

Expertise in the Selection of Electronic Educational Resources – Conceptual Vision

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Abstract—The current stage of training of pedagogical specialists is associated with the search for opportunities for the continuous development of their digital competences. It is viewed as a dynamic system that integrates the constantly expanding set of competencies given the dynamic development of information and communication technologies and the requirements for training in a digital environment. The main component (competency) in the digital competency profile of pedagogical specialists is the expertise in the selection and combination of electronic educational resources for the creation of a dynamic technologically enriched digital environment, which guarantees higher quality of education and consequently – higher educational results. This article presents an author's system of criteria and indicators as a conceptual vision for expert evaluation of electronic educational resources, which can be enriched and expanded in a technological and methodological context.

Keywords—Digital competency, electronic educational resources, selection and experts' knowledge.

1 Introduction

Enhancing the quality of education and training of pedagogical specialists is an issue that is gaining momentum and relevance. Its solution is increasingly associated with the use of information and communication technologies, given the spread of modern technologies and learning environments such as: learning in virtual and digital environments, cerebral-compatible environment, project-based training, problem training, discovery/research training, electronic and mixed training, computer-based cloud training, virtual and reversed classrooms, Web 2.0 training technologies, etc.

The digital educational environment is an opportunity for transformation of education into an open one, which according Y. Rasheva-Merdjanova's understanding [1] is a dynamic state of the educational system. In her opinion, it is genuinely ready (in a legal, resource-based and personal aspect) to flexibly determine the entry-transition-exit of that state (in their conventions) through a balance between age, socio-demographic, socio-cultural and personality parameters with flexible mechanisms for legitimate free (and regulated) movement across its borders. Such an open mode of training can be realized through a transformed flexible balance between the functions

of the trainers and trainees, which leads to their real participation in the traditional functions of information, organization, and evaluation, to a real participation of the social partners, as well as to opening up (transformation) of all the components of the process (open content, open methods, open learning environment, open homework, open evaluation) – they become its mechanisms for providing the educational environment [1].

This directs the attention initially to the possibilities of integrating training in digital environments and traditional learning as complementary in the context of the concept of mixed learning and, consequently, to digital transformation in education that guarantees its continuity. However, learning in digital environments far exceeds a mere auxiliary role in traditional learning and cooperative learning. This is *because digital learning is basically multisensory, multimedial training that aims to form and empower students' ability to simultaneously process, transform and use information coming from their various sensor systems in the process of learning and problem solving by organizing the learning content and the didactic environment of multisensory principle*. The result will be a development of multi-sensory competence, meta-thinking (cognitive-affective) and behavioral strategies [2].

The concept of *multisensory learning in a digital environment* affects all elements of the didactic system: defining goals, selecting content, organizing and implementing the learning process, diagnosing results, responding to social needs for successful realization.

Learning in a digital environment implies compliance with the following new versions of learning principles considered as hypothetical grounds for designing and implementing learning:

- Training is facilitated when solving real problems and tasks;
- Training is facilitated when new knowledge and skills are based on old ones;
- Training is facilitated when new knowledge and skills are demonstrated and affirmed by the students;
- Training is facilitated when new knowledge and skills are applied by the students;
- Training is facilitated when new knowledge and skills are integrated and transferred to new conditions;
- Multilateral support of intellect, interest, emotions and motivation;
- Reflection of learning;
- Balanced arrangement for the participation of teachers and students in the training;
- Optimization, efficiency and self-managed learning;
- Accessibility and response to expectations;
- Clarity, simplicity, flexibility and adaptability of the instructions;
- Complex learning environment for authentic activities [3].

The prospects for the development of educational technologies are associated with the possibilities of integrating the different media for presenting information, i.e. turning them into multimedia technologies in the context of multisensor learning in a dynamic, continually enriching educational digital environment. Electronic learning resources complement this perspective by making it realistic and synergistically possible in the conditions of a technologically enriched environment by deliberately ap-

plying multimedia technologies and integrating the different media for presenting information and provoking different senses and activities. This requires pedagogical specialists to adopt a different approach with respect to the planning and design of the educational environment and the realization of the training itself. Therefore, the digital competence of pedagogical specialists is an essential component of their overall professional profile considering the digital transformation in education. As a system of competencies, the digital competence of the pedagogical specialists integrates knowledge and skills to efficiently apply information and communication technologies, and work in a digital environment at different levels: basic, pedagogical, methodical, personal, which in turn ensure the realization of professional roles in technologically enriched environment. In the exercise of professional activity and in the context of the educational process, pedagogical specialists often face challenges related to the selection and combining of different electronic learning resources in traditional training or the creation of a technology-enriched learning environment. Therefore, the expertise in the selection of electronic educational resources appears to be a core component of the digital competence of pedagogical specialists.

2 Conceptual Framework for Evaluation

Electronic resources can perform and often perform integrated functions in the educational process: informational, cognitive, systematizing, forming, developing, exercising, reflexive, translating, transforming, prognostic, controlling-evaluative, socio-cultural, etc.

The selection of electronic learning resources can be specified in the context of cognitive activities of the subjects – i.e., at the reproductive level, cognitively-productive level, coding, decoding or transcoding, reflexive level, self-knowledge level, etc. Although all these didactic and methodical projections of a full-fledged expertise deserve attention, the present study examines the technological and general-dimensional parameters (criteria and indicators) in the selection of electronic learning resources, which can be complemented in different directions in a private-didactic (methodical) context.

There are a number of publications offering frameworks for evaluating e-learning resources, some addressing the digital educational resources more generally [4, 5], while others focusing mainly on web-based resources [6, 7]. In most cases, the criteria are categorized in terms of functional, technical and aesthetic aspects, as well as pedagogical-didactic ones.

The conceptual framework proposed by the authors comprises six main points of view:

- Technical
- Functional
- Pedagogical
- Didactic
- Social
- Content and structure aspects

Which form the basis for specifying basic criteria and indicators for expert evaluation of the electronic educational resources in the context of their selection by the pedagogical specialists. Each of these aspects can be viewed as general or personal. The personal aspect is a projection of the instructors' personal perception of the characteristics of the digital resource. For example, while the technical parameters are common and display no variation in personal perception and evaluation, most of the functional parameters are perceived individually. On the other hand, each of these aspects cannot be considered on its own, since there are certain formal dependencies between them which determine the evaluation parameters. For example, the technological development determines the variations in functionality, which in turn affect the structure and content, etc.

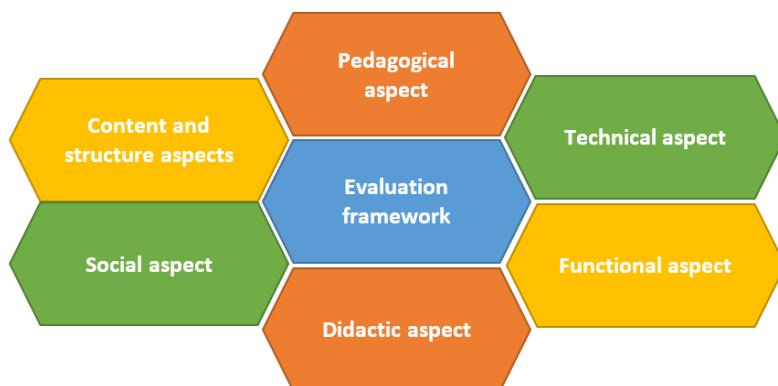


Fig. 1. Conceptual framework for evaluation

Content is the main element of the e-learning resource. It encompasses a set of ideas, messages, and knowledge that you pass on to learners. Structuring the content, *navigational accessibility, annotation (tagging) and indexing*, as well as the full coverage of content through *mechanisms for search* and discovery of individual elements of the content, are defining functional characteristics that influence its structural build-up. With regard to the content itself – its *relevance* and *timeliness* at the time of use, as well as the *reliability* and *credibility of the sources* on which it is based. There are four types of utilization of digital resources [5] – pure, pure/combined, adapted and dynamic. However, the use of digital resources must also be in line with the *license restrictions* imposed by their creators. Although educational resources are largely promoted as licensed with Creative Commons license¹, their modification and distribution is often limited. Paid digital resources are also license-limited, but for them, price-affordability is a determining parameter as well. Achieving maximum accessibility of education and the integration of learners with special educational needs imposes additional functional requirements on the digital educational resources – in terms of functional design, *interface, usability, intuitiveness*, etc.

¹<https://creativecommons.org/>

The manipulation and interaction are key aspects of the effective learning resources: through interaction practitioners build their own understanding and use of resources; and by including digital assets or information objects in an interactive framework, practitioners ascribe educational goals and values to them by creating learning activities or projects [5].

Pedagogical aspects are related to the conceptual model (as a conceptual structure) and the approach to the design of electronic learning resources as pedagogically meaningful ones. Pedagogical aspects are seen from the position of approaches to the realization of the specific technological solution in the specific electronic educational resource and the possibilities for its categorization and standardization, namely:

- Goal-oriented
- Process-oriented
- Results-oriented
- Student-oriented (facilitated) - centered on learning
- Centered on teaching (coaching oriented)
- Oriented towards cooperative learning or interaction
- Hermeneutically-oriented (towards explanation, interpretation)
- Behavior-oriented
- Cognitively-oriented
- Constructivist-oriented
- Connectivistically-oriented, and so on

The didactic context of expertise generally comprises the complex of tools for the effective use of electronic educational resources in the following directions:

- Management-regulatory
- Intellectual-cognitive
- Informational-communicative
- Practical application
- Heuristic, research
- Social-cognitive
- Control/evaluative-resultant
- Situationally-constructive
- Intuitive-associative
- Problematic
- Adaptive, inclusive

The specification of the proposed aspects as basis for a conceptual framework for evaluation of the electronic educational resources is the reason for formulating a set of core criteria and indicators for their expert assessment, presented in Table 1.

Table 1. Conceptual framework for evaluation of the electronic educational resources as integrated multi-layer polyfunctional product.

Criteria	Indicators for evaluation
Technical applicability	hardware and software compatibility accessibility (remote, authentication-authorization, independent access) required storage and maintenance infrastructure access time accessible to external users platform/media dependency
Functionality and reliability	options for search and extraction of information options for availability of export and download options for annotation (tagging), sorting and classification intuitiveness of the interface suitable navigation content licensing terms degree of functional and technical personalization relevance to people with SEN (special educational needs), relevant level of gender, ethnic, cultural and social integration use by embedding and interaction
Access to the electronic resource (options and transformations)	it is not online-offline providing information only unidirectional interaction two-way interaction transaction and integration of options multi-channel access
Overall design of the electronic resource	usefulness of the content degree of specification degree of integration constructive grouping number of media integrated in the course
Design of learning via the electronic resource	predominant learning strategy (satisfying/minimizing; optimizing, maximizing, algorithmic, heuristic, perspective, situational) stimuli potential reaction options support level of personalization
Content design – organization	map of the resource map of the content – static nature, dynamism, functionality, interactivity use of quick links and metaphors horizontal content correlation (within one cognitive level) vertical content correlation (between different cognitive levels)

The modernization of present-day education is directly related to its digital transformation. The digital children and students require new approaches and continuous search for opportunities to create an enriching and interactive digital environment. All this in the context of Europe's Digital Agenda² strengthens the interest towards a new

²Key Data on Learning and Innovation through ICT at School in Europe 2011,
<http://eacea.ec.europa.eu/education/eurydice/>

vision for the continuous expansion of e-Skills upgraded to digital literacy and consequently to digital competence. All of these challenges related to digital, distant, mixed and mobile learning are the subject of author's searches [8, 9]. The digital environment is highly heterogeneous, resulting in problems with technological compatibility and platform constraints. These are also some of the elements of the technical category parameters for evaluation of digital educational resources.

All of this draws attention to the search for opportunities for comprehensive expertise on the part of the pedagogical specialists of electronic educational resources so as to ensure the fulfillment of their basic functions, namely informational, forming, developing, exercising, evaluating, self-assessing, reflexive, socio-cultural. This makes their vision for the assessment of electronic learning resources as part of their digital competence, particularly important for the full utilization of the latter in the educational activity with students in different educational degree programs and stages.

3 Criteria for Expertise in the Selection of Electronic Educational Resources – Pedagogical Specialists' Viewpoint

The study is directed towards examining the perspective of the pedagogical specialists with respect to the main criteria and indicators used to assess the expertise in the selection of the electronic educational resources. The subject of the study is the expertise in the selection of electronic educational resources. The objective of the study is to determine the significance of the criteria and indicators for evaluation and selection of electronic educational resources as elements of the summarized expertise.

The empirical study is conducted through an expert assessment where pedagogical specialists rank their preferences for the criteria and indicators for the expertise of the electronic educational resources in the context of their application in the educational practice. A contingent of the research are 37 pedagogical specialists working in different stages and levels of school education.

The expert opinion of the subjects included in the empirical study focuses on the search for opportunities for better hardware and software compatibility, a top priority indicator (ranked first by 48% of the respondents) in terms of technical feasibility as evaluation criteria of e-learning resources. Accessibility of e-learning resources is a determinant (ranked second) for 45% of the experts and access time is for 33% of them. Particular attention is also paid to the necessary storage and maintenance infrastructure. The intuitiveness of the interface of the relevant electronic learning resource is highlighted by 41% of the surveyed experts, while 33% of them put the export and download capabilities as the most important functionality. For 30% of the experts, the possibility of annotation, sorting and classification, as well as the proper navigation in e-learning resource (26%) is the third priority.

Experts determine as most significant indicator in the access to e-resources (capabilities and transformations) criteria bidirectional interaction (41%) and multi-channel access (33%), followed by transaction and opportunity integration (30%).

The degree of integration is decisive for the overall design of the electronic resource and is related to the preference of 26% of the experts, whereas for 29% of

them the second place in the ranking is the degree of specification followed by the constructive grouping.

The predominant learning strategy predetermines the selection of the e-resource for 67% of the experts, while the potential response opportunities are ranked second by 30% of the respondents followed by the level of personalization. There is a clear trend of preference for the high degree of resource subjectivization and increased opportunities for personalization of activities in and through them. Content map evaluation determines the resource's relevance to the design and organization, followed by a resource map and the use of quick links and metaphors, in other words, more and more it relies on dynamic performance and rapid orientation.

With the highest factor weight (0.82), expert judgment to benchmark the criteria for evaluating electronic learning resources is access to the electronic resource, followed by its functionality, reliability and technical feasibility. Explained as significant is the possibility of designing learning, based on the relevant electronic learning resource - Figure 2.

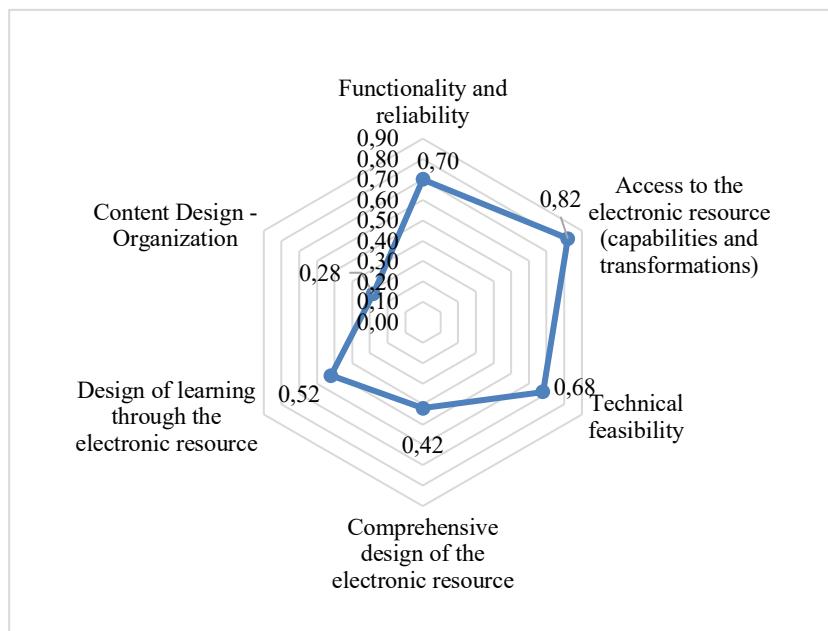


Fig. 2. Breakdown of factor weights

4 Conclusion

The overall study focuses on the search for ways to develop the expertise of pedagogical specialists regarding the selection and evaluation of electronic learning resources as an integral part of the didactic and methodical means of learning in different educational stages and grades. Given the degree of development of information

and communication technologies, this type of competence occupies an increasingly important place in the professional profile of the teacher and determines his success in the classroom and beyond in the overall educational process. Technological and content expertise is at the forefront, and it is becoming increasingly important to reflect and expand the opportunities to implement increasingly diverse learning strategies through the various electronic learning resources. Therefore, as technology advances, in addition to accessing e-resources and content design, navigational capabilities, levels of intuitive interface and personalization, degree of integration, caution and research prospects should focus on the design of learning. All this in the conditions of development of the competence of the pedagogical specialists regarding a complex expertise of the electronic educational resources will guarantee their more purposeful and systematic use in the educational process as well as their continuous improvement according to the applied learning strategies in their diversity.

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