey done for the EC in 31 countries (EU28, Iceland, Norway and Turkey) by Deloitte and IPSUS in 2019 [3] on average in Europe there are 54% of students in schools with a VLE at ISCED 2 and 65% at ISCED 3. For Bulgaria, the results are respectively 33% and 39% for ISCED 2 and ISCED 3 which is quite lower than the average. Moreover, the teachers involved in the survey perceive the insufficient number of tablets, laptops and notebooks as the most important obstacle to the use of digital technologies at schools. Most students use their own smartphones for learning purposes ranging from 30% (ISCED 2) to 53% (ISCED 3).

Considering the complexity of the processes related to the TEL and its QA at institutional level the following categories stakeholders – managers, teaching staff, technical and administrative staff as well as the students and parents should be familiarized with the regulations, procedures, processes, tools, and criteria for TEL quality. Professional development for staff, including TEL related skills, and digital competences, is obligatory

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– professional development courses should be organised on regular basis. Some parts of this trainings could be delivered in the form of online self-paced modules. Students and parents support services should be provided and coordinated taking into consideration the digital home environments. The proper selection of appropriate training methods and strategies is highly influenced by the trainees' profile and educational background as well as the concrete educational context. Another key determinant in the training concept development process is the fact that the learners learn better when information is presented in different ways – usage of different contents' formats and variety of teaching techniques to meet the learners' preferences regarding usage of different learning styles. The trainees should have the flexibility to learn "anytime and anywhere" and also, they should be given some opportunities to create flexible learning paths (i.e. some opportunities for the learners to be able to have choices about their own learning should be provided in the instructional flows) and thus contribute to the design of learning experiences. The main principles of the holistic education [5] are of great importance for the TEL concept implementation. It is crucial for the participatory training methods to be supported by the encouragement of the teamwork and group problem solving.

2. Instructional design model. 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. The instructional design model allows the purpose and reason behind a strategy to be communicated. The ADDIE model [4] is still one of the most broadly used instructional design models. The acronym stands for *Analysis Design Develop Implement Evaluate* described as follows: Analysis – analysis of the target audience and the training needs; with special attention to the pedagogy the learning constraints, digital infrastructure, delivery options, available solutions and digital resources; Design – development of the courseware structure; sequencing the learning activities on the base of learning aims, objectives and expected results, defining custom layouts for all items integrated into the courseware (lessons, quizzes, assessments, etc.); Develop – development of learning objects based on the defined layouts; development of prototype; internal testing debugging and improvement; Implement – preliminary training for the participants on how to use the new tools (hardware, software) if necessary; training delivery; monitoring, control, and management of the educational activities; Evaluate – collecting feedback and information, analysis of the collected data and achieved results, impact of the training, detecting pros and cons as well as areas for improvement.

Each phase of the model offers an opportunity for iterations and changes before moving to the next one. A new loop of the cycle could be started on the base of the results from the evaluation stage. The development of the training solutions should be done with special attention to the quality assurance and its enhancement. Some crucial factors in this regard are listed below:

- Learner-centred content: e-learning curricula and contents must be in line with the National framework, standards, and regulations but the contents should be designed and created in a way providing for opportunities the students to be able to see the relevance of the tasks they are completing to their lives outside of the classroom. Skills, knowledge, and information should be provided to this end which will guarantee the high level of the students' motivation.
- Granularity: the e-learning content should be segmented to facilitate assimilation

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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 content 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 self-paced e-learning sessions are an appropriate solution because the learners can review the 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 also could be considered as appropriate component because it integrates a self-study with collaborative activities such as discussions and teamwork, which are very important regarding the reflection of the content, exchange of opinions and ideas, group discussions, practical team-based activities, and provision of synchronous and/or asynchronous support and feedback. During the participation in debates regarding subject topics the participants may even learn from other participants and take in viewpoints that they have not considered yet. Taking all the above into account a blended approach could be applied where e-learning sessions (self-paced and instructor-led) are integrated with face-to-face activities making use of all main advantages of this type of training such as real-life human interactions with other participants in the training, opportunities for the teacher to implement strategies to keep trainees involved and engaged as much as possible, which retain the trainees' attention and stimulate better results. Considering all factors and arguments presented above the training could be designed as a flow of logically structured learning activities with defined durations, specified learning outcomes and expected results, transparent assessment criteria and evaluation system as well as opportunities for learners to build their own flexible training paths.

3. Digital learning content development. Development and QA of digital learning resources are key priorities addressed in the current strategies of many educational systems in Europe. In other countries, actions in this field have originated from different policy documents or specific initiatives where a variety of public and private stakeholders are involved. In the Eurydice Report "Digital Education at School in Europe" for 2019 [1] Bulgaria is registered as one of the countries with no top-level policies that facilitate the development of digital learning resources or improve access to them which is an aspect for significant improvements of the school-system QA strategy.

When creating learning content, irrespective of the resource format (i.e. interactive multimedia lesson, video lecture, PowerPoint, worksheet, etc.) the following structure should be adhered to:

1. *Introduction, Aims, and Objectives* – introduction of the title of the resource; a brief description of the resource, its learning outcomes and main content areas.

2. *Key Learning Content* – learning content that targets a very specific topic or thematic issue related to developing competencies in trainees.

3. *Reflection & Transfer* – questions or statements to help the learner reflect the content against the background of their own development. Contextualizing the content in this way fosters the learning transfer and reaffirms what the learners have learned

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thus helping them to develop their self-confidence. At this phase apart from the conclusions and examples, 2 reflection questions per each topic, which need to be further discussed during the face-to-face workshop dedicated to the respective course's module, are provided.

4. *Assessment & Outlook* – module-related e-tests and group projects developed during the local face-to-face workshops.

This structure is based on common approaches used in teaching settings and on didactical principles and learning theory. Following this structure guarantees that the curriculum content is highly informative and concise, relevant, and focused on ensuring the value of the learning content in developing key knowledge, skills, and competences in subject domain.

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

- Problem-orientation: Theoretic content should be contextualised in a real-world setting to ensure that learning content is practical and relevant. This help learners to understand better the learning content and to be able to apply it appropriately in different situations.
- Learning Outcomes: The learning outcomes or goals for a specific resource should be defined based on the use of Blooms Taxonomy.
- Referenced: It is necessary that acquired knowledge is not only reflected, but that it will be referenced, linked, and extended by offering students 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. To ensure a pedagogic value QA standards should be applied to the additional resources as well.
- Practice: To ensure the development of the practical skills in trainees, the examples and exercises provided should be appropriately connected to real-life practical situations and scenarios. Round table discussions and group activities integrated into the curriculum will facilitate the reflection and the development of a common vision. These activities can be carried out face-to-face and/or online using cloud services and collaborative spaces. This is a good opportunity for learners to practice teamwork and networking.

Regarding the learning content development – the usage of open educational resources and provision of contents in form of learning objects (LOs), i.e. computer-based instructional components (content items, practice items, and assessment items) combined based on a single learning objective but could be used and reused independently or in sequences in different educational contexts, is fundamental. The LOs developed are with different levels of complexity and granularity. These LOs are assembled into higher-order collections on the base of sound instructional strategies and in line with the broadly adopted open e-learning standards in accordance with the Learnativity Aggregation Model [6, 8].

4. Delivery methods and tools. The e-training will be delivered through a VLE developed based on an open-source software platform such as Moodle, Claroline, ILIAS, ATutor, etc. School VLE should be designed to provide a single robust, secure, and integrated system ensuring the possibility for all participants in the training processes to be able to establish their flexible and personalized learning paths [6]. All learning objects as well as the additional learning materials could be reviewed online but also some materials could be downloaded by the trainees and used in offline modality. The

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interactive content such as multimedia lessons and tests cannot be downloaded. The completion of these training elements is evaluated through the learning management system based on predefined evaluation criteria. Moreover, via integrated forums and messaging system, the VLE will play a role of a central hub providing the social area with a wide range of opportunities for collaboration and communication. It is important for the school VLE and integrated services and tools to be easily accessible by all participants in the training (anytime and anyplace). In this respect, the digital home environment of the students requires particular attention as the resources for home-based digital learning must be equally available to all [3].

Conclusions. Innovations in education systems have a great potential to significantly improve learning outcomes, enhance equity and improve efficiency. If broadband availability and adoption of digital equipment are not diffusing in rural and urban areas or between different European countries at the same speed, the already existing divides between schools which can benefit from fast Internet access and latest technological developments, and those which are left behind will further increase. The provision of tools for schools to reflect on their usage of digital technologies for pedagogical goals is crucial. It is also important to develop a better common understanding of schools' access to digital technologies and their usage for teaching and learning. The current global health situation requires European schools to discuss, learn and share experiences in adapting learning activities to new learning situations to recover and thrive in the educational world after pandemic.

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НАСЪРЧАВАНЕ НА ТЕХНОЛОГИЧНО-ПОДПОМОГНАТОТО ОБУЧЕНИЕ И ЦИФРОВИТЕ ИНОВАЦИИ В УЧИЛИЩАТА – КЛЮЧОВИ ФАКТОРИ И ПРЕДИЗВИКАТЕЛСТВА

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Използването на технологии за подпомагане на обучението е двигател за значителни промени в образованието. Критичната COVID-19 ситуация създаде редица проблеми и предизвикателства за училищата, принуждавайки ги бързо да усвоят и приложат различни методи за провеждане на технологично-подпомогнато обучение (ТПО). Въпросите, свързани с качеството на ТПО, са актуални повече от всякога. Предвид хетерогенността на ТПО приложенията, както и сложността на процесите, свързани с интеграцията на цифровите технологии в образованието, от решаващо значение е да бъдат идентифицирани релевантни модели за ТПО и стратегии за осигуряване на неговото качество със специален фокус върху разработването, наличността и използването на подходящи решения за е-обучение и цифрови образователни ресурси по отношение на тяхното приложение на различни нива и в различен образователен контекст. Тази статия описва някои ключови фактори и предизвикателства по отношение на подобряването на достъпа и използването на решения за ТПО и цифрови иновации в прогимназиалното и в средното образование в България.