Perception of the digital technological integration by the teachers of technology and entrepreneurship

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Abstract – In the conditions of ubiquitous informatization and global connectivity, the integration of ICT (Information and Communication Technologies) in education is a major way to modernize today's education. It is a matter of gradual and progressive changes to the extent of transformation of the educational system and construction of new educational models. The degree of integration depends on many factors. In addition to the resource provision, the digital competencies of teachers, and especially their value parameters, have an important impact.

The ways in which teachers in Bulgarian junior high school technological education perceive information and communication technologies (ICT) in the learning process, as well as their attitude to innovative digital forms of learning and teaching have been tested by surveying 127 teachers and conducting semi-structured interviews with 18 of them. The tools used in the process reflect the understanding of the essence of digital technological integration based on theoretical analysis. The participants in the study express their thoughts about the educational potential of learning methods such as game-based learning, use of computer simulations, virtual reality, learning with mobile devices and others.

The results of the empirical research show that teachers in technological and entrepreneurial subjects perceive ICT not only as a way of improving existing methodological practices, but also as a tool for overall transformation of learning. The participants in the survey declare a positive attitude towards most of the listed innovative forms of training; however, they are reserved in the assessments of their capacity and express concerns about their effective methodological interpretation. The results are a prerequisite for increasing the degree of integration of ICT in the Bulgarian high school education in technology and entrepreneurship and show the need for in-depth methodological research in the field of pedagogical use of digital technologies

Keywords – Technology Education, Digital Technological Integration, Information and Communication Technologies, Innovative Forms of Learning and Teaching, Digital Pedagogical Competencies

I. INTRODUCTION

Modern social reality is characterized by global informatization and connectedness. The digital information processing is broadly covered by the daily subject activities. The mobile and cloud technologies bring about new challenges. Computer and network technologies provide opportunities for huge pedagogic innovations, which are impossible without digital means. The integration of digital

information and communication technologies (ICT) in tuition is basic means for educational modernization in direction that would allow answering the public requirements and procurement of the opportunities to satisfy the educational needs of students of the so-called net generation.

The integration degree of ICT depends on numerous factors, among which important impact is attributable to the digital competencies of pedagogues and in particular their value parameters. ICT could modify the tuition process when the teachers have sufficient understanding of technologies, they believe that these would improve tuition and have the strength to apply it in their programs [5]. The conviction in educational capacities of computer-based tuition and tutoring and the faith in the huge didactic capacity of information technologies are factors that predefine integration [6]. Teacher's capacity to use various computer-based pedagogic strategies is of key importance to the high-tech integration [3]. Numerous surveys such as C.Lim [8], K.Hew and T.Brush [7], B. Andoh [2] etc. establish the significance of teacher convictions, attitudes, inclinations and beliefs for improving the degree of digital technology integration in education.

The perception of the transforming nature of integration process is prerequisite for getting to know and accepting the high-tech procured pedagogic innovations, incentive for experimentation and readiness to implement new type of tuition. The high integration degree is prerequisite for constructivism implementation, the ever increasing independence, personal responsibility of students and the opportunity for personalized tuition [13].

II. MATERIALS AND METHOD

A. Aspects of perceiving ict integration in education

The term "integration of digital information and communication technologies in tuition is being used for designating exceptionally complex phenomena and processes that unite versatile elements. Adhiamo and Cheset [1] state that integrating computer technologies is comprehensive complex process that at micro-level focuses onto the didactic tuition strategies.

According to Churukova [4], the term "integration" reflects the processes of movement and development of particular system, in which the interactions between the elements accelerate the interconnectedness and their unification. T.Thayer [10] systematizes three meanings of the term "technology integration" in the scientific literature: TIL - technology integration in learning, TIC- technology integration in the classroom and TII- technology integration in instructors duties). When we talk about digital technology integration usually we mean integration in the classroom, which refers to ICT supporting the scheduled and structured educational activities in school-based environments.

On many occasions, just like Trinidad, P.Newhouse, B.Clarkson and other authors [11] state, ICT are being used within the available tutoring strategies. In these cases, computers are more cutting edge, improved instrument for the implementation of classic tutoring and studying methods. This process is defined as transposition [11, p.10]. According to M.Lloyd, [9] integration is present when using ICT is routine, natural part of the tuition process, the individual students and the teacher could access and use freely the technological instruments they need. The effective integration requires assigning accessible computer-based tasks, selection and use of suitable technological instruments for achieving the educational purposes. Transformation is such stage of the educational development whereas ICT "disappeared at the background" in the classroom.

Digital integration is exceptionally complex and multi-layered phenomenon. It is a process and result at the same time. It requires synthesis of classic and computer-mediated learning and tutoring patterns and creation of innovative pedagogic technologies that cannot be implemented without cutting-edge technological means. The integration suggests use of ICT for supporting the learning process and the personal development of students, as well as their use for planning, procurement and management of tuition in the technologically reinforced classrooms and online environments.

B. Research of the perceptions for digital technology integration of bulgarian teachers in technologies and entrepreneurship

The perceptions of digital technology integration of teachers that are tutoring the school subject "technologies and entrepreneurship" in the Bulgarian primary education have been surveyed via inquiring 127 pedagogues and performing semi-structured interviews with 18 of these in 2014. The

survey excerpt was defined via the random selection method.

The used instrumentarium reflects the various understandings outlined on the grounds of theoretical analysis concerning the essence of the integration process and assumption of the capacity of some innovative tuition patterns via computer means. The inquired persons should define to what degree the selected staging is significant to them. Likert scale has been applied for evaluation with the use of 5 arranged in ascending evaluation order.

III. RESULTS

The results on perception of the digital technology integration are reflected in table 1

Table 1: Relative results for the perception of digital technological integration

According to you, to what degree ICT are:	Evaluation				
	They are not	Low degree	Medium degree	High degree	Mandatory prerequisite
Instrument for improvement of the available tuition patterns and methods	0,00%	0,00%	18,90%	40,16%	40,94%
Instrument that would change the ways of tutoring and learning	0,00%	1,57%	17,32%	47,24%	32,28%
Objective prerequisite for changing the lecture contents	6,30%	7,87%	36,22%	18,11%	25,20%
Control and measurement means	1,57%	7,87%	12,60%	7,87%	2,36%
Instrument for implementing project-based technological tuition	4,65%	0,00%	18,60%	46,51%	20,93%
Basic means for extending the academic-educational space.	0,00%	0,00%	18,90%	57,48%	17,32%
Some of the reforms that would change the organization and structure of school education itself.	3,15%	6,30%	9,45%	51,97%	24,41%

The calculated statistical parameters for numerical distribution of the received answers and the curve of normal distribution show domination of the high values. The average measure for central trend in view of all aspects is $\bar{X}$, i.e. 3,9574. The resulting mode values show that the most often used assessment in wording when it comes to defining the included understanding of the process of ICT integration in the technological tuition is "high degree of significance" (35%). The relative share of the evaluations that define ICT as a prerequisite for the performance of the enlisted pedagogic activities is also high - 21,37% . The "no" evaluations are 1,8%, and the relative share of the ones who defined "low degree of significance" is 3,3%.

The statistical parameters show that the prevailing part of teachers believe ICT are mandatory prerequisite in order to improve the available tuition patterns and methods. Highly evaluated are the ICT capacities for changing the ways of tutoring and learning, the implementation of project based technological tuition, expansion of the academic-educational field and reforms of the school education.

In the case of low values – Mode (Mo) and $\bar{X}$ have the 3 value that corresponds to medium degree when perceiving ICT as means for modifying the school contents and as means for control and evaluation.

The defined evaluation concerning the control-evaluation capacities of digital technologies in technology and entrepreneurship tuition could be explained by the specific practical-applicable nature of the tuition process. The tuition concerning the subject is characterized by the large relative share of the individual practical activities of students whose results are indicative of the acquired knowledge and skills and could be easily measured. Probably that is why the inquired pedagogues do not think it is necessary to use ICT for improving the control and evaluation manners.

The graphic results concerning teacher perceptions concerning the ICT functions in tutoring technologies and entrepreneurship are visualized with the following polygon of distributed measured statistical indications.
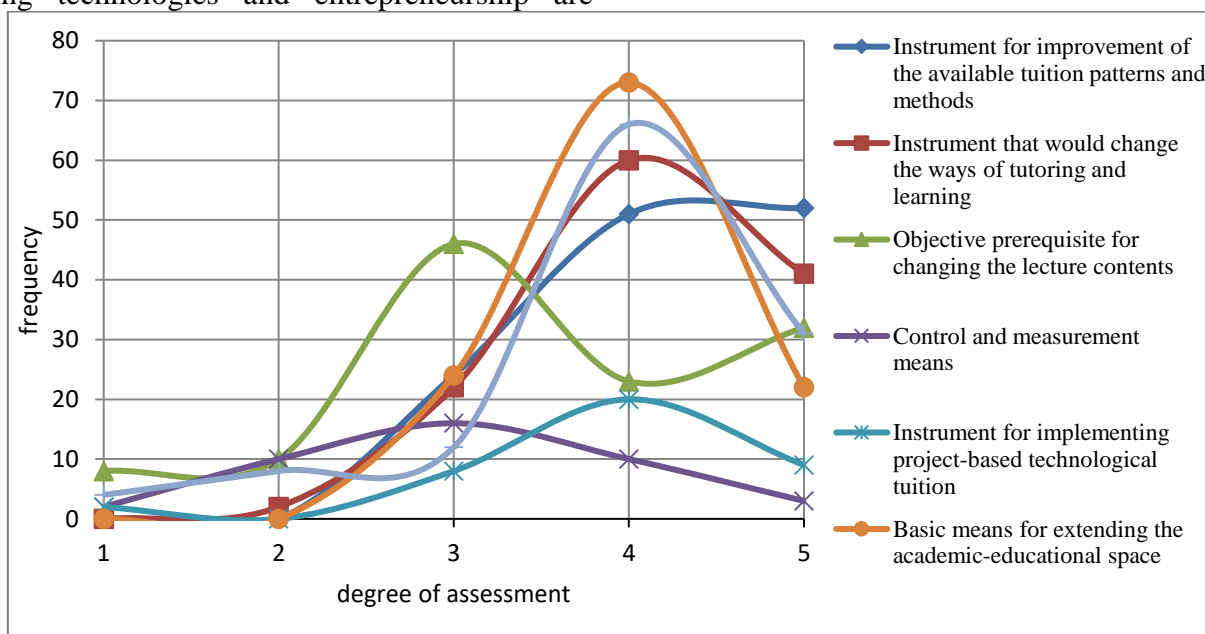

Figure 1: Teacher perceptions concerning the ICT functions in the "technologies and entrepreneurship" tutoring

The variation coefficient when it comes to defining the frequency distribution that characterizes the perception of ICT as prerequisite for changing the academic contents show great dispersion. The results about the statistical variable being described reflect the dynamic changes in the source for selecting academic contents in technologies and entrepreneurship, predefined by the rapid technological development.

The resulting statistical values for the minimum X_{min} values undoubtedly show that there are no pedagogues who stated ICT are no means for optimizing the learning and tutoring methods and expanding the academic educational field to them. ($X_{min} \geq 2$).

The calculated statistical parameters and the results of Student's test in order to compare data about the perceptions formulated in the inquiry card show that the teachers in Technologies and entrepreneurship perceive ICT greatly not only as means for improving the already available pedagogic technologies, yet as instrument for creating new learning and tutoring methods, means for educational transformation.

The perception of some innovative tuition patterns with computer means by the teachers in technologies and entrepreneurship has been surveyed via reply to the question included in the inquiry card that requires valuation of their educational potential.

The resulting relative values concerning the frequency distribution are reflected in the table below

Table 2: Relative results for educational potential of some innovative tuition patterns with computer

What is the potential of the innovative learning patterns via computer means, enlisted below?	Not suit able	Low	Medium	High	I have no opinion
Game-based learning	9%	11%	26%	24%	20%
Learning via computer simulations	2%	0%	14%	72%	6%
Use of web-based resources in the academic process	0%	0%	15%	52%	28%
Use of added reality (virtual academic environments)	9%	0%	23%	49%	19%
Learning via mobile devices	5%	13%	32%	36%	9%
1:1 computing	2%	5%	18%	39%	31%

The results of the registered answers show that the inquired persons define with "average" grade the learning potential via computer games and learning via mobile devices and perceive as high the potential of all other enlisted computer-supported learning methods. Highest value is attributable to the average grade of learning via the use of web-based resources during the academic process – 4,140. In view of this method, no negative and low grades were registered.
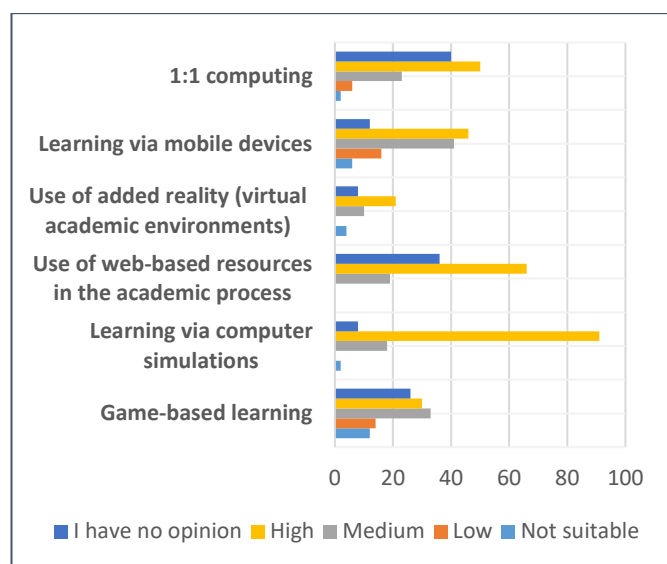

Figure 2: Perception of the innovative tuition patterns with computer

The asymmetry coefficients of all the tutoring methods enlisted in the expert card are negative, meaning that the curves of the frequency distributions are shifted on the right and high values are prevailing. These evaluations indicate the positive attitude of the pedagogues who tutor the school subject "Technologies and entrepreneurship" to the enlisted pedagogic innovations.

The respondents have not stated other methods in the option for open answer provided in the inquiry card. Nevertheless, what impresses us is the relatively high share – 20% of the teachers who cannot evaluate the researched pedagogic potential. This result could be explained with the absence of scientific methodical knowledge on the implementation of the enlisted methods in the process of technological tuition.

The resulting values for low (11%) and average grade (32%) concerning the potential of the game-based tuition could be explained by the insufficient availability of specialized educational software and not being aware of their capacities as tuition means. As a result of the interviews performed with the teachers we established numerous concerns related to the negative consequences of using the method and the effectiveness degree in educational context.

The assumptions related to the hindered attention focus, effective management of individual and group cognitive activity are expressed in terms of using of using mobile devices for the tuition purposes in technologies and entrepreneurship.

The expressed opinions are logical, taking into account the innovative character of the versions of pedagogical technologies being discussed and the fact that they are undergoing elaboration, experimentation, analysis and systematization of particular methical knowledge about their implementation. Additionally, they outline the need of continuous enrichment of teacher's methodology culture and professional improvement. When studying the factors that would enhance the improvement of the ICT integration degree in tuition in technologies and entrepreneurship [13] we established high dependency of the factor "providing more opportunities for professional development" - 78,74%.

The awareness of this need is prerequisite for further successful implementation of the computer-based tutoring and learning manners when it comes to the technological studies.

IV. CONCLUSION

The results of the empirical research show that the teachers in technologies and entrepreneurship perceive ICT not only as an instrument for improving the available methodology practices, but also as means for comprehensive transformation of tuition.

The research participants declare positive attitude towards most of the enlisted innovative tuition patterns, yet they are reluctant when it comes to assessing their capacity and express concerns about their effective methical interpretation.

The established results are prerequisites for improving the ICT integration degree in the Bulgarian primary education in technologies and entrepreneurship and demonstrate the need of in-depth methical research in the field of pedagogic use of digital technologies.

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