
Cognitive Educational Technologies

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Abstract

Modern educational environment is a quickly developing high-tech sphere overloaded with information. Modern students have adapted to the new environment: they became informative digital natives; they have mosaic thinking and can do several things simultaneously; they are quite poor personal time managers and have a low level of motivation; they are more viewers than readers, are too sensitive and emotional, and are quite naïve and childish for their age. The challenge of modern education is to provide students with up-to-date techniques to choose and filter information so that to overcome functional illiteracy and perform successfully in modern world. Cognitive educational technologies pay emphasis on development, enhancement and elaboration of principal cognitive processes – acquisition, concentration, memory, imaginative thinking and cognition

Key Words: cognitive educational technologies, functional illiteracy, information comprehension



Modern educational environment is a quickly developing high-tech area overloaded with information and digital devices that deliver information. Modern world accumulates information with the incredible speed. Researchers estimate that over the last 10 years we produced more information than in the entire history of mankind. [1] Every year, they say, humanity produces the amount of information equal to a thousand years volume. Besides, scholars point out that at no time in history has technology moved so fast. [2]

New time raises new questions: How to cope with information overloaded environment? How to live and work productively in modern society? How to separate valuable and useful information from information that clogs the brains? What are the criteria for such a choice?

Any educational system should meet the needs of the society. Information saturated society has changed the University, the system of education and the object of education – modern students. Who are they – modern students?

Modern-day Students

Modern students are very often called digital natives (digi-natives). They are familiar with the hi-tech culture. They are more informative than their parents and grandparents used to be at their age. They know how to access any information they need from anywhere on the planet. To assimilate and absorb the information necessary and useful for life and study, it is of the most immediate interest to be prepared and to understand how technology can change and better live. And that's what young people are not good at. [3] Many students experience difficulties in basic issues like life-motifs, vital interests, future career, academic achievements, etc.

Modern students do not know how to filter information. They have troubles in telling the difference between high-quality and low-quality resources, in “distinguishing media outlets and websites that at least try to report news and facts

objectively from those that are deliberately partisan or ideological.” Educators insist, that “a fine eye for evaluating the quality of sources must be learned, and even taught, rather than assumed to be part of our standard equipment.” [4] To filter information students have to learn how to distinguish between valuable information and obvious garbage. It's one of the main goals of modern education – to provide students with significant criteria to filter the information. And that's what students intuitively expect from the university education. They also want to professionally identify themselves, to clear-up ways of their self-education and to find out their own way to live and grow up in information-rich environment.

Modern students have mosaic thinking. They formed a fundamentally different mechanism of memory: they record the facts and not the content, and the place where the desired information is kept. [5] It is natural that the brain adapts to new needs. And to assimilate huge amounts of information, representatives of the digital generation have to make enormous efforts to develop mental concentration. But they are not eager to do it. Young people cannot concentrate and focus on a particular subject for a long time. Sustained attention is not a key-strength of modern students.

Modern students can do several things simultaneously. They do several things at a time: check their e-mails, chat in nets and with their classmates, listen to parents/ teachers, participate in classroom activities and even try to get ready for the next class. Neurologists call it “multitasking”. But they also say there's nothing to be proud of because the so-called multitasking is a powerful and diabolical illusion. [1] Earl Miller insists that “there's always a cognitive cost”. Multitasking causes mental fog or scrambled thinking, the brain loses focus; we become less efficient. Multitask is detrimental to cognitive performance. Glenn Wilson points out “that being in a situation where you are trying to concentrate on a task, and an email is sitting unread in your inbox, can reduce your effective IQ by 10 points.” Wilson showed



that the cognitive losses from multitasking are even greater than the cognitive losses from pot-smoking. Russ Poldrack, a neuroscientist at Stanford, found that learning information while multitasking causes the new information to go to the wrong part of the brain. Earl Miller adds, "People can't do [multitasking] very well, and when they say they can, they're deluding themselves." [ob.cit.]

Modern students are quite poor personal time managers. They sometimes cannot adopt tasks like staying in touch with friends or associates, checking e-mails, chatting with friends, attending parties, shows, etc. To improve time management D. Levitin recommends off-loading of the responsibilities of "personal management". [4]

Modern students have low level of motivation. They do not try hard to get the best possible education and high grades at the exams. Evidently, the more motivated the students are the more productive, successful and effective is the process and the results of education. Scholars distinguish between two different kinds of motivation – intrinsic and extrinsic – which are based on the different reasons or goals that give rise to an action. Intrinsic motivation refers to doing something because it is inherently interesting or enjoyable; extrinsic motivation refers to doing something because it leads to a separable outcome. Student can be highly motivated to do homework out of curiosity and interest or, alternatively, because they want to procure the approval of a teacher or parent. These two types of motivation have functional differences. [6] Over three decades of research showed that it is intrinsic motivation that results in high-quality learning and creativity. Results of extrinsic motivation are not that obvious and depend on the type of extrinsic motivation. Thus, students can perform extrinsically motivated actions with resentment, resistance, and disinterest or, alternatively, with an attitude of willingness that reflects an inner acceptance of the value or utility of a task. [ob.cit]. Nowadays, many teachers point out that students are neither intrinsically nor

extrinsically motivated to do homework, read books, pass proficiency tests, find a good job. They are not enthusiastic enough to learn, read and practice in class. However, some students show quite a progress when they start asking questions when they feel curious enough about their future career perspectives and effective ways of studying.

Modern students are more viewers than readers. They prefer visual aids to reading. They would rather choose watching videos, video-clips and TV shows and play computer games than read books. Researchers found out that modern young people comprehend video materials 6 times better and faster than any printed matter. They simply do not understand printed material; they need a moving picture. [7] Students do not want to read books they have to ponder over. Old classic conceptual thinking, when it was necessary to understand the essence of things, today is an outdated option. Student would like to view the beginning, the process, the sequence of events and the end of the story in a 2-minute clip, than spend evenings on reading books where events do not come thick and fast.

Modern students are too emotional and too sensitive. They feel offensive and depressed – sometimes quite unexpectedly for teachers. Their overprotective parents send warnings to school, report to the MOE about mistreatment of their children. The newspaper "Daily Mail" (Daily Mail Online) reports that in America, students are increasingly demanding that college officials protect them from words and concepts that they find offensive, claiming that such matter may harm their emotional welfare. American teachers have to use "trigger warnings" to let students avoid discomfort by opting out of viewing it. [8] Many professionals point out, that such "oversensitivity" might damage the whole education, generate dangerous mental habits, effect the entire class, etc. 'One of my biggest concerns about trigger warnings is that they will apply not just to those who have experienced trauma, but to all students,' one of the teachers wrote in "The Chronicle of Higher Education" last year. She said the warnings could create an atmosphere in which students 'are



encouraged to believe that there is something dangerous or damaging about discussing difficult aspects of our history'. [ob.cit] Greg Lukianoff and Jonathan Haidt, authors of "The Atlantic report", add that allowing students to avoid subjects that might upset them is not effective in the long run - because they will simply retain their fear of the topics. Instead, 'colleges should do all they can to equip students to thrive in a world full of words and ideas that they cannot control,' they write. [ob.cit]

. In such a situation the President of the country, Barak Obama had to clarify his position. In his speech at an education town hall in Des Moines, he said that college students should not be shielded from different perspectives due to sensitivity. According to "The Washington Post", he said: 'I've heard of some college campuses where they don't want to have a guest speaker who is too conservative, or they don't want to read a book if it had language that is offensive to African Americans or somehow sends a demeaning signal towards women. I've got to tell you, I don't agree with that either - that you when you become students at colleges, you have to be coddled and protected from different points of view. 'Anybody who comes to speak to you and you disagree with, you should have an argument with them, but you shouldn't silence them by saying you can't come because I'm too sensitive to hear what you have to say.' [ob.cit]

Modern students, at least the bulk of them, are more naïve and childish than their parents used to be at their age. Scholars say there is an evolutionary reason for that - in modern world life expectancy increases, people live longer, that is why young people remain in their adolescent period longer than their parents. The puberty age of their grandparents started around 13-15 years but with modern students the picture is different - it starts around 21 or even 23 years. Most of modern students are not mature or experienced people. Some of them cannot identify their goals and their motives; they cannot realize why they have to practice that hard at school. They quite often do not realize why they study, what they

study for, what job they have to do after they graduate from the university. They set up goals, start doing homework and try to reach success in studies. [7]

That's why it is of utmost importance for the teachers to take into account modern students' unique features and focus on their needs, help them become mature, knowledgeable and highly qualified professionals and avoid the so-called functional illiteracy - an overwhelming phenomenon disrupting life of young generation, causing stress and disappointment of their life and their future in general.

Functional Illiteracy

Scholars recognize 2 meanings of illiteracy - a narrow meaning and a wide meaning. In its narrow meaning "illiteracy" means "inability of people to read and write". In its wide meaning "illiteracy" is "any inability of a person to learn or to apply what he studies". [9]

Researchers distinguish between at least 20 types of illiteracy - cultural illiteracy, critical illiteracy, emotional, functional, information, reading and writing illiteracy, etc. (for more details see: ob. cit.) Some of them refer to the field of education, e.g., "functional illiteracy" which is defined as any inability of an individual to use reading and writing skills efficiently in everyday life situations. It is a sort of professional illiteracy. In this case we speak about the quality of any activity - functional illiterates cannot function effectively in modern society. They can read elementary texts and write messages using limited vocabulary, simple grammar, syntax and style but cannot deal well enough with everyday requirements and cannot adequately perform fundamental tasks in modern society.

Roots for professional illiteracy lie in high school and university education. Functional illiterate cannot learn properly well from parents and teachers, cannot understand what teachers want from them, cannot comprehend texts, tasks, orders, content, etc. Functional illiterates may have spent up to 12 years in public schools and



learned how to recognize some words but are incapable of decoding the written language. They are frustrated, handicapped readers who find reading so onerous that they avoid it.

Statistics

In the US, 43% of the adult population is at the below or basic level for prose literacy; 34% are at the below or basic level for document literacy; and 55% are at those levels for quantitative literacy. Only 13% of the population is proficient in these three areas—able to compare viewpoints in two editorials; interpret a table about blood pressure, age, and physical activity; or compute and compare the cost per ounce of food items. [11]

In 2003, the National Center for Education Statistics (NCES) reported that only 13 % of American adults are highly literate, 56 % have intermediate literacy skills, and that 43% of American adults are virtually illiterate. According to "Business" magazine, an estimated 15 million functionally illiterate adults held jobs at the beginning of the 21st century. The American Council of Life Insurers reported that 75% of the Fortune 500 companies provide some level of remedial training for their workers. [10]

In 2007, the National Endowment for the Arts released its own survey of literacy in the United States. According to its report, *Reading at Risk*, the number of 17-year-olds who never read for pleasure increased from 9 % in 1984 to 19 % in 2004. Almost half of Americans between the ages of 18 and 24 never read books for pleasure. Endowment chairman, Dana Gioia, commented: "This is a massive social problem. We are losing the majority of the new generation. They will not achieve anything close to their potential because of poor reading." [16]

According to Slow Decline's Weblog: "Functional illiteracy in the United States is growing at a rate of over 2 million new inductees per year into its ranks and the tide will only grow stronger if current educational policies are not changed to address the problem. The Presidential legislation of "No Child Left Behind" is not

working and the country as a whole is now and will in the future suffer the consequences." [17]

In the UK, according to the "Daily Telegraph" (14 June 2006) "one in six British adults lacks the literacy skills of an 11-year-old". The UK government's Department for Education reported in 2006 that 47 % of school children left school at age 16 without having achieved a basic level in functional maths, and 42 % fail to achieve a basic level of functional English. Every year 100,000 pupils leave school functionally illiterate in the UK. [11]

Hidden Illiteracy

Functional illiteracy belongs to the type of hidden illiteracies. English philosopher Alfred North Whitehead once said, "Not ignorance, but the ignorance of ignorance is the death of knowledge." "Hidden illiterates are ignorant of their own illiteracy. Their illiteracy is hidden from themselves. They do not fully comprehend the information and ideas being received, studied, or applied; they are not aware they do not understand. Their actions, feelings and beliefs are founded on their unknown wrong suppositions, ideas and understandings." [12] This creates a damaging self-image that can last a lifetime.

Who are the hidden illiterates? It is the office worker who can't figure out why his computer erased an important document; the marketing person who can't seem to finish the promotional piece; the dentist whose fillings need to be replaced more often than they should; the mechanic who "fixed" your car three times for the same problem; or the student who works hard studying for a history or biology test but never gets a good grade.

The problems caused by hidden illiteracy are seen in products not completed, jobs poorly done, or great potential unrealized. Functional illiterates become a problem that dramatically impacts not only their individual lives, but also their families and their work. It even reaches into the political, economic and social health of the nation.



Cognitive Approach: Informational Competence

In the new environment the role of a modern teacher has changed. The teacher is no longer the only one who exclusively carries information. A couple of decades ago, only the teacher possessed information because he had had methodical and regular knowledge which he received from his teachers and books and as a result of his systematic hard work and highly qualified education. Nowadays every student has access to vast amounts of data. In this situation, the question arises whether students need a teacher in the classroom or not. The challenge of modern education is to provide our students with up-to-date techniques to choose and filter the right information; to provide students with criteria and relevant backgrounds that might help them to live and work and function successfully in modern world. That's why the main purpose of modern educational system is the formation of the so-called informational competence of students.

Informational competence means that students acquire a set of skills to use information from different sources, books, article and websites; have skills to express their own ideas in accord with the norms of the language, rules of logic and quite extended vocabulary; review articles, books, speeches, and movies; collect data on a particular problem, analyze and compare by using appropriate criteria; assess the material in terms of its usefulness, etc.

They say a mark of true education is an ability to produce quality products in quantity. [ob.cit.] Rapid changes in the society, increasing information exchange between people and the fact that the amount of information already exceeds human capabilities of its perception gave start to the development of new educational technologies. One of quite effective educational approaches is the so-called cognitive approach. New cognitive technologies are methods, practices and ways that provide effective comprehension of the real world and the society they live in, successful adjustment to the information saturated environment and

intellectual and mental growth of an individual. New techniques pay emphasis on development, enhancement and elaboration of principal cognitive processes – perception, attention, memory, imagination and thinking.

Cognitive educational approach develops skills of perception and processing of information, commenting of oral presentations, ability to ask special and clarifying questions, participation in discussions, ability to find strong arguments to support his/ her points of view, ability to find and analyze mistakes in his/ her own texts and authentic texts (oral or written), etc.

Cognitive educational approach develops critical thinking – ability to find difference between factual statements and value judgments and statements, facts and assumptions, to distinguish between logical and specific means of communication, between substantial and non-substantial arguments, between reasonable and unreasonable assessments, etc.

Cognitive Educational Techniques

When it comes to language education, it is of utmost importance to use a whole complex of cognitive educational techniques to focus on the development and improvement of basic cognitive processes such as acquisition, concentration, memory, imaginative thinking, and cognition. As a result, a number of functional illiterates reduce whatever the field of endeavor. Language as the means of social-cultural communication guarantees outgrowth of students' social activities, expression of their thoughts, ideas, feelings, beliefs, emotions, assessments, etc.

To realize students' potential in foreign language, learning efforts should be concentrated on three levels: a level of the vocabulary, a level of the discourse structure and a level of communicative patterns.

A problem of shallow vocabulary might cause miscomprehension of ideas, of interaction itself and as a result dramatically impacts students' identity, self-determination and self-image which could be damaged if students are not able to



provide communication in a proper way. To remedy this problem, students should focus on five aspects: word-definition, word-building patterns, word-grouping, correct usage of word-combinations, and stylistic reference. Word-definitions in the English language help to clear a misunderstood word, a concept of its meaning and its uses in a sentence. Educators point out that this could require ten or even more sentences. Competence in word-building patterns (word-derivation, word-composition, shortening, conversion, etc) provides students with skills to understand extended English vocabulary and neologisms. Restrictions on word-combinations are caused by linguistic traditions. That is why they should be singled-out in a sentence and memorized as set-up phrases and idiomatic expressions. Improvement of the vocabulary assumes careful work and practice on word-groupings – synonyms, antonyms, homonyms, paronyms and the like. Correct stylistic references make students sound adequately.

Educators fervently believe that it is extensive reading and reading for pleasure that could ensure correct word usage. Extensive reading, in other words “free voluntary reading”, means a large amount of reading. Researchers point out that “reading for pleasure is more important for students’ educational achievements than their family’s wealth or social class. Extensive reading in language learning motivates learners, it can provide comprehensible input, increase knowledge of vocabulary, enhance learners’ general language competence, increases the students’ exposure to the language, can lead to improvement in writing, consolidate previously learned languages, helps to build confidence with extended texts, encourages the exploitation of textual redundancy, facilitates the development of prediction skills”. [13]

Contextual analysis leads to critical thinking – an essential component of language education. Researchers define critical thinking from various aspects as it is a multi-sided phenomenon is communicative “ability and

willingness to ask and answer questions” (Keeley and Browne, 1994), a mode of thinking (Paul, 2003); mental ability and cognitive activity, “skilled and active interpretation and evaluation of observations and communications, information and argumentation” (Fisher, 2001); possibility to set up a hypothesis or draw conclusions about it - that integrates all available information and can therefore be convincingly justified.” (Kurfiss, 1988) [for details see: 17]

In American Philosophical Association they refer to critical thinking as purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, or contextual considerations upon which that judgment is based... They define the ideal critical thinker as habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. [14]

Critical thinking encourages active learning. Some useful tools to promote critical thinking are: students interpret the title of the book, predict the content, explicate the main idea, analyze and evaluate the logic of the text, find implications of the author’s reasoning, most fundamental inferences and conclusions, the author’s basic concepts, etc. [for more details see: [15] On the other hand, reading and analyses of the text play a significant role in dynamic development of critical thinking. Employers commonly complain that “entry-level employees lack the reasoning and critical thinking abilities needed to process and refine information.” [16]Critical thinking strategies accomplish a variety of academic tasks and also let graduates “function effectively when they enter the workforce.”

Studies have shown that critical thinking



encompasses a broad range of linguistic and cognitive skills and sub-skills that include information processing, inquiry, reasoning, creative thinking, and evaluation skills - all of which are crucial for academic success. [for more details see: 15]

All the cognitive educational strategies and techniques described above develop language competence, improve quality of language education, reduce functional illiteracy and organize students' independent self-learning and continuing education of under-graduates.

Obviously, education is the right source for the development and improvement of an individual. Without education, without acquiring cultural values, behavior modals, mastering professional skills it is very difficult to become an individual, to acquire self-determined behavior, competence, freedom and autonomy.

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