Tätigkeitstheorie

Neue Medien in Schule und Hochschule. Konzepte und Praxisberichte aus der MGPPU

zusammengestellt von
Olga Rubtsova und Natalja Ulanova,

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herausgegeben von Georg Rückriem und Hartmut Giest

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Editorial

Digitale Medien und insbesondere netzbasierte Informations- und Kommunikationssysteme (Web 2.0) haben international die Diskussion zum Zusammenhang von Lernen und Medien beflügelt. Nachdem zunächst um die Jahrtausendwende unrealistische Vorstellungen aufkamen, ist inzwischen Ernüchterung eingetreten. Die geforderte, ersehnte, erwünschte und sicher mit Blick auf Erfordernisse der gesellschaftlichen Entwicklung notwendige (neue, d.h. digitale) Lernkultur stellt sich nicht durch das Verfügbarmachen der ihr zugrundeliegenden Technologie ein: Der Computer, Multimedia, das Web als Technologie beeinflussen das Lernen bzw. seine Kultur weit weniger als erwartet. Die breite Verfügbarkeit der digitalen Technologie hat zwar Auswirkungen auf das Lernen und Lehren, aber keineswegs immer die, welche man sich wünschen würde, um die Lernprobleme moderner Gesellschaften lösen zu können (Stichwort neue Lernkultur – vgl. Giest 2010, Porshnev/ Giest 2012).

Kulturvergleichende Untersuchungen (Deutschland/ Russland) machen auf deutliche Unterschiede aufmerksam – Porshnev/ Giest/ Sircova 2012): Der Ausstattungsgrad mit Computern, der Zugang zur Breitbandtechnologie zeigen deutliche Einflüsse auf Lernen und Lernmotivation, nicht aber in der Richtung, dass technologische Ausstattung immer auch höhere Qualität der Lerntätigkeit bedeutet. Ein Kurzschluss zwischen Ausstattung mit digitaler Technik und qualitativ höherwertigem Lernen greift zu kurz, wie inzwischen eigentlich alle medienpädagogischen Untersuchungen belegen.

Eine Ursache für diesen Befund ist, dass eine theoretische Fundierung medienbasierten Lernens zur Voraussetzung hat, dass eine gründliche Beschäftigung mit dem Medienbegriff und mit den Besonderheiten digitaler Medien auf dem Hintergrund der gesellschaftlichen Entwicklung vorgenommen wurde. Lernen mit Medien ist eben nicht nur ein lerntheoretisches, pädagogisches oder medienpädagogisches Problem, sondern muss für eine adäquate Untersuchung in den Zusammenhang von Medienentwicklung und Gesellschaft eingebettet werden. Dies leistet eine moderne Medientheorie, welche zunächst konsultiert werden müsste, sollen pädagogisch oder psychologisch intendierte Untersuchungen unternommen werden.

Russland hat hinsichtlich der Medienausstattung und Mediennutzung einen gewissen Rückstand gegenüber Westeuropa. Daher ist verständlich, dass man sich hier mit

einiger Verspätung dem Problem des Zusammenhangs zwischen digitalen Medien und dem Lernen und Lehren theoretisch und praktisch widmet.

Interessant ist in diesem Zusammenhang, dass es an der Moskauer Staatlichen Universität für Psychologie und Pädagogik (MGPPU) an der Fakultät für Informatik, der Fakultät für Psychologie und Pädagogik Forschungsprogramme gibt, die sich auf dem Hintergrund der Tätigkeitstheorie explizit mit der theoretischen Diskussion und praktischen Entwicklung von computerunterstützten Methoden des universitären und schulischen Unterrichts befassen. Auch wenn wir den Eindruck haben, dass die theoretische und methodologische Diskussion des Medienverständnisses noch nicht sehr ausgeprägt ist und auch die Rezeption der Entwicklung zahlreichen Formen des E-Learning bzw. Blended-Learning, der netzbasierten Kollaboration (Social-Software in Lern- und Lehrprozessen) vor allem in den USA noch eher in den Anfängen steckt, haben wir das Angebot gerne angenommen, mit der vorliegenden Auswahl von Beiträgen von führenden Vertretern einen Überblick über den Stand der Entwicklung an der MGPPU zu und interessante Anregungen auch für uns zu erhalten, die wir hier zur Diskussion stellen.

Georg Rückriem und Hartmut Giest

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Content

Abstracts

Vitaly Rubtsov: Der Tätigkeitsansatz des Lernens und das Problem digitaler Lernunterstützung

Der Artikel berührt verschiedene Aspekte der Nutzung von Computern und digitalen Techniken im Lernprozess aus Sicht des Tätigkeitsansatzes. Herausforderungen, die Computer als Mittel der Tätigkeitsmodellierung darstellt, werden diskutiert.

Bronyus Bronevich Aysmontas: Psychologisches Hochschulstudium auf der Basis des Distance Learnings: Erfahrungen, Probleme, Perspektiven

Dieser Artikel analysiert Erfahrungen bei der Entwicklung und Anwendung von Technologien des Distance-Learning im Bereich der höheren Berufsbildung. Besonderes Augenmerk wird auf die Entwicklung wissenschaftlicher, tutorieller und methodischer Materialien für das E-Learning gelegt: wissenschaftliche und methodische elektronische Komplexe, per Video aufgezeichnete Vorträge, Tests für On- und Offline-Prüfungen usw. Der Artikel beschreibt Besonderheiten der verschiedenen Materialien, analysiert ihre Struktur und berichtet über Erfahrungen bei ihrer Entwicklung. Die Qualität des Fernunterrichts wird in Abhängigkeit von einer Vielzahl von Faktoren behandelt, einschließlich speziell angeordneter Wechselwirkungen zwischen Dekan und Studenten, Mitarbeitern und Studenten sowie Studenten und ihren Kommiliton/innen. Solche Wechselwirkungen sind Internet-Konferenzen, Webinars und anderen Formen der Interaktion zwischen den Gegenständen eines Lernprozesses. Darüber hinaus betrachtet der Artikel Fragen des Einflusses von Distance-Learning-Technologien auf die Entwicklung der Persönlichkeit von Schülerinnen und Schülern wie z.B. Selbständigkeit und Aktivität.

Konstantin Yulievich Bokhorov, Elena Yurievna Ermakova and Viktorya Andreevna Fomina: Multimedia Technologien – ein Weg zur Kreativität

Dieser Artikel beschreibt psychologische, kreative und kognitive Probleme, denen behinderte Studenten während des Studiums im Kurs „Leitung von Multimedia-Programmen“ an der Fakultät für Informationstechnologien an der MGPPU begegnen. Unsere These ist, dass Schüler nicht so sehr instrumentelle Einführungen zu Multimedia als vielmehr theoretische- und paradigmatische Anpassungen an die

intensive Entwicklung der Realität der digitalen Revolution benötigen. Auf der Basis unserer Lehrerfahrungen im Kurs „Leitung von Multimedia Programmen“ und in der kreativen Arbeit mit Studenten geben wir Empfehlungen zur Unterstützung behinderter Studenten zur Überwindung psychologische Barrieren bei der Entwicklung neuer (Multimedia) Werkzeuge für eine vollständige Aufdeckung ihres humanitären Potentials.

Tatiana Ermolova: Der Einfluss von Computerspielen auf soziale Determinanten der Schulfähigkeit von Vorschulkindern

Der Artikel konzentriert sich darauf, wie die Reduzierung traditioneller Spiele von Vorschulkindern und deren Ersatz durch Computerspiele die soziale Entwicklung von Kindern am Ende des Vorschulalters sowie ihre Schulfähigkeit hinsichtlich der sozialen Determinanten ihrer Persönlichkeit beeinflusst. Diese Studie ist Teil einer Reihe von Arbeiten, die sich beschäftigen mit 1) sozialer Reife als einer neuen Spezifik der Persönlichkeitsbildung von Kindern, die mit dem systematischen Schulunterricht beginnt, und 2) der Bewertung von Faktoren, die die quantitativen und qualitativen Merkmale dieser neuen Bildung bestimmen. Zur Klärung der Logik der aktuellen Studie halten wir es für notwendig, die Leser mit dem Inhalt der vorangehenden Phasen vertraut zu machen.

A. Yu. Kremlyova and E. O. Smirnova: Ein pädagogisch-psychologischer Ansatz für die Entwicklung computergestützter Förderprogramme für Vorschulkinder

Dieser Artikel beschreibt die Besonderheiten der Verwendung von Computern und Computerprogrammen in der Entwicklungsarbeit mit Kindern im Vorschulalter. Der Begriff des Computerspiels und der computervermittelten Tätigkeit wird diskutiert. Wir analysieren moderne Computerprogramme für Kinder im Vorschulalter einschließlich der Mängel und Risiken bei der Nutzung von Unterhaltungsprogrammen. Entwicklungsphasen des Computerprogrammes werden aus der Sicht des Tätigkeitsansatzes aus eingeführt. Zwei Arten von Entwicklungscomputerprogrammen – offene und geschlossene – werden eingesetzt. Die Vorteile der offenen (kreativen) Programme werden präsentiert. Der Inhalt eines einzigartig gestalteten Computerprogrammes des offenen (kreativen) Typs wird beschrieben, unter Angabe der Prinzipien, auf denen die Methodik des Unterrichts beruht. Schließlich präsentieren wir die Ergebnisse eines Ausbildungsexperimentes, das zeigte, dass das entwickelnde Computerprogramm und die vorgeschlagene Methodik des Unterrichts die Entwicklung

bestimmter Komponenten des systemischen Denkens, einem allgemeinen wesentlichen Indikator für Systematik wie Flexibilität des Denkens und der Phantasie, bei älteren Kindergarten Kinder fördern.

Olga Rubtsova and Natalya Ulanova: Digitale Medien als Mittel der Entwicklung der Reflexion bei behinderten Schülern – aus kultur-historischer Perspektive

Ein interdisziplinäres Forschungsprojekt „Digitale Medien verstehen“ wurde im Jahr 2011 in der Moskauer Staatlichen Universität für Psychologie und Erziehung gestartet. Das Projekt bezweckt die Untersuchung des Einflusses, den digitale Technologien auf verschiedene intrapsychische Aspekte der Entwicklung – insbesondere auf die Bildung höherer geistiger Prozesse – ausüben. Die Untersuchung basiert auf der Grundidee der kulturhistorischen Theorie (L.S. Vygotsky, A.N. Leontjew, A.R. Luria), die auf den entscheidenden Unterschied zwischen Werkzeug und Zeichen in der menschlichen Tätigkeit verweist. In der Forschung werden digitale Medien als kulturelle Zeichen verstanden, die auf höhere psychische Funktionen und mentale Prozessen orientieren. Der Artikel befasst sich mit einer longitudinalen Fallstudie eines behinderten Studenten von der Fakultät für Informationstechnologie. Das Ziel der Studie besteht in der Untersuchung des Einflusses digitaler Technologien auf die Reflexion des Studenten, während er an seiner Diplomarbeit – einem Dokumentarfilm über seine Liebesgeschichte – arbeitet.

Vladimir Vyacheslavovich Sokolov: Psychologische Merkmale visueller Informationsaufnahme bei Schülern mit visuellen Beeinträchtigungen beim Üben der Arbeit am Computer

Dieser Artikel beschreibt, wie Kinder mit tiefgreifender Sehbehinderung visuelle Informationen auf einem Computerbildschirm mittels synthetischer Sprache wahrnehmen und die Erforschung der Eigenschaften von Benutzerkompetenzentwicklung bei Kindern mit visueller Deprivation. Wir stellen die wichtigsten Ergebnisse der Forschung und eine Reihe von methodischen Empfehlungen für die Erziehung der Kinder dieser Kategorie in der Arbeit auf dem PC ohne visuelle Kontrolle bereit.

Activity approach to learning and the problem of creating digital learning aids

Vitaly Rubtsov

The article touches upon various aspects of using computers and digital technologies in the learning process from the perspective of the activity approach. The challenges of using computers as a means of activity modeling are discussed.

1. The role of machines in human activity

Computerization of learning is one of the forms in which human-machine systems are extensively entering all areas of life. According to theory, the main component of such systems is human activity, while the machine component serves as a means and as a tool for its effective realization. Human activity has many types and forms, all of them derived from work activity. Its evolution in history generated other forms of activity, such as play, learning, research, etc. All forms of activity, though different in specific content, have common structure, which includes the following main elements (see A.A. Leontiev):

1. needs and motives;
2. tasks;
3. actions;
4. operations.

Actions of a human correspond to goals of a certain activity, and operations included into those actions correspond to conditions of accomplishment of those goals. When a machine is involved in the action, the human executes goal-setting and delegates operational realization of the action to the machine. At that, the proportion of actions and operations complies with a certain principle: when an action loses its goal, it turns into an operation, and vice versa – when an operation gains a goal, it turns into an action. Such mutual transitions are embodied in the process of creating human-machine systems.

In human-machine systems, which correspond to a certain type of activity, the human follows specific needs and motives to set forth tasks, and executes the operational part of the action directed at solving that task with the help of the machine. In other words, when human-machine system functions, the goal of the activity is defined by the human, while reaching the goal, i.e. getting some real product, is carried out by the machine.

However any human-machine system is effective only with the concurrency of its components, when the machine is well “inscribed” into the wholeness of human activity where needs, motives, goals and actions ultimately define productive functioning of the whole system.

Conditions for achievement of the goal, to which the operational part of the human action and, consequently, the use of machine tools and means are inextricably connected, can vary greatly – for instance they can be related to properties of the end product, speed of its production, physical or psychical capabilities of the acting person, or alterability of the conditions themselves. Human-machine systems were created when the human for one reason or another was not able to perform the operational part of his actions, and the machine could do it for him. Traditional machines were performing operations predominantly related to relatively constant and stable conditions of achievement of the goal, such as physical capabilities of human, requirements for speed of the product production and product quality etc. However the machines, being oriented at such conditions, were not able to perform operations that suggest, for example, account for rapid change in conditions of execution of the human actions.

This situation changed drastically when development of informational technologies led to emergence of intellectual systems, which intruded into the way a human executes cognitive actions. Such actions usually demand that the human orients himself to a large quantity of rapidly changing non-recurrent conditions, many of which are connected to properties of human psyche and properties of functioning of its products. Intellectual systems (IS) can fixate a certain part of those conditions in their configuration, and in that way perform operations of corresponding cognitive actions of a human. Yet any IS remains a tool and a means for performing operational part of such actions, while the tasks are always set by the human.

2. Human-machine systems for learning activity

Learning activity, in accordance with its specific content, is composed of learning needs and motives, learning tasks, learning actions and learning operations. The content of this activity consists in mastering theoretically generalized knowledge and skills, which allow a person to successfully solve different practical problems. Needs and motives of learning activity are connected to the aspiration of a person to master such knowledge and skills before one actually encounters practical problems, so as to be prepared to resolve them correctly. The learning tasks possess a special quality – when solving these tasks a person discovers the process of the genesis of the content of theoretical knowledge and skills and masters generalized modes of action in specific practical situations (see V.V. Davydov 1986).

The composition of learning actions, which a person performs when solving a learning task, is quite complicated, so they need to be listed. They are:

- transforming conditions of the learning task with an objective to discover a common relation in the basis of system of theoretical knowledge being studied;
- modeling a relation that was found in graphic or sign medium;
- transforming the relation model with an objective to study its general properties;
- singling out and solving specific practical problems using a generalized mode;
- control over aforementioned actions;
- evaluation of mastering the generalized mode of solving this learning task.

When a person performs these learning actions, he\she masters a certain system of theoretical knowledge and a general mode of solving a certain class of practical problems.

Learning operations are related to conditions of execution of learning cognitive actions; they are quite diverse and changeable, because those conditions correspond to the content of the subject, which is studied (mathematics, physics, language, history, etc.). If we consider the interchangeability of learning actions and operations, defining the composition of operations affirmatively to any extent is very difficult.

Due to this circumstance creating human-machine systems in the area of learning activity posed great problems, even though technologies, both elementary and complex, have been used since long ago (for example, calculation devices in learning arithmetic, different audio-visual aids, etc.). In 1920s in USA attempts were made to create real learning machines which would make learning easier for people, and in 1940-1950s programmed learning emerged, which was implemented necessarily with the use of computers, i.e. modern human-machine learning systems.

The experience of programmed learning with the use of computers still has scientific and practical significance. However we need to keep in mind that it was created on the theoretical basis of behaviorism, which tends to regard the learning process in a limited way, does not uncover the true content and structure of learning activity and is unable to define the true place of computer components in this activity. Behaviorist theory of learning made an absolute of exercise in the integral process of mastering knowledge and skills. Exercise may be correlated to some extent with such learning actions as solving specific practical problems and result control; however its connection to other significant learning actions, such as modeling, is negligible.

Based on this theory and with the use of computer systems, exerciser-type learning machines were created, which executed the processes of training and testing of knowledge and skills in different subject areas. However there are grounds to assume that in this way not the operations of the student's learning actions were mechanized, but certain operations of teacher's work (which in itself is surely important). As a result, when introducing students to new areas of knowledge and organization of learning activity such systems do not overcome but aggravate the problems that are typical of traditional machine-free learning. The scheme of knowledge transfer process accepted in this educational technology creates great difficulty for students in mastering the bases of reflective theoretical knowledge, because in the framework of this scheme learning becomes some sort of "programming" of actions and operations of the students.

Use of computers in educational process is not only a prerequisite of improvement of learning, but also a potential source of negative consequences. In particular, using IS can be a reason for breakdown of integrated activity system "teacher –

class" into isolated elements "student – computer" controlled by a teacher. Therefore, when designing computerized educational technologies one faces a special challenge of finding ways to organize communication and cooperation between teacher and students and among students. Development of such ways should involve:

- creating conditions of cooperation between schoolchildren and teacher during their work when such work is mediated by a computer;
- organizing collective "projects" which demand for a group of students to interact with a computer and for groups of students to interact with other groups;
- defining an optimal balance of computerized and non-computerized forms of learning;

The following three main aspects allow an integrated cohesive organization of educational process in conditions of computerized learning:

- management of gnostic activity of individual students
- management of learning activity as a system "teacher – computer – student"
- management of interactions between teacher and students and students among themselves

Being guided by psychological regularities and principles of each of these types of management is a mandatory condition for development of human-machine systems in education.

3. New computerized educational technologies – basis for development of modern education: Integration of the learning subjects in conditions of using computerized learning aids

Analysis of worldwide trends shows that digitalization expectedly led to new demands towards the system of education and towards the very principles of how we organize transmission of cultural-historical experience to younger generation.

The new intellectual learning gnostic tool with unlimited application potential that emerged in our culture uncovered widespread inadequacy of existing traditional forms of education, its objectives, content and ways of organization. Accordingly a

more constructive and essentially humanistic approach to design and prognosis of applicability of computer technologies in education gradually emerged and now dominates; this approach consists in shifting focus from the machine itself onto the subject of learning activity ("teacher – student – students") as the key factor in designing educational technologies.

Dedicated attempts to understand and conceptualize the poly-functional application of computer technologies in learning, to define their true influence on children's learning and upbringing processes and processes of acquisition of knowledge and skills resulted in emergence of interdisciplinary research area on the junction of psychology, pedagogy and technics which deals with a wide range of issues in knowledge engineering, computer science, linguistics, sociology, artificial intelligence and most importantly developmental psychology. In this new socio-ocultural situation the task of reconstructing education and developing new educational technologies (using IS or not) can only be solved with participation of all the aforementioned research areas, most importantly the ones that are human-oriented.

The following are the main characteristics of a computer as an instrument of human activity and principally new learning aid:

1. Computer provides access to virtually unlimited volume of information and its analytical processing. Sharp quantitative increase of potentially available information and speed of its acquisition leads to qualitative leap – a phenomenon of "direct involvement" of a person in the society's informational culture.
2. Computer is a universal tool of human gnostic and research activity.
3. Computer provides new, active form of fixation of psychic activity products. All preceding means of objectivation of psychic activity only created prerequisites for transformations performed by human himself, for example, analysis of selected aspects of knowledge content, verification against preexisting data, adding new information to data, using information to organize practical actions, and so on. Computer allows for the first time to fully execute and partially automatize these transformations.
4. Computer is the second most important (after traditional writing) sign tool enabling efficient exchange of information on the content of activity. Thus we

see an emergence of an essentially new area of application for language and generally for sign-symbol means of activity.

5. Among tools and instruments of human activity a computer has a special communicative characteristic which makes it stand out, a capacity to "enter into a constructive substantial dialogue" with a user and constitute together with a user a unified functional subject-oriented medium. Special character of this activity approach to organizing "the world of objects" is that a computer not just merely enhances a person's intellectual capabilities, affecting his memory, emotions, motives and interests, but changes and reconstructs the very structure of human gnostic and then productive activity.

It is known that active independent construction or reconstruction of activity is available to a person when he is able to purposefully access the basis of his own actions, perform planning and reflection, transform and construct subject content with which he is working. A computer mediating the gnostic activity provides such a possibility, because any action and impact from the user can be indexed, represented as a scheme or a model, saved, returned and fixated for analysis, evaluation and control. Additionally, any action can be scaled down to an operation and contrariwise explicated or reconstructed according to intentions and possibilities of the user and conditions of dynamic time-space representation of objects. In that sense computer is such an effective and sophisticated tool of objectivation for all components of learning activity, that it's hard to find an analogue in educational practice. At the same time computer as bearer of sign-symbol universe of activity is naturally oriented at integral, a priori ideal mode of representation of objects, whose modeling is impossible outside of integral poly-semantic explication that adequately reflects the contents of reality.

Hence we can make at least two conclusions. The first one is related to possibility of an integral representation of the content of the object environment created with the help of a computer, which seamlessly combines specific structures of knowledge (sciences and humanities) that fully represent the content of relevant items of learning. The second conclusion is that by virtue of integral object environment the most effective conditions emerged for children to form generalized modes of action, which determine development of proper forms of reflective theoretical thinking.

This integration itself can be done in two interrelated directions. Firstly, by combining material from different subject areas, which allows to determine and define the generalized principles and regularities of its explication. Secondly, such integration can be done as per modes of action of a student with subject content. In this case a system of generalized strategies for solution searching, information structuring, problem setting, etc. is formed, and at the same time this contributed both for the cognitive development of students and for effective mastering of the learning material. It should be noted that both integration per content of items of learning and integration per modes of transformation of items of learning should be based on logical-psychological analysis of subject or operational structures of knowledge that essentially define the new content of education.

That being said, using computers in the system of activity, which only aims at production of "symbolic material" (i.e. purely quasi-object-related activity) creates the risk of knowledge being broken off from object-related practical basis from which it originated. The solution to this problem lies in the way we use the learning aids. This is an area of complimentary complex application of the whole spectrum of cultural means of organizing learning activity and representation of knowledge content. In this context one can mention complex use of different IT tools in creating poly-functional object environment – joining computer, video, television, film, and interaction of this poly-functional environment with object-related "computerized learning forms".

4. Functions of educational computer as a means of activity modeling

As modern teaching practice shows, using computers in educational process is intended for predominantly the flowing four types of tasks:

First, a computer is used as aid for a more effective solution of existing didactic tasks. The content of an item of learning in a computerized learning program of this type is reference data, instructions, calculation operations, demonstration, etc. An example of such use of computers is IS.

Second, a computer can be a tool of solving individual didactic tasks within the common structure, goals and tasks of machine less learning. In this case the learning content itself is not input into a computer (which performs functions of con-

trol, training, etc.). This function of a computer is widely represented by interactive systems which model the activity of a teacher.

Third, the use of a computer allows setting and solving new didactic tasks, which cannot be solved in traditional way. A good example are computer programs imitating experiments. In these programs the item of learning can be: a) external parameters of some process; b) regularities not accessible to observation in natural circumstances; c) connections of phenomena being imitated with parameters automatically set by the program; d) search for parameters which optimize the process being imitated, etc. Possibilities for conjugation of real and computer experiment in learning are also subject of research.

And finally, fourth, a computer may be used as a means of modeling of the content of learning items by constructing it. In this process we can see realization of principally new educational strategies. A good example of such developments in computerization of education are the so called computer-based learning media, which represent models of knowledge areas that are being learned (see S. Papert, USA). Functionally oriented learning environment creates prerequisites for creating objectives and plans of action, which opens a possibility for a student to be the subject of his own activity. At the same time problems and restrictions of this learning technology based on constructivism principle in psychology (according to the concept of intellectual development of J. Piaget) are determined by the spontaneity of students' activity which in turn is related to the activity being performed through a system of game-like actions of a user with the content of object environment. For that reason the problem of transforming play motivation of children's activity into a full-scale executed and internally motivated learning activity remains an urgent issue in development of such technologies.

We believe that the principle of computerized activity modeling where conditions for search, representation through models and analysis of essential characteristics of an item of learning are recreated should be the basis for designing new developmental computer technologies in education. Computer is a peculiar learning aid and as such it performs several fundamental functions, more precisely, serves as a means for:

a) modeling subject content of items of learning;
b) modeling corresponding generalized modes of action;

c) modeling interactions and joint activity organization (“student” – “group of students”, “student” – “student”, “student” – “teacher”);
d) performing control and evaluation of students' actions adequately to joint activity structure and content of items of learning.

In interaction of the aforementioned functions computerized learning systems constitute an object-focused and communication-focused reflexively administered learning environment, which is organized as an integrated activity system including control as a necessary condition of its full functioning.

Attempts of experimental implementation of the named functions of computers demonstrate a number of important psychological characteristics of computerized technologies application on different stages of learning. For instance, constructing models of content of the items of learning with the help of a computer allows students to set and solve new problems on their own, which in turn allows a teacher to manage their improvement and transitions from one form of learning activity organization to another, so that the students develop in the logic of learning material. Possibility for mediated evaluation of their actions allows students to develop the basis of reflexive theoretical attitude to reality, ability of self-organization, planning and correcting their own learning work. Finally, we need to note the efficiency of using computers in the control and evaluation activity of schoolchildren.

To specify the strategy of activity approach based development and the use of computerized and digital learning aids in education let us lay out some clauses:

1. Computerized learning systems must be created purposefully for inclusion into integrated learning activity while taking into account all its components (with a special emphasis on learning actions and operations). This will ensure that the activity will not be deformed or even destroyed by the use of computers in learning process (which is what goes on more often than not). Computers should be used not only to teach a person certain knowledge and skills, but also to organize and manage his learning activity.
2. Computerized learning systems should be designed on the basis of preparatory analysis of content of the corresponding knowledge and skills as learning items: different content should have accordingly different programs of com-

puterized learning. But one computer can service the demands of different learning subjects.

3. Each program is created for the purposes of mastering some content represented in the language of some specific actions and operations. This allows construction of learning activity in accordance with the principle of movement of the thought from mastering basic actions and operations to mastering their complex ensemble; the latter is a prerequisite of integration of study subjects.
4. Computerized learning systems must combine the qualities of dynamic and semiotic (sign) models; when mastering these models a person performs the corresponding learning actions and thus will master the content of a certain subject matter that these models uncover. When working with such systems a person does not adapt to them, but instead acts with them, performs transformations of some subject material and controls these transformations in relation to the tasks set forth.
5. Computerized systems per se are not the "teacher", they are not the "management apparatus" which regulates the learning process; they are organically included into the process of solving learning tasks by the student. Computers here serve as a means of organizing joint activity of the teacher and students among themselves, providing for the following forms of their interaction:

    - distribution of actions and operations in the process of solving learning tasks between participants as well as cooperation between them;
    - mutual control and evaluation of actions and operations of students in the process of solving learning tasks with a certain sequence
    - joint modeling of schemes of object transformation as per teachers specification
    - reflection and presentation by one student of mode of solving the task applied by another student

6. These forms of student interaction organization allow the teacher to use the computer to organize learning activity in the system of "a collective polyalogue", i.e. to design learning situations as a dynamically modeled communicatively organized environment that provides wide interaction and cooperation possibilities to participants of the activity.
7. Certain types of computerized learning systems should be used for purposes of diagnostics of the level of development of certain learning activity compo-

nents, as well as control and evaluation (including testing) of results of knowledge mastering and skills content.

8. Computerized systems should be based on the age aspects of human development: different age periods correspond to different modes of content representation in learning systems (from quasi-object-related play forms in primary school age to quasi-research and creative research forms in middle school and high school age, etc.).
9. Creation of computerized learning systems should be done through in-depth research of modes of their application in different learning situations; such research and development should be the basis of understanding the possibilities of each system and its application in teaching and learning.
10. Using computerized learning systems should foster development of reflexive theoretical thinking, which uses logical and mathematical means for programming and planning of one's own cognitive actions and analysis of their implementation.

Clauses and conditions set forth above are already being put into practice:

- in development of examples of computerized learning systems based on modeling the content of objects of Russian language, physics, English language, nature study;
- in development of computerized methods of organizing joint activity of teacher and students in the process of setting and solving learning tasks, including ones based on using computer networks;
- in development of computerized methods of diagnostics of learning actions development level in different age groups of schoolchildren, and also computerized methods of reflexive-theoretical thinking development diagnostics.

This being said, there is still the need to deepen the research in this direction and create supportive conditions for it. We need to construct, on the basis of activity approach in learning and the acquired experimental data, a theory of design and application of computers in the system of integrated learning activity, and then we need to fill educational institutions with exactly such computerized learning systems, using which, in our opinion, will create the required learning effect.

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Higher professional psychological education on the basis of distance learning technologies: experience, problems, perspectives

Bronyus Bronevich Aysmontas

This article analyzes an experience of development and application of distance learning technologies in the field of higher professional education. A special attention is paid to the development of academic, tutorial and methodological materials for e-learning: academic and methodological electronic complexes, video-taped lectures, tests for on- and offline exams, etc. The article describes specific features of the given materials, analyzes their structure and shares some of the experience, concerning their development. The quality of distance learning is treated as depending on a variety of factors, including specially arranged interactions between a dean and students, between staff members of the dean's office and students, among students and their classmates. These interactions are practiced in the form of Internet-conferences, webinars, and other forms of interaction between the subjects of a learning process. In addition, the article considers the matter of influence of distance learning on the development of students' personality, namely such features as self-dependence and activity.

1. Introduction
Distance learning of psychology: pro et contra

Today, new approaches and technologies of education grow rapidly throughout the world. Elaboration and application of Internet-technologies change considerably all the aspects of our life, including education. Modern education is definitely inconceivable without information and communication technologies (ICT). The given technologies require a different approach to arrangement of the education process, present various methods of presentation of information, lead to a completely different level of arrangement of students' independent learning and require the revision of a teachers' role. Distance learning, different variants of open education are an excellent example of ICT application in education (Krasnova/ Belyaev/ Solovyev 2002, Shennikov/ Teslinov/ Tchernyavskaya 2006, Polat/ Bu-

kharkina 2007). In recent years, they have been actively applied in learning of psychology as well. As Michael G. Moore points out, “the time for transition to the distance learning is a truly historical moment”. Before now distance learning was not considered so important for social and economic growth. Over recent years the situation has changed a lot due to a constantly growing teachers’ interest to the application of information technologies, i.e. ICT, which provided new perspectives for interpersonal communication (Moore/ Macintosh/ Black 2006).

The term “distance learning“ is often used as a synonym for “distance education“, but is not identical to it. Distance education is a system and a process that provides curriculum resources for students. Distance learning can take many different forms and is typically characterized by the following: 1) separation by space and/or time of a student and a teacher, students and training materials, 2) communication among a student and a teacher, among students and their classmates, access to learning content is provided through one or more technologies (and not necessarily through electronic ones).

In Moscow State University of Psychology and Education distance learning has been put into life over the previous 10 years. Now we can conclude that within this period a new non-borrowed model of higher professional education for psychologists has been created. Many people may ask the question: Can one remotely teach psychology? If you understand remote learning in a simplified form, only as a “distance learning“, similar to the extramural traditional education, the answer is unequivocal: it is impossible. Why?

Traditional and distance learning have their advantages and disadvantages. Traditional pedagogy is considered to be based on technologies and methods of coercion. Unfortunately, the traditional approach to learning does not attach a special value to an independent work of students. A teacher (not a student) is usually the main figure in the learning process. Teachers often reproduce the out of date information from their own regularly reprinted tutorials or reduce the number of issues for discussion to the ones they know better or prefer more. In this case, the student is not an ordering side in his/her own education, and teaching methods are out of line with the advanced information technologies. These are just some of the common characteristics of our traditional training. Today, a variety of modern informational and communicative technologies alongside with Internet technologies has penetrated into all spheres of our lives. The nature of the educational

process has changed a lot under the pressure of these technologies. The well-known Soviet slogan “education for the rest of your life“ is now regarded as a throwback to the general progress. Every educated and intelligent person today understands that getting “education for the rest of his/ her life“ in a modern, rapidly changing information-related situation is unreal. So many people from general populace and businesses make a decision on qualification upgrading or getting the second higher education, including a psychological one. They cannot spend several hours per day for learning, which is necessary within traditional and often inefficient technology. They prefer to combine work and study at the University. This requires new approaches, new technologies, and new pedagogy, namely, andragogy. This is mainly what defines the degree of such rapid development of distance technologies both abroad and in Russia within recent decades. In the traditional sense, these technologies are associated with lack of contact with a teacher. It is quite possible in case of the advanced training, yet, it is not possible on the level of higher professional education. It is impossible to train specialists without their communication with a teacher. However, remote sensing technologies provide entirely different level of organization and management of an independent activity of the trainee. In our opinion, the best results can be obtained with the help of an optimal combination of the advantages of traditional learning and distance technologies, as the shortcomings of one system are compensated by the advantages of a different approach. This approach provided the basis for development of a model of distance learning of psychology at the faculty of distance learning in Moscow State University of Psychology and Education (MSUPE).

Specific features of a distance model of psychology learning in MSUPE as follows:

- Large volume of independent work.
- High self-organization and responsibility, ability to plan one's work.
- Purposefulness and inner motivation for a success.
- Readiness to change the habitual ways and forms of educational activity (“technological flexibility“).
- Experience of work with information on electronic media.
- Interactivity, orientation on parity relations in communication with a teacher and other students.
- Focus on the inner control in the situation of the teacher's “deferred“ mode control.

We will consider below a series of the above mentioned and other features.

2. Basis of distance learning in the distance learning department of MSUPE – a new approach to training and methodological support and arrangement of the educational process, development and implementation of information and communication technologies.

2.1 Training and methodological support

The quality of the distance learning depends largely on the level of training and methodological support. At present, the Bachelor program in psychology at the distance education faculty in Moscow State University of Psychology and Education is entirely supplied with the following tutorial items:

- Electronic training and methodological complexes (ETMC).
- Video–taped lectures.
- Video-guides on psychological diagnostics, professional-counseling and intervention techniques.
- Psychological media library.
- Educational materials on various aspects of learning.
- Information and enquiry materials.
- Interactive test (for self-test and self-control) and other materials (Fig. 1).

The training materials are the education-methodical complexes in electronic form (e-books). By now, we have developed more than 30 ones. 10 complexes were elaborated together with Peoples' Friendship University of Russia (software and engineering implementation). It was done within the framework of the federal program "Development, testing and trial operation of network teaching packages for e-learning in the direction of preparation 020400, 52000 (invariant disciplines of psychology), and in accordance with the nation-wide program "Development of the System of Open Education", launched by the Ministry of Education of the Russian Federation. Many designs for the development of distance learning programs were elaborated in 2007-2008 in the course of implementation of the Innovative educational program "Formation of the system of psychological education in Universities as resource centers for practice-related psychology".

Fig.1.: Items of training and methodological support, developed by the staff members of distance learning faculty in Moscow State University of Psychology and Education.

Alternatively to printed textbooks, electronic tutorials were worked out in a way to provide:

- detailed structuring of an educational course content,
- interactivity (including an easy-to-navigate interface) providing a possibility to change the format of presenting teaching materials in accordance with the trainees' abilities, thus changing the trajectory of learning,
- hypertext structure of theoretical courses, especially in conceptual parts of these courses (links to glossaries and encyclopedias),
- common use of illustrations - pictures, schemes, diagrams, drawings and animation,
- utilization of monitoring facilities for self-control, control and assessment of the knowledge received,

- availability of reference system (hyper-references) to printed and electronic editions, electronic libraries and other educational and scientific resources placed in Internet.

Electronic textbooks on fundamental educational disciplines include an educational program, a student book, reading books, an interactive testing system, a practice guidance for electronic textbooks, databases and enquiry materials (vocabularies, library- and Internet-resources) and others. The main feature of the educational-methodological complex is that all its elements are elaborated on the ground of a general approach to the subject matter and the structure of teaching materials provided (Aysmontas 2004).

The faculty members are provided with special guidelines on how to elaborate Electronic Training and Methodological Complexes (ETMC), and are assisted in the process of their utilization.

An important stage in the development of the distance-learning program at the Faculty was the videotaping of lectures, delivered by the leading lecturers in psychological sciences from Moscow State University of Psychology and Education and Psychological Institute of Russian Academy of Education.

All the filmed lectures have been adapted for distance education (structured headings and pop-up text links with key provisions of the investigated subject, terminology definitions, diagrams, graphs, tables, and illustrations), which greatly facilitated the perception and learning. With the same end, all the video courses were supplied with the plans of lectures and captions that accompany all the topics, themes and content questions. Specifically for the convenience of visually impaired students all video courses are transferred into audio mpg3 format.

Another important item in academic and training–methodological support of distance learning at the faculty is the development of video tutorials on *psychodiagnostics, professional counseling, intervention and developing techniques*. The number of such tutorial videos has come up to 12. They contain descriptions of various (both adapted and original), techniques, the history of their creation, the instructions for the processing and interpretation of results, stimulus materials, videos of counseling sessions, video comments and video recommendations on different aspects of psychological practice. The authors of these video guides answer questions, share their professional experiences, and give advice to future

experimenters. They also discuss the common errors in the methodology, processing and interpretation of the empirical data, and introduce interesting cases.

To present the content of video courses in a structured fashion we use text-inserts with the titles of the issues under consideration. Text materials are usually equipped with tool tips-notes, making it possible to explore the material, to clarify it or to add to it. Some video tutorials include excerpts from recommended references, thus giving an opportunity to be acquainted with various aspects of the techniques used.

The students of the distance-learning faculty are provided with electronic teaching materials and textbooks, multimedia and information and reference materials on all the subjects. Each student receives for permanent use a complete pack of CD and DVD discs with educational materials for the running semester (tutorial CDs, electronic textbooks, video lectures, video guidelines, and additional materials).

To improve the quality of teaching we have accumulated a kind of a „multimedia psychological library" with an access to the most important public lectures, non-fiction films in psychology and pedagogy, videotaped lectures from research and practice conferences, symposiums, seminars, etc.).

2.2 Arrangement of academic process at the faculty of Distance Learning

- Academic process at the faculty is based on a combination of classroom teaching, independent work of trainees and lessons with a use of Internet-technologies conducted in an inter-active mode (students may choose all the forms of training or only some of them).
- Full-time classroom lessons for students are held in the evening on weekdays and on Saturdays.
- Teachers arrange additional group and individual consultations via Internet to explain separate issues/aspects of the studied disciplines.
- Training is provided on individual plans.
- Moscow students take exams in the University building. Others are given exams in a distance mode through Internet.
- Training according to an accelerated schedule is possible for students with the higher professional or secondary specialized education.

2.3 The development and use of information and communication technologies (ICT) at the faculty of distance learning

Distance learning is impossible without the development and use of modern information and communication technologies in the educational process. One of the most important roles belongs to a so-called *electronic deanery*.

The teaching process of every student in the faculty of distance learning is planned, organized and supervised by the dean's office electronic system OROKS, by means of which the remote control of the organization and conduct of full-scale training is provided.

The network software OROKS was developed at the Moscow Regional Center for New Information Technologies (MRCNIT) in Moscow State Institute of Electronic Engineering.

Since 2011, one more system of electronic Dean’s office, built on Moodle system, is being elaborated. It is called MODUS.

Student’s personal account in the electronic dean’s office is a student’s private space and is accessible after the introduction of his/her own login and password. Personal electronic cabinet provides a number of services available to a student user category. Personal account gives way to individual educational plan for the current semester with the description of disciplines, names and surnames of teachers, terms of learning, forms and dates of passing tests and exams. In case of student’s getting the second higher education, coming back to study after an academic leave or having a diploma on incomplete higher education, the individual academic plan is drawn up, in which all the years of education, all passed tests, practices and course works are credited.

Students may perform various operations via the electronic personal account:

- Get variants of the assignments and dispatch the prepared ones.
- Find out the results of the work performed and read the teacher’s review on it.
- Receive different information about the training process and send messages to any member of the administration staff.
- Dispatch reports on field practices, applications, copies of receipts and other files.

- Have a remote access to information resources: educational, training and methodological support items, scheduled classes, etc.
- Place references to information resources that may be of interest to other students.
- Participate in forum activities: ask questions to a teacher on an academic discipline, get information on any training and/or organizational matter from a curriculum coordinator or any staff member of the faculty.

For students who cannot attend classroom lessons, e-learning at the Faculty is carried out online and they are also provided with videotaped lectures and workshops taking place in the classroom.

Online classes can be the ones, specially arranged for remote students, and traditional classroom training. Students have the opportunity not only to listen and watch the classroom activities, but also to participate in the discussion in real time via text chat. After the broadcast, students have an opportunity to download audio and video files of the lesson. In addition to the just heard material, there is a list of all previous lessons on page “Online-transmission” in the mp3 format allowing their downloading. The Department is constantly working to improve the quality and capacity of coverage online. Thanks to recent developments, we now can simultaneously broadcast two or three sessions for different groups of students.

Video conferences have been actively used in recent years at the faculty of distance learning. The use of this kind of conferences in the educational process is not limited to the classroom.

Video conferencing in distance education provides instant and targeted knowledge transfer at any distance and thus contribute to the expansion of geography of active learning, exchange of experiences with foreign educational institutions and organizations.

“Educational videoconferencing for distance education provides a huge opportunity for us now to access the Russian teachers, undergraduate and graduate students to knowledge gained in the national research and educational centers, the world's leading universities, to communicate with well-known Russian and foreign scientists, professors and highly qualified specialists. It seems very promising, considering the vastness of the territory of the Russian Federation, the remoteness of teaching centers from each other, as well as the need for the rapid exchange of

information between the constantly increasing higher educational establishments of Russia and leading foreign universities" (Krasnova/ Belyaev/ Solovyev 2002).

The Faculty has developed its own *Web application for video conferencing* and its pilot testing in the regular education process proved to be successful. It is integrated into the e-learning system Moodle. An essential means of communication available to the teacher and students is an oral communication in a multilateral video conference. It facilitates interaction between the participants in the form of natural visual communication, provides training materials, checks home assignments, etc. Oral communication, through videoconferencing, helps the students receive educational information, and teacher-monitor learning. It also enhances learning about the individual abilities of students and, as a result, makes it possible to shape a model of current knowledge of each student. The combination of oral communication with various multimedia technologies enriches the educational process and thereby improves the quality of teaching material.

With the help of this program there are planned *Internet-studies* on all academic disciplines in the department. Internet-seminars are functioning in a "point – many points" mode. There are windows of all students on the screen, in addition to the teacher's window, who are able to see each other simultaneously that gives the effect of a live presence. There are students' surnames and initials signed on the screen windows. Students visit the Internet-seminars page in the same way as online transmission, under their login-PW. Analogous to the online-transmission, the "Attendants of seminar" and "Chat" modules are used. Moreover, a teacher has an opportunity to use the "Presentations" and "Virtual board" control output modules in "Internet-seminars".

Through this program, all the scheduled online classes in all academic disciplines can be held. Web seminars are conducted in the mode of "one point-many points". The computer screen contains the teacher's "window" and the "windows" of all the students, which gives an effect of natural interaction. Windows on the screen bear the names of the students. As in the online broadcast, students go to the page "Web seminars" with the help of their login passwords. In the regime of "Web seminars" as well as in "On-line" regime the modules of "seminar participants" and "chat rooms" are used. In the "Web -seminar" regime the teacher is able to use the managing modules "Presentation" and "Virtual Whiteboard".

To clarify difficult points of studied disciplines to students, online consultations with teachers are held. Consultations normally involve the analysis of the educational material, insufficiently learned by students. Therefore, the main purpose of consultations is to fill learning gaps of students. The teacher can also clarify the coursework structure, degree paper projects, field practice objectives, and so on. Online consultations of teachers on all academic disciplines may take place in individual and group modes.

Web-seminars and Internet conferences are also used to instruct teachers on the questions of development and application of Information and Communication Technologies (ICT) in the educational process and the creation of Electronic Training and Methodological Complexes (ETMC) relevant to special educational needs of students with limited health abilities.

Video conference technology is used to hosts teleconferences with the leading foreign specialists. Among the recent conferences, the meeting with Prof. B. Rotenberg from Tel Aviv University can be mentioned. It concerned the issue of "Search activity, stress and health". Another meeting, with T. Cottle from Washington, was devoted to problems of "Self-regulation and self-organization". This practice makes it possible to engage foreign experts in the teaching process through extending the range of subjects for study and discussions.

The main task performed by virtual technologies in distance learning is to provide educational interaction between a teacher and students, as close to the traditional one as possible.

In order to improve the quality of distance learning a research program aimed at the study of the efficiency of distance learning has been elaborated. We have designed a questionnaire to examine the quality of electronic textbooks, lectures, video training courses on various aspects of distance learning. The results of the survey help improve educational programs, introduce new tutorial materials, and arrange staff development. As an example, we introduce the results of the study in which we were examining «students' impression of the learning process". It was carried out in March 2012. Distance learning technologies display a significant effect on students ' personal and professional development. Answering the question "In what way does distance learning influence the development of your per-

sonal potential?“ 70% of respondents answered that „it has significantly contributed to the development of my personal potential”.

A matter of influence of distance learning on a trainee’s personality development has not been studied thoroughly, though we find if a matter of a special interest.

2.4 Discussion of distance learning issues at research and practice-related conferences.

From 2010 onwards the thematic annual international conferences “Psychological assistance to socially vulnerable people via distance technologies (e-counseling and distance learning)“ are organized by the faculty to discuss various aspects of the development and application of distance learning technologies and their efficiency. Another purpose of these conferences is to develop recommendations on psychological assistance to socially vulnerable categories of population (people with disabilities, HIV-patients, people in difficult life situation, people with addictive behavior, prisoners, etc.) with the help of modern distance technologies (like telephone and online counseling) (Aysmontas/ Menshikova 2011).

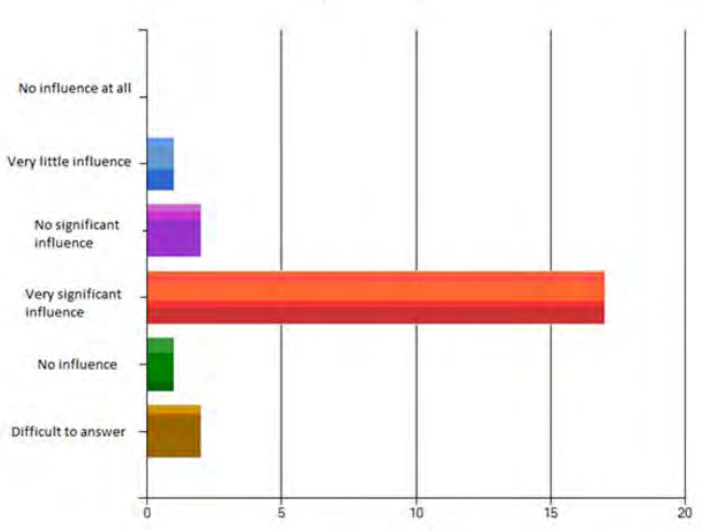

Fig. 2: Influence of the distance learning on personality development

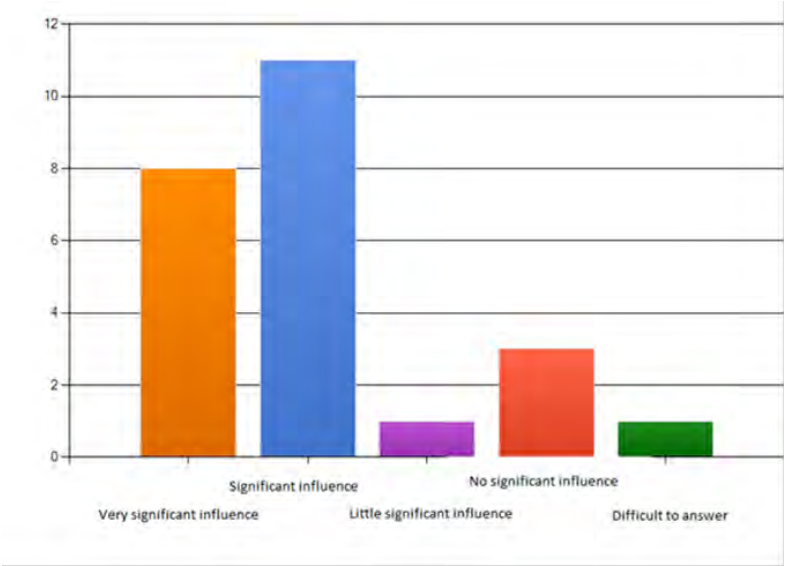

Fig. 3: Influence of distance learning on learners' autonomy.

Four basic clusters of questions are discussed at the conferences:

- *Internet-counseling*: Psychological counseling for socially unprotected categories of the population, limited in access to psychological assistance (theory, methodology, organization of services on-line).
- *Internet-telephony*: Adoption of foreign experience of a distant consulting and psychotherapy (crisis assistance, consulting by telephone and via Internet). Adaptation of foreign experience of distant counseling and psychotherapy (assistance in crisis situation, counseling via telephone and Internet).
- *Distance learning*: Distance learning technologies and counseling for disadvantaged and marginalized populations; problems and perspectives of psychological services as integrated into distant technologies (training counselors, providing supervision, assessment of the efficiency of different approaches).
- *Internet addiction*: Interactions in "human-computer" and "human-internet" systems; Internet addiction and new perspectives in personality development of children and adults.

3. Conclusion

1. Nowadays, the distant training as a form of training is not recognized on a legislative level. Despite the fact that in new “Law on education” the amendments have appeared, a lack of the normative-legal base seriously impedes an application of such progressive and prosperous approaches to the training as a distant training. The world experience analysis shows that distant technologies are the leading ones in the present-day education.
2. We presume that a rather prospective direction in the development of the distance training is a taking into account of so-called cognitive styles of trainees. The great importance has a study of factors improving a successfulness of any group or any individual student considering psychological peculiarities of students and teacher in the center of which the cognitive styles are set above all. Cognitive style is a term used in the cognitive psychology for designation of stable descriptions of how different persons think, perceive and remember information or a preferable for them way for solving problems. Up to nowadays there are discrepancies about the meaning of term “cognitive style”. Cognitive styles of a cognition process present the base of a successful mastering of one or another area of knowledge. Taking into account of cognitive styles features of trainees in the psychology training process inevitably assumes (along with other elements) an application of individualized methodologies, methods and technologies of the distant training. More various visual means (pictures, video, etc.) are also required for students of a visual type of perception of information in the distance training; for students of an audio type - perception of information, logic diagrams aurally. Students of a kinesthetic type will prefer better interactive assignments and practical assignments. An account of cognitive styles may give a new stimulus when adapting the available tutorial materials for students with different nosologies.
3. However, as our experience showed, a majority of students possess insufficiently developed skills of planning their own time, work with academic books, methods of efficient remembering, etc. Their sets are to be considerably changed in the course of learning and foremost, to form a customer’s position for one’s own education. In view of this, a development of a complex program is required on a psychological-pedagogical support of their learning, consulting, training with application of more efficient methods of academic and cog-

nitive activities. One can point out that psychological and pedagogical foundations of the distance learning as a whole are insufficiently developed in the domestic pedagogical, psychological-pedagogical sciences as well as in practice. As a rule, more attention was paid to technical and organizational aspects of distance learning. The existing experience shows that both employees of the department and teachers have to become tutors, experts on development of adults by means of education, but not just administrators, supervisors who are willing to instruct and primitively demonstrate their power. Unfortunately, overcoming of such stereotypes, persuasions and transition to another outlook of a student in the personality-orientated training paradigm has turned out to be a great problem (Shennikov/ Teslinov/ Tchernyavskaya 2006).

4. A quality of distance learning depends on competence of a professorial-teaching staff not only in the appropriate psychological field but as well in the field of information-communication technologies, namely, the distance training. As our experience has shown, the most efficient training with the help of the given technologies is possible when they are applied and improved simultaneously. For purposes of a more profound learning via distance learning methodologies, the dean's office has arranged a course of the English language in a distant form for the lecturers of the faculty. One can also note that a number of problems concerning a raise of teachers' motivation to use the distance learning technologies are associated with a lack of the normative-legal standardization base and remuneration of labor for teachers, using ICT.

We have enumerated certain problems and prospective ways of development and application of the distance learning technologies in the field of higher professional psychological education. Our ten-year experience of work in the given area has proved that the said technologies are a powerful factor of the educational system development. They are a unique incubator in searching for new approaches to learning, experimental site for development of new methodologies and training technologies, educational environment for a progress of not only students but also teachers. Training based on application of formation of contemporary ICT requires another comprehension of the sense of education: a student him/herself becomes a customer on education. Formation of students' need and ability for self-education and self-development becomes a value of education.

A competent usage of the available developments may appreciably change the higher psychological education in the whole in diverse forms of training, since in such education a student becomes the key figure, his needs, his interests and bents, and the aim of managers in education is to create the optimal conditions for his/her progress and self-development. By means of the distance learning technologies, we are able to proceed from the „pedagogy of compulsion" to the „pedagogy of motivation". One question left: to understand and analyze the values of education as well as one's own understanding of education.

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MULTIMEDIA TECHNOLOGIES – A PATH TO CREATIVITY

Konstantin Yulievich Bokhorov, Elena Yurievna Ermakova and Viktorya Andreevna Fomina

This article describes psychological, creative and cognitive problems which disabled students face while studying „Direction of multimedia programs" course at Information Technologies faculty of MSUPE. We argue that students need not so much instrumental approach to multimedia, as theoretical and paradigmal adaptation to intensively developing reality of digital revolution. On the basis of our experience in teaching "Direction of Multimedia Programs" course and creative work with students we present recommendations on helping disabled students overcome psychological barriers in development of new (multimedia) tools to fully reveal their humanitarian potential.

1. Virtual shoemaker: media directing as a form of compensation and defence

The uniqueness of our experience in teaching at higher school is related, on one hand, to health limitations of our students, and on the other hand, to specific properties of our subject domain. Paradoxically, the problem of „the small adult" (the teenager, whose chronic disease, as a rule, impeded his/her high school education) and the world sociocultural crisis of transition to visual language of culture, weaved together before our eyes into one storyline. And this storyline is extraordinarily cinematic: it unites particular with universal and gives hope.[1]

With the avalanche-like development of „multimedia" the world plunged into some semantic compote: the variety of information resources, social networks,

[1] In Hays Code (1930) it is specified that the cinema has to give hope to each shoe cleaner that he will be able "to grab good luck by a tail" and reach social tops (URL: http://seance.ru/n/37-38/flashback-depress/hays_code/, access date: 23.04.2014).

remote forms of professional activity, virtual opportunities of interaction, ways of integration into sociocultural space generates quite a Babylonian confusion. The plethora of meanings assigned to the concept ”multimedia“ is particularly noteworthy. There are grounds to believe that coordination of positions and structuring of our approach to definition will help solve a number of problems, both methodological and productive.

In system of cinematic images director H. Hawks presented the XX century as a train travelling from New York to Hollywood, this metaphor quite keeps within a context of culturological conclusions. Yu. Lotman called cinema a universal language of culture in the XX century [1, p. 14.].

Discussing characterologic properties of cinematic art, S. Kracauer names the following three [2, p. 13 - 14]: collective nature of production, essentially mass mode of perception[2], high cost which often means institutional or state nature of financing. In poverty-struck Russia of 1920-s, dreaming of communism and electrification, the film-making industry held second place in investments of capital, and in Germany after World War I – the fourth. Our soldiers went to World War II frontlines straight from the ”Udarnik“ cinema hall which showcased documentaries of frontline cameramen – yesterday’s students of Cinematography Institute who went into battle unarmed with just their camera in hands. Military profession in the middle of the XX century and physicist in the sixties owe their prestige in many respects to the films ”Officers“ (M. Romm, 1962) and „Nine Days of One Year“ (M. Romm, 1962). In that situation the film director consolidated in his hands a lion’s share of public influence, administrative resources and budgetary funds, which put him in a position of a real demiurge.

In modern media environment, the excess of information channels, quantities of screen forms and content is compensated by local or corporate character of target audience, low budgets, portability of equipment, small film crews which in extreme cases consist of only the director as all-round craftsman. Instead of large-

[2] In the middle of the XX century it was difficult to imagine a movie without cinema hall with rows of seats, though precedents of individual viewings took place: for instance, future founders of the Italian neo-realism learned from experience of the Soviet cinema, which they could only see using montage device. Only a few decades ago everyone watched the same movies at movie theaters: everything was released for movie theaters.

scale filmmaking studios with ten assistants carrying one feed-cable, the yesterday's «regent of dreams» and demiurge turns today into a handicraftsman, a virtual shoemaker, with the laptop in his bag or even an iPod (after all now they too have video editing software, and amateur hand-held cameras have resolution admissible and even superfluous for a TV screen).

Even with identical production operations (screenwriting, director's explication, shooting, editing, voiceover) and subject domains (fundamentals of directing, theory of editing, etc.) taught in education institutions we see art with absolutely different social and cultural tasks, publication forms (Internet, festival display, digital carriers, cable TV channels) and different principles of viewer's perception. In the XX century a movie was perceived by the viewer from the fetters of a chair, in silence and darkness of the movie hall[3], the storyline of life was completely replaced by that of the film and catharsis was almost inevitable. Modern screen forms appear before the eyes of the viewer in one of several windows of the computer, in parallel with e-mail, news of a social network and continuous signals from the mobile phone. Such perception demands other formats and types of screen work, which brings back to life a variety of dramaturgic principles which were ignored during the era of "big cinema" [3, p. 208].

2. Using interactivity as resource for performance of educational tasks, and much more

Having chosen a profession of multimedia director, a young man encounters a whole area of innovations and quickly developing technologies, and more often than not his level of understanding of these technologies is too low to take advantage of opportunities they bear. Having intuitively taken a step in this direction, he faces a psychological problem of mastering the new. In this situation career guidance raising issues of philosophy of technics and theory of information becomes the most important task on the way to unveiling creative and personal potential of students, especially with disability. Such work allows students to solve

[3] A. Konchalovsky wrote that traditional one-and-a-half hour timing of movies is connected with bladder volume (A Cinematographer's profession. Collected works. Moscow, high courses of screenwriters and directors – 1995).

educational and creative problems much more effectively, bringing them to new creative level of self-realization.

Herein we present results of introductory career guidance classes for first-year students of the course “Multimedia direction“ at Applied Informatics and Multimedia Technologies department, MSUPE. Five students with cerebral palsy in various forms, whose success depends on mastering a wide range of digital tools and technologies, became its participants.

Classes were given in the form of discussion, and first on the agenda were specifics of information processing and presentation tools used by students in study and performance of tasks. Future ”directors of multimedia“ had to answer a key philosophical question of their profession: ”What is multimedia?“

Most answers came down to composite, complex character of means of information representation, which is characteristic of the environment they work with. For instance, according to Alexander Zorkin (age 20): „Multimedia is an aggregate of audio, graphic, text information. For example advertising, computer games, different effects at the Olympic Games, dolls which move their hands“. (note: Sochi Winter Olympic Games 2014 is referenced). Other student, Kirill Belousov (age 25) answered that it is ”a huge industry sector in media production. By means of multimedia it is possible to create any project, organize an event. Multimedia plays a huge role in organizing exhibitions of contemporary art, art shows and various biennale“. Students noted that multimedia is also used in cinema and making presentations, though some found it difficult to specify its purpose. This poll revealed that students, having well acquired a sense of connection between the words ”multi“ (multiple) and ”media“ (means), did not quite realize the qualitative change in informational environment that this concept carries.

The same problem was revealed even more clearly when the group was asked a question: ”What is the basic difference of multimedia environment they deal with today and the one used earlier, in the era of analog information processing?“ The common opinion came down to a thought that now by means of multimedia it is possible to do editing, voiceover, add subtitles and credits. Psychologically it was very difficult for students to accept that during the era of analog technologies all these operations were carried out easily by students of amateur film schools. It took some inducing questions for students to realize that multimedia is an

achievement of digital information processing, a result of emergence of computer technologies. Alexander Zorkin even doubted, whether the concept of multimedia is an effemizm. ”We like to borrow new concepts“, – Alexander said. In Socratic dialogue the group understood the essentially different character of the environment they used for creative work. Alexander admitted: ”In this sense new opportunities started appearing. Multimedia is after all both computer modeling and computer graphics. In Soviet period there were no means for computer modeling“.

Our poll revealed that the group is not yet ready for creative use of achievements of digital revolution and those basic changes it brought to the language of media. Students noted more traditional factors of usefulness of new technologies. First, availability and simplicity of digital editing. Secondly, that, as Alexander mentioned, ”there is now digital format of files. There is no more need to store the recorded material on film, it is possible to store it on more compact carriers, and make many copies“. Thirdly, possibilities of the Internet for information search. Though, at the same time we saw an ambiguous attitude to the Internet. According to Alexander Zorkin: ”The computer is a convenient tool to search for necessary information in spite of the fact that Internet can be called garbage can, where everything is lumped together. But sometimes it’s easier to search the Internet and find something there, than to go to archives. The Internet should be used intelligently. It made information search easier“. Fourthly, creating visual and audio-effects using computers. Only one student noted interactive possibilities of the digital environment. According to Konstantin Kaziyev (age 20, II group of disability) ”we can keep the recorded material in different places, and then remotely communicate with others and edit something together on the Internet“.

Finally, the last block of questions about how students use multimedia possibilities in learning and creative activity also revealed that their approach to digital technologies is mainly applicative, user-like. All students reported using communication possibilities of their devices: obtaining information (especially video information from YouTube service), communication in social networks, use of text messengers and so on. At the same time some students ignored the software nature of communication process, as such, Maria Siminchenko (age 24) found it difficult to say what program she uses to go online, and then to name the browser she uses. The software organization of information processing environment seems like something natural and is taken for granted. Among most used tools were: Power

Point, Photoimpact, Sound Forge, Pinacl Studio, Easy GIF Animator, Autodesk Animator Studio and some others. The Adobe package, probably because of price policy of the company, was ignored by students. As for the digital equipment, its possibilities were well-known to the group, but they had not yet formed the creative tasks which they want to solve with it besides some mundane tasks.

We see the motivation for creative work in the group, although creative tasks are yet in the future. Generally they aim for short films. Konstantin Kaziyev would like to make a movie about how ”robots invade our planet“ using 3D graphics for development of characters. Alexander Zorkin wants to make a movie based on classical literature (which text – he hasn't chosen yet) and to present it on a modern style, using computer tools of image processing, like in the last screen version of ”King Kong“. Kirill Belousov wants to make a movie about „inclusive education of disabled students“. We should note that this attitude is rather related to the need for self-expression, than for communication with society. Only Christina Alexandrova (age 22) has creative plans of designing an educational program, and demonstrates the attitude towards request from a certain target group, which implies socialization of her creative position.

Digital technologies created an essentially new environment of communication, in which multimedia is means of creative self-expression and overcoming physical reality. ”Multi“ is not only ”a lot of“, but also ”more“, ”increased opportunities“. This lesson in career guidance revealed that students still have vague idea of this qualitative change. They still feel like consumers in the virtual environment of the increased opportunities. It is necessary to overcome this ”user“ complex and to come to a new qualitative level of understanding that in the virtual environment there are no health limitations, that here they are compensated by multimedia which has changed the quality of creative communication by giving it *interactivity,* which means creativity seeking to overcome monodirectional self-expression and to become socially oriented, addressing consumers' demands. Demands to virtuality have to be reformatted in this way to implement qualitatively new possibilities of multimedia. It is wrong to transfer ”user“ complexes from reality to this environment, because it is an environment without disability. In the era of multimedia one-way communication technically becomes outdated, and this is probably the main lesson of the career guidance class about multimedia.

3. Multimedia – create your own world

I uploaded a video to Russian social network ”V kontakte“ for our student directors in MSUPE showing Guinness Book of Records nomination ”Best montage“[4], and commented: ”Now that’s how you do montage!“ The answer came in an hour: ”It’s not editing – it’s composing…“. I am proud because the message came from our former student Dmitry Kiryukhin who graduated MSUPE Information Technologies faculty in 2010. His graduation project was technologically complex and difficult – it was a multimedia project ”Birds of War“ in which the animated component was executed on a game engine of ”Il-2 Sturmovik: Forgotten Battles.“. Logical tasks – actions of all objects were made in the detailed editor of the game which allowed receiving a set of high-quality repetitions of the same event, and the author could participate personally, control the events in real time and play for different characters. Back then we called this genre ”documentary animation“: couldn’t pick a traditional analog. In final version the movie ”Birds of War“ (2011, directed by D. Kiryukhin, supervisor V. Fomina, consultants N. Orlov, E. Ermakova), devoted to pilots who lost their lives during the Great Patriotic war, recreating air fight of 1941 – approach of the German aircrafts to border airfields of the USSR, was burnt to DVD. The movie features poetry of Josif Utkin who died in a plane crash in 1944, and in the computer sky planes are forced by fate to destroy each other instead of enjoying flight and beauty of the sky.

Dmitry’s comment to my post seemed symbolic and very modern to me, as the concept ”traditional montage“ (on film, linear) ceases to exist in the way it was understood 10 years ago. Director’s profession today acquires a new meaning in the context of quickly developing multimedia culture, or as it is fashionable to say, in a postmodernism era. So what is multimedia cinema and how we can use its specific properties for socialization, education and upbringing, in our case, students with health limitations (disability)?

Small historical reference. As a major in universities ”Direction of Multimedia Programs“ appeared in Russia in St. Petersburg State University of Cinema and Televi-

[4] URL: www.youtube.com/watch?v=NRA9PpCbZHQ.

sion, All-Russian State Institute of Cinematography, MSUPE (faculty of Information Technologies), and Liberal Institute Of Television and Radio n.a. M. A. Litovchin in 2005.

The ”Dictionary of terms of television and radio“, published in Zhukovsky in 1999 and composed by V. A. Hleborodov, P. P. Olefirenko defines the new at the time word «media» (among other) as ”the audiovisual environment“. So then ”multimedia“ presupposes richness and versatility, multi-symbolic nature and multifunctionality. In this case I will take the liberty to assume that activity of the director, as creator of the film’s emotional framework, including multimedia, today is defined by the fact that in his artistic toolbox he has various elements of this audiovisual (media) environment, from which he creates the movie. Chronicle and documentary videos of current events, 2D and 3D animation, fragments from popular scientific and fiction films of all eras and countries, and also music and noises – all this the modern multimedia director can get on the Internet and use as a palette for his own creativity. And, despite that the set of audiovisual images will consist of fragments of others works the final product presupposes authorship, individual direction, the proper filmmaking creativity. The reason for this is that the elements of multimedia environment taken from other works get other sense and meaning in an author’s context of new film work.

As a matter of fact, this is what researchers of post-modern culture call transformation of quote into text. If we set aside all disputes on copyright of the artist to creation of cinematic images as elements of cinematic language, then with common availability of modern computer technologies cinematic language and its system of images become property of world culture and general public [4]. In 2012 an amendment was made to regulations of disciplines at MSUPE, which brought back the name of the major – ”Direction in Cinema and Television“, but with addition of a new specialization – ”Director of multimedia Teacher“. This is the profession that MSUPE Information Technologies faculty graduates get. This specialization justifies engagement of students with disability in creativity, self-expression and gives them chance to get one of the most demanded professions today – director and editor of multimedia production.

I would like to note here some specific features of our department at the faculty of Information Technologies. During our 9 years of work we have assembled a unique

group of teachers who educate students with account for their physical, social and mental capabilities. This collective is also “multimedia-like“. Nikita Viktorovich Orlov, director of documentary films, whose works are awarded on international film festivals, one of MSUPE’s oldest teachers, educates students in classical cinematic montage, which is in the basis of all classical cinema of the XX century. Despite the fact that his students, working in the multimedia environment of the Internet, will never have the necessity to hold a piece of film in their hand, they need to be familiar with traditional culture of film production. Also as it is necessary for any director to have seen an abundance of cinematic classics in fiction, documentary, educational genres. Lessons always include viewings, comments of the teacher and joint discussion.

One of the major subjects is ”History of world cinema“. For many years the lecturer for the course was professor of All-Russian State Institute Of Cinematography, doctor of science in art criticism Vladimir Aleksandrovich Utilov. After his death his wife, doctor of science in art criticism, professor of All-Russian State Institute Of Cinematography Natalya Ivanovna Utilova, took over. This course does not simply introduce students to history of world cinema. In her lectures professor Utilova has an opportunity to use materials of her husband’s lectures recorded by MSUPE graduate of 2010 Roman Kushka during his study, and presented for his thesis as audiovisual multimedia project „World History of Cinema by Vladimir Utilov“ (multimedia disk, 2011, directed by R. Kushka, supervisor V. Fomina, consultant V. Koshkin).

Roman Kushka, due to his medical condition (cerebral palsy), visited lectures together with mother Elena Vladimirovna. He was fond of history, so no wonder lectures on history of world cinema became his most favorite course. He started videorecording them and working with montage and sound, selecting illustrations – fragments from movies which he found on the Internet or bought on DVD disks. “Era of pioneers“, ”History of the American cinema“, ”Cinema of Germany“, ”Pioneers of the Russian cinema“ – in total seven parts. The first movie became Roman’s graduation project. Now he finishes editing the last seventh part of the set in MSUPE Center of information technologies for psychological research.

This project was designed and created as educational audiovisual aid for teachers and students. But for us, the teachers, the most important was to understand and

use this aspect of multimedia technologies giving the student a possibility to create, as multimedia director, a learning aid for him- or herself. It is a kind of workbook of the XXI century student, who not only makes lecture notes, but also lives them through, creates a relation towards them, and shares the acquired knowledge with fellow students. Implementation of this project gave the teachers thoughts about other important video-lecture sets which students could create for teachers as educational audiovisual aids. While carrying out these practical, creative and technical tasks students would acquire not only theoretical knowledge of history and practice of world cinema, but also would study modern editing methods, computer graphics and animation, work with sound and music.

Practice of computer interaction, nonlinear, digital editing and special effects are taught by Vadim Yuryevich Koshkin, graduate of the legendary course of the famous director Vladimir Kobrin at All-Russian State Institute Of Cinematography. Vadim Yuryevich has a unique approach to educational process of disabled students. Independent work is regarded as of paramount importance. The student has to learn not only to create, but also to get the daily bread after graduating university, has to be able to work professionally, regardless whether in collective or independently, and his product, in our case multimedia movie, has to be executed at a high qualitative and technological level. I would like to give an example of one of graduates of 2011 supervised by Vadim Yuryevich Koshkin, Boris Moiseyev, state-funded department student with very peculiar mental perception of the world. Boris attended all lectures, spoke very little, but listened with great attention. Teachers knew that when asking him a question they needed to wait patiently. Sometimes some minutes. But, having shown patience, they could get the brightest, most interesting, non-conventional answer. Boris is creative, closed on the outside, but on the inside … He spent his free time in chess club. His graduation project on which he worked scrupulously the whole year was also about chess. The screenplay, recording, editing, separate interviews, voiceover and special effects – everything was made by Boris. His supervisor Vadim Koshkin helped only with technical advice. The documentary film (2012, directed by B. Moiseyev, supervisor V. Koshkin) turned out unexpectedly personal, because while listening to the story about chess, the viewer got to dive into the emotional world of Boris' perception of the game. This state was created by intonation with which the director himself read the voiceover text. Boris presented his thesis and passed state

examinations perfectly and was employed by Engineering Center of Information Technologies for psychological Research, MSUPE.

To be a film director it is necessary not only to know your way around audiovisual images, but to be a storyteller, create dramatic events to catch the viewer's interest. The dramatic art is taught by screenwriter and director, PhD in art criticism Victoria Andreevna Fomina. The work on diploma project of the student Valentina Deterleeva, graduate of 2010, wheelchair invalid brought to lectures by her mother, was an unexpected wonder. Her movie "Halkalakhta" (multimedia movie, 2010, directed by V. Deterleeva, supervisor V. Fomina, consultant V. Koshkin) was shown on cable and Internet channel "Pervy Igrovoy". The literary basis of the project is a story by Maria Orlova with the same name about a role-playing game based on J.R.R. Tolkien's book "Silmarillion". Her role-playing fan friends from St. Petersburg used amateur digital camera to record their "elvish" journey on ice of the Gulf of Finland. And Valya began montage.

– But the movie didn't turn out until Valentina herself joined the company of traveling elves, – the project supervisor Victoria Fomina remembers. – We started recording Valya while she edits the movie and talks about the game. And this external plot became not less interesting, than internal, and the movie became documentary and multimedia at the same time. Valya opened for us, the audience, a door to the fantasy world of fantastic Halkalakhta, having done enormous work on selection of fragments and drawing up the editorial script, having mastered video editing programs, elements of computer graphics and animation, having aqcuired skills of work with image and sound. It's not often that you meet a student's film which is not merely recorded, edited, voiceovered, but lived through. "Halkalakhta" was lived by Valya from beginning to end. Now Valya plays in drama school at sociocultural integration club "Wings", is engaged in vocal and dance classes in the same club, and works as freelancer in multimedia film editing.

Now I would like to share my own personal experience with disabled students. I am the journalist by education (I graduated faculty of journalism at Lomonosov Moscow State University), and got my PhD in art criticism at All-Russian State Institute Of Cinematography. I am a theorist, so except for love and attachment to cinema, there is little I can offer to students. Therefore, having chosen a most convenient position, I tried to show them beauty, mystery and charm of any

screen image, from cinematic masterpieces to avanguard experiments with new digital technologies. For example, speaking about pictorial art and cinema, I very much like to tell about how the painter Vasily Ivanovich Surikov created his ”Boyarinya Morozova“. The legend has it, that he stayed at home for two months… adding canvas because his horse harnessed in the sleigh didn’t want to run. By increasing the area of the painting he achieved the effect of movement. And when, with the next strip of canvas, he saw that his boyarinya started to move, at this moment the painting became one of the best-known artworks in the world, having conceded superiority maybe only to „Night watch“ by Rembrandt and ”Las Meninas“ by Velasquez. My 20 years’ experience in the journal ”Equipment of Cinema and Television“ taught me to consider any movie from a position of his creators, directors, operators, sound producers, as a certain multimedia environment which has been emotionally organized by the director. Therefore it was easy for me to show and tell students about cinematic language in its today’s understanding, to compare concepts of various film experts on this matter and … to show. I constantly search the Internet for audiovisual images of how pictures, book illustrations, photos, chronicles, documentary and animated fragments can live in a modern multimedia cinema. I believe that the main thing is to motivate our disabled students for self-expression in a new type of screen art. After all many of them can’t hold the camera in hand, can’t independently move, some have weak sight or hearing. But in new multimedia art they can become artists, using instead of paints and brushes audiovisual images.

In my constantly growing video collection there are about one thousand such audiovisual examples. And my teaching activity also brought student’s works worthy of pride. Among them a documentary and at the same time multimedia movie of my first student of 2010 Alexey Kulanin ”A name for it is Volga“. Such movie can be created only by means of computer and editing programs. As elements of narration this movie contains fragments from a fiction film by director E. Ryazanov “Cruel romance“, historical and publicistic movie “Genghis Khan“ (BBC, 2005), an episode made by director and computer design artist Nikolay Shiroky for the movie of director B. Liznev “Visions on Neva“ (“Fatherland“, 2005) where a huge computer wave covers the city of St. Petersburg. Alexey took a kingdom of fishes from the Internet, as well as some city views of Kazan. After computer processing photos, maps, pictorial art, in particular I. E. Repin’s painting “Barge haulers on Volga“,

were integrated into the movie. You would ask, what is the connection between a wave covering St. Petersburg, and Volga? We can say today that the “common“ is in the fact that screen images can be used by directors in the same way an artist uses paint on a palette; they are mixed and combined and the movies are made with this mix. So we can say multimedia consists in essentially new approach to cinematic means and methods.

If it is interesting to technical specialists, I can provide the detailed list of the software which helped Dmitry to make the movie. For recompression of initial video records from initial formats mov, mp4, mpg, flv into the format suitable for the subsequent processing and video editing avi uncompressed was used, Alexey also used AONE Software FLV to AVI MPEG WMV 3GP MP4 iPod Converter, Amadis Video Converter Suite 3.7.2, Canopus Pro Coder 3 software, for video capture from the screen – TechSmith Camtasia Studio 5.0, for processing and editing of sound – Sony Sound Forge 9.0, for video editing and application of special effects to video – Adobe Premiere Pro 2.0. It is noteworthy that landscape shots were made with Panasonic Lumix DMC-FX9 digital camera.

The movie of my other student of 2010 Anton Nikolaichev “D-20“ (cameraman Alexey Moiseyev, editing and computer design Artur Tsyupilo – both graduates of MSUPE) – is about a game of “Dungeons and Dragons“. We could call it fictional film, if it were not for the main documentary scenes of the game itself, culminative in nature, and multimedia-like, collage-like edited fantasy reality of “Dungeons & Dragons: Wrath of the Dragon God“ (directed by G. Liveli, 2005) . Paraphrasing the axiomatic heading of Eric Berne’s “Games people play“, Anton at the same time tells a story about the game, about its characters in game and real life, about the world of “fantasy“ and about our young generation. The movie was filmed using a digital semi-professional camcorder Sony DCR RD 175P in ViniDVCom format, using the following software and hardware: VKSaver 2.0 – the automated browser add-on for import/export of digital videos/audio files, video editing software Adobe Premiere CS 4.0 and Pinacle Studio 12 Ultimate, Adobe Encore CS 4.0 –program for DvD – autoring, Canopus Pro Coder 3.0 – sotware for converting audio\video files, and also the popular Adobe Photoshop CS 4.0 in which the cover design was made. This movie was included in the program of cable and an Internet TV channel “Pervy Igrovoy“ describing modern role-playing games.

I would like to give another striking example of creative work and destiny of our graduates. It is a slideshow by Victoria Brital called “Loneliness“ (supervisor V. Koshkin), deaf graduate of our faculty of the year 2012. This work was made as course project on third year of study. I still show it in schools and boarding schools when I tell children about our students’ creative work. “The most ringing shout is silence, the brightest light is night“, – the words of Edmund Shklyarsky leader of the Russian rock band „Picnic“, were the undersong in all audiovisual imagery, that emotional glue that connected very different photos. Victoria chose them from the Internet, and then worked in Photoshop with color, light, contrast, scaling, thus placing emotional accents. Other people’s photos gained the author’s overtone and became material for self-expression of multimedia director’s creativity. Certainly, some could have said that slideshow production on a third year of university is technically unreasonable. Nevertheless, this work was marked “best“ by the common decision of a selection committee because the student was able to show the director’s emotional attitude to the problem of loneliness in our densely populated world. And as one of the teachers neatly put, “pressing buttons is something you can teach a monkey, but you cannot teach feeling“. Victoria has it. Now Victoria is trying to set up her own photographic studio, she is married and raises a daughter.

Individual approach is an obligatory component of our teaching. The relations of teachers and student directors, especially by the end of the fifth year, develop rather as the relations of colleagues, than teachers and students. For the cinema community such relations are quite normal, for pedagogical – aren’t always acceptable. But for our students, many of whom begin their studies not at 18, but at 25, being colleagues is much more comfortable. And it is more helpful. It imposes a certain responsibility both from the teacher, and from the student. And there I was, in 2009, preparing for my first graduates to present their projects, when one evening a phone rang. Andrey Kolpakov, having returned from a trip, was eager to show me his 10 minute movie “The locomotive by the name of LN-5231“ in which he, Andrey, solemnly opened the first “run“ on Moscow Minor circular railroad which hasn’t been used for already half a century.

In an hour my two children and I became the first audience of a wonderful travel on the first Moscow locomotive. Andrey has cerebral palsy, it’s hard for him to keep balance when walking and carry a heavy camera. But he always has his favor-

ite “point and shoot“ camera with him, and at home – his computer and skills of video editing and work with color and light. Even defects of clarity and contrast he managed to turn into an artistic touch – indistinct contours of passengers became a metaphor of eternal inhabitants of the train which goes round and round… «Locomotive by the name of LN-5231» is the first movie of an MSUPE student which made it to the list of a festival of debut and student’s works „Saint Anna“. Andrey travelled half of Russia by trains and hitchhiking, he writes poetry and songs, edits video, music and advertising clips for clients, he was the lead actor in a music video of the band DDT directed by his teacher Vadim Koshkin, and recently he returned from Mexico where he made over 2000 photos. His first photo-clip about this amazing country already appeared on the Internet.

There is one more special feature of educating multimedia directors at Information Technologies faculty of MSUPE. In higher education institutions for cinema, such as All-Russian State Institute of Cinematography, or St. Petersburg State University of Cinema and Television, students receive specified cinema specializations, like operator, director, and actor. In these higher education institutions there are acting and producing departments, and as a result, the graduation project becomes collective work, often paid for, the way it happens in the real “big“ cinema. Our multimedia directors have to do everything themselves: do the shooting, work with nonprofessional actors, edit video and sound, and of course add multimedia components (special effects, additional documentary, photographic, art materials, etc.). Therefore supervisors initially don’t advise students to make fiction films, as results are mostly deplorable. But it is very welcomed if the project is done by a group of students, and everyone brings a feasible contribution. For example, Eldar Abdullaev, graduate of 2013, a composer of music with vision impairment. He plays drums in a rock band of his friend Vsevolod Filatov with a symbolical name – Nicht Kapitulieren. His movie named “Nicht kapitulieren“ tells a story of these blind kids’ creative work, how they perceive the world and how they live in it, not giving up in the face of difficulties. His supervisor Natalya Utilova acquainted Eldar with Victoria Kurevleva who works on television. She helped operators Ilya Samorodsky (4th year student at MSUPE) and Konstantin Tsvetkov with shooting and edited the film. Eldar acted as the screenwriter, author of the idea, actor, composer and sound producer. This project was noted as best work by the selection committee.

4. Instead of conclusion

Languages of cinema and modern media are similar approximately the same way as the English spoken in Eaton, and language of the American slums. Unlike institutionality of cinema, semantics of modern media language develops spontaneously, due to availability of means of production of today's video, when not all "poets" know about existence of rhymes (Yu. Lotman compared montage comparisons to rhymes, and A. Alekseev drew a parallel between tempo-rhythm of animation and poetic metre). In this sense education of multimedia director which gives graduates a number of advantages is of particular importance.

It is especially important for students with disability who are in no way inferior in creatively in virtual space of modern media to other students, and even have a number of advantages.

The example of using multimedia as a social tool was created within our course in MSUPE. Artur Kazakov (11th group of disability with locomotoric system impairment) decided to devote his graduation project to a declaration of love to his wife Lyudmila Kazakova, who was imprisoned on the ninth month of pregnancy. Artur's companions decided to use their multimedia director skills to help him in difficult life situation, thus the documentary film "I LOVE" came to be (idea of A. Kazakov, directed by joint efforts of: M. Orekhov, N. Roshchin, K. Kuznetsova, N. Sarnatsky, A. Kirilkina, P. Belyaev, D. Prilukova, S. Troitskaya, E. Abdullaev, I. Samorodsky, supervisor– V. Fomina). The movie was nominated for the National award in the area of documentary films "Laurel branch", it was shown and awarded at a number of large Russian and international festivals, such as "Agrosvit" festival (Ukraine) and "Golden Amphora" (Bulgaria). But the most important is that by means of cinema the group was able to raise money for a lawyer and we hope that Artur's wife and son will come back home soon. It is important also that work on this movie revealed with new force the abilities, talents and personal traits of the group. A remarkable creative collective formed attracting students of other courses and former graduates. The film was not only about Artur Kazakov, but also about all of us. Multimedia direction became that gracious language in which one can tell something important both in social and psychological dimension.

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Keywords

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Impact of Computer Games on Social Determinants of School Readiness in Preschoolers

Tatiana Ermolova

The article focuses on how reduction of the preschoolers' traditional game and its substitute by computer games affect the social development of children at the end of the preschool age as well as their readiness for school education with regard to the social determinants of their personalities. This study is a part of a series of works dealing with: 1) social maturity as a specific new formation in personality of children, entering upon systematic schooling, and 2) assessment of factors, determining the quantitative and qualitative characteristics of this new formation. To clear up the logic of the current study, we consider it necessary to familiarize readers with the content of the preceding phases.

1. Introduction

1.1 The purpose of the preceding study

The main purpose of the study, carried out in early 2000es, was to test the hypothesis that the real role behavior (as an opposite to the pretend play behavior) as a special form of voluntary self-regulation, typical for 6-7 year-olds, reflects the child's concept of his/ her social competence and his/ her special attitude to this quality of self and thus can be regarded as a unit of analysis for social development in preschool age and as an indicator of the child's school readiness on this parameter.

The necessity to go back to the issue of social competence in children at the turn of the preschool and school age was brought about by dramatic changes in preschool education at the end of the 20th century (namely, decrease in the number of children attending pre-school kindergartens and a lower age at which kids started to go to school). Established as a fact by educators and scientists the so called social infantilism was reported to be the reason for poor academic achievements and school maladjustment in junior school students, including those, who were

diagnosed as ready for school on such commonly used criteria as: intellectual development, object-related activity, psycho-emotional status, etc. (Illesh E./ Venger 1988, Elkonin 1989, Venger 1988). At the same time, specific knowledge about the social competence of children in pre-school age as well as the ways of measuring levels of "social maturity" of preschoolers were extremely contradictory and incomplete.

We see the reason for this in the fact that in Russian psychology the sphere of child's social relationships with others was traditionally regarded as a context of his/ her general development. Sociogenesis and ontogeny were always treated as identical concepts (Vygotsky 1983, Leontiev 1978, Rubinstein 1957). There were only a few studies in Russian genetic psychology that focused on child's social competence as their special object of research. They described it as a child's capacity to get oriented in the system of social relationships, to cognize its specific laws and actually be involved in it (Bozhovich 1995, Zaporozhets 1978, Venger 1988, Elkonin 1989).

However, the generally accepted term for this ability has not been worked out. Writers often use either conventional definitions, or notions, actually narrowing the scope of functionality of the terms, used for designation of this ability. Correspondently the scientists' views of child's social qualities are contradictory enough, and absolutely different aspects of social activity of preschoolers become the object of their study, e.g.: social reflection, ethical standards, moral regulation of behavior, personality traits which can complicate or facilitate child's contacts with other people (such as altruism, conformity, aggression, shyness, etc.). This leads to the confused phenomenological picture of "social maturity" of children at the turn of the preschool and school age.

Considering this, we initiated a series of studies aimed at systematic examination of preschooler's social development in ontogenesis with regard to his/ her personality development and the selection of the unit of analysis for social development of pre-school children, able to simultaneously make a reliable indicator of the age and individual level of social competence of young children.

1.2 Theoretical approach

The methodological basis of the study was the Vygotskian concept of age and his idea of development of child's personality in ontogenesis as its qualitative transformation (within the crisis phase of development), and shaping specific (central for the age) new formations, which integrate the developmental processes of the previous stable phase and set the direction of development for the coming stable age. Personality in our study is understood as a system of attitudes, social in nature and directed simultaneously to the object-related world, to other people and to oneself (Lisina 1986, Rubinstein 1957). The attitude to the self sets the semantic orientation in human life (Lisina 1986). Child communicative activity with adults is believed to be the leading factor of his/ her personality development. In this type of communication the child's "self-image", as the specific affective-cognitive unit, reflecting the ontogeny of his/ her self-knowledge and self-esteem, is shaped. Child's image of self integrates the experience of his/ her individual activities and communicative experience that in total determine the character of his/ her activity (Lisina 1986).

In our study we also maintained the definition, given to psychological content of personality new formation emerging at the end of the preschool age, as connected with the shaping of the "feeling of social competence", which was proved to be connected with child's integral attitude to the surrounding physical and social world and to self as its part. It was reported to generalize child's experience of self-cognition, self-estimation and self-regulation in situations of solving social tasks (Ermolova/ Komogortseva 1995).

1.3 Aims and objectives of the study

We carried our several studies to test the following hypotheses: 1) The child's social competence at the end of preschool age manifests itself as a constellation of preschooler's views about his/ her social qualities and his/ her attitude to self as a subject of social relations, and provides a particular kind of self-regulation – the real role-behavior. 2) The real role-behavior is closely linked with the content of the leading activity of the following stage of development – learning activity, typical for junior schoolchildren. 3) The major factors of formation of real role-behaviors in ontogenesis is their age-appropriate communication with adults and peers, and the traditional game.

In testing the above mentioned hypotheses we were solving the following tasks: 1) designing and testing the experimental technique, allowing to produce quantitative and qualitative assessment of the non-play role behavior at the end of the preschool age, 2) description of the real role-behavior in preschoolers, 3) establishment of association between the specificity of the real role-behavior of 6-7-year-old and their readiness for school, 4) identifying influence of preschoolers' social experience on their adjustment to school.

1.4 Experimental models and samples

At the first stage, in the sample of preschoolers aged 5-7 years we measured the levels of their development with regard to 5 variables: "general intellect", and "social cognitions" (recognized by several researchers as the main sources of social content in the structure of self-consciousness in children); "form of communication with adults" and "game activity"(as defined in the science as the main factors for mental and personality development in the preschool years); as well as the features of the "real role-behavior". Diagnostics and evaluation of the development of children on the mentioned above parameters were carried out using tests developed in the laboratory of mental development of preschool children (Smirnova/ Ermolova/ Galiguzova/ Meshcheryakova 2008).

At the second stage, we were examining the levels of school adaptation of the same participants (aged 7-8 years) with application of the following variables: "academic achievement", "school behavior", "sociometric status", "mastering the elements of learning activity".

"Academic achievement" was measured as an average of three school grades (in mathematics, writing, reading). The "sociometric status" was determined with the help of the adapted sociometric test. Features of "school behavior" were evaluated in the standardized observation of children's behavior in class and during their free time from the point of view of its conformity with the requirements of the teacher. "Mastering the elements of learning activity" was estimated in a specially designed experimental situation, approximating it to children's joint performance aimed at solving the teacher's task (Pantsirnaya 2000).

The main experimental method, used for assessing and analyzing the specificity of the real role behavior as a behavioral correlate of the personality new formation

of preschool age, was the laboratory experiment “Role oppositions”. It was designed to simulate the situation of the child’s fulfilling a social task in the course of his/ her joint activity with a peer. This situation helped to actualize the child’s image of self and attitude to self as to a subject of specific social activity, and made it possible to stimulate a special kind of social actions arising from this kind of understanding and assessment of his/ her relations with partners.

1.5 The experimental situation "Role oppositions"

Two participants were invited by an experimenter into an isolated classroom. Their pairing was held on a voluntary basis. Then the children were told that their task would be to make a drawing and they were seated next to the table on which there were the standard album sheets and color pencils. Then the experimenter reported that the drawing was not going to be a usual one and asked each of the participants to indicate what they would like to draw. After the verbalization of the participants’ intentions was over, the experimenter announced that each of them in turn would realize the drawing project of his/ her partner and not the one of his/ her own.

Several rules of behavior in experiment were introduced by the experimenter. The “author” of the drawing project was supposed to explain in details the idea of his/ her plot and was given a right to regulate the process of its fulfillment and estimate the result. Simultaneously the “author” was forbidden to draw instead of a partner. The “executer” of the drawing project was not allowed to substitute the “author’s” project by the one of his/ her own or ignore the remarks of the “author”. The “executer” also had a right to ask for extra explanations and discuss the quality of his/ her drawing with the “author”. The role-behavior of each participant in both positions (active – “author” and passive – “executer”) was estimated in conditional points with an aid of a specially designed scale.

The experiment designed in this way made it possible to objectivize the *social character of the experimental task* (joint activity with a peer implemented from a perspective of a particular role), to measure the adequacy of *role-mastery* in various positions, the *subjective value* of a certain position for the child and the *experience of his/ her compliance* to it, child’s *views on rules* of conduct imposed by a definite position and his/ her *attitude* to the violation of experimenter’s instructions by him/ herself or by a peer. In general this experimental model offered an

opportunity to assess the preschooler's image of self and attitude to self in a certain position and also specific forms of his/ her role behavior in it.

1.6 Discussion

The analysis of the specific repertoire of children's behavior in the experiment made it possible to develop a scale that allowed to carry out the qualitative analysis of child activity in the experiment and to express the behaviors we observed in conditional points through the establishment of the developmental levels of each aspect of children's activity.

The behavior of children in the experiment was estimated from several viewpoints: *ability to accept the social task; emotional involvement in socio-centered activity; influence of the occupied position on behavior; observation of formal rules; retaining the initial sense of the experimental task.*

The analysis of children's behavior in the experiment allowed distributing them into three groups: with low, medium and high level of development of the real role-behavior and to analyze the behavior of each group separately. The ratio of children in groups with different levels of development of the real role-behavior in 6-7-year-olds was as follows: low-17%, medium-26% and high-57%. Typical behaviors of children in each group were as follows.

Children in Group 1 (low total scores on the real role-behavior – 17% of children) tended to ignore the social content of the experimental tasks, and sometimes refused to carry out the drawing project of the partner. Their emotional involvement in experimental situations was usually high but non-specific, i.e., they used to substitute the initial goal by the ones of their own. For example, a child was drawing something on his/ her own initiative and then put wise to his behavior as connected with impossibility to draw on someone else's idea.

Sometimes the children of this group resorted to "social" ways of transforming the initial plot of their partners, i.e., tried to spirit them for changing their initial plan and giving them the one they could carry out ("Let us say that you have changed your mind and now you want me to draw a cat, because I don't know how to draw a Robocop"). Children in this group display extremely weak ability to keep an adequate role behavior in both positions. For example, they oppose the implementation of partner's rights to regulate their actions, they take offence at every remark

of the peer, but simultaneously they are very critically-minded in their estimations of their partners. Also, they tend to look for the adult's not the partner's approval of their drawings. In Group 2 (with an average level the real role behavior – 26% of children) participants rarely take the experimental task as a nominal one and therefore not obligatory for precise execution. However, like children of the previous group, they sometimes transform it into a task of just drawing on a particular topic. Yet, part of the subjects manifests the ability to withhold a social context of the experimental situation and are capable of attaining and observing the rules of the experiment either in the position of the "author" or the "executer". Their involvement in the experiment is more specific: they clarify the action rules, his/ her rights and obligations in a certain positions, but they do not always hold them in memory until the end of the experiment. Their behaviors in different roles appeared sensitive to the positions they occupied in the experiment, but not always consistent or free from partial distortions. They are more accurate in explaining the details of their drawing projects to their partners and display more adequate ways of regulating their partner's activity (e.g., they do not try to draw instead of a partner). However, they often estimated the peer's drawing at a low rate and asked the experimenter to let them show "how to draw".

In group 3 (with a high level of development of "real role-behavior" – 57% of children) there appeared a special attitude to experimental settings. The experiment was not perceived by them as an interesting game or an unusual session of drawing, but as a special task, the main feature of which is their responsibility for the partner's success in implementing their drawing project and the extent to which their own performance will meet the requirements of the "author". It was typical for children in this group to give a clear and detailed description of their projects and also thorough familiarization with the details of their partners' drafts. They often demonstrated a high degree of awareness of the abilities of other children ("do not erase much, always you have dirt in the picture, and I don't like it, and then I'll say: 'poorly made'").

Children in this group appeared capable of observing the rules of the experiment in both positions, though sometimes they were too ardent in one of the roles, for example, in the position of the "author" of the project where they were mercilessly criticizing the drawings of their partners or commenting on every step in the implementation of their projects. The active position (the position of the "author")

is easily assimilated by all the children of this group, and in the passive one (the position of the “executer“) several children resorted to the transformation of the task in case of difficulty in its fulfillment (e.g., “Come on, say that my picture is all right, and I’ll say the same about your picture“).

In this group, children rarely demonstrated the interference of interpersonal relationships and communicative experiences with their partners into the implementation of the experimental task. They kept “fair“ position even if they had fellow feelings for failing partners: they provided maximum of “legitimate” support to them, but never tried to break the rules to help out.

The typology of children’s behavior in the experiment “Role oppositions“ shows the main areas in which we may observe differences between them.

First of all, it is a motivational sphere, providing specific (social and personal) or nonspecific (game-related and object-related) drives for action.

Second, it is the stage of their personality development, reflecting the presence or absence of the child’s ability to recognize and experience the experimental task as subjectively significant for him; his/ her attempts to select and implement particular ways of its solving, and his/ her capacity to hold in memory the criteria of “proper” behaviors and self-estimation in accordance with these criteria.

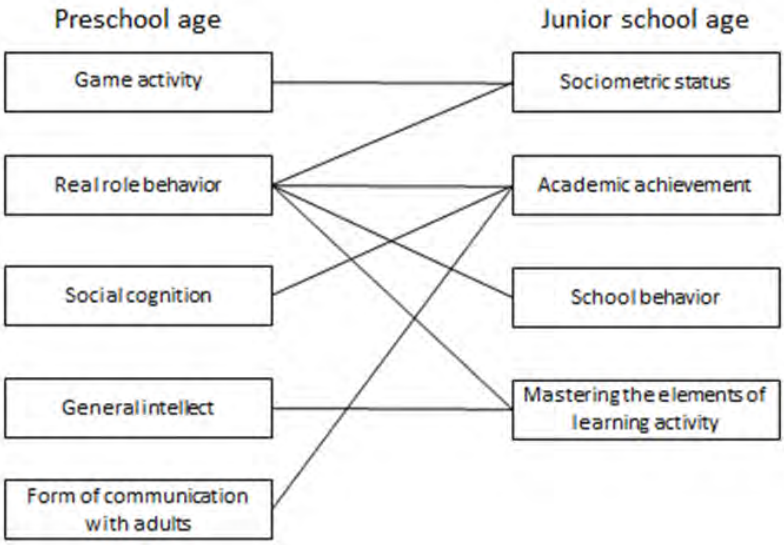
Third, it is a behavioral sphere, showing the presence or absence of the children’s ability to organize themselves in the situation of social tasks solution, i.e. the adequacy of their role behavior in a certain position.

Together they determine a child’s ability to comprehend the social content of some tasks and to select appropriate forms of voluntary self-organization for their implementation, i.e. they provide the measure of child’s social competence at this age. The behavioral component, especially the real role behavior, acts as an objective measure of social components of child’s self, as it is extremely sensitive to deficiency of other components or their deformities, and, as the experiment shows, it generally does not reveal itself in children with lack of expressed social motives or social criteria of their self-awareness.

On the second stage of the experiment, we evaluated the peculiarities of school adaptation in subjects, taking part in the 1st part of the experiment on the param-

eters of academic achievement, school behavior, sociometric status and mastery of the elements of learning activity.

To illustrate the results of this part of the study we used the figure published in the article written in co-authorship with E. Pantsirnaya (2000) that contained the correlation analysis of developmental indicators of 68 children who participated in the 1-st and the 2-nd parts of the experiment (preschool and junior school age). It displayed the significance of links between the certain developmental indices of children at the end of the preschool and the beginning of school ages and made it possible to discuss the predictability of "real role behavior" as a reliable criteria of assessing school readiness (see picture 1).



Picture 1: Measure of correlation between the indices of child development in preschool and junior school ages

1. Spearman coefficient of correlation was applied to reveal correlation between the indices of child development in preschool and school ages.
2. The arrows show the significance of correlations at 0.01 level.

1.7 Conclusion

The results of the correlation analysis showed that almost all the parameters of children's activity in preschool age (except the real role-behavior) had single or numerically insignificant links with their school activities. Yet, their ability to exercise self-regulation in the form of role-behavior was associated with all the parameters of their school life. It correlated not only with the social activity of junior schoolchildren, i.e. their relationship with the teacher (school behavior) and peers (sociometric status), but with the mastering of the elements of learning activity (the leading activity of the school age). At the same time, game activity manifested a poor predictability of participants' social development. Actually it only defined sociometric status of children in a group of classmates.

In other words, the study showed the close relationship between the level of the real role-behavior in senior preschoolers and their success in mastering the integral system of learning activity at school, which indicates the necessity to take into account the level of child's social competence (including his/ her ability to be engaged in real role-behavior with people around) when evaluating his/ her readiness for school education.

2. The current study

Two decades after the previous study, we made an attempt to go back to the results of our work in order to find out whether the real role-behavior retained its predictability in assessing the children's readiness for systematic learning, or whether it has lost its potential due to active interference of computer games into preschoolers' life thus reducing the amount of traditional symbolic game and transforming their relationships with adults and peers. If so, what form does the social competence acquire in preschool children nowadays?

In other words, we wanted to clarify the features of the real role-behavior in today's preschoolers and examine its dependence on gaming and communication activities. We do not claim that computer games in preschool children necessarily provide the negative impact on a child's social competence; however, we assume that they arrange preschoolers' communicative acts differently than the traditional game. In our last study, game activity (in the form of a traditional symbolic game) was not regarded as the leading factor in determining the quantitative and qualita-

tive characteristics of the real role-behavior of children. However, its relevance to the process of personal development in childhood is recognized by many scientists, as well as its dependence on the nature of the child's communication with adults and peers. As for computer games, their "contribution" to the developmental processes in the preschool years is still not fully clarified.

If we turn to empirical studies on the issues of computer games in early childhood we'll see that the attitude to early experience in computer gaming is rather ambiguous among researchers. Many studies suggest that computer games have a generally negative impact on a child as computer games with violence, criminal behavior or offensive themes can increase negative behavior in children.[1] Some researchers state that only video games which are solitary in nature can lead to disintegration of social fabric, and encourage children to spend their time in isolation and not from meaningful bonds with their peers. Although this might continue to be true for many games, the growing popularity of massive multiplayer role-playing games suggests that they have the potential to encourage cooperation and a degree of socialization. Some researchers found positive effects of moderate computer gaming on computer competence, cognition, and school readiness (Provenzo 1995). A study by Li and Atkins (2004) shows that students who play games on a weekly basis have improved hand-eye coordination and marginally higher IQs than their non-game-playing peers. School performance also increases slightly, though those students who play games on a daily basis lose this edge and actually perform more poorly at school than those who play no games at all.

Following the line of reasoning, we found it necessary to start a pilot research in order to examine whether the nature of the real role-behavior (which was regarded earlier as predictable for school readiness) transforms in children with regular computer gaming experience and whether this change is the same for children with different experience of communication with adults and peers (e.g. in children being brought up in the family and in the children's homes for orphans). This experiment has not been completed fully and not all received data are processed. So, we present the preliminary results. They seem to be interesting though disputable and requiring further examination.

[1] National Center for Education Statistics. Young Children's Access to Computers in the Home and at School in 1999 and 2000.

In response to this task we have carried out the comparative analysis of the real role-behavior in a group of preschoolers aged 6-7 years alongside with the level of their development at the end of their first year at school (at 8 years). The participants (202 boys and 110 girls) were divided into two groups, differing in communicative experience with adults and peers (children being brought up in the families – F group and in the children's homes for orphans – O group). They were further subdivided into two subgroups (78 participants in each), differing in experience of their play activities (with or without an experience of computer games). They were labeled as F- and F+, O- and O+ subgroups (- and + meant the absence or presence of computer games experience in children).

This kind of sampling allowed assessing the "contribution" of the participants' communicative experience with adults and peers and their gaming experience to the processes of development in the preschool years. Namely, children who were brought up in the families (F-sample) had full-scale contacts with adults and peers, and different experience of gaming activity. Children growing up in an orphanage (O-sample) were lacking communication with adults, had dissonant relationships with peers and also different experiences of gaming activity.

The specificity of participants' development in this series of experiments was evaluated according to the same parameters and with the help of the same methods as in the previous series (assessment of their real role-behavior at the end of the preschool age and examination of their school readiness with regard to their academic achievements, sociometric status in a group of peers, school behavior, mastering the elements of learning activity).

The assessment of the real role behavior according to qualitative characteristics used in the previous study made it possible to estimate its formedness[2] as high, medium or low in a new sample of participants.

[2] Formedness – is a new word in psychology that appeared after the latest wave of penetration of Vygotskian ideas into the Western science. It is a direct translation of the Russian term "сформированность", which does not have a proper English equivalent. It means in general "the result of the process of formation of some function or a phenomenon, when they reach their complete or final (sometimes typical for age) form. This word roots from the words: Form, formation, formed. It can be substituted by the word "maturity".

Indices of the 1st sub-group (F-) on the real role behavior actually coincided with the data obtained in the previous study: 15% of the children in the sample showed a low level of development according to this index, 29% participants were rated as medium and 56% – as high. It is likely that the socio-cultural context of participants' development in the 1st subgroup (F-) completely coincided with the one which was previously studied. Ratings of the participants in in three other subgroups differed from previously received data.

In the 2nd sub-group (F +) the percentage of children with a high level of formedness of the real role-behavior unexpectedly turned out to be lower than in the 1st sub-group while the medium level was the most expressed one: 25% of children in the sample showed a low level of development, 54% – the medium one and only 21% were rated high.

In the 3rd subgroup (O-) the rating distribution was as follows: 40% of children had low levels of the real role behavior, 47% – medium one and 13% – high levels.

In the 4th subgroup (O+) the rates were higher than those in subgroup 3, including orphans who had no access to computer games. Distribution in this sample was similar to F- subgroup, including children with family upbringing and having access to computer gaming: 26% of children had low levels of the real role-behavior, 50% – the medium one, and 24% were rated high.

Qualitative analysis of children's behavior in the experiment "Role oppositions" revealed the following differences in two samples of participants as connected with their communicative experiences with adults and peers (F and O samples).

As far as the children's *ability to accept the social task* is concerned we rated children with regard to their capacity to perceive the social sense of the experimental tasks and to focus on it in their actions. In O group it was significantly lower than in F group, but in the O+ subgroup it exceeded the indices of O-subgroup.

On the parameter of *"emotional involvement in socio-centered activity"* the differences in children's behavior were discussed from the point of view of their emotional and cognitive attitude to the experimental task and the number of deviations from its initial content. Emotional involvement into the experimental task was fairly high in all the participants in both groups, but the cognitive attitude was more pronounced in participants of F+ and O+ subgroups.

As far as the *"influence of the occupied position on behavior"* is concerned the differences displayed themselves in presence or absence of role behaviors appropriate to the occupied position. Here, the highest rates were in two groups: F- and F+. The participants in O- and O+ subgroups were not sensitive to changes of positions and often displayed similar behaviors in different positions.

Differences in participants' "*ability to observe formal rules*" were regarded as keeping in mind the experimenter's instructions and observing them in solving a social task. It could also display itself as child's complains about breaking the rules by peers, or an attempt to clarifying the prescribed rules for "authors" and "executers". The lowest rates on this parameter are observed in both O samples and sometimes in F+ subgroup.

The capacity "*to retain the initial sense of the experimental task"* was distinctly expressed F+ and O+ subgroups. The participants in subgroups without an access to computer games (F- and O-) were rated lower according to this parameter.

An overall picture of the behavior of children from F and O samples in the experiment shows that for a significant number of children with family upbringing a role self-organization in the situations of solving social tasks becomes a typical form of activity at 7. Children start assessing the capabilities of their own and of their partners' when distributing obligations and responsibilities in the experiment or estimating the reliability of peers. They control the compliance of their actions and the actions of the partner to the prescribed rules, become interested in adequacy of the peer's social behavior and practice non-aggressive ways of resolving conflicts.

Role self-organization of 7-year-olds living in the orphanage can be observed in a smaller group of participants. Children in this sample are rather selfish and hardly capable of cooperative interaction with the partner in the experiment. They are more aggressive in expressing disagreement with the peer's assessment, in general are less sensitive to peer's opinion, and usually look for the adult's approval of their performance.

School readiness being regarded on the part of preschooler's social competence, manifesting itself in real role behavior, made it possible to predict that the number of children in our experiment who were objectively prepared to systematic learn-

ing were: 56% of the children in the sample F-; 21% of children in the F+ sample, 13% of the children in the O- sample and 24% of children and in the O+ sample.

This data also allows us to conclude that access to computer games reduces the level of the real role-behavior in F-samples and increases it in the O-samples.

The next step was to evaluate the peculiarities of children's development at the end of the first school year on the parameters characterizing their school activity. At this stage of the data processing we can provide only preliminary scores, describing the rate of children with high, above average, average, below average, and low level of development on each parameter of observation in each sample: (F-), (F+), (O-) and (O+). This data is presented in table 1.

As the results of this part of the experiment show, preschoolers having full families and visiting kindergartens (subgroups F- and F+), were ahead of their peers living in an orphanage on almost all the parameters of observation. They have better academic achievements, they are more ready to accept the necessary forms of school behavior, and they are more successful in mastering the elements of learning activity. At the same time, children in this sample with different experiences in play activity at the preschool age differ a lot. The unexpected result was that children with the experience of computer gaming before school have lower rates on the parameters of academic achievements and mastery of the elements of learning activity.

Children with the orphanage background (subgroups O- and O+), though rated lower than peers, living with parents, for the most part of activities in school settings, however, seem to do better at school if they had an experience of computer gaming before school. In this case they significantly outpaced their peers with an orphanage background, who had not had the opportunity to use the computer before.

Table 1: Levels of school-related activity in junior schoolchildren with various communicative and play experience.

Parameters of development	Samples	Levels of development				
		High	Above average	Average	Below average	Low
Academic achievements	**(FC-)**	52	26	17	5	0
	(FC+)	6	67	20	7	0
	(O-)	3	1	64	27	5
	(O+)	44	20	18	13	5
School behavior	**(FC-)**	55	36	9	0	0
	(FC+)	45	30	12	13	0
	(O-)	20	40	13	27	0
	(O+)	11	56	22	0	11
	(FC-)	25	21	33	17	4
Sociometric status	**(FC+)**	20	20	33	20	7
	(O-)	0	7	29	42	22
	(O+)	0	17	49	20	14
	(FC-)	37	13	25	25	0
Mastery of learning activity	**(FC+)**	0	16	67	17	0
	(O-)	0	0	12	74	14
	(O+)	7	14	42	17	20

In general, the qualitative analysis of the participants' activity in the school settings has shown that in a sample of children living in children homes for orphans (O sample), who had the potential opportunity to interact with peers but experienced lack of communication with adults, all indicators of development are lower than in the F sample. They have a poorly formed capacity for collective forms of activity with peers and weakly expressed understanding of the peers' qualities. These children show a high degree of adaptation to school from the perspective of the normativity of behavior in the classroom (they raised their hand to show that they know the answer to the teacher's question, readily lined up, and positively perceived the teacher's limiting instructions). At the same time, they have trouble in mastery of the elements of learning activity, and do not remember the specific conditions of the forthcoming activity. Their academic achievement is significantly lower than that in F samples.

Children who had full-scale and adequate for their age contacts with adults and peers before school (F sample), reveal a wide variation in indices of their development at school. They are not necessarily high rated students with a high level of self-organization in the class-room. They may have both high and low sociometric status, be exemplary students or violate the discipline at the lesson, but it is only in this sample where the participants demonstrated high levels in mastering the elements of learning activity.

Comparison of samples with different experience of communication with adults and peers shows that these two spheres of communicative activity in children have different effects on the emergence of child's social behavior. With a deficit of communication with adults (O sample) the child aged 7 years is not aware of his/ her social qualities and is incapable of independent relations with peers. Lack of communication with peers even if it is accompanied by full-scale contacts with adults leads to distortions in child's self-esteem in situations of solving social tasks, inadequacy of his/ her group behavior caused by high levels of egocentrism and insensitivity to peers' initiatives. Experience of computer gaming in pre-school age, partly smoothes away this difference, but did not completely eliminate it.

3. Conclusion

At the age of 6-7 years, many children (though not all) are able to take different positions in their relations to surrounding people, and behave in accordance with them. Our study shows that it is this very ability of a child that determines the specificity of his/ her real role-behavior at the end of preschool age as well as his/ her readiness for productive forms of cooperative interactions with peers in situations of educational type.

The preschool experience of regulating contacts with peers, cooperation with peers in solving practice-related, cognitive and personal goals help the 8-year-olds to gain the ability to navigate through the business and personal qualities of peers, rely on these qualities in their joint activity with them, take them into account in arrangements of their own affairs and to seek recognition on the part of the peers.

Alongside with acknowledgement of an adult as a teacher, junior schoolchildren seek for recognition on the side of peers, who seem to become a mighty stimulus for self-improvement in junior schoolchildren.

The preliminary results of our study showed that children who lacked communication with adults, display insufficiently expressed ability to perceive the peer in all the positions possible for this age. Children with orphanage background rarely regard the peer as an object for imitation, as an equal partner, and as a judge of their accomplishments. More often, they consider a peer to be a rival standing between them and an adult, who has an absolute value for them. Children aged 7 with secure family background strive to communicate both with peers and adults.

It results in impoverishment of orphans' social contacts (e.g. they have trouble in making friends with peers). Their contacts are situational, dissonant and emotionally cold. The peer does not attain the quality of an additional source of knowledge and education for orphans living in children homes.

To sum up, we believe it is necessary to emphasize that the development of the child as a subject of social relations at the end of preschool age is not a purely intellectual or cognitive act. It is not a kind of insight, leading a preschooler to understanding of his/ her social entity. This quality is being formed gradually in the course of specific interaction with other people through taking the corresponding positions in interrelations with them.

It is in the course of this interrelation that the child cognizes the attitude of other people to his/ her social qualities. This knowledge enriches the cognitive areas of child's image of self through clarifying the idea of social sphere of human life in general and the one of his/ her own in particular. Closer to the 7th year of life the experience of real role-behavior penetrates into the nuclear areas of child's image of self and arises a specific experience of success in situations of social interactions.

Real role-behavior of preschoolers becomes the main activity into which children project themselves. It becomes an area in which child's self can become an object of assessment on the part of other people and in which new criteria for child's self-estimation (as social self) are being shaped. Communication with adults and peers is the leading factor of the role forms of social behavior. In communication with the surrounding people children single out attain the other people's attitudes to the specific (social) qualities of their selves. These attitudes are then interiorized and become psychological signs providing new means of self-cognition, self-estimation and self-control in situation of solving social tasks, that is, the task.

The change of play activity in preschoolers, the substitute of the traditional symbolic games by computer games seems not to affect the processes of socialization in 6-7-year olds if they have full-scale interrelations with relatives and peers. More so, computer games may have a positive effect on academic achievements in children with disadvantaged social background.

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Psychological and Pedagogical Approach to Designing Developmental Computer Programs for Senior Preschool Children

A. Yu. Kremlyova and E. O. Smirnova

This article decribes the specifics of using computers and computer programs in developmental work with children of preschool age. The concept of a computer game and the activity mediated by the computer is discussed. We present analysis of modern computer programs for preschool children, including shortcomings and risks of the usage of entertainment programs. Design stages of the computer program from the point of view of activity approach are introduced. Two types of developmental computer programs are appointed: closed and open type. Advantages of programs of open (creative) type are shown. The contents of a uniquely designed computer program of open (creative) type are described, with indication of the principles that methodology of the lessons is based upon. Finally, we present the results of a formative experiment, which showed that the developmental computer program and the suggested methodology of lessons promote development of certain components of systemic thinking, general integral indicator of systematic, as well as flexibility of thinking and imagination of senior preschool children.

1. Special features of using computer technologies in education

Nowadays modern preschool education faces the tasks related to active and effective use of new technologies in education and developmental work with children. Preschool education in this context demands a special approach to the contents, methods and forms of work with children. New computer technologies cannot be mechanically transferred to the educational environment of a kindergarten. Special research is necessary to provide scientific ground for introduction of the computer technologies into this primary and in many respects key stage of education.

Already at preschool age, modern children become a part of a new kind of activity – a computer game. The term “computer game“ is used for designation of children’s interactive computer programs. However, is it possible to call such kind of activity a “play“ in the true sense of the word? Play of preschool children is a creative activity; in this activity they create a special play situation, in which they replace some objects with others, and real actions with symbolic ones, reproduce the main meanings and relations between people. In the real play, the child assumes functions of the adult, thus reproducing in generalized and symbolic way the activity of an adult and subordinating his/ her actions to the rules of this role (Vygotsky 1966, Elkonin 1999, Obukhova 1998)

Therefore, in a role-playing game “playing computer“ a suitable replacement object, which is externally similar to the computer should be enough for the child. But, as practice shows, it is more interesting for modern children to interact with the computer, instead of playing it. At that, cognitive activity that the child will carry out at the computer and the impact of this activity on the child’s development depend on the tasks set for the child by the computer, or rather, by the program which was put in it by adults.

In this article we will consider interaction of the preschool child with the computer not as a play, but as an activity in which the computer and contents of computer programs offered by it act as one of didactic developmental educational tools.

The first acquaintance of the child with the computer often begins with computer interactive software bought by adults. At present, the market offers an abundance of computer programs for children from the age of 3. Among them, there are arcades, quests, strategies, simulators. Such programs should be classified as entertaining. Many of them are developed with purely commercial purposes and do not meet the psychological and pedagogical requirements. Moreover, they bear potential harm for the child: they do not set intellectual tasks, prematurely actualize competitive motives, advocate aggression and most importantly – form computer dependence.

It is better to engage a preschooler in computing by means of the programs, which haven’t been constructed on a suspenseful, venturesome, emotionally charged plot. Game programs with long suspenseful plots do not allow stopping computer game over a short period of time – 10-15 minutes, which are dictated by age norms and sanitary requirements. Compulsory attempts of adults to do it often

lead to negative affective reactions of children as they are interrupted in the most interesting moment, cannot finish a level, receive a bonus, etc.

Computer programs created by the principle of play-like developmental mini-tasks, each of which represents logically complete plot, are the most preferable for children of preschool age. Such programs make it possible to stop computing without stress, meet timing standards of this age (10-15 minutes), and let the child a chance to finish a task, to get and see the result of his/her activity and an assessment (or encouragement) from the computer program. We would call such programs the developmental computer programs (DCP).

Quality requirements for DCP in many respects are defined by characteristics and capabilities of age, therefore, it is important to note that we can acquaint the child with the computer not earlier than at 5 years of age. The reason for this is the complexity of actions and operations, which the child should carry out in activity mediated by the computer:

- First, in order to use the computer as a means of activity in full, the child needs an ability to use symbols (signs) and generalized images (and, therefore, a rather well developed thinking and creative imagination). Images on the screen are always images and symbols of real or play objects and in order to successfully operate them, a substitutionary (symbolical) function of thinking has to be developed.
- Second, work with the computer program can be considered as twice-mediated activity: the preschooler has to act with hands, pressing fingers on keyboard or mouse buttons and at the same time to observe the changes of objects and backgrounds represented on the screen.
- Third, the child needs to have developed a certain level of voluntary actions (attention, perception, memory), and volitional self-regulation (Novoselova/ Petku 1997, Gorovits et al. 1998).
- Finally, and that is the most important thing, if DCP is introduced to a child too early it can inhibit and reduce normal development of real play in which personality and mental development of preschool child is carried out.

The analysis of the results of theoretical and experimental research leads to conclusion that computer can become an effective means of personality and cognitive development of a child at the senior preschool age. The main factor here is a quality of computer programs and pedagogical conditions of their utilization. In this

regard, it is extremely important to reveal basic provisions of psychological and pedagogical approach to design of computer programs for children of preschool age and on this basis to develop adequate programs for preschool children. This article is devoted to the solution of these tasks.

2. Design stages of the developmental computer program for children of senior preschool age

A fundamental thing in designing any tools for the educational environment (including computer programs) is the *analysis of activity*, which defines the ways of utilizing these tools which, in turn, are aimed at receiving a certain developing result (Davydov et al. 1996, Rubtsov et al. 1991). According to this requirement, we can postulate the main design stages of developmental computer programs (CDP).

At the *first stage* it is necessary to carry out the analysis of the educational developmental situation and to define types of activity which influence the possibility of developmental effect. In relation to work with senior preschool children it is important to combine activity with objects, productive activity, and play activity (both individual and cooperative).

Let us look at types of activity and actions of children with DCP, which we had divided for the purposes of our discussion into programs of the closed and open type.

The main feature of computer tasks of the *closed type* is a complete external control on the side the computer program. In such tasks the instruction defines and directs specific actions of the child in accord with the computer program: to choose the correct answer to a question, to connect corresponding figures, to choose only demanded pictures, to point out a certain letter, etc. These are mainly the tasks aimed at training the skills and exercising some cognitive processes.

When performing such tasks the child becomes an executer, the “doer”. The computer sets a task, controls its execution and evaluates results. The child has no opportunity to show any initiative in such a work.

In tasks of the *open type* there is no external control from the computer, and the tasks the child solves and actions he/ she carries out can be diverse and varying.

Such tasks allow the child to show maximum of initiative and self-control of his own actions.

Computer tasks of the open type correspond more to requirements of the age and provide a bigger developmental potential.

At the *second design* stage it is necessary to carry out the analysis of the subject content which children face when performing activity. DCP has to be guided by the educational content for preschool children. Since the activity mediated by the computer has a sign and symbolical basis, we believe constructive-modeling activity with objects representing signs (models) of some things familiar to children can be an effective design option.

At the *third stage* it is necessary to create a system of tasks, actions and operations which implement the allocated type of activity. DCP designed as an open (creative) program gives children a possibility to carry out varying constructive modeling actions in all their completeness. It creates a basis for the substantive analysis and comparison of properties of objects with pronounced search activity, a basis for generalization of concepts and actions, helps children to solve problems through their own productive and creative activity, to include play elements in the activity mediated by the computer, to organize children in collaboration. The solution of such tasks creates a basis for formation of systematic thinking.

3. Characteristics of the experimental developmental computer program for senior preschool children

The purpose of our experimental study was the development of DCP accounting for the mentioned provisions, and further examination of its efficiency in development of cognitive abilities of preschoolers, namely systematic of thinking and its prerequisites as leading indicator of intellectual maturity of children of senior preschool age.

At the *first stage* of this study, we developed a DCP of open (creative) type based on requirements from a psychological and pedagogical point of view.

The developed program represents an open type environment, in which specific tasks are not given to the child, instead, the tools for performance of varying actions are provided. Various elements, objects, forms and figures act as these kinds of tools (squares, circles, triangles, leaves, petals, cones, cockleshells, etc.). These elements can be picked out and transferred into a working field of the screen

where there are opportunities to perform different actions with them by means of special functional keys (movement, turn, change of an arrangement, size and/ or color, deleting) (see Fig. 1). Thus, any activity of the child in this program has a constructive character. Performing any tasks on creating something whole from several elements, the child carries out constructive modeling actions with the elements presented in the program, thus analyzing, comparing and generalizing their properties.

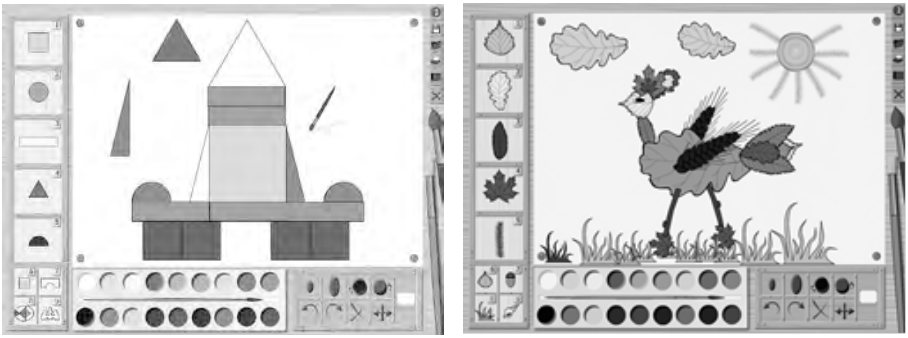

Fig. 1: Fragments of DCP design

This program allows operating in imaginative mode the visual objects and develops substitutionary function of thinking. All elements and objects to work with are presented on the screen (as drawings) and are symbols, signs of real objects. Each time creating a product, the child selects elements, which have the properties necessary to create what was intended, which promotes the development of generalizing function of thinking (for example, the sun is round, but the circle among elements isn't present, however there is a berry which is in shape similar to the sun, so the berry can be used to make the sun). Such activity has also a productive nature, meaning that it actively involves creative imagination.

The contents of this DCP take into account the contents of educational and developmental programs for children of senior preschool age. When working with the computer program children operate familiar objects (natural, construction materials, artistic and decorative elements, etc.), which they learn about at other lessons and use in other types of activity.

The program helps to enrich computer lessons with organizational forms of work with elements of joint activity of children with the teacher and joint-distributed activity between children. Also the program allows combining activity by means of which it mediates with children's own productive, object-related and play activity.

4. Research of influence of experimental DCP on cognitive development of preschool children

In total 87 children of senior preschool age took part in the study: 26 children participated in the pilot run, 61 children – in the main formative experiment. During the main experiment, we gave 24 developmental lessons with the computer. Lessons were given during 3 months, two times per week; they took place in a computer class of a preschool institution with the use of DCP we developed. Each lesson lasted not more than 30-35 minutes and included the following stages:

1 stage – preparatory (5-10 minutes). It took place in a play area of a computer class. Children were introduced to the content of the forthcoming activity by means of visual didactic materials; the motivation to work was formed.

2 stage – the main stage (15 minutes). It was carried out at the computers. At first children were given general explanations and short instruction, then, they took their places and got down to work. Observation over their work was carried out, if necessary additional explanations were given, the task was clarified. At the end of the lesson all children's creative works were saved in the computer, if necessary, they were also printed out.

3 stage – final stage (5-7 minutes). Children went back to the play area of a computer class, where they had discussion on the results of their work, comparison and discussion of all works and summing up the impressions from their activity. Using the results of their work, children were involved in a play, productive and object-related activities (drawing, construction, composing fairy tales, etc.).

At some lessons, children were paired up and worked over one project together at the same time (using different computer mice) or in turns (using one computer mouse). Occasionally we divided some tasks between the children, so that everyone carried out some part of the project at the computer to be further integrated into a final product.

It is very important that at the final stage of the lesson (control and evaluation stage) the works of children were looked at, compared, discussed, used to compose stories or create games to play together, etc. In this way the result of their work becomes a part of new kinds of activity – productive, practice-related: drawing, scissoring, gluing, using their computer projects as an example for further work, etc.

The main diagnostic method was the set of tests designed by N.I. Polivanova and I.V. Rivina (1996), which help measure the levels of formation of imaginative component of systemic thinking (”Turns of figures“), analytical components (”Choice by analogy“, ”Classification“, ”Add to a set“), and also an integrated indicator of development of systematic of thinking as a whole (”Row of rings“). As an additional measurement in the second diagnostic session, which followed the main formative experiment, we used V.V. Holmovskaya’s test, which measures the levels of development of child ability to freely mentally operate with objects and to see the object as a whole when it is deliberately divided into several parts. For diagnostics of the levels of creative thinking development (fluency, flexibility, originality) we used the „Circles“ test. Statistical significance of differences was evaluated with φ – Fisher LSD criterion and U Mann–Whitney criterion.

Results of the diagnostics, which has been carried out prior to the beginning of formative experiment showed no significant differences between experimental and control groups in all tests.

Comparative data analysis of control and experimental groups after formative experiment (see Table 1) testifies that children from experimental group surpass children from control group in terms of levels of development of imaginative thinking: they have better developed ability of mental operating the visual objects („Turns of figures“) ($p \leq 0{,}01$ U – Mann-Whitney). Children from experimental group also have significantly higher rates in level of development of ability to point out and correlate essential characteristics of objects, to establish the principle by which a system is structured and how its essential characteristics are interrelated („Add to a set“) ($p \leq 0{,}01$ U – Mann-Whitney). If we look at the levels of development of ability to abstract from insignificant characteristics in the process of classification („Classification“) we can see that in experimental group the number of children with the highest level (1 level) of this ability significantly prevails ($p \leq 0{,}05$ ϕ–Fisher) (see Table 1).

Above we compared the results obtained in each group, according to indicators of development of the main components of systemic thinking (imaginative and analytical). Diagnostic methods applied in this research also show the level of development of systematic of thinking, which manifests itself in the development of child analytical and constructive ability. We can detect it when the child demonstrates an ability not only to point out the principle of a system's structure, but also to create a new system on the basis of the revealed regularity („Row of rings"). Results show (see Table 1) that in larger number of children from experimental group we can observe that systematic of thinking is formed (1 level) (p≤0,05 ϕ–Fisher).

Table 1: Results of the experiment in control group (CG) and experimental group (EG) after formative experiment according to subtests of a system thinking diagnostic procedure

Methods		**CG**	**EG**	**Criterion value and significance of difference**
«Turns of figures»		69,5	84,2	U_{emp}=110,5 (U– Mann-Whitney), p≤0,01
«Choice by analogy»		69,9	72,4	–
«Add to a set»		59,1	74,7	U_{emp}=113 (U– Mann-Whitney), p≤0,01
Classification (%)	level 1	24	50	Φ_{emp}=1,75 (ϕ–Fisher), p≤0,05
	level 2	71	50	–
	level 3	5	0	–
Row of rings (%)	level 1	10	35	Φ_{emp}=1,99 (ϕ–Fisher), p≤0,05
	level 2	33	20	–
	level 3	57	45	–
V.V. Holmovskaya test		9,6	12,3	U_{emp}=95,5 (U– Mann-Whitney), p≤0,01

Note: Only values of criteria having significant difference are presented in the table.

The diagnostic set also included a method of diagnostics of creative thinking "Circles" which measures such characteristics of creative thinking as fluency, flexibility, originality.

The analysis of the results helped define that only the indicator of flexibility of thinking was significantly higher in children from experimental group ($p \leq 0,05$ U – Mann-Whitney) (see Table 2). Flexibility of thinking in this experiment characterizes ability to generate different creative images belonging to different classes of objects, overcome rigidity of thinking, ability to give varying answers.

Table 2: Comparison of results of "Circles" test in control (CG) and experimental (EG) groups after formative experiment (GPAs)

Indicators of the test	CG	EG	Criterion value and significance of difference
fluency	12,2	13,4	–
flexibility	20,4	26,1	U_{emp}=131,5 (U– Mann-Whitney), $p \leq 0,05$
originality	4	5,3	–

Note: Only the values of criteria having significant difference are presented in the table.

5. Discussion of results

The obtained data show that use of DCP we developed substantially promoted development of imaginative component of systemic thinking. It can be explained by the features of DCP, which is the program of the open type and presupposes that children implement productive activity with elements of designing, modeling, performance of mental transformations of objects, and also, in planning and predicting actions.

The contents of tasks solved by children, the nature of their actions with DCP (modeling, project creation using sample model, classification, connection to practice-related experience, creative projects, performance of creative tasks with rules) had an impact on development of separate analytical components of systemic thinking. It promotes the development of ability to carry out operations of analysis, synthesis, comparison, abstraction, which are the basis of implementation of generalized actions, and skills of finding essential characteristics of objects and characteristics of system structures.

The fact that the methods applied in computer lessons took into account the interrelation of computer activity with other key activities for development of preschool children also influenced the development of components of thinking.

Children's activity at computer lessons had essential impact on development of flexibility of creative thinking. We can see that an ability to generate different images, to give varying answers; to overcome stereotypes of thinking in task performance were much higher in children from the experimental group. Development of this quality was promoted by creative nature of activity of children with the DCP, which presupposes solution of varying productive tasks with the use of construction material.

Using computer as a means of activity creates a basis for development of the highest forms of thinking, which are determined by sign-symbolic essence of this activity. It appeared that DCP of the open (creative) type helps the child carry out productive activity, design, experiment with a set of objects. It also creates a basis for active analysis and comparison of their properties and thus can be taken as a more effective one.

When activity with DCP is included in joint activity with the adult and with other children, children's' own productive activity, and a play as well, it provides favorable pedagogical conditions corresponding to special aspects of age and creating a basis for effective development and formation of systematic of thinking as a whole.

Thus, results of our research confirm efficiency of DCP utilization in education of preschool children, as long as such program corresponds to special properties of preschool age.

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Digital Media as a Means of Developing Reflection in Students with Disabilities: Cultural-Historical Perspective

Olga Rubtsova and Natalya Ulanova

A multidisciplinary research project "Understanding Digital Media" was launched in Moscow State University of Psychology and Education in 2011. The project aims at investigating the influence that digital technologies exert on various intra-psychological aspects of development – particularly on the formation of higher mental processes. The research is based on the fundamental idea of the cultural-historical theory (L.S. Vygotsky, A.N. Leontev, A.R. Luria) that demonstrates the crucial difference between tools and signs in human activity. In the research digital media are perceived as cultural signs, oriented towards higher psychological functions and mental processes. The article focuses on a longitudinal case-study undertaken with a disabled student of the IT Department[1] . The goal of the study consists in investigating the influence of digital technologies on the reflection of the student while he is working on his graduation project – shooting a documentary about his love story.

1. Introduction

In the past few decades there has been a boom of research on digital media particularly in the context of upbringing and education. Scholars coming from various theoretical backgrounds highlight the importance of technologies in reshaping educational practices worldwide (Bonk 2009, Christensen et al. 2008, Heldberg 2011, Volman 2005, Voogt 2003). However the majority of recent works seem to focus mainly on the visible consequences of ICT usage (e.g.: improvement of information accessibility, expansion of the traditional borders of schooling environ-

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ment, modification of classroom communication, shifts in school performance, changes in interaction between teacher and students). Insufficient attention is paid to the intra-psychological aspects of media usage, particularly concerning the process of development and formation of higher psychological functions. Thus, till now there have been very few works devoted to the influence that digital technologies exert on attention, speech, memory, perception and other mental functions and processes.

Since 2011 these issues have become the focus of a multidisciplinary research project "Understanding Digital Media" launched in Moscow State University of Psychology and Education. The project aims at tracing the impact that digital technologies, used in educational process, have on various aspects of development in young people. The research is conducted in collaboration with the Department of Informational Technologies, which specializes in the education of disabled students. Thus one of the research target groups is represented by students with disabilities.

The International Classification of Functioning, Disability and Health define disability not solely in terms of health, but as the interaction between mental and physical conditions and personal and environmental factors (World Health Organization 2001). People with disabilities are often at the forefront of new media practices (Hartz 2000). Moreover, they regularly drive the demand for technological development (Verlager 2009) and push ahead the able-bodied population in their understanding of the media changes happening around (Jenkins 2008). Digital technologies deeply affect life of disabled students, who are extremely sensible to various aspects of ICT usage and represent a target group which can provide relevant data on the developing potential of digital media. Therefore it is not surprising that many scholars stress the need for a deeper theoretical understanding of the potential of technology usage and media literacy in the context of various disabilities (Alper 2012, Burne et al. 2011, Floyd et al. 2008).

The article presents a longitudinal case study undertaken with Arthur Kazakov – a 23-year-old student facing cerebral palsy. Arthur voluntarily agreed to participate in the project and gave the permission to use his name in the research work without any changes.

2. Digital Technologies: Tools or Signs?

Among various ways and practices of media usage, we can single out two essentially different approaches. According to the first, digital technologies are used as instruments, or tools, which are applied for achieving a certain objective. With this approach the investigator perceives media as external mediators that the student operates in order to solve concrete learning tasks. Psychological studies taking the first approach usually focus on the visible changes that emerge in the activity with the appearance of a particular media and compare them with the former practices. An example for this could be a study of how teacher-student interaction in the classroom changed with the introduction of interactive boards (compared with traditional blackboards). In the framework of the second approach, technologies are used as a means of internal activity which does not only result in changes within the activity itself, but also influences inner functions and processes. The theoretical basis for this approach is provided by the cultural-historical theory and particularly by the essential distinction that it makes between tools and signs in human activity. This distinction is closely connected with the Vygotskian understanding of mediation.

L.S. Vygotsky distinguishes between two forms of human activity – external and internal. Consequently, he distinguishes between two kinds of mediational means – tools, which refer to the external, or **mediated**, activity, and signs, which refer to the internal, or *mediating* activity. N.N. Veresov accentuates the difference between the two:

> *"Mediated activity is already mediated by mediators, which were given or established, i.e. are created before. … It is therefore, related to the fruits of development. Mediating activity, in contrast, is an activity that is not mediated, but mediates the whole process; it is an activity of mediating, not of mediation" (Veresov 2010, 86).*

From Vygotsky's perspective, the tool reorganizes the structure of labor operations, while the sign recreates the whole structure of behavior. Thus, the substantial difference of sign from tool resides in the different purpose of the one and the other:

> *"The tool serves for conveying man's activity to the object of his activity, it is directed outward, it must result in one change or another in the object, it is the means for man's external activity directed toward subjugating nature. The sign changes nothing in the object of the psychological operation, it is a means of psychological action on behavior, one's own or another's, a means of internal activity directed toward mastering man himself; the sign is directed inward" (Vygotsky 1997).*

According to this distinction, tools are directed outward and applied to the objects in the outer environment. Tools, therefore, remain external mediators. On the contrary, signs represent a means of internal activity directed toward functions and relationships. They are used to direct mind and behavior. Consequently, signs are internalized. In the context of research on mediational means (including technology) it is thus necessary to identify, to what form of activity – external or internal – a particular means refers to, and for what purpose it is applied in it.

The possible limitations of this approach in relation to media are connected with the fact that while reflecting on mediational means, L.S. Vygotsky spoke very little about the medium which makes an object being a means. According to G. Rückriem, the reason is obvious: living at the end of the "Gutenberg galaxy", Vygotsky took for granted the mediating principles of the book printing century. He "never came under the water of digitalization" and did never reflect "neither on digital technology nor on its revolutionary importance as a new leading medium". However the change of the leading medium always triggers profound shifts in on all the aspects of mediation:

> *"In reliance to the given leading medium the understanding of what could be a tool or a helpful instrument changes. Existence, form and function of tools and instruments as well as the social rules of their application and use depend on the actually given medium and its information and communication systems. No exceptions are possible. … Every leading medium constellation produces its own typical practices and products, activities and cooperation forms, its means, tools and devices as medium between man and environment, and it emerges symbolically generalized communication media to steer the communication between individual or social systems…" (Rückriem 2010, 36).*

From this perspective, digital technologies as the leading medium deeply affect all the aspects of mediation, reorganizing its practices, introducing new activities and forms of cooperation. In the context of digitalization the changes seem as dramatic as never before, since technologies reshape the very character of the mediational process, turning it from linear and causal, to a more interactive and dynamic one. Thus, in relation to technologies, it often becomes quite challenging to draw the line between internal and external activity, as well as to identify whether in a given situation a particular technology is used as a tool, directed outward, or as a sign, directed inward and influencing inner functions and processes. The interactive character of digital media blurs out clear boundaries separating these phenomena, and makes the relationship between them much more flexible.

At this point it might seem that distinctions, proposed by L.S. Vygotsky with regard to mediation in the XX century, are no longer relevant in the Information Age. However, despite the fact that Vygotsky never got in touch with digitalization and never witnessed technologies becoming the leading medium, he was quite aware of the dynamic character of the relationships existing between the basic components of mediating practices. Thus, even while contrasting tools and signs, Vygotsky always presupposed a profound connection between them. According to H. Daniels:

> *"Vygotsky saw tools and symbols as two aspects of the same phenomena: a tool being technical and altering "the process of a natural adaptation by determining the form of labor operations"; the sign being psychological and altering "the entire flow and structure of mental functions" (Daniels 2008, 9).*

In that way Vygotsky did not set rigid boundaries separating tools and signs. Moreover, not only did he speak about close interrelation between the phenomena, but also did he point out to the developmental character of this relationship, saying that originally signs (or system of signs) exist as external tools, as a kind of cultural material, which later become tools of internal mediating activity (Vygotsky 1997). With regard to digital technologies it is important to emphasize the dynamic aspect of this transformation, which cannot be perceived as a linear, step-by-step process.

Summing up, we can assume that the general principles of mediation, provided by the cultural-historical theory, are perfectly applicable in the Information Age.

However it is important to highlight, that digital technologies as the leading medium deeply affect all the aspects of mediation. In particular, they blur out clear boundaries between mediated (external) and mediating (internal) activity, making the relationship between such phenomena as tools and signs much more flexible and dynamic.

3. Genetic Research Methodology: Tracing the Process

Since our research group set the goal of investigating the influence of ICTs on intra-psychological processes, the main focus is put on the use of digital media as cultural signs. At the same time, as we are regarding the sign from a developmental perspective, structural analysis of sign mediation is not enough. We cannot be satisfied with investigating the place of sign in the structure of functions that are already formed and mature, regarding the sign exclusively as the result or the final product, but we need to study it in the course of development, tracing the very process of it becoming a sign. Importantly, we have to keep in mind that "the sign is a mental tool … which does not simply exist, and does not only reorganize the structure of functions, but arises with necessity in the process of the cultural development of the higher mental functions" (Veresov 2010, 86). The word "necessity" here is crucial, since it implies that cultural signs (e.g. digital media) should not be studied in isolation from the general developmental frame. In our case it means that the goal of the experimental research consists in observing the process of transition from direct operation with digital technologies to using them as signs, oriented toward certain mental functions and processes – particularly, toward reflection.

The foundation for understanding reflection in the framework of the Cultural-Historical Theory was laid by L.S. Vygotsky, who perceived this phenomenon as the image of one's own inner processes in consciousness. From his standpoint reflection is an extremely important mechanism, since it always underlies new types of connections as well as correlation of functions (Vygotsky 1997). A.N. Leontiev regarded reflection as the capacity to assess one's own actions and their underlying basis (Leontiev 1978). V.V. Davydov perceived reflection as turning to the foundations of one's own actions (Davydov 1998). Each of these definitions presupposes certain alienation from one's own position in order to evaluate it from the standpoint of an outside observer.

As any higher mental process, reflection originally emerges in social interaction – that is, between people. Investigating it from a developmental perspective can be done with the help of experimental genetic method, which according to Vygotsky, artificially elicits a genetic process of mental development and aims at *«restoring the process to its initial stage, or, in other words, converting a thing into a process» (Vygotsky 1997, 68)*. One of the central principles of genetic research methodology consists in *«experimental unfolding of higher mental process into the drama, which happened between the people» (Vygotsky 1983, 145)*. The concept of drama here implies a collision, an emotionally-colored moment of social interaction, where the mental process first appeared as a social relation that was later internalized.

According to N. Veresov:

> *«… the requirement for experimental research is the necessity to reveal the original form of any mental function, the form of social relations named by Vygotsky clearly and openly — the drama. Every higher mental function originally exists as an interpsychological category (dramatic social event in the relations of the two people) and after that it appears as an intrapsychological category. If the only objective analysis of the higher mental function is experimental reconstruction of the history of its development, we have to start from the experimental reconstruction of its original form — the drama between the people» (Veresov 2010, 88).*

Taking this idea as the starting point, our research group set the following aims of the experimental study:

- to study the process of development of reflection tracing it from its original form – the drama;
- to observe the process of transition from direct operations with technological devices to using them as signs, mediating reflection (transformation of media-tools to media-signs).

We will target these issues on the example of a case-study, undertaken with a disabled student.

4. Research Context and Data Collection

The research was conducted on the basis of the Department of Informational Technologies of MSUPE. Founded in 2001, for over 12 years already the Department has specialized in the education of students with disabilities (particularly with visual and locomotive impairments). According to the common requirements for learning results, teaching students with disabilities at the Department is performed inclusively in mixed groups with regular students. Inclusion of students with disabilities usually demands an extensive period of adaptation. Thus a comprehensive support program was elaborated for disabled students entering the IT Department. The program includes:

- *Pedagogical support* (presupposes providing an individual educational program and individual schedule for each student; organizing close cooperation between students' individual supervisors and department staff including lecturers, professors, support specialists, as well as administrators and students' family members);
- *Technological and methodical support* (implies providing students with various learning aids, as well as assistance in mastering computer skills to compensate for visual impairments and locomotive deficiencies);
- *Psycho-social support* (presupposes individual counseling, correction of personality distortions, motivational work, career guidance, information on various social benefits and aids).

Based upon 12-years' experience, the IT Department staff mention a number of factors which are the most challenging for students with disabilities, particularly: weak social orientation, knowledge deficiencies, communication skills deficit, self-indulgence, problems with regulation of behavior, lack of skills to assess adequately one's own abilities and one's own limitations etc. Many of these challenges are closely linked with various aspects of reflection. Thus there is a strong demand for developing reflection and various reflexive skills in students with disabilities.

The idea of conducting research on digital media at the IT Department was enthusiastically accepted both by students and staff. Many students expressed the wish to participate in the project.

As far as the data collected by our research group in 2011-2013 is rather extensive, in this article we would like to focus on a longitudinal case-study undertaken with Arthur Kazakov, who was particularly involved in the research.

Arthur Kazakov (born in 1989) entered MSUPE after graduating from a boarding-school. From his childhood he has suffered from cerebral palsy. Due to dysfunctional family background he didn't receive the necessary medical care in time. According to his own words, it was his sister who supported him the most, since she managed to organize a series of surgeries due to which he stood up from the wheel-chair. Now Arthur is walking with the help of crutches.

Arthur learned about MSUPE while he was taking part in a preparatory course organized in his school by the University. As far as he wanted to have a creative profession he decided to apply for the program "Directing and production in cinema and television" offered by the IT Department. The curriculum includes courses in directing and production for multimedia projects, multimedia software and hardware, computer graphics and animation, computer music technologies, design and composition of multimedia programs. Educational process involves implementation of diverse practical tasks: photo and video sessions, photo script, performing theatrical pieces based on modern and classical literature, video reports, photo and video montage, creating computer graphics and animation. Besides traditional forms of work such as lectures and seminars, other learning activities e.g. practical workshops, group brainstorming and round tables are widely used. Areas of professional activities of the program's graduates include documentary films, animation, TV, commercials, educational DVDs, web-sites etc.

The research group accompanied Arthur during the last semester of his studies (December 2012 – July 2013), which was devoted to accomplishing his graduation project – shooting a short film using various digital media and computer software.

Data collection for the research included:

- gathering information about the IT Department and its support programs for disabled students;
- gathering information about the student and other participants of the film-making process;

- gathering information about the video-editing technologies and software used in the film-making process;
- interviews and interaction with the student on different stages of the film-making process;
- interim and final versions of the film.

Fragments of the film-making process and interviews were video-recorded, transcribed and put on various storage devices. Thus participants of the research group were provided access to all the materials for individual work and analysis. Later on videos and transcripts were collectively studied and discussed by the researchers. Solid volume of the data collected during the semester provided a deep and multi-facet perspective of the film-making process as well as of each participant's background. In data analysis the main focus was put on studying the final version of the film.

Film Content[2]:

The film opens with a scene of traditional ice-hole bathing on Epiphany's day. With the help of acolytes, Arthur, the protagonist of the film, performs traditional ablution in an ice hole, which for Orthodox Christians signifies purification from the sins. After the opening title - "I Love" - spectators are shown fragments of Arthur's personal archives about his hobby – carting. Arthur starts speaking about his work on the graduation project and explains how the choice of the topic was made. The story is accompanied by pieces of Arthur's interview taken by his group mates in the University, as well as by snaps of the film shooting. When Arthur talks about choosing his love story to become the main topic of the film, family photos from his smartphone appear on the screen.

In the next fragment we see an episode from Arthur's life – visiting his wife in an isolation ward. The operator – Arthur's fellow student – explains to the people around that they are making a film for their friend, whose wife is in the isolation ward. At that moment Arthur tells the spectators that his wife is under arrest. Snapshots from Arthur's family archive appear on the screen, while he is explaining that their son was born in prison. The following story of their love is accompanied by scenes from Arthur's first year project, a film called "The Parting", particu-

[2] The full version of the film is available at http://vimeo.com/75342726

larly a fragment where a young man (Arthur) is slowly walking towards a girl (Arthur's wife).

Scenes from the film are interlaced with snapshots from Arthur's interview, where we see Arthur's college classmates. Views of Arthur's legs and crutches constantly accompany the story. Snapshots from the carting club interlace with snapshots from the isolation ward, where see Arthur picking up his wife's personal belongings. Arthur continues telling the story of their love which is accompanied by pictures from their family archive and snapshots from the interview. In the next episode we see the walls of the prison, where Arthur's wife is, and a church nearby. In the following scenes from the interview Arthur talks about the event that led to his wife's imprisonment. We see scenes from "The Parting" and snapshots of Arthur walking along the prison walls. When the story comes to the most tragic part – the midnight arrest –we see Arthur crossing a busy street. On the photo from the family archive Arthur's wife appears, and later on emerges a fragment of the video of their marriage.

The story of the court session is accompanied with the scenes of a suburban train and snapshots of the municipal court building where the sentence to Arthur's wife was announced. In the next moment we see Arthur in an Orthodox church and by the monastery walls, in the voiceover he describes the circumstances which led to his wife's imprisonment. She was accused of beating her sister's baby during a quarrel, which she kept denying and which, according to Arthur's words, was extremely hard to believe. The situation was complicated by the fact that there were no witnesses to testify for her upon the trial.

In the following scenes of the interview Arthur talks about his wife's sentence and arrest, his voice breaks. In the video from the family archive we see the spouses' Orthodox wedding ceremony which took place in prison, as well as a few photos of the moment when Arthur saw his baby for the first time. Next the spectators are shown fragments of Arthur's visiting his wife in prison, we see him on the railroad station carrying gifts. The episode of his visit to prison is accompanied with a bardic song. At the end of the film the monastery walls appear on the screen once again. The closing scene brings the spectators back to Epiphany's day bathing and Arthur walking towards the church which produces the feeling of a round\circle composition.

Generally the film is shot in black and white, only the scenes of Epiphany's day bathing and final shots in the church are performed in color. Many scenes are seen by the spectators as if looking through a barred window or through a glass covered with raindrops. The film's musical score is minimal: there are church bells, church choir singing, a bardic song, a piece of instrumental music and city sounds.

5. Digital Media as Cultural Signs, Mediating Reflection: Data Analysis

As we have already pointed out, one of the main tasks of the research consisted in tracing the process of development of reflection through experimental reconstruction of its original form – that is, «the drama». Therefore in the course of data analysis the emphasis was put on studying the very process of film-making, rather than the film as the final product. For this reason our research group focused on the following aspects:

- stages of film-making;
- roles\positions, experienced by the student in the course of film-making;
- functions of digital media on different stages of film-making.

Careful analysis of the collected data permitted to divide the film-making process into five stages (s. Fig. 1):

Fig 1: stages of film-making process

Let us have a closer look at each of the stages.

1. Preparation

The stage of preparation embraced the following activities:

- choosing the topic of the film;
- writing preliminary scenario for the film;
- building up a film-making team (film crew).

At this stage the student was to decide which topic his short film would touch upon. He was free to choose any topic and any kind of genre (documentary, feature, educational film, or even animated cartoon). From the very start Arthur Kazakov wanted to shoot a documentary. Originally he was thinking of making a film about carting, which used to be his hobby for a few years. He shared the idea with one of his professors. The professor told him, that carting was a nice topic, however, he said, that he couldn't feel Arthur's enthusiasm about it – more precisely "he didn't see fire in his eyes". And he asked Arthur: "Why don't you shoot a film about your wife? You always have fire in your eye when you speak about her".

This moment is crucial for understanding the context of the whole semester's work and interaction. First, the professor pointed out that the main criteria in choosing the topic of the film should be the student's enthusiasm, involvement, his "pereživanie". Second, he warned against a formal approach to the film as to a graduation project, setting the pitch of the future interaction. Thus professor's advice reshaped Arthur's attitude to the film as to a formal, alienated from life learning task, into a meaningful project about himself, his own life and his "important others".

Since the final decision about the film-making at the IT Department is always made by the student, Arthur was totally free to stick with his original idea. However he preferred to follow his professor's advice. The importance of this moment was many times highlighted by Arthur himself during our meetings and interviews throughout the semester. Moreover Arthur retells this episode at the beginning of the film which testifies that this conversation was indeed a turning point in the film- making process:

Arthur: *«He [Arthur's scientific advisor] noticed that when I start talking about my wife, a fire appears on my eye» («Он увидел, что у меня появляется огонь в глазах, когда я начинаю говорить о жене») (Documentary «I love», 02:36).*

After the choice of the topic was made, Arthur was supposed to come up with a preliminary scenario for the film. At this stage of film-making the student found himself in the position of author, who was free to choose and to experiment with versions and ideas. In this creative process Arthur was mostly interacting with the supervisor and professors – the main challenge consisted in shaping the plot and

designing the main episodes. It turned out that the original version of the scenario underwent numerous changes in the course of the semester.

In parallel with writing of the scenario, the film-making team was formed. According to the Department's tradition all the students of the group are involved in each other's work on the graduation project. Thus the film crew consisted of Arthur's group mates, including other disabled students. Officially they were mostly responsible for operative work and film-cutting, however from the very beginning they were deeply involved in the project. The attitude of Arthur's group mates was totally informal: they accompanied him to the film sets, took part in long-hour discussions about the film, as well as participated in his daily life problems and activities. "We perceive and treat each other like friends, rather than colleagues," – these words were repeated by Arthur and his group mates on different stages of film-making throughout the year. As Arthur later highlighted in his interviews, the process of film-making, which was originally launched as a graduation project, quickly evolved into a meaningful collaboration and even close friendship between the participants. Arthur: *«Despite the fact that originally I was just a stranger to them, all the guys got so deeply involved in my situation, that they participated in film production, postponing their personal plans» («Все ребята, несмотря на то, что я изначально был никто, так прониклись моей историей, что участвовали в подготовке фильма, откладывая свои дела») (Postproduction interview, 04:02).*

2. Shooting

Film-shooting was not organized according to a strict plan. Arthur's original scenario and his vision of the film kept changing throughout the semester. The film crew simply accompanied Arthur, recording various moments of his daily life. Thus the final version of "I Love" consists mostly of the episodes shot in the course of Arthur's life (bathing in the ice-hole on Epiphany's day, visiting isolation ward etc). The film also includes materials from Arthur's personal archive (photos and videos from his wedding) as well as fragments of his earlier works (his first-year qualification film: "The Parting"). Importantly, the final version includes numerous episodes about the film making process ("film about the film"), as well as fragments of interviews and film discussions by Arthur, his group mates and his supervisor.

Thus the film, shot by Arthur and his group mates, is a true documentary, which means that *the characters are not acting in any of the episodes*.

It is necessary to highlight, that at the stage of shooting we observe students involved in direct operations with media. Cameras and other digital devices are used as tools for targeting a concrete objective: recording various moments of reality. Thus, at this point they represent *external mediators*, and the film-making process itself can be perceived as the activity, *mediated by digital media*.

3. General Discussion

The shooting of each episode was followed by a discussion. At this point Arthur, his supervisor and all the members of the film-making team gathered together to evaluate the results of the latest work. It is important to stress the informal character of these meetings. They were held either in the university, or sometimes in the flats of the participants in a friendly atmosphere and could take long hours. Arthur and the crew watched the episodes a few times, discussing the content and the stylistics of each fragment.

At this stage a few important transformations took place. First, in the situation of discussion the students changed position from participants of the shooting process to the film's exterior spectators. Their standpoint shifted from "in-side" to "outside", which was especially visible in Arthur's case. Though he had already performed in two different roles – as the author of the scenario and the protagonist of the film – both of those roles gave him an inward perspective, while the position of a discussant immediately turned him to an "outside observer".

Second, at this stage various digital media, which were earlier applied as tools for recording, were now used for a totally different objective. Their function now consisted in reproducing the recorded moments of reality on the screen. That means that they underwent a transformation from instruments of film-shooting into an image, a mirror, which became the center of the discussion. At this point we may say that media turned from a means of external activity into a means of internal activity – in other words, from tools to signs. Consequently at this point the mediated activity of film-making gave way to the *mediating activity of reflexive communication*, which we decided to single out as a particular stage of the film-making process.

4. Reflexive communication

Apparently it is very difficult to draw the line between discussion and reflexive communication, since the latter gradually emerged from the previous one. However we decided to regard reflexive communication as a particular stage, in order to emphasize that it was characterized by a conflict – a dramatic collision of the participants' standpoints and opinions. We perceive this point of film-making as "*the drama*" in Vygotskian sense, and this very moment is crucial for our research, since "the dramatic event is the form in which the higher mental function appears first as a social relation before it becomes an internal higher mental function" (Veresov 2010, 83-90).

At this point the participants of the discussion came to realize that each of them had a different perception of the "ideal film". These different perceptions became the source of the argument that started between discussants concerning the plot, the stylistics, and other aspects of film-shooting. This situation made the participants "exchange standpoints", shift perspectives, and, eventually, "turn to the foundations of their own actions" (Davydov). Importantly, this moment was extremely strained: all the participants were deeply involved in the interaction, and each of them was experiencing and co-experiencing "pereživanie" – the individual emotional experience of the situation. Thus, we may say that this is the *moment*, where reflection appeared as a social relation between the participants of the dramatic event.

A fragment of this discussion can be found in the final version of the film:

Peter: Still, I don't believe and that's it.
(Петр: Все равно, не верю. Вот не верю - и всё.)
Nikita: Water-melon, Arthur, eat the water-melon.
(Никита: Арбуз, Артур. Съешь арбуз.)
Max: Why don't you believe? Arthur speaks the truth.
(Макс: Почему ты не веришь? Артур говорит правду.)
Peter: He doesn't seem to speak it in the right way…
(Петр: Ну, он как-то не так рассказывает…)
Supervisor: We have Stanislavsky among us!
(Научный руководитель: Здесь в наших рядах есть Станиславский!)

Peter: I don't deny that Arthur speaks honestly, but from your words it seems that you're thinking about yourself firstly, so that your life is not hollow, and she and her love comes after that.
(Петр: Не, я не отрицаю, что Артур искренне говорит. Ты, как бы, о себе говоришь в первую очередь, чтобы твоя жизнь не была пуста, но только потом, во вторую очередь, о своей жене.)
Christina: And why are you afraid to lose her love? And where are the children now?
(Кристина: А почему ты боишься потерять ее любовь? А где сейчас дети?)
21:44 – 21:47
Supervisor: What shall we film so that you believe?
(Научный руководитель: Вот что надо снять такое, чтобы вы поверили?)
(Documentary «I love», 20:50 – 21:15).

It is necessary to highlight that from the very beginning the character of the argument was constructive, which means that the discussants were:

- ready to listen to each other;
- willing to understand the others' perspective;
- aware of the necessity to overcome the differences in understanding and to achieve consensus.

Later on, in the course of postproduction interviews Arthur stressed the importance of these discussions for shaping his capacities:

Arthur: «The whole film production process changed me a lot, as well my attitude to myself and other people» *(«Весь процесс съемки очень изменил меня, мое отношение к себе и другим людям»)* (Postproduction interview, 48:05).

Thus, we may say that reflexive communication, which emerged in numerous discussions of the film, contributed to the development of Arthur's reflexive skills.

5. Reconsideration

The stage of reconsideration included reassessment of the previous work according to the outcome of discussions and making of the corresponding changes in the

film. The final decision was always made by Arthur. As he later stated in one of the interviews, *«the film was changing together with himself and his group mates» («фильм менялся сам вместе со мной и моими однокурсниками»*; Postproduction interview, 50:14).

From Arthur's words the most important source of self-reevaluation for him was connected with the change of positions that he experienced while working on the project:

Arthur*: «I can't say that I am just the author of this film. Together with many other people, I was involved in the process sometimes as an actor, sometimes as the director, sometimes as the script writer» («Я не могу сказать, что я только автор этого фильма. Очень много людей принимали участие в его подготовке, и я выступал там то как актер, то как режиссер, то как сценарист»); Postproduction interview, 82:26»).*

According to data analysis, throughout the film-making process Arthur performed at least in three different positions:

- the author of the text
- the protagonist of the film
- the discussant of the film

In the first two positions he shared the inner perspective of the film-crew, while in the process of discussion he was evaluating his own work from the standpoint of an external spectator. It is important to highlight, that each of the stages did not occur only once or twice in the course of film-making, but repeated many times due to the fact that discussion followed the shooting of almost every episode. Thus Arthur was taking on new positions and continually changing his perspective. This continuous process of role-alternation can be perceived as an *important source of reflection development that emerged as the result of the mediating* activity.

One of the main questions which emerged after data analysis, is whether the same effect could be achieved without the use of digital media – e.g. if Arthur and his group mates performed the same story in the form of a dramatic play. A theatrical production would definitely have given the students the opportunity of experiencing various roles and positions. It could also provide the chance of role-alternation

and emotional involvement in the process of interaction. However without the use of digital technologies the perspective of the participants could have remained "inward" - the process of the interaction could not be recorded and become the object of further discussion and analysis. Video-editing media allowed to capture the exact moment of "pereživanie" and created a unique opportunity of "re-experiencing the experience". They permitted Arthur and his group mates to go through the same situation in the position of spectators, to comment on it and to assess each other's words and actions. Thus, if we may say so, in the case-study digital media provided the opportunity of a "double pereživanie" – one directed inward, and one – directed outward – creating favorable conditions for the development of reflection and reflexive skills.

6. Summary

- In the first two stages (preparation and film shooting) video-editing media were used as tools, necessary for recording. Their function consisted in capturing concrete moments of reality. At this point they represented *external mediators*, and the film-making process itself could be perceived as the activity, *mediated by digital media*.
- At the stage of discussion video-editing media underwent a transformation from instruments of film-shooting into an image, a mirror, which meant that they could no longer be perceived as external tools, but as signs, oriented toward internal functions and processes. Consequently at this point the mediated activity of film-making gave way to *the mediating activity of reflexive communication* - a particular stage, characterized by a collision of the participants' standpoints and opinions. We perceive this point of film-making as "*the drama"* in Vygotskian sense.
- Throughout the film-making process Arthur performed at least in three different positions: the author of the scenario, the protagonist of the film and the discussant of the film. The first and the second positions granted him the perspective of the internal participant. At the stage of discussion he turned into one of the film's exterior spectators and his standpoint shifted from "in-side" to "out-side".
- Constant alternation of roles and positions, and the opportunity of "re-experiencing the experience", provided by digital technologies, created favor-

able conditions for the development of reflection and reflexive skills in the participants of the film-making process.

7. Some Concluding Remarks

The departing point for the study undertaken by our research group is represented by the basic distinction that cultural-historical theory makes between tools and signs in human activity. Tools are directed outward (toward the object) and represent a means of external, or mediated, activity. Signs are directed inward (toward human functions and relationships) and represent a means of internal, or mediating, activity. Tools remain external mediators, while signs are internalized. In relation to technologies, it often becomes quite challenging to draw the line between internal and external activity, as well as to identify whether in a given situation a particular technology is used as a tool, directed outward, or as a sign, directed inward. The interactive character of digital media blurs out clear boundaries between tools and signs, making the relationship between them much more flexible and dynamic.

Keeping in mind that the sign arises with necessity in the process of the cultural development of higher mental functions, we investigated the sign from a developmental perspective, focusing not on the place of sign in the structure of functions that are already formed and mature, but on tracing the very process of it becoming a sign. Therefore, in our case the goal of the experimental research consisted in observing the process of transition from direct operation with digital technologies to using them as signs, oriented toward mental functions and processes – particularly, toward reflection. For targeting this objective we applied the genetic method, which, according to Vygotsky, consists in experimental reconstruction of the original form of any higher mental process — the drama between the people.

The limited space of this paper allowed us to present the results of one case-study, which illustrates only a few aspects of the developmental potential of digital media.

Further research challenges are connected with providing a deeper insight into the problem of transformation of digital media from external mediators (tools) into signs that could stimulate the development of different psychological functions. A

detailed investigation of the developmental potential of ICTs for various target groups could help in reorganizing educational practices in order to acquire better learning and developmental results. Our research group will continue working on these issues in the framework of the multidisciplinary project “Understanding Digital media” in the coming two years.

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Index of names

Psychological characteristics of visual information perception of students with visual deprivation in training to work on a personal computer

Vladimir Vyacheslavovich Sokolov

This article discusses how children with profound sight impairment perceive visual information from a computer screen by means of synthesized speech, and describes research of characteristics of user skills development in children with visual deprivation. We provide the most significant results of research and a number of methodical recommendations on educating children of this category in work on the personal computer without visual control.

1. Introduction

Those who are not experiencing difficulties related to impaired sight most often don't think of how the processes of perception and of visual information are carried out in a blind person. As a result, the considerable part of information environment is inaccessible or has essential restrictions for people with a visual deprivation. When interacting with visually organized environment a blind person needs a mediator to promote transformation of visual stimuli into accordingly acceptable modality. In some cases, transformation can be distorted due to subjective evaluations and judgment of the mediator (for example, picture description).

In visual perception of normally seeing person the processes of examining objects include at the same time simultaneous and successive modes of information processing. However, a blind person in most cases has only access to successive mode of object perception. Drawing an analogy between operation of visual and tactile analyzers we can suggest that the simultaneity of perception of the blind is limited by the object's size, that is, the object being perceived has to fit completely into a hand. In tactile identification the same conditions are met, as in the visual one: object examining, defining its main characteristics, establishment of the relations between characteristics, etc. The essential role in formation of visual representations and understanding of the spatial relations between objects is played by a

period during which the person possessed sight before its loss, meaning that the later visual deprivation occurred, the visual representations were formed in the blind person.

Understanding problems of the blind related not only to perception of visual information, but also to its adequate transformation first of all is necessary for those who are engaged in teaching information technologies to blind children.

In the beginning of the XXI century it is difficult to find a field of activity in which computers wouldn't be involved. Universal implementation and continuous improvement of information technologies significantly changes life of the modern man, and especially the person with a visual deprivation. Constantly expanding range of digital blind aids creates demands towards visually impaired persons to have special training for effective use of this equipment.

Use of non-visual information access software significantly extended the limits of information available to the blind. Emergence of such programs can be compared in significance to the invention of Braille system.

Programs of non-visual access to information (Screen Reader) are special software allowing blind people to work at the personal computer. In their function they are similar to "seeing assistant" who finds text information on the computer screen and either reads it aloud by means of a speech synthesizer, or displays on the Braille (tactile) display.

It is necessary to note that properties of perception of information by visually impaired students, who are capable, though with restrictions, to perceive visual information, is significantly different from properties of perception in totally blind children who are guided only by the synthesized speech and the Braille information output. In this article we discuss properties of perception of information during the work on the computer without visual control, and consequently the principles of teaching practice-related work methods to totally blind children not capable of using visual interface.

Our experimental work took place on the premises of special (correctional) general education boarding school of III-IV types No. 1 in Moscow; research was aimed at finding specific features of how children with profound vision impairment work on

personal computer during study course “Informatics and Information Technologies“.

Our over 20 years’ experience of teaching “Informatics“ course in school No. 1 in Moscow and other schools for children with profound visual impairment showed no problems in mastering the theoretical part of this subject. Using the usual textbook for general schools reprinted in Braille font, blind school students easily learn the theoretical material. Such subjects as “Various numeral systems“, “The mathematical logic“, “Information coding“, etc., do not cause any additional difficulties related to lack of sight.

Problems in mastering this subject are related to acquisition of practical skills of using the computer without visual control. Let us look at an example illustrating work with a computer using non-visual access software. In this example and further all commands and working methods of the non-visual access program will correspond to JAWS for Windows, as the most popular software in Russian special education system.

Table 1

№	***Operation***	**Visual method**	**Non-visual method**
1.	*Context search*	Visual reading from screen	Reading line by line using speech synthesizer or Braille display is done by pressing «scroll down» on each page of the text.
2.	*Allocation of a text segment*	Moving mouse with pressed left button Visual reading from screen, movement of mouse is controlled visually.	Moving cursor with «scroll down» while holding «Shift»-button, controlled line by line using speech synthesizer or Braille display.
3.	*Copying segment of text to exchange buffer*	Using a command from context menu (accessed by clicking right button of the mouse).	Using keyboard combination «Ctrl + C».
4.	*Search for paste point*	Visual reading from screen	Reading line by line using speech synthesizer or Braille display is done by pressing «scroll down» on each page of text.
5.	*Pasting a text segment*	Using a command from context menu (accessed by clicking right button of the mouse).	Using keyboard combination «Ctrl + V».

One of the common tasks during the work on the personal computer is editing text information. Let's say we need to cut some lines in one paragraph of the text file and paste them in another. This task breaks up into five elementary operations. In the given example the main difficulty of non-visual mode of work consists in searching for the needed text segment. The person using visual interface is capable to see the whole screen of the monitor at once and scroll down the page to quickly find the right text. Due to combination of successive and simultaneous modes of perception, the person without visual restrictions easily solves the task of finding a certain context.

It should be noted that when performing any tasks with text, lack of visual perception ability leads not only to reduction of amount of information, but also a decrease in its quality. For example, if one needs to find the word marked with a bold-face type, the user with visual deprivation has to either move word by word, giving the non-visual access program Insert+f command (information on font characteristics) on each word, or change the settings of the program and listen to information on font characteristics change in all document. Therefore, time necessary for the blind user to perform the majority of practical tasks considerably increases, as compared to the user free from visual restrictions.

The impossibility of using visual interface causes considerable difficulties in solving practical tasks of information processing on the personal computer. Non-visual access software does not replace sight, but only allows carrying out the main operations on the computer, using speech and tactile interfaces.

So, for example, during the work in a dialogue window, the blind user, consecutively going through control elements by means of the TAB key, has to find the necessary one, define its type, the name and the current value and only after that to set the desirable value. Defining the type of control element is necessary to choose the correct strategy, allowing changing values of this element.

By means of the TAB key, it is possible to go from one control element to another. After each time it is pressed the non-visual access program will report first the element name, then its type, and then its value. Exceptions are radio buttons and the buttons to be mentioned at the end of the article.

For obtaining the speech or tactile message on the name of control element, its type and current value the Ins +Tab key combination is used.

Let us look at another example showing differences between standard and non-visual work methods. Another common task is working with a dialog box. Dialog boxes open up when saving the file in a text editor, changing settings of any program and in many other situations. Let's say, for example, we need to change value of one control element in some dialogue:

Table 2

Operation: Setting a desired value to control element in dialog	
Visual method	**Non-visual method**
Visually obvious operation, performed with a «mouse» handling device	Searching for necessary control element through consecutive sorting
	Defining control element type and choice of strategy of work
	Changing properties of control element
	Search for OK button and its activation

From the given example, we see that due to the lack of possibility to use visual interface, the blind user is compelled to solve a number of additional tasks: definition of control element type, choice of correct strategy of work with it, consecutive search of the element and the Ok button. All this increases time expenditures and demands additional knowledge. The average user of a personal computer is not even familiar with such concepts as "radio button", "combobox", "spin box", etc. The blind user has to master all these concepts, remember work strategies with various control elements, remember tens and even hundreds of keyboard commands, and many other things.

The main difficulty of non-visual mode of work consists in search for necessary control element, its identification and choice of a correct work method. The person using graphic interface is capable to see the whole dialog box at once and, relying on visual presentation, to execute necessary action using the mouse. As in the previous example, by virtue of combination of successive and simultaneous

modes of perception, the person without visual restrictions easily solves the task of finding and identifying a control element.

Thus, it is obvious that mastering practical skills of work without visual control causes considerable difficulties in students.

Practical use of computers in informatics lessons at special (correctional) general education boarding school of III-IV types No. 1 in Moscow, where the research described in this article was conducted, began in 1989 with the project of computerization of special schools.

The first computers in the computer education class were equipped with a hardware speech synthesizer and non-visual access software “Screen Reader”. Subsequently this name began to designate all programs of this class and purpose. During these long years, we have accumulated considerable practical experience of teaching computer technologies to children with profound visual impairment.

Now teaching of the subject “Informatics“ begins at this school in the 2nd grade. The whole course is divided into four stages:

1. First stage – propaedeutic (2nd – 3rd grades). At this stage, school students get acquainted with the basic concepts of informatics.
2. Second stage (4th – 7th grades). The main task of this stage – studying the keyboard of the computer in Cyrillic and Latin layouts, and also preliminary acquaintance to a text editor and the non-visual access software JAWS for Windows.
3. Third stage (8th – 9th grades). Tasks of this stage are studying the bases of file system management, more detailed (than at the second stage) study of the text editor, acquaintance to the Internet and the tabular processor.
4. Fourth stage (10th – 12th grades). At this stage, students acquire more profound knowledge on processing information presented in texts, tabular and sound forms, study more sophisticated control of the JAWS for Windows software which is giving the blind user a chance to comfortably work in any Windows applications. They also study programming bases in Pascal and bases of object-oriented programming in Delphi environment.

At the fourth stage of learning «Informatics and Information Technologies» lessons are separated into two subjects: theoretical part “Informatics“ and practical part

“Information technologies“. The hours for «Informatics» correspond to a basic federal component, and hours for «Information Technologies» are organized at the expense of the subject «Technology» and school component – 1 hour of informatics and 2 hours of information technologies.

Throughout the course children have an additional opportunity to study in the second half of the day. For this purpose, there are teachers of informatics who are constantly present in two computer classes.

Such significant increase in time for the practical training on the computer is connected with high complexity of work without visual control, and the need of this increase in hours is confirmed by the experiments performed in this research.

To increase the efficiency of educational process, two teachers work in classes with more than 7 students. The reason is that, as a rule, student groups are not homogenous: some students can work quicker, some need constant help from the teacher and work more slowly. The average of 4 – 5 students per teacher provides possibility to overcome the difficulties connected with individual characteristics of each student.

After analyzing the learning material, we selected certain subjects causing the greatest difficulties in studying computer technologies for students with vision impairment. In the framework of selected topics, we performed series of ascertaining and formative experiments.

Here we provide the description of two most typical experiments confirming an empirically obvious fact that properties of perception of blind school students demand special teaching methods and materials, based on the following principles:

- a blind student’s work on computer is based on computer keyboard commands, speech and tactile messages of the non-visual access software, and also special functionality of this program, which leads to a radical change of working methods on the personal computer;
- for effective use of personal computer without visual control the student needs to master classification and structuring of the main objects of the operating system, application software and information content;

- a student with profound visual impairment needs much more time for mastering practical skills of work without visual control and performing practical tasks as compared to the student using visual interface.

Experimental work was carried out with participation of 10th and 11th grades students who are already familiar with the non-visual access software JAWS for Windows and have mastered the main methods of text editing and file system management. Students were divided into two groups:

1. blind children with acuity of vision from 0 to 0,04 (4%) – 31 persons;
2. visually impaired children with acuity from 0,05 (5%) to 0,4 (40%) – 39 persons.

The following is the experiment layout:

1. Students received the learning material in a standard form as offered in textbooks and manuals for mass schools and normally seeing children.
2. Students were offered to perform a test task, time of performance was recorded (we will emphasize that the general methods of non-visual work on the computer were already familiar to examinees, and the test task was easy to do).
3. The teacher explained the same material, but taking into account special properties of information perception of the blind user, gave as needed the specific work methods of JAWS for Windows using texture and graphic aids.
4. Students were offered to perform again a test task similar to the initial one, time of performance was recorded.

2. Description of experiments

2.1 First experiment: Work with tables

Students were offered to fill in the table 4X4 in the MS Word program. Previously the material was explained to students in a standard form (as for normally seeing). The teacher checked that students comprehended the concepts “table“, “column“, “line“, “cell“, “heading of a line and column“.

All students already knew how to work with text in JAWS for Windows at a very good level. For visually impaired students (2nd group) the text in the task was in Arial font, font size was selected individually.

The test task was offered in the Word document containing the following text:

> *Place each phrase from the list in the corresponding cell. For example, the phrase "red square" is located in the cell on the crossing of «square» column and "red" line. Phrases are given in the list below the table.*

Table 3:

	Square	**Triangle**	**Rhombus**	**Circle**
Red				
Green				
Yellow				
Blue				

Red square
Green square
Yellow rhombus
Green circle
Green rhombus
Blue circle
Yellow circle
Blue triangle
Yellow triangle
Green triangle
Red triangle
Yellow square
Blue rhombus
Red circle
Blue square

Blind children (1st group) couldn't use the visual information displayed on the monitor (though some of them had residual sight). Visually impaired children (2nd group) used the visual interface rather freely, provided that the Arial font of individually selected size and a monitor with big diagonal were used. It should be noted that actually in the second group acuity of students' vision was not lower than 0,1 (10%).

Visually impaired examinees (2nd group) performed tasks with almost no mistakes, average timing was 4 minutes. 5 blind students didn't cope at all with the task, others did the work, but spent more than 15 minutes on it.

At the following lesson children were acquainted with the texture image of the table, and also with special commands of JAWS for Windows ensuring comfortable work with tables in the Word text processor environment for the blind user.

Further, according to the lesson plan, the examinees were offered to study the table below under supervision of the teacher, using the corresponding commands of the JAWS for Windows:

Table 4

Day of the week	**Lesson 1**	**Lesson 2**	**Lesson 3**	**Lesson 4**
Monday	Algebra	Physics	Chemistry	Geometry
Tuesday	Physics	Algebra	Geometry	Chemistry
Wednesday	Geometry	Algebra	Physics	Chemistry
Thursday	Geometry	Chemistry	Algebra	Physics
Friday	Algebra	Physics	Biology	Geometry

When studying the table teachers suggested the most convenient algorithm of action helped to choose a necessary command. This work went on almost individually, with no more than 4 students per each teacher. Students had to learn to quickly answer such questions as «which lesson is chemistry on Wednesday?», «what is the second lesson on Thursday?», etc.

Having mastered this special functionality of the non-visual access software during the work with tables, students tried again to solve a test task similar in difficulty to the initial test task. This time all students coped with the task! In the second group

no essential changes in time of performance occurred. In the first group average time of performance got to about 10 minutes, with very few mistakes.

2.2 Second experiment: Web page navigation

Before the task, the material on loading web pages, their structure and basic elements, was explained to students in standard form (as for normally seeing). Then students were offered to find different information on a website specially developed for users with profound vision impairment: http://tiflocomp.ru

Blind and visually impaired students were offered tasks identical in level of difficulty. Children using visual interface found the required information quickly enough, and blind children were compelled to read all the information on the screen before they found what they needed. Records of time showed that blind students were 4-5 times slower and this lag increased according to how far the required information is hidden in the structure of the site.

At the following lesson students were introduced to texturized image of the Internet Explorer window and schematic image of a web page. Also they were shown how to use JAWS commands to move around the structural elements of a web page.

Then test tasks on information search were offered; they were different from what was offered originally, but with same level of difficulty. This time blind students solved the task much more successfully, their lag from visually impaired was by 2 – 2,5 times, and in some cases the lag was practically absent.

Other series of experiments carried out with some other themes of the course ”Informatics and Information Technologies“ showed similar results, which supports legitimacy of the conclusions given below.

3. Conclusions

A person using visual interface is capable of seeing and capturing the whole screen of the monitor at once and quickly finding the necessary information due to a combination of successive and simultaneous modes of perception. Profound visual impairment demands a different way of control over text information processing activity. If normally control is exercised by means of sight, in this case it is a

control by technical means. Implementation of activity occurs via transfer to other sensory system of perception.

Modern technologies of non-visual access to information cannot provide the blind person with this simultaneity of perception of information on the computer screen. The speech synthesizer and the Braille display output information consecutively, in linear manner. When the blind user presses «Down» arrow, he perceives the text line by line from the first word in line to the last; perception in this case is successive. It considerably increases time necessary for the blind user to perform the majority of practical tasks, as compared to users free from visual restrictions.

Thus, the main condition for successful teaching of blind school students to work on the personal computer is special training of the teacher. Besides traditional knowledge in teaching the blind, the informatics teacher working with blind children has to master the non-visual work methods, know the special functions of the non-visual access software and the special teaching techniques, which take into account the information perception properties of blind children:

- Blind students need to develop an adequate idea of how information is presented on the monitor screen (for this purpose it is necessary to use texture and graphic tools and other means).
- The work of blind school student on the computer is based on keyboard commands, speech and tactile messages of the non-visual access software, and also special functionality of this program.
- For effective use of personal computers without visual control students need to master classification and structure of the operating system’s main objects, application software and information content.
- A student with profound visual impairment needs much more time for mastering practical skills of work without visual control and performing practical tasks as compared to the student using visual interface.

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