PSYCHOLOGICAL FITNESS OF LEARNERS FOR USE OF COMPUTER TECHNOLOGIES IN EDUCATIONAL MODELS

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Abstract

In traditional school teachers actively oppose the introduction of computer technology in the learning process, questioning the necessity and feasibility thereof. As a result, students do not receive the necessary knowledge and skills in computer technology. Their presented knowledge, significantly with respect to independence and identity in contemporary society - is no longer possible in the old way, and in a new way it is not given (knowledge of computers is as a plaything or deemed to be a partner in dialogue).

In its context the problem must be considered for the consequences of computerization, both positive and negative. In terms of personal development, strengthening of intelligence by engaging students in solving more complex algorithmic problems, the development of logical, predictable, operational thinking, specialization of cognitive processes - perception, thinking, memory, and the formation of specialized, objective content to motivate the use of computers to solve educational problems, increased self-confidence in a computerized world. Negative transformations include reducing solutions to educational problems officially logical components depletion of verbal thinking, narrowing of social contacts, excessive individualization. So, computerization of education in general and psychological suitability to accept this phenomenon in particular is under investigation.

Keywords: psychological fitness; computerization in education; identity in contemporary society

1. THE STATE OF COMPUTERIZATION OF EDUCATION

The desire to improve the efficiency of education has led to the need to incorporate computer technology in education. So far, computerized training has been there for several decades and is now entering a new historical phase that we call ***active*.** This process is accompanied by numerous disputes and contradictions. Their essence boils down to the fact that superior educational techniques develop with significantly faster pace than psychological and pedagogical understanding and research. Among the arising problems is a need for identification of the problem and evaluation of the possible psychological consequences of computerization.

Studying aspects of psychological consequences of computerization and their classification depends on the research criteria. For example, in studying functional ontogenetic and historical aspects of the development of the psyche, the most established criterion of mental processes is considered the goal of solving problems. In accordance with this, the possible criteria of psychological consequences of computerization are the functional consequences of the transformation of routine (template) and creative components occurring in tasks solved with the help of computers, compared to their traditional forms:

- the ontogeny consequences of the impact of computerization on the formation of personal qualities of the person in the computerization of his activities;
- historical consequences of the direct impact of computers, the ratio of their high and low psychological (mental) functions, i.e. the curve of psychological development, which Vygotsky, traditionally

associated with the idea of the historical development of the psyche.

Researchers agree that the psychological consequences of computerization are contrary to human development. Despite these findings, other statements are known to us as well. For example, O.K. Tikhomirov stated that the strengthening of logical thinking can be accompanied by suppression of the intuitive principle in thinking (Tihomirov, O., Babanin, L. 1986). Besides, the computer facilitates the development of the cognitive needs of the individual, providing such knowledge that one can not get without its help, but it can also give a powerful impetus to the development of external prestigious motivation. V.V. David said: "The use of computers in programmed training leads to the formation in learners of narrow, specialized knowledge and skills of executive nature and does not facilitate their transfer to new situations, nor does it develop their creative thinking" (Davidov, V. Rubtsov, V. Kritskiy, A. G. 1996). There is also a view that, when using computers, including in the management of human cognitive activity, quite higher indicators of human creative activity can be observed than in the traditional environment. The question is how to develop psychological and educational software computer programs suitable for educational programs and forming a need to work with computers.

One important factor in the effective use of computer technology in education is the mental state of users in computer information technology (CIT), which is also a psychological consequence of computerization. The peculiarities of teaching using computers have their own specifics that affect the mental state of the person at the computer, including emotional, volitional, intellectual, motivational features and depend on the specific situations arising in the process, and the factors of age, gender, intensity of work on the computers and the readiness to use such equipment. A very wide range of mental states give a negative impact - anger, nervousness, anxiety, confusion, fear and others. They occur in unusual situations - insufficient time, the need to think and decide in the short term, the need to correct the dependency to the system, finding a key, etc. The researchers note that the incidence of positive student attitudes is approximately equal to the frequency of negative ones as well as the fact that the performance of computer activities depends on the length of experience with computers.

The effectiveness of computerized training is also affected by the personal characteristics of the students. The positive effects of computerized training include a high degree of individualization of cognitive activities, great opportunities to use illustrative materials as compared with traditional methods, the opportunity to choose an individual way of studying academic and scientific material and regulation of the learning pace.

With the introduction of the active practice of training with computer technologies, the deficiency in the active speech of the students increased so much that there is a real danger of collapse in social contacts and of individualism in society. Parents, psychologists and pedagogues have found that modern children prefer to communicate in social networks and the Internet, they like SMS correspondence much more than social contacts. These phenomena are widespread in countries where computers are widely introduced in all aspects of life.

2. PRINCIPLES OF IMPACT

Consequently, it is too early to speak about “a high degree of individualization of cognitive activity”. The personalization and intuitive attitude of the learner is not an objective but a means for achieving certain educational goals and a means of training.

One of the distinctive features of computerization is its dual mediation. The implementation of the process “activities with a computer” has its own specific instruments of human activity relating not so much to the sensual-practical aspect (physical labor) but to the field of mental and psychological human activities – a mediated activity, mostly with mediated “psychological tools”. Or we can say that the mediation computer activity contributes to release from responsibility, i.e. transfer of psychological tools from the outer to the inner form of personality which could lead to new levels of the qualities of awareness, knowledge and voluntary activities. A “more complicated structure” of psychological functions is formed: the use not only of sign tools but also of special information technologies as an indirect mediator. So, today we can speak of two types of superior psychological functions: characterized with the use of signs and the introduction of additional technologies for work with them.” (Tihomirov, O., Babanin, L. 1986.).

We must note that Computer Information Technologies have direct and indirect impact of human mental activities. The direct impact is associated with the transformation activities of mediated information technologies in the content and structural aspects as compared with the traditional ones.

As a result of the experimental tests we can identify the following key principles of impact of this type:

1. Principle of *distribution of transformations* – change of activities in the very source of additional transformations of other types of activities;

2. Principle of *reverse effects* – the change of the specific type of information activities could lead to change of non-information traditional forms of the same activity;

3. Principle of *generalization of transformations* – the psychological effects of information could affect not only the separate mental processes but also the overall personal goals;

4. Principle of *interference of transformations* – some mental effects of information affect other ones which could lead to hyperbolization as well as to neutralize the effect (Babaeva, Yu., Voyekunekiy, A. 1998.).

The direct interaction with information technology in education, employment, games and other forms of activities form the central zone of psychological consequences of information.

The distribution of transformation shows efferent and afferent tendencies. The first are characterized with the distribution of new formations in the conditions of traditional activities. E.g., in the process of communication, a computer forms a number of new formations as compared with traditional interpersonal communication: significantly higher requirements for precise wording, logic and consequence of expression, higher significance of reflections, limitation of the role of affective means of communication, etc. These new formations can be transferred in traditional communication between people.

The afferent tendency is the situation when information activities transfer in computerization components typical for traditional activities. In this way the computer imitates personal communication with its users. The transfer of skills for work with information technology to traditional activities is realized with the help of analogy, comparing one's own activities with the operation of the equipment.

The studies of a number of psychologists show differentiation between the direct and indirect impact of information technology on mental activity. The mechanisms of transformation are described, including by analogy and similarity, and vice versa. Under the influence of direct and indirect effects, significant transformation was observed in the individual. There are conflicting views on the effect of this personal transformation.

Within the new formations, we must differentiate local transformations relating only to more or less limited number of psychological phenomena, distributed and globalized, including the transformation of a personality in general.

It was found that the ontogeny development in computerization depends on the degree of stability and user functions interacting with functional formations. These formations are equated to personality, with strengthening and reinforcement of his/her existing psychological qualities, changing them or not. The initial association of personal qualities with functional transformations determines the different variants of personal changes in various fields.

The analysis on the study of psychological effects of computerization brings a whole class of phenomena:

- the embodiment of the computer;
- the phenomenon "computer anxiety";
- formation of overconfidence in the machine;
- formation of psychological barrier in the process of "manual work"
- computer technology creates "escape from reality" – a virtual reality;
- hacking.

The context of computer technology brings a change in the idea of *proximal development* zone – one of the most productive concepts introduced by Vygotsky. It is a fact that a child is not able to do everything but he/she can do everything with the help of computer technologies. Besides, he/she does not always need the help of adults for this.

N.F.Talizan emphasizes the insufficiently high quality of computerized educational programs. The problem is that programmes are developed in the process of development or via empiric means, or on the basis of the behavioral theory of learning which is inadequate to the characteristics of human education (Talizin, N. 1998.). The author is certain that the use of modern technology is justified only when it increases the effectiveness of the process of training an education and at least one of the following basic criteria is observed: quality of teaching, less waste of time and efforts by students and teachers. The quality of education must be the first priority. This purpose may be achieved if computerization is based on modern

scientifically grounded models in the learning process. The establishment of scientifically grounded educational programs is crucial for the success of computerization of education.

3. CHARACTERISTICS OF EDUCATIONAL ACTIVITIES THROUGH APPLICATION OF COMPUTER TECHNOLOGIES

The introduction of computer technologies in secondary and higher educational establishments is already widespread. The training of students in integrated computer environment does not limit the process of internalization of new information. The development of modern methods of educational activities continues, along with the desire to broaden the intelligence of modern students and learn new strategies for the development of thought. Computer technology is also used for automation of the process of the educational process in all stages. On stage – presentation of educational information – with the use of multimedia, computer hardware, new software and accessories (interactive boards, etc.). On stage - teaching – in the process of interaction with the computer as well as on display, repetition and consolidation of the acquired knowledge, skills and abilities. On stage – intermediate and final control and self-training – summarization of achieved results.

The attempts to automate the educational process date back to ancient times and still continue today. E.g. the American psychologist J. Green states that medieval knights were trained with machines how to successfully throw a spear.

The educational process is an exchange of information between the ones that teach and the ones that learn. The dialogue between teachers and students is frequently mediated by any way of transfer of information and mainly through educational books (textbooks). Printed materials are replaced by online editions which significantly improves transfer of educational information through a dramatic reduction of costs for printing books and significantly increasing their circulation. We have to keep in mind that the technical capacity of media is a gradual drop in the share of verbal information and increase in the share of the nonverbal. Printed words are replaced with images and words can be heard.

In the 50ies of the XX century, a new stage started in the hardware used in schools; this hardware was developed by science and technology, or the technological revolution. The first new invention was television which gave an opportunity for a new way to organize visual training of schoolchildren and students. Some countries started to use electronic equipment. Then specialists, led by J. Keme (USA), out of respect to schools developed a relatively simple computer language.

The use of computer technologies in education is launched by teachers on the basis of certain didactic ideas, one of which is the *concept of programmed education Burres Skinner.* He proposes increase of the educational process efficiency by development and application of algorhythm programmes – prescription of strict consequence in education (algorhythms). Through an electronic device configured for such programme the learner makes a step-by-step performance of specific tasks. When the learner performs them he/she will be able to move to the next stage (the next topic). The programme is configured so as to help the learner find the correct solutions.

Norman Crowder, considering that the use of Burres Skinner's *linear programmed education* has a fundamental drawback, he offers the idea of branched programme instructions, applied in the 50ies of the XX century in the so called "branched books". Later, he published a number of „*TutorText"* books as well as the computer programme „*AutoTutor*".

There are several definitions in scientific literature of the phenomenon "computerization of education", including "new information technology" "computer technology in education", "didactic computer technology", etc. which presupposes that the terms in this field are in a constant development.

The end of the 80^{ies} of the XX century is the time when the term "computerized education" was created (Mashbitz E. 1988.), which presupposes the use of personal computers for automation of the distribution of an electronic database. In the opinion of the author, computers have significantly improved the presentation of research information and increase the motivation for teaching, with active participation of learners in the process of education.

In the 90ies, more powerful computers appeared and software became easier to use. This stage is mainly characterized by use of the dialogue interaction "man-computer". The learners in the process of education for the first time have the opportunity to work with a computer, to interact with the models-substitutes of real objects and, most important, to control the studied objects. Didactic computer technology allows simulation

of studies – chemical, physical, social, educational and other processes and phenomena. Computer technology has become a powerful tool of training in automated systems with different degrees of intelligence. In the field of education, automated study of the knowledge and leaning management is used more and more frequently.

The modern hardware and software adds to the power of the computer which gradually led to the replacement of the term "computer technology" with the term "information technology" (IT). A new form of education was formed – *distance learning*, where the separation between teachers and learners and the limitation of the place of the learner exist no more and everything is done by means of electronic media. The essence of computerization of education is defined as the establishment of conditions for free student access to a large amount of active information in databases, knowledge bases, electronic archives, reference books, encyclopedias. Computer technology is already fully directed to achievement of the purposes of computerization of education by using complex functional relations - educational, information, methodological, psycho-physiological and ergonomic tools and technologies. The development of information technology gives a basis to use in education the principles of multimedia and hypermedia, the data carrier CD-ROM (Compact Disk – read only). In modern information technology, the training with hypermedia includes text, graphs, digitalized speech, audio, pictures, animations, videos, etc.

Information technology is a new level of activity for training in mediation with deep changes of the very activity- teaching and learning. The active use of computers significantly changes the structure and dynamics of training activities, of the restructuring and development of indicative, operational and technical aspects of training activities, of changes of spatial and temporal borders of interaction, a system of self-regulation of interaction with computer technology. Interaction with computer technology is turning into an important new source of psychological formations in various fields: personal, cognitive, operational. For this reason it is necessary to develop not only new strategies for organization of teaching and learning but also adequate concepts of individuals and their development.

The theoretic basis of training activities is the theory of human activity of JI. S. Vygotsky (1996); the activity approach of A. N. Leontiev (1981); and the theory of S. L. Rubinshteyn (2000) about the origin of human psychology.

O. Tikhomirov and L.Guriev (1989) consider relevant information processes of "activity resulting from the use of information technology" provided that several aspects are available:

1. *Change in the content of the object and formulated performance goals*. These changes are reflected in the emergence of production formations which include:

a) new, more complex solutions of traditionally known tasks that become possible only by means of information technology;

b) types of tasks that are formulated in traditional activities but have not been present previously because of their extreme complexity;

c) formulating objectives and entirely new tasks that are not included in the subject area and can be set only through application of information technology.

2. *Change in the structure of objectives*. With the use of information technology new types of invariant and variant purposes are developed. The objectives focus on achieving activities by substitution, compensation and duplicates.

3. *Change in the importance of the objectives and results of their implementation using information technology.* This change is subject to contradictory trends: on one hand, the importance of the results obtained with the help of information technologies is increasing dramatically, which allows solution of problems of super complexes, on the other hand - in the practice of information technology there are lots of obtained results that are not used.

4. ANALYSIS OF MODERN EDUCATIONAL MODELS AND USE OF COMPUTER TECHNOOGY

For a quarter of a century now Bulgarian secondary and higher schools and universities have been using computer technology as tools of educational activities. An important issue for experts – psychologists, teachers, programmers is how to prevent computer technology from "damaging" (or, as ancient teachers say) – "not to influence badly" modern society. Now there are lots of educational models, due to the diversity

of their purposes, content, organization and realization of the educational process, including the attitude to computer technology.

Institutions focusing on computer education focus on thousands of programmes that can be classified according to the way they will be used in the classroom:

- Didactic programmes; demonstration programmes; computer models, laboratory programmes for exercises;
- Programme for control and computer training materials.

This classification is quite arbitrary as lots of prorammes include elements of two or more software types.

The issue whether to introduce in classes topics of computer science, information and communication technology as part of education has to be solved in accordance with the psychological characteristics of learners. For elementary school children, an integrated system of information picture of the world is formed, i.e. ideas of hierarchy of concepts and activities. At this age children usually do not ask questions about the laws of nature. They are sufficiently happy about the fact that they have a computer and it works. The children are not interested in the elements used for its construction. However, with time they start to be curious about the way this technology works. The task of the teacher on this stage is to build up and form a system if initial ideas in accordance with the content of the computer science course, in the psychological development of small learners. In adolescence learners are ready to learn serious theoretic topics of computer science as well as to form an opinion and attitude about interaction between man and computers and the capacity of this machine. This means that even in elementary school computers can be used in lessons for acquisition of knowledge and for exercises as an opportunity for synthesis and development of knowledge and as a source of scientific information.

Ideas of information laws of animate and inanimate systems are very important in the life of every human being. This is not presented in all grade of secondary education. There is no school subject that gives information of knowledge in these concepts. With the exception of the computer, textbooks do not give information about the existence, management and development of various systems - social, technical, etc. as well as for the functions – collection, storage, processing, presentation and transfer of information electronically. Most of the reviewed issues are solved individually at each and every educational level and educational institution.

The presented research is a comparative analysis of two educational models, traditional and computer-oriented (use of computer technology in teaching).

The most frequent and typical differences between these models are the following: differences in logistics; diversity – in the quantity and quality of computer technologies used in teaching. Computer-oriented schools (mainly private ones) are fully equipped with new computer technologies, e.g. didactic computer programmes including online lessons, seminars, test systems, didactic systems based on multimedia technologies and formed on the basis of video technology, with all school computers connected to the Internet. Traditionally oriented schools (mainly state schools) have computer classes but, in general, with old technology and use of computers is limited to the subject Computer Technologies.

This resulted in the emergence of the concept "*usability"* that can be reviewed from different viewpoints:

- as practical activity;
- as science;
- as branch of ergonomics;
- as property of a product or system;
- as ideology.

Usability is the property of a product by means of which operation users achieve their set objectives and solve various tasks without hindrance. In the context of computer technology, the concept of usability is reviewed as a discipline developing user interface for software, mostly oriented to the psychological and esthetic convenience of the user. The basis of usability in these fields is the applied-science discipline HCI (human-computer interaction).

As early as the 40ies it was already known that a great number of interface problems are related to human psychology. Thus, in 1949 the United Kingdom approves the term "ergonomics" and the same name was given to the science of testing and creation of effective systems managed by humans. A main objective of HCI is improvement of the communication between computer systems and users by the creating of computers that are more comfortable and more sensitive to the needs of users.

There are various criteria determining usability of products. The basic criteria are:

- *utility* – whether the product satisfies the needs of the user. Usability and utility are equally important – it is not important if the object is easily used if it does not cause interest. By analogy, if the system theoretically has the capacity to do what you need but its practical use is so complicated it is impossible to achieve the desired results. In order to find the use of the object or programme, you can use the same methods as in the analysis of utility. In order to find the utility of a subject or programme you can use the same methods as in the analysis of usability.

- *Learnability* – how easily and with what success users will be able to perform their tasks in an unfamiliar interface.

- *Productivity of use* – how fast users can perform their tasks after they are already familiar with the interface and after they have studied it.

- *Remember ability* – if users have already used the system, are they able to remember enough in order to use it effectively or do they have to learn it again.

- *Mistakes* – how many mistakes users make, how serious they are and how successfully they are able to manage with the problematic situation.

- *Satisfaction* – how pleasant it is for users to work with the interface.

5. TESTING THE PSYCHOLOGICAL READINESS OF TEENAGERS TO USE COMPUTER TECHNOLOGY

In the pilot study, the objective is to investigate the psychological characteristics of interaction of young people with computer information technology (CIT) and to identify individual psychological characteristics of teenagers with different levels of mental efficiency in using computers.

A psychodiagnostic complex is developed and it includes the following methods: “Psychological Efficiency of the Interaction between Users and Computers” (I. Nikolaeva, N. M. Subbotin); “General Self-Efficiency” (R. Schwartzer, M. Jerusalem, V. G. Romek), “Testing Situational Anxiety, Ch. Spielberg” (modification).

The sample consists of students of two schools in Burgas, Bulgaria. Specifics of studies in the first school – secondary education specialized in the field of humanities. Computer studies start in the 7th grade with the school subject Informatics. Basic school subjects are taught in the traditional educational model, without using computer technology. The second school – secondary education, starts training in computer sciences from the 5th grade. Most subjects in the school are taught with computer information technology (CIT). Classrooms are equipped with computers, multimedia equipment for watching information and modern interactive consoles which allows you to create the usual large interactive screen with multimedia projector and interactive whiteboard. Given the specifics and intensity of used computer technology in the studied schools as well as age-related characteristics of the adolescents we found it was necessary to divide our sample group into two groups – junior teenagers and senior teenagers. On this stage the sample consists of 127 students.

The basic objective of the study is to test the psychological characteristics of teenagers in their interaction with computer technology in the “school of humanities” and “school of CIT”. One of the most important conditions for the efficiency of learning activities mediated by computer is a *positive attitude towards it, increased interest and a comfortable psychological state*. For this purpose, diagnosis was made on the efficiency of the interaction of the learner with the computer during the training sessions. This gives a general description of indicators of psychological readiness, helps to identify the psychological and emotional background of teenagers, their skills in CIT and knowledge of computerized activities. The figure shows the distribution of the levels of psychological effectiveness of interaction of students with computers in two groups.

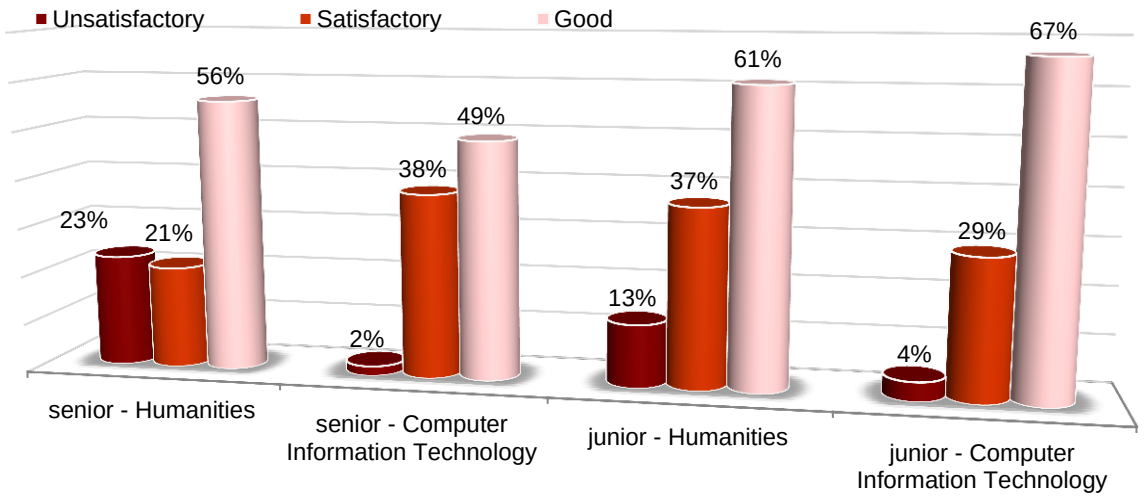

Fig. 1. Psychological efficiency of the interaction "student-computer" in the educational process in different school models

The study shows that a high percentage of junior and senior teenagers in the "school of humanities" feel emotional and psychological discomfort during their interaction with computers.

The level of dissatisfaction was found with 23% of the group of senior teenagers and 13% in the group of junior ones. Among the students in the school of CIT the "dissatisfaction" is observed in 2% of the senior and 4% of junior teenagers. The statistical processing with Fisher's coefficient (for angular transformation) confirmed significant differences in the group of senior teenagers ($\varphi = 2{,}24$ $\rho = 1\%$).

The satisfactory results in terms of the emotional and psychological status in the group of senior teenagers is 21% in the "school of humanities" and 37% in the "school of CIT" and in the junior groups it is respectively 38% and 29%.

The indicators of good status are as follows: 56% for senior teenagers of the "school of humanities" and 61% of the "school of CIT", for junior teenagers it is respectively 49% and 67%.

This gives us grounds to say that there is a tendency to affect the specifics of educational psychological efficiency of the interaction of learners with computer technology in educational activities. The variety of computer use in education in the "school of CIT" leads to the fact that interaction with computers consists of a high percentage of negative emotions, but there is no negative impact on the psychological state of the student.

In the logic of the study, we believe it is appropriate to consider the nature of self-efficiency of learners in the two types of schools. The results are shown in the below figure.

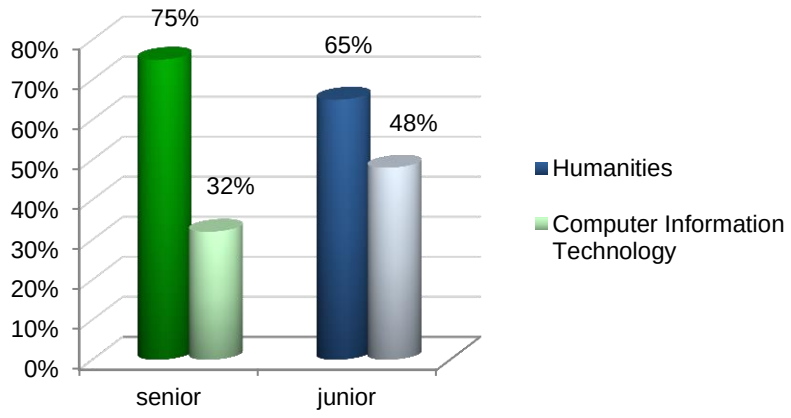

Fig. 2. Level of personal efficiency of learners

The analysis of the results shows that teenagers of the two schools have a sufficiently high index of self-confidence and confidence in their abilities.

The high self-efficiency could possibly show relatively high persistence of teenagers in achieving their goals, readiness for successful solution of educational problems, stable positive attitude to one's own abilities, the capacity to study actively in different social situations, high self-esteem. From a cognitive point of view, knowledge in a field of knowledge contributes for the efficiency of cognitive processes and high achievements in different educational situations.

Self-efficiency is evident in behavior: students with high perceptions of personal efficiency, which is a sign of higher productivity have a higher probability to succeed as compared with students with low self-efficiency. Results show that adolescents from both schools successfully apply their knowledge, skills and intellectual capacity in the proposed learning conditions.

An important aspect of the efficiency of the learners - computers interaction is to determine the individual characteristics of conscious self-regulation.

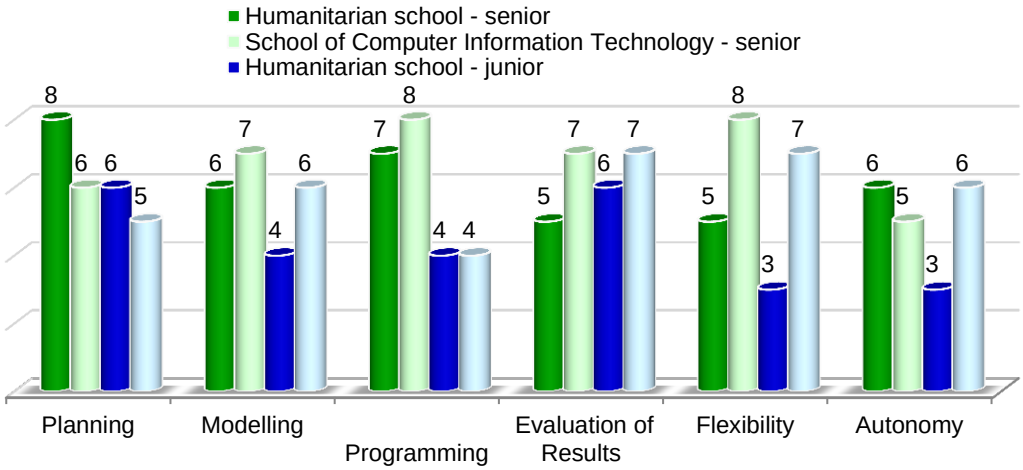

Fig. 3. Indicators of the style of conscious self-regulation of behavior in teenagers

We can expect from these data that senior teenagers in computerized educational activities could form an ability to significantly relieve pressure in order to achieve their goals in the present situation. The results from the programming indicator presuppose that teenagers need to consider how to form their actions and behavior in order to achieve the detailed purposes of programmes. Junior teenagers, as they have small experience in their work with computers in an educational environment have no time to develop the capacity to form a programme of action. But the tendency to develop these functions is identified.

The peculiarities of the interaction of teenagers with the computer can be linked to a state of anxiety, which refers to the psychological effects of training and computerization.

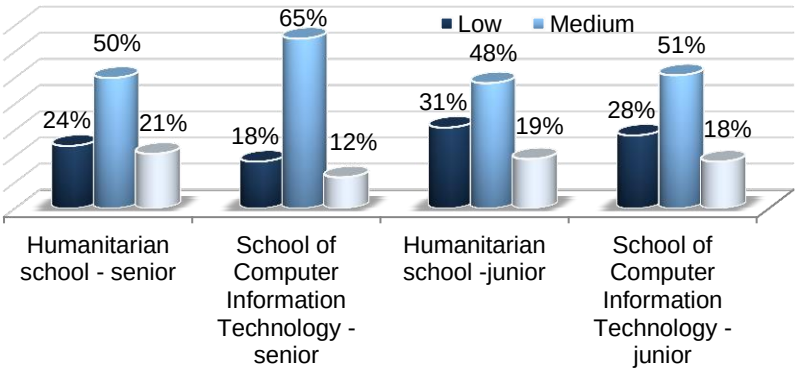

Fig.4. Indicators of levels of situational anxiety in lessons with computer technology

The analysis of results shows a tendency for emergence of anxiety in the "school of CIT". The tested situational anxiety allows qualitative and quantitative measurement of the state of anxiety that emerges as an emotional reaction to a stressful situation. Situational anxiety is characterized with stress, tension, nervousness. Very high reactive anxiety causes disorders of higher mental functions. The statistical analysis of data using Fisher's angular transformation confirms the significant differences in the average level of anxiety in the group of senior teenagers $\varphi = 2{,}51$ ($p < 0.01$).

This means that teenagers studying in schools teaching with CIT tend to be emotional in stressful situations. Significant deviations from the moderate level of anxiety require special attention. They presuppose tendency to situational anxiety in moments of assessment of competence. On the grounds of these details we will conclude that learners using computers tend to feel emotional and psychological discomfort. Or it means that training is done as computers take the role of teachers. But, by contrast with teachers, machines are not adapted to the individual needs of students and this could lead to emotional discomfort.

6. CONCLUSION

The results from the pilot study allow us to confirm the empirically established criteria and indicators of psychological readiness:

1. A high percentage of teenagers trained in schools of humanities have low level of psychological efficiency in their interaction with computers. They feel anxiety while they use them for learning and this is the *emotional and personal component*. The low level of competence in solving educational problems by using CIT is the *cognitive component*. Indicators of self-regulation, e.g. programming and modelling, and the lack of skills to work with computer technology is the *operational component*.

2. The different educational models form the image of computer characteristics of perception: in the "school of humanities" – *subjective attitude*; and in "schools of CIT" – *objective attitude*.

3. The introduction of computer technology in the educational process of secondary education has ambivalent[1] nature in the context of psychological effects of computer-based education: schools with CIT show increased levels of situational anxiety in situations requiring work with computers during school tasks.

On the other hand the machine language is an underdeveloped dictionary limited in the programme and this could lead to poorer verbalization of students. The representatives of the traditional educational model, in general, believe that state schools are not specialized in training programmers and specialists in CIT; they have other educational objectives but intensive use of computer technology in the field of education is a must.

This attitude to the use of computer technology in the variety of educational models is almost the opposite. We believe that it is necessary to find the optimal parameters of a modern educational model that must combine the two educational approaches and where the roles of teachers and computers will be complementary. After all, studying its characteristics in a well organized structure of educational activities depends on the development of students

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[1] ambivalent – duality, validity of two opposites

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