UNITED NATIONS EDUCATIONAL, SCIENTIFIC
AND CULTURAL ORGANIZATION

EXPERT MEETING

EDUCATION, ART AND ICTs: INTEGRATION FOR THE DEVELOPMENT OF ONE'S PERSONALITY

1 2–13 May 2003, IITE, Moscow

Final Report and Selected Materials

UNESCO INSTITUTE
FOR INFORMATION TECHNOLOGIES IN EDUCATION

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UNESCO
UNESCO Institute for Information Technologies in Education (IITE)

IITE editorial coordination:
Lev Gordon

The material *Education, Art and ICTs: Integration for the Development of One's Personality* is devoted to the expert meeting of the same name.
State-of-the-art and evolution of education, ICT usage in the development of visual perception and skills associated with investigation and creation in art and design education, as well as visual literacy and knowledge were the subjects of the meeting.
The speakers from various countries shared their experience of ICT usage in art and design education.

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TABLE OF CONTENTS

FINAL REPORT

EXECUTIVE SUMMARY

International expert meeting *Education, Art and ICTs: Integration for the Development of One's Personality* was held at the UNESCO Institute for Information Technologies in Education (IITE) in Moscow on 12 and 13 May 2003.

The main goal of the expert meeting was to analyze the state-of-the-art and evolution of the application of ICTs in the art and design education and their influence on the development of personality. The outcomes of the meeting were supposed to be recommendations on the structure and content of the analytical survey *Education, Art and ICTs: Integration for the Development of One's Personality,* and formation of international team of experts to prepare it.

In order to ensure fruitful outcomes of the meeting, IITE prepared working materials and reference documents and distributed in good time among the experts (see Annex 2).

Prof. Claudia Saccone (Italy), Chairperson of the expert meeting

The experts from Italy, Kazakhstan, Lithuania, Russian Federation and United Kingdom attended the meeting, shared their experience on ICT usage in the development of visual perception and skills associated with investigation and creation in art and design education, ICT usage in development of visual literacy and knowledge, understanding of art and design, including the history of art.

The meeting started with the introductory speech of Prof. Vladimir Kinelev, IITE Director. He pointed out the novelty of the selected theme for IITE and explained its choice. The ICTs open up the prospective of their use in education for information society, and their role consists in enhancing intellect and designating new abilities of the human mind. Prof. Kinelev gave a brief description of the peculiarities of the IITE programme activities and its working methods, identified the main goal of IITE activities: to assist UNESCO Member States to reinforce their national capacities for the application of ICTs in the educational systems and contribute to policy formulation and national action plans concerning ICT usage in education. He mentioned the training and retraining of educational personnel in the application of new ICTs in education as a top priority of IITE activities.

After the participants (see Annex 3) were introduced and the main goals of the meeting were discussed, the agenda (see Annex 4) and timetable (see Annex 5) were adopted. Prof. Claudia Saccone (University of Molise, Italy) was elected Chairperson of the meeting.

Dr Nicolas Selivanov (Russian State University for the Humanities) addressed the expert meeting with the keynote presentation *Education, Art and ICTs: Integration for the Development of One's Personality.* Dr Selivanov described the problems of changes in the information field and named three types of ICT products, listed the ICT features which influence culture education. The important issues were raised in relation to real integration of ICTs into actual training processes. One of the main assumptions is that the teachers must design new methods of organizing classes and cooperating with museums and art galleries. The roles of ICTs as a technical assistance for teaching, and a working tool for students were discussed. From the contemporary background, there is the necessity to find a way of teaching skills of abstraction and selection, and to avoid repro-ducing and translating art through technology. The diagram of per-sonality development on the basis of ICTs, the addresses of web cat-alogues, dictionaries and encyclopedic resources were presented.

Dr Nicolas Selivanov (Russian Federation)

The experts discussed the main issues of the keynote presentation and different fields related to the possible ways of connecting art and new technologies in the process of personality development.

Two round tables were held in the framework of thematic sessions where the following issues were discussed:

- Analysis of current state and development of ICT application in art and design education.
- The place and role of the UNESCO Institute for Information Technologies in Education (IITE) in the development of ICT application in art and design education: medium-term and long-term.
- The importance of integration of ICTs into actual training processes, art and culture activities.
- The usage of new technology as cross-cultural knowledge.

First thematic session

Round Table: _ICTs in the Art and Design Education: State-of-the-Art and Evolution_

The first thematic session _ICTs in the Art and Design Education: State-of-the-Art and Evolution_ was opened by Mr Peter Worrall (Birmingham Institute of Art and Design, United Kingdom) with the presentation _The Digital Derive and Art Education – ICT developments 1997–2002 in Initial Teacher Training at the Institute of Art and Design, University of Central England in Birmingham, United Kingdom._ The report considered the structured developmental use of ICTs in art education. The expert touched upon Post Graduate Certificate in Education (PGCE), Art and Design Education, curriculum workshop action research on the basis of the Institute of Art and Design, University of Central England, in Birmingham. As the result of his research Mr Worrall stated that Art and Design National Curriculum (UK) needed restructuring in some areas. Mr Worrall pointed out the international models of Art Education saying that the PGCE course was collaborated with the partners from Brazil and Finland. This project is aimed at developing "an international electronic curriculum interface through the use of contemporary technologies in art and design education". The most important change to affect teaching and learning will be the realignment of the role of a teacher as a media expert, because teachers are responsible for curriculum development.

Mr Peter Worrall (United Kingdom)

The presentation by Ms Leah Livshits (State Hermitage Museum, Russian Federation) _The Virtual Academy of the State Hermitage Museum_ depicted the museum training courses (MTC) prepared by the School Centre of the Hermitage in cooperation with IBM, RMC and on its own. The expert gave a detailed description of three courses worked out by the specialists of the State Hermitage Museum together with IBM East Europe/Asia Learning Services. Ms Livshits introduced her vision of the IITE role in the implementation of the project and suggested that IITE should connect groups of experts in museums working on MTC for different users and groups of museum experts with the teachers.

Ms Leah Livshiz (Russian Federation)

Dr Alessandro Piva (Florence University, Italy) proceeded the session with the report _ICT in Education for cultural heritage._ The expert noted the increasing impact of ICTs in the cultural heritage area, but added that ICT capacities had not been fully developed. The main role of ICT integration in education is

Dr Alessandro Piva (Italy)

to create new ef-ficient education capacities. Dr Piva cited Italy as an example and mentioned several initiatives started in the country last years: new degrees regarding the cultural heritage with ICT courses, NETTUNO programme, the VICom Project funded by the Italian Ministry of University and Research. He accentuated the importance of the research concepts like telepresence, immersivity and virtual reality because of "great potentialities that these issues offer for a new way to do learning."

The presentation by Dr Almira Tazhigulova (Republican Scientific and Methodological Centre of Informatization in Education, Kazakhstan) was devoted to the theme *Electronic Textbook in Scholastic Process*. Considering digital textbooks to be the important factor of informatization of education, the expert depicted their main advantages:

Dr Almira Tazhigulova (Kazakhstan)

- Digital textbooks offer the necessary facilities to use visual methods.
- Active usage of illustrated material.
- Versatility of the material that helps a teacher accommodate the training process to the student's individual features, i.e. be adaptive (ICTs offer new opportunities for the organization of the material).
- A student can choose the sphere he/she wants to study.
- A digital textbook is available for the user at any level.

The first thematic session ended with the presentation *ICT in the Art Lessons in the Secondary School* by Ms Jolita Morkunaite (Kaisiadorys Algirdas Brazauskas Secondary School, Lithuania). The expert demonstrated the current state of ICT application in art education in Lithuania and introduced her vision of advantages and disadvantages of ICTs at art lessons. She mentioned the effectiveness, suitable time of work, supplement to the art course. She agreed with the points of the keynote presentation made by Dr Selivanov, but expressed her dissent of general view. Ms Morkunaite considered ICTs to be the only tool to develop one's personality in equal value with other educational equipments.

Ms Jolita Morkunaite (Lithuania)

Second thematic session

Round table: *The Place and Role of the UNESCO Institute for Information Technologies in Education in the Development of ICT Application in the Art and Design Education: Medium-Term and Long-Term Perspectives*

At the beginning of the second thematic session the review *UNESCO on ICTs in Art and Culture Medium-Term Strategy* prepared by IITE was distributed among the participants.

Prof. Claudia Saccone started the thematic session with the presentation *Neothemi: a Collaborative Development of a Virtual Museum*. The presentation was focused on Neothemi (The new Network of Thematic Museums and Institutes), a three-year Comenius-supported European collaborative project aiming at creation of a strong network for cultural heritage developed in the framework of a virtual educational museum. Prof. Saccone noted that the contributions of the ten countries involved in Neothemi were grouped in broad themes, called thematic "pavilions", which were designed around themes of varied types but all related to cultural heritage, and showed the main organizing principles of the project. The expert underlined the coincidence in assumption of the project and the logic of ICTs: from local to global. According to the presentation, the use of ICTs helps the users at

every level (teachers, specialists, researchers, general public) be more active in aspects of cultural heritage outside their local field of knowledge. Prof. Saccone showed the possibilities of online teaching and learning and emphasized the main goals of the project:

- young people are motivated to overcome any digital divide, know other countries' culture;
- the application of ICTs in education is increasing;
- more democratic access to cultural heritage is promoted;
- the results are disseminated on the Internet and through seminars.

The expert demonstrated that the benefits could be recognized in the quality of learning (human senses are more active) and social experience.

The experts took part in final discussion and, as a result, they approved the draft recommendations (see Annex 6).

The expert meeting *Education, Art and ICTs: Integration for the Development of One's Personality* was a useful, important and successful event. The participants stated its results, agreed that cooperation is needed for further development, requested to elaborate the requirements for the analytical survey. They expressed gratitude to the IITE administration and organizers of the expert meeting who provided the opportunity to share visions and personal experiences on the problem of ICT application in art and design education.

FIRST ANNOUNCEMENT

Dear colleagues,

We are very pleased to inform you about the expert meeting *Education, Art and ICTs: Integration for the Development of One's Personality* which will be organized by the UNESCO Institute for Information Technologies in Education (IITE) in Moscow from 11 to 14 May 2003.

The aims of the expert meeting are:

- to analyze state-of-the-art and evolution of the application of ICTs in the art and design education,
- to analyze ICT usage in the development of visual perception and skills associated with investigating and making in art and design education,
- to analyze ICT usage in the development of visual literacy and knowledge and understanding of art and design including the history of art, our divers artistic heritage and a variety of other artistic traditions, together with the ability to make practical connection between this and pupil's own work.

The target of research is review and evaluation of ICT application for:

- Teaching how to identify the typology of cultural phenomena, formation of skills of a competent spectator;
- Teaching how to obtain necessary art information by analyzing the well-known forms of artistic language, including the means of semiotics of arts;
- Teaching how to design in the context of history of artistic ideas by combining everyday experience with the experience of aesthetic perception.

The outcomes of the meeting should be:

- to formulate requirements concerning elaboration of analytical survey *Education, Art and ICTs: Integration for the Development of One's Personality* (to compose the international team, structure, content);
- to form a committee to frame a common approach in the field and to take responsibilities.

If you are interested in taking part in the expert meeting, please inform us as soon as possible.

For further information please contact Lev Gordon, IITE project manager e-mail: Lev.Gordon@iite.ru, www.iite.ru, tel.: 7 095 718 0844.

Yours faithfully,

Vladimir Kinelev
Director of IITE

ANNEX 2
IITE/MOS/ME1/03/INF.4

LIST OF DOCUMENTS

IITE/MOS/ME1/03/DOC.1	AGENDA
IITE/MOS/ME1/01/DOC.2	RECOMMENDATIONS OF THE EXPERT MEETING
	Education, Art and ICTs: Integration for the Development of One's Personality

INFORMATION DOCUMENTS

IITE/MOS/ME1/03/INF. 1	FIRST ANNOUNCEMENT
IITE/MOS/ME1/03/INF.2	TIMETABLE
IITE/MOS/ME1/03/INF.3	LIST OF PARTICIPANTS
IITE/MOS/ME1/03/INF.4	LIST OF DOCUMENTS

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Prof. Valery MESKOV   National Programme Specialist

Mr Lev GORDON   Project Manager

AGENDA

1. Opening of the expert meeting

2. Adoption of the agenda

3. Election of the Chairperson

4. Presentations, Round Table thematic discussions:

   • Presentation by keynote speaker on: *Education, Art and ICTs: Integration for the Development of One's Personality*
   • Analyses of current state and development of ICT application in the art and design education
   • The place and role of the UNESCO Institute for Information Technologies in Education in the development of ICT application in the art and design education: medium-term and long-term perspectives

5. Adoption of Recommendations of the expert meeting

6. Closure of the expert meeting

TIMETABLE

May 11, Sunday

Arrival of the participants

May 12, Monday

09.30 – 10.00   Registration of the participants

10.00 – 10.50   Opening of the expert meeting
Introduction of the participants
Adoption of the agenda
Election of the Chairperson

10.50 – 11.30   **First Thematic session:**
Keynote speaker:
– Dr Nicolas Selivanov. *Education, Art and ICTs: Integration
for the Development of One's Personality*

11.30 – 12.00   Coffee-break

12.00 – 13.00   General discussion

13.00 – 15.00   Lunch time

15.00 – 17.00   **First Thematic Session**
Round table: *ICTs in the Art and Design Education: State-of-the-Art
and Evolution*
Presentations:
– Mr Peter Worrall. *The Digital Derive and Art Education – ICT Developments
1997–2002 in Initial Teacher Training at the Institute of Art and Design,
University of Central England in Birmingham, United Kingdom*
– Ms Leah Livshits. *The Virtual Academy of the State Hermitage Museum*
– Dr Alessandro Piva. *ICT in Education for Cultural Heritage*
– Dr Almira Tazhigulova. *Electronic Textbook in Scholastic Process*
– Ms Jolita Morkunaite. *ICT in the Art Lessons in the Secondary School*

17.00 – 18.00   Cocktail

19.00   Cultural programme

May 13, Tuesday

10.00 – 11.30   **Second Thematic Session**
Round table: *The Place and Role of the UNESCO Institute for Information
Technologies in Education in the Development of ICT Application in the Art
and Design Education: Medium-Term and Long-Term Perspectives*
Presentation:
– Prof. Claudia Saccone. *Neothemi: a Collaborative Development
of a Virtual Museum*

11.30 – 12.00   Coffee-break

12.00 – 13.00   General discussion

13.00 – 14.30   Lunch time

14.30 – 15.30   Discussion and approval of Recommendations of the expert meeting

15.30   Closure of the expert meeting

May 13, Wednesday

Departure of the participants

RECOMMENDATIONS

OF THE EXPERT MEETING
EDUCATION, ART AND ICTs: INTEGRATION
FOR THE DEVELOPMENT OF ONE'S PERSONALITY

The expert meeting **Education, Arts and ICTs: Integration for the Development of One's Personality** was held at the UNESCO Institute for Information Technologies in Education (IITE) in Moscow on 12 and 13 May 2003.

We, the participants from France, Italy, Kazakhstan, Lithuania, Russian Federation, and United Kingdom have discussed aspects of ICT application in art and design education, adverting to the Information Materials prepared by IITE:

sharing the UNESCO position as a forum for multicultural aesthetical reflection on science and technology,

supporting the UNESCO initiatives regarding aesthetical and sociocultural challenges of the information society as a high priority for the sustainable development of personality,

taking into account the importance and specificity of art and design in social life, on the one hand, and a lack of relevant applied researches and scientific information, which could be helpful for teachers, learners and decision-makers in educational sphere, on the other,

suggest:

- to support IITE's undertakings in the field, including those aimed at elaboration of an analytical survey on the basis of submitted Information Materials, in accordance with the preliminary structure attached;
- to ask IITE to form an international working team for preparation of the survey;
- to develop specialized training module for educational personnel;
- to consider the design and development of a special sub-system supporting the features of obtaining and disseminating data on the existing experience and best practices on the issues under discussion within the framework of the IITE Information System in planning of IITE's clearing-house activity.

SELECTED MATERIALS

Nicolas Selivanov
Senior Reseacher
Russian State University for the Humanities

Russian Federation

Education, Art and ICTs: Integration for the Development of One's Personality

General issues

Global changes in informational environment

Informational community
Replacement of dominant language models
New forms of communication

Prevailing technologies of reproducing, storing and transmitting of information in today's world have changed irrevocably. Information technologies have modified the nature of civilization and brought new ideas and ideals. In his work *The Medium is the Massage* Marshall McLuhan claimed that a tool (or a technological process) of the modern time – electronics – attains a new form and restructures the schemes of social interdependence as well as every aspect of our private life... Social life is more dependent on the nature of the tools, through which people converse with each other, rather than on the communication context. Being unaware of how the communication means operate one will never comprehend social and cultural changes.

However, a significant number of tools created with advanced technologies offering users hence unknown possibilities for self-development and self-actualization, remains redundant and unrequited, and is not used to their full capacity, because people are not prepared for them. Equally evident are crises of all structures that reproduce information, which testifies to the fact that intellectual foundations of these structures (management, analysis and design systems) are not ready to adequately absorb technical innovations.

When technical virtualisation was introduced in such areas as arts and education, a full range of problems became apparent there as well, from complete rejection to misuse. For example, experts in arts are adamant in defending the values shaped by social consciousness of yesterday.

Marshall McLuhan stated that hard times have come, as we witness a drastic collision of two great technological epochs. We approach the new epoch with psychological bias and emotional reactions borne out of the old one. The collision takes place inevitably at any time of transition: for example, in late medieval art the fear of a new printing device is felt in the "Dances of Death". Today's fears are expressed in the theatre of the absurd. Either is equally fruitless: an attempt to accomplish something demanded by a new medium with obsolete tools.

Which is understandable, since they are having a vested interest in preserving the existing arts market. Information and communication technologies (ICTs) bring communal informational resources, generate new language models, introduce new forms of aesthetic communication, and use the Internet as a platform, which is catastrophic for existing expert systems because it changes the current axiological paradigm completely.

"To have value ... an artefact must be usable." But how can an artwork be used within the framework of traditional art market (including market for modern arts), if it is published on the Web or if it constitutes an instance of interactive artistic communication realized through multimedia? Attempts to purchase and sell Net art have demonstrated invalidity of the very act of buying. What is the meaning of purchase, if a purchased artwork is open and fully available to anyone, and when access to that artwork is somehow restricted, then it ceases being an instance of Net art? Apparently, we are dealing with artefacts and/or communication models that presently cannot be appraised or evaluated by established means. Precisely characterizing the essence of the processes coupled with the market of modern art J-F. Lyotard exposed how innovations behave in the arts: the time-proved formulas are restored, their balance is shattered as they are combined with new ones on the incompatibility principle by mixing up citations and ornaments as well as through conventionalizing. Thus, one can advance as far as either kitsch or baroque indulging the "taste" of public which can have no taste, and sensitivity eclectic weakened with numerous forms and available objects. It is thought that the spirit of times manifests itself this way, but in fact, the spirit of market is thus reflected. The lofty is no more in the arts but in its speculations.

The situation is even more problematic with the education systems shaped during the industrial era. These systems have not developed any methodology for integrating ICTs into actual training process yet. The core of the problem is that instead of trying to update education by using ICTs, one should change the very structure of learning process by designing new approaches and developing new educational technologies within the context of ICTs. Providing the informatization of education must be directed constructively, escaping computer fetishism. Unfortunately, nobody gives a regular thought to it when incorporating a computer in a learning process for its own sake; its use becomes a mere sign of up-to-date education system.

From narrowly professional to interdisciplinary approach

Today it is becoming more and more evident that narrow specialization of knowledge leads to the crisis of knowledge as such. One can suggest that fundamentally new methods of knowledge transmission or mastering might solve the problem.

For example, we can witness the crisis of traditional taxonomy of visual arts based on production techniques (painting, drawing, applied arts, sculpture, architecture etc.) The taxonomy grounded in different specialization of artists, typical of industrial society, becomes meaningless in the post-industrial age and does not apply to post-modern art, and even less so to the emerging information society. This is why the traditional taxonomy ignores the so-called "contemporary art" – a phenomenon that extends the limits of traditional classification.

Redundancy and supersaturation of informational environment

The quantity of information, its abundance and other qualitative parameters are basic for the theory of information, which describes them with mathematical tools. C.E. Shannon was the first to formulate the theory of information. The key concept of information theory is the concept of entropy as a measure of uncertainty for a test (experiment) that can result in various outcomes. In our case, redundancy and supersaturation are viewed from the modern standpoint of perceiving human mind.

According to Abraham Moll, information is defined as something that adds something new to the already existing. According to another author, "any interaction between objects, which results in one of them acquiring certain substance while another one does not lose that substance, is called informational interaction" (_Concepts of General Information Theory_ by Stanislaw Jankowski). ICTs aim at intensifying this process, at removing any obstacles to information access, at increasing traffic speed and capacity of information channels.

Thanks to these accomplishments today we receive hundreds of times more messages, data, images that require our reactions, choices or decisions. As soon as the information is received, a fresher one ousts it. Our electronics-shaped world has forced us to abandon a habit of classification of facts and recognition by the types. No longer can we construct by sections, brick after brick, step by step, because the immediate information provides for our existence in the state of active interaction of various factors of environment and experience, as Marshall McLuhan maintained.

In educational process, search for a necessary bit of information by means of ICTs can bring a rich harvest of contradictory data, parallels, interpretations, so the results will be very hard to process. In most cases, we are either unready or consciously refuse to absorb even the information that can have certain value for us. We treat this potential information as redundant. However, these unlearned resources delivered to our computer but unrequited, may contain most significant information that could have changed our behaviour. Indeed, it is careless to consider potential knowledge redundant. Redundant is informational noise consisting of data that have no value for us and repeat the known information, or are located outside the limits of our attention or understanding.

Moreover, speaking of supersaturated informational landscape, we should mean not the Internet or mass media, but our entire environment supersaturated with representations of ideas, quotations, symbols and messages.

As a result of this informational supersaturation, education faces very definite objectives, and one of them is practical training of students to process complex and massive informational entities.

- Attention should be focussed on teaching the methods of abstracting and systematising of information.
- It is also necessary to use and develop such skills as:
  - revealing typological details in phenomena;
  - discovering systemic features of informational packages;
  - delineating interconnection and interaction between informational packages.

ICTs can actively assist in achieving these objectives by using the same means that resulted in informational supersaturation:

- visualized information;
- simultaneous representation of several objects that belong to different semantic and hierarchical levels;
- multimedia capacities.

To establish any simple order, as Michel Foucault proves in the book *Dits et Écrits (Words and Things)* "a system of elements" is needed, i.e. identified segments, within which similarities and discrepancies can occur as well as types of changes experienced by the segments, and finally, a threshold, beyond which a discrepancy will manifest itself and under which – the similarity. The order is what is implied in the things as their internal law and a latent mesh, according to which they correlate, and alongside what exists only when passing through the prism of vision, attention and speaking; deep inside the order reveals itself only in empty cells of the mesh silently awaiting a moment, when it is formulated.

Fundamental codes of any culture controlling its language, perception schemes, exchanges, forms of expression and reproduction, its values, hierarchy of its practices for every man immediately identify the empiric orders, which he will deal with and which will be his frame of reference. On the opposite end of thinking the scientific theories or philosophical interpretations treat general causes of any order, a universal law, which the former obeys, as well as the principles describing it and the grounds defining the particular order. Between the codified point of view and reflexive cognition there exists a shadow area reveling the essence of the order: it is here that it can be detected depending on cultures and epochs as continuous and gradual, or fractioned and discrete, space-related or created in every instant by the force of time as a table of variables, or determined by means of isolated homogeneous systems; it is composed of similarities augmenting steadily or spreading in the manner of a mirror reflection, organized around the growing discrepancies, etc.

Actualizing the content resources of arts and culture

Under conditions of informational supersaturation that shapes modern consciousness, special value should be ascribed to the educational products that allow students to develop abilities for abstracting and systematizing of informational entities, i.e. generalization, typologisation, delineating of interconnection and interaction among the entities. The most productive field for these operations can be found in the history of civilization manifested in arts and culture, which were integrating and expressing the knowledge of reality and models of managing the reality.

Modern information technologies are the most effective tools for teaching methods for typologisation, understanding and analysis of cultural models, since ICTs allow analysis, modelling and visualization of information in its structural complexity.

Transformation and interpretation of information

Cultural heritage used for any forms of communication, including education, reveals a number of the most important issues related to informational phenomena. For example, attempts to digitise museum holdings and the works of art make evident that changing material vehicle of information

cannot be limited solely to a technological transformation, i.e. digitalisation, but must include a whole number of additional components. J.-F. Lyotard in his work _La Condition Postmoderne_ believes it to be extremely important that the knowledge can be conveyed through other channels and become operational only when it is transferred into certain amounts of information. Consequently, we can expect that the non-transferable in the established knowledge will be discarded, and the new research will depend on the condition of translability of future results into the machine language.

If a text on paper can be transformed into electronic format easily and without essential loss, digital representation of material objects, which include all artefacts, requires special means and methods. It is possible to represent an image of a thing, but without additional effort it is impossible to represent its scale, texture, "aura" (according to the definition proposed by W. Benjamin).

We believe that the solution for this fundamental problem can be found not so much in the area of 3D representations and virtual reality, but in developing semiotic models of material objects (i.e. informational matrices) that can further be digitised by means of comprehensive ICTs.

Another problem is related to the first. It concerns actualisations of information, which becomes possible by activating routine codes that are stored as sheeted paintings in the back rooms of museums, "unremembered" memories, unused computer applications, or, on the contrary, as too well-known things, which lose for that reason their capacity to communicate information, and are perceived as "empty spaces".

Changing context actualises information and makes "empty" objects informationally filled. Consciously placing an object into new context per se is a practical act of actualising information and creating a new meaning every time. This is why it is impossible to literally transport ideas and concepts into various contexts or various historical periods, regardless of a vehicle for these ideas – be it architecture, text or music.

Based on contextual analysis in relation to a perceived object we can forecast what meaning an informational object will have for an addressee, in other words, we can manage informational content. The most productive way of learning how to manage informational content is studying works of art and culture. For this purpose ICTs offer the most perfect means of training, modelling, testing, optimising and managing.

Finally, potential information, when transformed into an object of communication, always exists as a part of a specific communicative chain. Therefore, it is especially important to know who is at the end of the chain, who is the addressee? Is it an amateur, a collector, an expert or a student? If you know your addressee, you can format an informational object so that its content will be topical for an addressee; while a sender will be able to predict with more certainty the results of a communication act.

Social and cultural issues defining the role and place of developmental arts education involving ICTs

Problems of consciousness–shaping and enculturation

Under conditions of change in prevailing forms of creating, storing and transmitting of information, the problem of enculturation and broad humanitarian development of an individual becomes especially poignant.

It is based on the following:

- crisis of professional, ethnic, cultural and age identity of individuals who are involved in the production of informational metaproducts and services;
- their search for personal identity in various social contexts;
- their need to master various language systems;
- interaction with various cultures and subcultures.

(The applied concept of enculturation synonymous to the notion of socialization, denotes the priority of cultural components when individual consciousness is formed. Socialization (lat. socialis – public, social) is a process in which a human being acquires a certain system of knowledge, norms and values providing for his functions as a full-fledged member of society).

Key notions for developing of enculturation methods in contemporary society are as follows: diversity, contrast and comparison, and dialogue.

Within the framework of this problem, it is necessary to determine cultural and subcultural aspects of modern society evolution. In general, in respect to the problems of personality development by means of arts and culture involving ICTs, the following aspects can be identified:

1. Introduction of high intellectual technologies into all areas of human activity have provoked a social reaction that manifests in active creation of new cultural and subcultural models, first of all, within urbane environment;
   - The new cultural and subcultural models that use free time niche for self-actualization, dominate in shaping consciousness of new generations and enculturating them;
   - The same free time is claimed by supplementary, open classroom, developmental education activities that include arts and aesthetics and by educational products based on cultural heritage and arts.

That means conflicting claims for the same time resource.

2. New cultural and sub cultural models actively use ICTs for achieving their objectives.
   Products of supplemental developmental education are viewed by users in the context of products created within the framework of new cultural and subcultural models.

3. New cultural and subcultural models:
   - manifest themselves as integrated entities expressed by various language means for the purposes of self-representation;
   - carry multicultural content;
   - demonstrate reflective treatment of ideas and relationships, formed in the digital environment, which can be defined by the concept of virtualization that, among other things, views living processes as reversible;
   - use active and playing forms of communication.

New generations learned to solve their own problems, developing several cultural models and using them as a basis for creating multiple subcultures. For example, within informational cultural paradigm such phenomenon as "punk" has been born, and its mutations generated various subcultures, created a model for interrelations with cultural memory and a model for future forecasts.

Digital technologies and telecommunications served the grounds for intense development of subcultures that offer to developing consciousness an integrated informational package which includes limited but sufficient number of components for personal development within the context of new postindustrial reality. But these subcultural models, which objectives are introvert, since they have to position themselves in relation to external reality in order to preserve their identity, have neither resources nor channels for full-scale development of independent reflective consciousness which can develop only in the context of more profound cultural traditions and special educational efforts.

Global population within a relatively brief period of time has been presented with these models, assimilated them and turned them in an integral part of public life in virtually all countries. Their innovative character, intellectual topicality and relevance to the challenges of modern life made the models prevalent in shaping consciousness of new generations.

Educational systems based on e-technologies and aimed at a broad consumer range as supplementary, developmental products, i.e. laying claim on the free time resources, are viewed by subcultural users within the context of the new cultural and subcultural models.

These models represent themselves by means of integrative packages which aim is the most poignant, frequently aggressive demonstration of their semantic elements, expressed by various language means and marked by multicultural characteristics.

Emergence of the latest cultural models, despite their advantages, justifies certain concern that accomplishments of past cultures can be lost, ties with cultural memory severed, natural connections between generations broken, i.e. a well-maintained system of personal enculturation can be disrupted, as well as an ability for a person to design his or her individual developmental project consciously.

These concerns pose before specialists a problem of developing personality within such processes as active study of multiple cultures, learning multiple languages, analyzing methods of informational phenomena construction throughout the history of civilization satisfying demands of new generations.

Therefore, the problem is that of proactive mastering of cultural heritage by means of ICTs.

That will require a certain effort from specialists to abandon — well-developed but outdated methodologies. Educational projects must offer active learning forms in terms of students' intellectual, organizational and psychophysical standing.

Instrumental knowledge needed to solve this central task can be obtained after one analyzes and masters methods of active creative education. If we recall how emotionally active, enterprising and dynamic teenagers are while playing computer Net games, we can see what a powerful potential do ICTs possess for activating perception.

In order to create educational products of developmental nature based on informational resources of culture and arts, it makes sense to analyze a holistic system: student — game — technology revealing psychological foundation for involvement, initiative and dependency.

Structural characteristics of ICTs relevant for developing education systems based on culture and arts

Three types of ICT-based products

Practical development of education systems that use ICTs and aim at creating new forms of education organization enforces new definition of such product types. The necessity for such re-definition becomes manifest when we try to determine the role of products' creators in education process.

Three types of ICT-based products can be identified:

- **entirely alienable/autonomous:** e-book, CD-ROM, hard copy + CD-ROM, 'self-developing' resources etc.;
- **unalienable:** updateable, modifiable or moderated Internet-publications, interactive resources etc.;
- **hybrid:** hard copy + CD-ROM + updateable and modifiable Internet-publication.

The above types can be used for group work (group training, network classes) or for individual study.

Hybrid segments of educational environment

Hybrid segments of educational environment imply distribution of information, unified content and single projecting process over various vehicles and functional objects — paper and digital.

Distributing art spaces, resources and tools in paper and digital form significantly increases available field of creative projective activities in arts education.

Hybrid forms combine two principally different parts – actual physical space and virtual environment.

Main requirements for hybrid segments of educational environment are clear interdependence and technological "transparency".

Equally important and necessary is an opportunity for interactive manipulation of educational tools and freedom of students' creative initiative.

Most examples of applying ICTs for arts education known today use hybrid forms, in which digital vehicles provide information and means of demonstration. Paper media base individual projects (notebooks, print-outs, images etc.). Opportunities offered by ICTs are much wider and can potentially become a powerful environment for creative self-actualization and project design. This potential must meet the need of creative mind to implement creative concepts via traditional material and tangible media.

Visual language and screen objects as means of arts education and personality development

New representation and communication milieu created by digital technologies forms the base for creative, intellectual and humanitarian development of a personality. The milieu is shaped by complex means aimed at interaction with all senses, predominantly, visual perception. Thus, predominant communication form in the milieu is visual, and language phenomena created in the milieu are shaped as screen artifacts.

Screen artifacts are the end communication objects that students interact with. Therefore, organization of visual objects not only acquires aesthetic significance, but also represents the most important element of content and organizational structure. In terms of semiotics, we can examine syntax, semantics, and pragmatics of screen images.

History of arts knows many examples of visual image analysis, including screen images. The 20th century offers especially productive attempts to formalize visual language. S. Eisenstein wrote a lot about the semiotic aspects of screen images, their control as well as cultorological and philosophical aspects of visual information. One can find many prolific ideas on the semiotics of visual languages in the works of Umberto Eco.

This experience can be only partially applied to computer products. When we try to analyze perception of computer-generated screen images, we encounter a whole range of problems, which, if solved, would have allowed us to forecast communication results. For example, how are design elements and screen controls understood by users when perceived simultaneously with the main content? Which transmission speed is the best for perception? What is the best number of simultaneously available informational entities? How is one to choose the best screen color scheme? How does culturally conditioned perception affect reading of screen information? Designers are faced with multiple questions that cannot be answered with universally applicable recommendations. However, in each particular case an answer can be found if we determine who are the target audience and what are their preferences. In other cases technologies offer a whole spectrum of opportunities for customizing screen structures by users themselves.

Psychological and educational foundation for arts and ICT integration

Functional bilateral brain asymmetry

According to the theory of bilateral brain asymmetry, left-brain domination determines logical and verbal cognition process, i.e. discoursive thinking, as well as inclination toward abstraction and generalization, i.e. integrative thinking (left-brain individuals). Right-brain dominance results in the prevailing specific thinking and creative imagination (right-brain individuals). Most people don't have a clearly expressed dominance of left or right brain (equibrain individuals).

Left-brain logical thinking organizes any sign material into a clearly ordered and unambiguous context necessary for successful human communication. The material can include words and other symbols, signs and even images. Western civilization is characterised by predominance of formal logical analysis and left-brain cognitive style defined as discoursive thinking. The shift toward absolute rule of left-brain cognitive strategy emerged as a result of cultural traditions, social influences and education. The development of modern education views on logical thinking as one of its major goals; consequently, educators focus their efforts on stimulating left-brain capacities, developing logical thinking and mastering methods of creating unambiguous context.

Right-brain thinking functions as simultaneous perception of numerous contradictory connections and creation of their holistic and polysemic representation. Advantages of that cognitive strategy manifest themselves when information is complex, contradictory and cannot be reduced to an unambiguous context. Right-brain cognitive strategy that allows capturing a large number of connections and variants in a polysemic context becomes by this token the most important component of a creative process.

Speaking of ICT role in development of creative personality, four psychological and learning components need to be identified:

- image thinking,
- discoursive thinking,
- integrative thinking,
- projective thinking.

Besides, ICTs give an opportunity for balanced cognitive development, including all aforementioned components, due to their specifics.

Image thinking

Arts have more experience in and more means for manipulating informational entities in order to turn them into communication objects than any other human activity.

Arts today comprise multiple old and new forms of artistic communication. Each of them has its own opportunities and limitations, but all are based on one type of informational entities: derivatives of concrete image thinking. Image thinking itself is the most effective foundation for integrating diverse information in a communication object. It provides for information compression during communication, qualitatively changes information, introduces noise-resistant elements, and organizes a field of potential informational resources around them. Besides, products of image thinking in many cases can appear as super-language means of communication, i.e. decipherable by different national, ethnic, cultural and subcultural groups.

Developing abilities for image thinking is possible only within the framework of artistic activities and arts; their history and practice can serve as a main educational resource for that purpose.

Discursive thinking

Discursive thinking (from Latin "discursus") combines two forms of cognitive strategies – deduction and induction – based on a common principle, according to which each next step in reasoning is founded on the result of a previous one. Deductive cognitive strategy is a logical progression from general to particular. Inductive strategy, on the contrary, is a progression from particular, fragmented elements to general conclusions.

Cognitive procedures of discursive thinking form a psychological basis for unambiguous, linear perception of reality. With such perception, any action or relationship automatically precludes an opposite, contradictory one. Usually discursive thinking does not generate new ideas; its main function lies in accumulating and transmitting a past experience. Therefore, discursive thinking plays a paramount role in any systematic educational process.

Problems of limited, one-dimensional character of discursive cognitive strategy can be successfully dealt with by means of ICTs. With ICTs, any derivative form of discursive thinking can be transformed into a creative statement because of the multimedia and imagery nature of representation means per se. Student projects, scholarly papers, analytical materials presented by means of ICTs can be transformed into a colorful visual narrative based on all cognitive strategies (first of all, on image thinking).

Integrative thinking

Integrative thinking is a system of cognitive operations directed at analysis and abstraction of information, its systematization and synthesis of new ideas. One of the major cognitive procedures of integrative thinking is a mental manipulation by determinants of various conceptual and special categories in order to integrate them into a new stable meaningful construct.

For the purposes of artistic education, integrative thinking manifests a creative mechanism aimed at synthesis of new meanings, ideas and concepts by integration of existing ideas.

Projective thinking

Projective thinking combines cognitive operations typical of imaginary, integrative and discursive thinking, and aims at conceiving creative ideas, designing optimal solutions for creative problems, selecting material and expressive means, and planning creative process.

Projective organization of creative educational process as the basis for integrating ICTs in education

Projective culture and ICTs

Education organized on the basis of projective culture ideas can conform to all trends and criteria of new education focused not on knowledge and subject matter per se, but on human beings, who cross professional and conventional borders and create new reality at the crossroads of various subjects and disciplines, activities and areas of knowledge.

By the end of the 20th century it has become evident that in order to form a creative personality capable of self-development under post-industrial conditions, one needs to develop projective thinking.

Moreover, introduction of projective culture into education can assist in overcoming a certain crisis that came into existence during industrial era and manifested itself in the increasing gap between educational content related to the humanities, engineering and technologies. This conflict is clearly demonstrated in the powerful inertia of the 19th century polytechnic education model, that presently dominates education systems across the globe, both in terms of mass character and of rootage.

This crisis leads toward emotionally underdeveloped personality, insufficient mobility in terms of mastering new technologies and activities, and, consequently, toward unrealized creative potential.

Speaking about ICT application under the educational crisis, we should highlight a phenomenon that many teachers, who work with children, are aware of. Children were always especially good at generating descriptive imagery, but nowadays that requires an additional effort and extra attention on teachers' part, because children are inundated with visual information and frequently begin to retransmit "somebody else's" images, they are captivated by ready-made metaphors and see no need to create anything of their own. In other words, we encounter emotional deafness and imagery muteness that develop against the background of emerging unprecedented means for interpersonal communication.

Experience of introduction and development of projective culture, its cultivation within the framework of special education technologies, that simultaneously occurred at all stages of industrial and post-industrial societal developments, offers necessary tools for shaping new picture of the world and mastering the means of self-actualization under conditions of informational society. Moreover, it must be

noted that the 20th century arts methodology was developed along the lines of projective culture educational concepts, and frequently products of educational process became objects of art.

Projective organization of educational forms offers a comprehensive solution to all conflicts of our transitional period and creates intellectual and organizational foundations for integrating ICTs and education.

Projective culture equipped with ICTs must become an integrating structural foundation in respect to all areas of knowledge, disciplines and professional cycles. We are speaking about a special methodology and technology of education – about bringing up and developing creatively and projectively thinking individuals, regardless of their areas of work – be it science, technology, management, politics, education, marketing or ecology.

Developing creative projective thinking within the framework of arts education involving ICTs

The chart below demonstrates the logic of educational process, where ICTs are mastered in the context of general humanitarian personality development with projective means and methods. One principal feature of this organization is its new productivity of education, expressed in a virtually unlimited spectrum of forms of project realization.

If creativity is viewed not only as a spontaneous surge of inspiration and emotion, but rather as a step-by-step structurized process, a mobilizing mind appealing to cultural memories and artistic practices of different civilizations, closely connected with contemporary world of ideas and technologies, it gives students an opportunity to demonstrate their abilities and formulate internal goals, objectives and motives. Even more important, viewing creativity as a meaningful process allows students to feel their place within the living culture and realize their involvement in actual artistic processes, and opens prospective for further development.

In terms of subject matter, the disciplines that develop projective thinking should include, first of all, history of various cultures, which would give students an opportunity to learn cultural typology, characteristics and governing mechanisms of various cultures.

Introducing the ICTs in arts education on the basis of projective culture allows developing all forms of creative personal communication. Students will be given an opportunity to do the following:

- express their images; for that purpose, one can use training methods and means of ICTs that help develop spatial imagination, three-dimensional visualization and spatial simulation;
- express their ideas and concepts; for that purpose, one can use training methods and means of ICTs that help develop systemic thinking, generalization, abstraction and pattern-tracing skills, as well as skills in integrating various language means to express one idea;
- use cultural experience of humankind to express their images and ideas by means of ICTs; for that purpose, students are trained in methods of processing information, mastering various artistic techniques, and interpreting cultural experience.
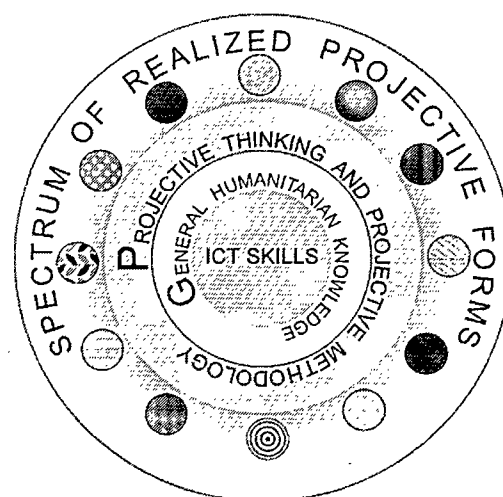
Memory/Project

Education technologies involving ICTs must take into account that the process of

Creative education and personal development scheme based on ICTs

31

shaping and accumulation of informational context cannot be separated in time from reproduction and creation. This dichotomy can be defined as Memory/Project.

The idea of modern educational dialectics is based on the thoughts of J.-F. Lyotard, which he expressed about the pragmatics of scientific knowledge. An addressee of an utterance – a student – doesn't know what an addresser knows; he can get educated and become an expert of his teacher's level. As the student (dialectics addressee) accumulates his competence, the expert can show him what he doesn't know but wants to know (if the expert is at the same time a researcher, in the least). Thus, the student is introduced to the dialectics of research, i.e. the game of scientific knowledge formation.

Memory means competence acquired by a student. An educator is an expert. Therefore, the main objective for an educator is to select and offer to a student necessary informational resources and methodology for independent discerning of typological characteristics of various phenomena, as well as methods for searching and navigating through informational array.

Project means active involvement of a student into a creative process. An educator is a researcher. A student takes part in the creative process jointly with an educator. In other words, they are involved in co-authorship.

Educational model oriented toward projection and co-authorship per se is potentially applicable for developing intellectual systems that naturally involve ICTs.

Using ICTs in arts education

ICT potential and objectives of arts education

ICTs can be used differently depending on the type of activity. In the area of arts education and aesthetic development, ICTs, besides general technological opportunities, can offer such important features as means of creative self-actualization, means of creating visual communication objects, modeling of virtual environment and informational objects, means for integrating visual, aural and moving images in one communication object.

One of the main objectives in educational projects that use ICTs is to organize two consecutive processes: virtual modeling (easily reversible and multivariable) and practical creation of integrated communication objects.

We can list the following opportunities offered by ICTs that have immediate impact on formulating objectives of arts education:

1. ICTs allow comprehensive impact on user's perception by means of synthesizing visual, aural and moving images in one communication object.
2. ICTs allow imitating any visual means of expression, including illusion of three-dimensionality, allow creating illusion of movement, as well as creating and objectively representing visually the objects that cannot exist in reality, or reconstructing the past and projecting the future (virtual modeling).
3. ICTs allow turning elements of screen images into interactive objects, i.e. into objects that interact with users. That means that each object can be assigned a function that results in a sequence of events. These functions can be assigned to static objects (turning an image into an interactive map) or dynamic objects, including digitalized video images, animated objects and films.
4. ICTs allow creating multilevel informational objects that reveal their contents in the process of spacio-temporal, non-linear interaction between users and interactive elements.
5. ICTs allow designing models of self-developing informational systems, the simplest of which are an interactive bulletin board, chat and e-forum, which contents develop, thanks to free access, for different users who can post their information. Many art projects on the Web such as collective Internet-artifacts, for example, virtual graffiti, also represent self-developing systems. The most interesting and original among self-developing projects are projects of the so-called artificial life forms based on mathematical models of biological or genetic processes.

6. ICTs offer users an opportunity to absorb information at his/her own speed, with his/her own motivation and thinking.
7. Organizational structure of informational digital objects is build upon the principle of focusing (multi-step classifiers – from general to more specific, or search engines with advanced search options), which allows intensified processing of information arrays.

One of ICTs' aspects important for arts education and aesthetic development is a spectrum of features enhancing visual representation of information:
- by means of synthesizing in one screen object several different visual images such as objective images, charts and graphs, symbols, animated visual "comments", video and sound indexing of events;
- by means of simultaneous representation of images;
- by means of dynamic screen refreshing;
- by means of direct interactive modification of images and graphical comments (it is possible to draw and modify images directly on the interactive screens).

These specific features assume certain correlation between means/opportunities and objectives of arts education aimed at mastering ICTs.

See Table *ICT opportunities and arts education objectives.*

The table compares four aspects:
- ICT opportunities,
- technologies providing these opportunities,
- educational objectives aimed at the development of students' abilities necessary for artistic self-expression by means of ICTs,
- opportunities for artistic, aesthetic and humanitarian personality development that are revealed by ICTs.

Table: ICT opportunities and arts education objectives

ICT opportunities	Technologies	Educational objectives: developing students' abilities for artistic self-expression using ICTs	Opportunities of artistic, aesthetic and humanitarian personality development offered by ICTs
1			
Comprehensive impact on user's perception by means of synthesizing visual, aural and moving images in one communication object.	Multimedia	Teaching self-expression in the process of projective creative activity. Developing image thinking. Teaching methodology for integrating information in order to create multimedia images. Teaching computer skills for multimedia applications.	Giving students clear and sustainable notions of past civilizations, arts and cultural heritage. Artistic, aesthetic, humanitarian personality development in the process of communication with multimedia artifacts.
2			
Imitating any visual expressive means, including simulation of 3D material objects, simulation of motion. Virtual modeling of spatial patterns, objects, functions, processes.	Software tools for 3D visualization, image processing, animation, virtual reality, etc.	Development of aesthetic concepts. Development of spatial imagination. Development of image thinking. Study of visual arts technologies. Teaching computer skills for graphics. Development of systemic thinking in the process of projective artistic activity.	Visual reconstructions, visualization of impossible objects, abstractions, processes, futurological hypotheses, images from micro- and macro-cosmos, etc. Increasing visualization of educational process involving ICTs: – synthesis of visual images of various nature in one screen object; – simultaneity of represented objects; – dynamic information update; – interactive modification of images.

ICT opportunities	Technologies	Educational objectives: developing students' abilities for artistic self-expression using ICTs	Opportunities of artistic, aesthetic and humanitarian personality development offered by ICTs
3			
Means for manipulating with informational elements. Transformation of screen image elements into interactive objects for users.	Interactive technologies	Development of associative thinking skills. Development of skills of manipulating with informational elements in the process of projective artistic activity.	Involving students into creative processes and interaction with informational entities. Creating active tools for students' independent work.
4			
Creating multi-level informational objects revealing their content in the process of temporal and spatial non-linear interaction with users.	Interactive technologies, databases, catalogues, search engines, HTML WWW, interactive videoconferencing	Development of analytical and systematizing skills applied to heterogeneous information. Development of systemic thinking. Development of spatial imagination. Introduction of history of spatial and temporal arts. Development of skills for projective organization of creative process.	Creating comprehensive systems for managing students' learning process. Intensification of learning process with offered customized information.
5			
Creating models of evolving, self-developing systems granted by free access to posting information by multiple users. Evolving self-developing systems based on mathematical models of biological and genetic processes.	Interactive bulletin boards, chats, databases, remote users' interaction; virtual "graffiti", software tools based on mathematical models of evolving and self-developing systems	Development of skills for joint creative activities, co-authorship. Teaching computer-programming basics. Development of picture of integrating humanities and technologies by means of arts in the process of projective artistic activity.	Development of the picture of informational society as a multicultural unity, self-developing and evolving system, about new scientific and cultural ideas and trends. Development of the picture of integrating humanities and technologies.
6			
Opportunity for independent processing of information at one's own pace, with one's own motivation and thought. Opportunity to focus information request.	Interactive technologies, databases, catalogues, search engines, HTML WWW	Development of self-teaching and independent learning skills. Development of skills for formulating ideas and concepts, finding ways for their implementation in the process of projective artistic activity.	Creating comprehensive educational systems. Intensification of learning process with offered customized information.

Concepts and skills a student can learn while accomplishing a creative projective assignment with multimedia educational products (CD-ROM)

1. Student becomes aware of basic concepts of artistic creativity as one of the main forms of cognition.
2. Student directly experiences artistic self-expression.
3. Student understands structural foundations of communication on the basis of languages of visual culture.
4. Student learns basic concepts of information object structures, their organizational types, linear and non-linear reading models.
5. Student familiarizes with aesthetic characteristics of various civilizations' artifacts.
6. Student masters graphical means of expression (two-dimensional), methods of graphical organization and presentation of information, communicative opportunities of color-coding.

7. Student learns spatial means of expression (three-dimensional), means of simulating 3D objects that represent integrated informational entities.
8. Student masters skills of projective thinking, that include:
   - spatial imagination,
   - image thinking,
   - abstracting and typology of phenomena,
   - systematization, formalization and transfer of information into various formats,
   - stage-by-stage projective modeling (studying and analyzing a projective situation, creative search through drafting, developing "initial plot" as "compositional skeleton", designing details and fragments, and finally integrating subsystems into a holistic artistic composition);
   - introspection and self-expression by metaphoric means.

(The above list of educational objectives is taken from the project *Artist's Book* by T. Selivanova and N. Selivanov)

Monitoring of ICT products used for arts education and creative personality development based on arts and culture

Monitoring

Selective monitoring of ICT applications in the field of arts education has been performed for the purposes of our research. The following items were examined:

- Internet databases that can be used for arts education;
- educational museum projects on CDs and the Web;
- educational Internet-projects of large non-governmental and governmental organizations;
- educational Internet-projects of commercial organizations and high-tech companies.

Applied educational techniques based on ICTs should be the main criteria for evaluating these resources:

- overall concept that defines goals, means and methods of using ICTs in education,
- projective creative organization of learning process by means of ICTs,
- methodology and technology supporting and developing creative personality,
- standards,
- analytical tools.

Levels of using ICT opportunities for creative personality development constitute another set of important criteria:

- interactive opportunities and objects that can be manipulated,
- level of visualization,
- level of multimedia penetration.

English and French Internet-resources have been studied.

Most typical examples of a general trend have been selected for each area.

Internet image databases and search engines to be used for arts education

Many resources, that are positioned as specialized information bases for arts education, are actually created on the basis of various museum collections or as a collaboration of several museums, and information on these sites resembles traditional museum catalogues. This most numerous group can be defined as "world museums". There are many thousands of the resources available, but for real educational process they are largely non-effective, and are required rather episodically in order to cover a certain issue more in depth or to develop a special project.

More in demand are dictionaries of art terms, or collections of images by period or style, or encyclopedias, glossaries, web sites on various art styles and movements. Art scholars design these sites, therefore, they are always helpful, since their structure and content meet international standards and concepts in teaching of art history. They are easy to use in class and in distance learning, for students' homework and for course preparation. (See Appendix 2). The resources are initially developed for education and designed as learning aids.

Another substantial portion of art resources is made available universities or enthusiastic researchers. The resources are put together for particular teaching or research projects, and their structure and content are localized within the framework of a particular topic. Typical example – a collection or all *Adoration of the Magi* paintings.

Search engines that allow searching only for images or sounds represent an optimal solution for putting together educational visual content. Thus, Yandex search engine shows as image search results in annotated thumbnails of files found. Another example – special catalogues equipped with search capacities (see Appendix 1).

Educational museum projects on CDs and on the Web

Education departments in many world museums are developing special target CDs and support education via the Internet.

However, even a cursory glance at a list of publications available in museum stores across the globe reveals, that CDs represent an exotic ornament in comparison with print material, and educational CDs are even less frequent. We mean educational projects based on ICTs, not CDs of encyclopedic or catalogue character.

Nevertheless, rare examples of educational products developed by museums offer the most advanced methods for integrating ICTs and arts aiming at creative personal development.

Thus, The State Hermitage project *Rafael's Loggias* offers an interesting example. Initially, the project was designed for newspaper kiosks located in museum halls. But its authors (team leader L.Lifshits), personnel of the education centre, considered children the target addressees for their product. Therefore, this project can be viewed as an educational information product that can exist autonomously. Among indisputable advantages of *Rafael's Loggias* are such features as educational technology manifested in particular organization of its content structure, in visually expressive representation of content, and, most important of all, in interactive educational testing tools. In that part of their project, the authors have made an attempt to modify a well-known kit for interactive image manipulation, and developed a system that integrates interactive instruments, artwork analysis and training methods.

Most world museums now use the Internet-resources. For educational purposes they offer virtual and guided tours, publish information about their educational centres, and offer training tests ("Do you know such-and-such artist?") However, there are virtually no examples of projective organization of learning processes, nor creative personality development by means of interactive ICTs.

Most educational segments of museum sites on the Web today begin to introduce Flash technology. Visually sites become more dynamic and interactive, information is presented in a more accessible way. Museum exhibitions are more interactively available as well.

As an interesting example of that trend we can cite the virtual exhibition *Devices of Wonder* partially presenting items of a large exhibition at the Getty Research Institute studying origins of our modern media in interactive play devices since the 17th century. Exhibition authors offer to "play and study" these devices.

This project successfully demonstrates the problem areas of contemporary culture, where engineering, technologies, arts and aesthetic content are combined to create unified communication objects. Virtual exhibition comprises two objects – Flash-version for high-speed connection and HTML-version for low-

erspeed connection. The versions, however, are not identical. Flash-version is dynamic and interactive, demonstrating 'magic' abilities of museum objects and surprising viewers, while the HTML-version is more informative due to the written commentary included. Both versions can be used in a complementary fashion, which expands their educational capacities. Web site "Devices of Wonder" offers a page for teachers, where sample curricula are offered for classes based on the exhibition, as well as recommendations and questions for students. Unfortunately, the project does not try to accomplish creative objectives, which could have been a logical development of studying such intriguing and inspiring material.

Educational Internet–projects of large non–governmental and governmental organizations

A number of large non-governmental and governmental organizations works in the field of arts education and offers informational resources accordingly.

Alongside with Getty Institute mentioned, another example is an educational programme of the Kennedy Center called ArtsEdge (http://artsedge.kennedy-center.org/), which defines the place of arts education as central for creative use of technology. ArtsEdge is perhaps the largest and fullest resource dedicated to the integration of art and ICTs for educational purposes. This site focuses on education techniques and methodology of teaching arts using ICTs. Its main headings are Contacts, Professional Development (that includes professional development links, distance learning links, workshops and online training opportunities), Standards and Exemplars, Overviews and Reviews, Advocacy Resources. Review of the web site links clearly reveals how scarce are the resources and educational projects for development of creative consciousness in general, and by means of ICTs in particular. The majority of resources are supplementary, supporting the traditional forms of arts education or digitally reproducing the traditional education methods.

Educational Internet–projects of commercial organizations and high–tech companies

DAVIS project is implemented by a commercial organization of the same name. Project web site offers everything necessary for arts education in high school with the help of digital technologies: textbooks and guidelines, standards, digital slides (see Appendix 1), model lessons, distance learning. However, not a single teaching aid offered proposes creative organization of a learning process. Each element provides questions to answer, gives linear assignments, etc. (See Appendix 2).

Entirely different approach can be found in the Internet-project entitled *KinderArt* (http://www. kinderart.com/) – a large open collection of art lessons on the Web, supported by an NGO with the same name. Over 800 curricula for creative arts education constitute the basis of this project. The project presents a multitude of art forms, but all of them are relevant to modern culture. "Disseminate your ideas and curricula,"– encourage project creators. There is a separate heading for ingenious ideas that can be supplied by children as well as adults. The site offers a plethora of creative education ideas revealing new methodology to use cultural content in arts education. This site resembles a laboratory for experimenting with arts education. However, it lacks any interactive learning tools and descriptions of educational projects that use ICTs. They offer books, slides, etc.

Museum, cultural and historical digital resources for arts education

Cultural heritage and arts education

Today we know a significant number of digital resources designated for creative personality development. Most of the large world museums give an access to enormous collections of digitalized images, publish e-catalogues and encyclopedias, host virtual tours of museum holdings; there are numerous personal sites of various artists – classical, old and very young.

The majority of these sites employ only one opportunity of ICTs – providing information. Examples of products, that would allow some activity on the part of students, are very rare. In such cases web

designers suggest limited interactive manipulations – solving a puzzle, trying a costume (a wig, a nose, etc.), turning a handle on a device, drawing.

Evidently, these resources can provide only raw material for arts education, which is a process of active cognition, and a hypothetical teacher can apply these resources only for independent development of learning tools based on the appropriate methodology. In reality, teachers cannot use even "raw" resources to the full. They lack methods how to use ICTs in teaching the subjects; and universal informational resources only partially solve this problem.

ICTs can overcome this problem by developing special tools appropriate for teaching various subject matters. There are virtually no developments of the kind in the field of arts education.

Examining the problem, one has to understand that only creative projective activities can serve a basis for including ICTs into education aimed at artistic and aesthetic personality development, and that requires, besides illustrative resources, projective assignments, methodologies and ICT tools for their fulfillment. An overall preparation plan to use and transform digital resources into finished products for arts education can be outlined as follows:

Outline for transformation of digital resources into finished products for arts education

For any project, the initial stage is training of trainers: projective and analytical seminars, training in projective methodology, tools, hard and software.

"Informational resource" unit (combination of firmware and methodology)
1. Unified informational project architecture.
2. Software for developing project resources.
3. Technology for securing information against an unauthorized access or use.
Unified specialized catalogue allowing multi-aspected grouping of information.

⇩

"Communication" unit (sequential system of methods and software tools)
Methods and software tools to develop content structure and management for individual projects.

⇩

Software tools to develop specialized multimedia scenarios for education, arts and culture.

⇩

Special software tools to create finished multimedia projects.

"Information resource" unit includes a combination of firmware and methodology necessary to prepare digital resources (digital image, audio, video, text documents) to transform them into communication objects.

"Communication" unit comprises methods and software tools to transform systematized informational resources into finished digital objects for end-users. Here, communication objects are created via actualization of content resources for specific purposes and targeted addressees.

"Communication" unit presents a methodological and technological sequence that results in a finished digital object.

Means of "Communication" unit must be optimized in terms of time and effort required at all stages of project development, which is essential in humanities practices to customize the education process. The unit should be adapted to the work with cultural heritage and arts.

"Communication" unit elements

Methodology and software tools to develop informational content architecture for individual projects.

1. Software and methodology to develop projects.
    These means assist in structuring content and designing management of individual projects, relating it to actual cultural and social contexts and designating parameters of future communication objects. Ideally, these means should use web technologies (HTML, Java Script).
2. Software and methodology for specialists in the humanities working in the field of arts and culture to develop multimedia curricula.
3. Software tools to turn a 'half-finished' product into a finished multimedia interactive form.

Commentaries for Complex Project on Digital Resource Transformation in Final Educational Products for the Needs of Arts Education

1. To realize the prime objectives of the project – formation of thematic digital resources **"Information resource" unit** – a complex technological structure is needed to solve the following tasks:

    - to develop a unified informational architecture of the project, which reveals its goals, regulates the interaction forms for the resource sources and determines technological and method-ological bases of activities;
    - to arrange a technological package to create and develop the resources;
    - to protect visual materials against unauthorized usage;
    - to protect texts against unauthorized usage;
    - to protect audio materials against unauthorized usage;
    - to compile a unified specialized reference book and dictionary to be further developed and edited via distant access;
    - to organize an access to standardized and protected resources.

2. To accomplish the tasks of information resource application in education. **"Communication" unit**, project technological methods and tools transforming the available resources in the forms of final educational products, must be included.

Traditional methods of education process comprising digital objects as illustrative material can be considered to be the first introduction experiments with the information technologies, which, to a greater extent, overcome psychological barriers of professors and teachers in the educational institutions. The experience shows that the images from the databases on the screen demonstrated during the lectures is ineffective use of new capacities, and for an expert a screen image can never replace the study of a monument proper.

Content interpretation is a necessary activity to create a full-fledged information product. Specially designed software providing for easy projecting and modification of the educational contest only can help a teacher here.

APPENDIX 1

Dedicated catalogues with search capabilities
http://artresources.com/ ArtResource
http://www.artline.com/ ArtLine
http://www.artlistings.com/artlistings/ ArtListings
http://www.artplanet.com/ Art Planet
http://www.artsednet.getty.edu/ Getty Arts education
http://www.artxpo.com/ Art Xpo
http://server.nich.edu/arted.html Arts education
http://www.mea-mt.org/news/surfari.htm Cyber Surfary
http://humanitas.ucsb.edu/ Voice of the Shuttle

http://www.eb.com/limited_search.html Britanica
http://edweb.sdsu.edu/edfirst/art/art.html Eyes on Art
http://www.msstate.edu/Fineart_Online/ fineArt forum
http://www.fine-art.com/ Internet for the Fine Arts
http://www.artswire.org/kenroar/site_of_week/ Art Site of the Week
http://www.comlab.ox.ac.uk/archive/other/museums/world.html Museums the World
http://www.wwar.com/ WWAR

APPENDIX 2

Dictionaries of art terms, image collections for particular periods and styles, encyclopedias, glossaries and art history image databases that can be freely used for educational and research purposes

http://www.artlex.com/ Dictionary of art terms
http://www.arts.ouc.bc.ca/fiar/glossary/gloshome.html Art theory and criticism glossary
http://www.incompetech.com/art/ Reference
http://www-lib.haifa.ac.il/www/art/images_by_period.html Collection of images by period
http://www.arthistory.net/ Art history, archeology and architecture links
http://www.siue.edu/PROJECT2000/ Stage design archive
http://archpropplan.auckland.ac.nz/virtualtour/ Art history – image base for students and faculty
http://www.tulane.edu/lester/text/lester.html Art history – image base for designers
http://www.thinker.org/imagebase/index.html Art history – image base
http://witcombe.sbc.edu/ARTHLinks.html Art history links
http://www.hart.bbk.ac.uk./chart/chart.html Art history links
http://www.harbrace.com/art/gardner/ Art history links
http://www.kn.pacbell.com/wired/art/art.html Art history links
http://www.aber.ac.uk/~dgc/media.html Media encyclopedia
http://sgwww.epfl.ch/BERGER/index.html World art treasures

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European projects

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Neothemi: a Collaborative Development of a Virtual Museum

At the very beginning of Comenius 3 projects

Centre Albert Borchette, Brussels, September 21, 2000, 9.30 am: *Information and Promotion Day on Comenius Networks.*

Plenary meeting: the first contact of national agencies, local authorities, universities, training centres and schools with the new Socrates Action Comenius 3 network. The presentation realized by the European Commission (EC) was shown and followed by numerous questions. Various workshops on thematic areas were organized in the afternoon. At the end of the day the participants had a clear understanding of the importance of planning a project for a network with a suitable collaborative awareness.

The basic aims of Comenius 3 networks are perfectly understandable, bearing in mind the evaluation reports at the end of the first phase of the Socrates program (1995/2000); some initial weak points were highlighted: cooperation and information exchange within specific thematic areas, real possibility of disseminating results, evaluation strategies and helping the birth of a real collaborative approach and of a network culture.

From the beginning, in fact, the EC listed what each network was expected to:
* open a web site;
* produce an annual report on the state of innovation in its area of activity;
* provide the Comenius players with full information about the network's events and activities;
* organize an annual conference combining several objectives of the network.

More information was given about the structure of the partnership and the budget: the network needed at least one organization from each of six different countries and a coordinating institution with a strong organizational base. Funding was possible for a maximum of three consecutive years.

Two meetings followed the *Information and Promotion Day*: the first was in Ischia in October 2000, where the partnership of Neothemi was first created, and the second – in Campobasso in February 2001 to finalize the proposal. Genuine cooperation and respect across national barriers helped the creation of a successful model of partnership involving the concepts like communication, interaction and mobility, leading people to work together on common objectives and following the negotiated path.

Dramatis personae: Neothemi actors and their role

* Università degli studi del Molise, Italy: *Coordinator, web site, online teacher training, Conference 2004*
* University of Helsinki, Finland: *Conference 2003, national pavilion, Conference publications 2002 and 2003*
* University of Warwick, UK: *Evaluation, national pavilion, teacher training*
* Eötvös Lòrand University, Hungary: *Conference 2002, national pavilion, dissemination*
* Østbyen Videregående Skole, Norway: *Newsletter, national pavilion*
* Mercy Secondary School, Mounthawk, Ireland: *National pavilion, Seminar 2004*
* Amtscentret for Undervisning, Aarhus Amt, Denmark: *National pavilion, Comenius 2 course*
* I.T.T.Bottardi, Roma, Italy: *National pavilion, online forum, Seminar 2002*
* VII I.T.I.S, Napoli, Italy: *National pavilion, technical support*
* I.T.C.Tramello, Piacenza, Italy: *National pavilion*
* Medienzentrum Kaiserslautern, Germany: *National pavilion, Seminar 2003*
* Universidade do Porto, Portugal: *National pavilion*
* Université Blaise Pascal, Clermont-Ferrand, France: *National pavilion*

Neothemi two years on

Helsinki on the Agenda: this is the title of the last printed issue of the Neothemi net-letter inviting European participants to the conference arranged on September 19–20, 2003 by the University of Helsinki, Department of Teacher Education and the Research Centre for Education, Cultures and the Arts.

What exactly is Neothemi? What are the main aims of the project? What are the main benefits? What are our results so far? These are some of the many questions a coordinator normally answers receiving e-mails from all over Europe and participating in meetings and conferences.

Neothemi (The new Network of Thematic Museums and Institutes) is a 3-year Comenius-supported European collaborative project aiming at the creation of a strong network for cultural heritage developed within the framework of a virtual educational museum. One of the first ten Comenius 3 pioneer projects approved in January 2002, Neothemi chose the museum as a virtual metaphor and embodiment of the place, which normally and traditionally displays the cultural heritage of one or more countries to illustrate some nationally relevant "realities".

In a reframed and flexible exhibition visitors can find, bring closer to each other and compare physically distant objects, texts and artefacts from different countries belonging to comparable cultural horizons. The history, style and society of ten countries find a suitable web space, where their thematic approaches and virtual pavilions are shown to a large public. National differences are respected, alongside with the promotion of a larger European perspective to overcome any cultural divide. Each of the partners from different institutions organises one theme autonomously but only after negotiation with the other partners to ensure compatibility.

The selected themes are:
- City Images (Italy)
- Communication and Interaction (Finland)
- Arts and Cultures (France)
- Sense of Identity (Norway)
- Through Memory (Germany)
- Folklore and Traditions (Denmark)
- Culture of Work (Hungary)
- Symbols of Citizenship (UK)
- Ordinary People (Ireland)
- Educational Heritage (Portugal)

Each institution has a very clear role, an active part in a project, where collaboration is certainly one of the keywords, and where a culture of teamwork and management is increasingly necessary to support discussion and exchanges, to create a real interaction.

Neothemi has embraced the theories and advantages of networking different competences and expertise. The project is organized in two phases: firstly, every participant organises one theme and pavilion autonomously, after a choice negotiated with the other partners; in the second phase, the logical development of the network allows the passage from cooperation to teamwork, where everybody is able to contribute to the themes proposed by other group members, redefining them according to differentiated thematic perspectives.

ICT, education and cultural heritage

Neothemi – Cultural Heritage and ICT at a Glance: this is the title of the first thematic conference in Budapest in June 2002 and of the subsequent publication edited by the University of Helsinki, the next network conference in September 2003 will be _Cultural Heritage and ICT – Theory & Practice_.

The conference aim is to increase understanding of the role of ICT in teaching, arts pedagogy and teacher education in general. To support the use of new technologies in education has, in fact, been one of the network main concern from the very outset. It puts both teachers and students in contact with a new cultural multimedia model characterised by constant contact between distant realities in both time and space, cross-cultural knowledge, interdisciplinary and multicentric logic. This is in accordance with the logic of ICT passing from local to global, and reflects the importance of art and cultural heritage as a sort of universal forum. It should help overcome cultural and anthropological differences and, therefore, matches perfectly the logic of transmitting information and knowledge across national barriers.

The use of ICT and the presence of diverse stimuli lead students to develop individual creativity and self-expression, it stimulates users to be more active in wider aspects of cultural heritage outside their local field of knowledge. In this respect the possibility of online teaching and learning has powerful advantages and ensures "mutual distance learning", by which the network participants produce materials to be used by learners; and the learners, in their turn, can influence the materials provided by the network, all in a distance.

In a classroom context students can use the computer as a tool to help them in reaching a fuller collaboration. Group attention and interest can revolve *around* the shared computers, which facilitate the learners in face-to-face interaction. Interaction *through* computers is something totally different, offering a variety of solutions: e-mails, forums, chats, videoconferences, boards for ads, etc. Creating an interest in how students can interact both around and through computers, Neothemi gives learners and teachers from different countries the opportunity to share knowledge and competences; documents are created, discussed and revised through our forum and mailing lists. Learning can become a social event and the development of Neothemi as a network includes the work performed by students and, therefore, their compared views of cultural heritage. The network also includes a feedback mechanism, by which the reaction of external users to the materials produced, can be used to modify the subsequent development.

Besides favouring CSCL (Computer Supported Collaborative Learning) the network is experimenting the advantages of using 3D rooms created with VRML software. Neothemi is a virtual museum where the ten countries' pavilions are electronically constructed on the Web, and there is not the slightest connection to real sites.

Upon opening a door from the virtual entrance hall, the visitor enters different rooms ("pavilions") with architectures or open spaces (a Tudor yard, a Danish landscape, a Finnish art gallery, an Irish castle, a classical Italian museum, an old German factory) chosen to represent national culture to cyber-visitors. The icons of art in each exhibition are clickable links connecting with useful information about the selected themes. The web potential for organizing and presenting knowledge offers a new dimension to the management and promotion of cultural heritage. In addition the very concept of.a virtual museum follows new trends in museology which, in the last decades, have shifted the focus of their attention from a museum having a mere preserving value to a place interested in attracting a large variety of visitors and providing them with educational material in a pleasant setting; the importance of information is highlighted rather than the importance of objects.

New means of cooperation between schools and museums and the involvement of students have often occurred through the introduction of new technologies. New media and the Internet give new ways of interactivity with information, images, sounds and pictures in motion, offering another method of learning connected with entertainment often called "edutainment".

The multimedia experience can, therefore, make a VM (virtual museum) more appealing, but the social value and the potential of a wider dissemination must be taken into account. Access to cultural heritage is more democratised, and virtual museum goers no longer belong to privileged social classes.

Keeping track of the process

Neothemi has applied a cyclic research methodology from its very first steps. Being a Comenius 3 pioneer project suggests pursuing action and research outcomes at the same time and advocates the criteria like recurrence, participation, reflection and responsiveness.

In planning the structure, the project was organized following a similar sequence, where the turning points are yearly conferences and publications. On these occasions, Neothemi has the opportunity of addressing a larger audience, receiving widespread feedback and stimulating critical reflection. Through questionnaires the network is recording and criticizing the progress to date in order to adapt and redesign the later steps. In this organization, planning is attached to real outputs and is embedded in the research itself. All partners and members are actively participating in this model,

offering mainly qualitative but also quantitative data to be analyzed. Neothemi action research is, therefore, empirical, and learning from experience can follow on the from effective reflection on the data collected.

Monitoring and assessment are, therefore, carried out through action research, where all participants cooperate in the final product, and their views and actions are based on understanding of the general plan and mutual agreement. Two questionnaires are available for users: one, web-based, for feedback on the individual web site themes for educators, students, museum specialists, and researchers, and the other for participants in the project annual conferences. The results will be analyzed to assess attitudes toward educational web material in learning and teaching and the use of a virtual museum to promote tolerance and cultural understanding.

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ICT in Education for Cultural Heritage

Information and communication technologies (ICTs) have an impact of increasing importance in all application areas. This is happening also in the area of Cultural Heritage with, however, not yet completely clear and defined development lines. The above consideration is particularly true in the education and training activities for Cultural Heritage. In this important cultural field, the new ICT capabilities and potentialities have not been fully developed for practical programmes and activities. The integration of ICTs into actual training has not yet happened to create *new efficient education capabilities.* In Italy there is an increasing interest in this field, due to the extremely important Cultural Heritage patrimony representing not only an intrinsic cultural richness, but also significantly contributing to the economy growth (e.g. through tourism activities).

Several initiatives started in Italy last years regarding the use of ICTs in the area of Cultural Heritage, in particular, in education activities. In some universities new degrees were launched regarding Literature, Culture and History (mainly Cultural Heritage), where ICTs were widely employed in new specific courses. In particular, at the Florence University, the Literature and Philosophy Faculty launched a University Degree (three years) for preparing "Operators for Cultural Heritage" with specific courses on Informatics, Applied Informatics, Image Processing and Laboratories to use computers for digitalisation, archiving, cataloguing.

What regards e-learning, the specific programme, called NETTUNO (Network per l'Università Ovunque) started some years ago with a degree in Cultural Heritage. Courses on Informatics and Image Processing were enclosed in the degree. Moreover, last two years CNIT Consortium (National Inter-university Consortium for Telecommunications) started the e-learning programme in English via several courses regarding the communication area (ITC), in the framework of the Project Teledoctorate funded by the Italian Ministry for University and Scientific and Technological Research. The course is given through a satellite network covering Italy and a part of Europe.

Recently, the research has concentrated the attention on the concepts like telepresence, immersivity, virtual reality exploiting the most recent information and communication technologies to create an environment, where the physical world meets the virtual world of services and applications. Particular interest is in great potentialities (i.e. distance interaction, virtual laboratories, etc.), which offer a new way to do learning. In this context, the VICom Project (Virtual Immersive Communication) funded by the Italian Ministry of University and Research has the aim to provide an environment, where people geographically distant are able to see/hear one another and to collaborate sharing the same space (real or virtual), to work together for achieving common purposes. One application is the creation of an advanced virtual classroom for learning and experimentation of restoration techniques for artworks. For example, let us suppose that a student, Robert, wants to participate in a course of "paintings' restoration". Robert enters the virtual laboratory, where through multimodal interfaces and virtual collaborative environments he is able to experiment restoration techniques as in a real restoration laboratory.

All examples presented witness that the community has several technological instruments that can help in art and design education. However, it is possible to feel a lack of relevant and specific applied researches and scientific information, which could be helpful for teachers, learners and decision-makers in educational sphere. So, as stated in the final recommendations, I agree with the suggestion to support IITE's undertakings in the field, including those aimed at elaboration of an analytical survey on this topic to build a common framework for research and future development in this field. For the development of the analytical survey it will be very important, in my opinion, to report some case studies of the involved countries, with particular reference to some projects in the field of Cultural Heritage. As an example, I would like to cite the European Commission funded MINERVA Project (MInisterial NEtwoRk for Valorising Activities in digitisation), which aim is to create a network of European States' Ministries to discuss, correlate and harmonise activities carried out in digitisation of cultural and scientific content to create an agreed European common platform, recommendations and guidelines.

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Electronic Textbooks in Scholastic Process

Informatization of education aiming at a wide-scale introduction of modern information and communication technologies (ICTs) into life and system of education is a priority of state policy in Kazakhstan. One of the main priorities formed in the modern world, especially in the coming 21st century, is a research progress and global technologyzation of the leading countries. The economic might and level of living as well as the position of a country and its capacities, commercial and political integration in the world community, let alone national safety, depend on the level of the technological development.

Nowadays the level of development and usage of modern technologies in one or another country rests on intellectualization of a society, its ability to produce, adopt and use new knowledge, not on a mere expansion of the material base. This image is related to the level of education in a country and its informatization. At present the process of informatization of professional training is being intensively comprehended from scientific and pedagogical points of view.

The introduction of ICTs into education is one of the most important factors in the process of education, which increases the number of qualified specialists. Informatization of education depends on the information resources/means of computer hardware, communication technology, equipment of educational servers, database, knowledgebase, etc; the degree of pedagogical personnel training and quality of programme systems for scholastic purposes (electronic textbooks, multimedia textbooks and electronic publishing).

In the current context of society computerization and new generation, COMPUTER turned out to be an objective condition for making a new type of textbooks, which is already accepted as electronic. At present, we have constructed more than 100 multimedia and electronic textbooks. An electronic textbook realizes the process of education from its aim to its results, however the technologies are different and depend on the authors' pedagogical concept. It is the opinion of foreign experts that many of them single out by their originality, high scientific and methodical level.

Unlike other researchers, we consider an electronic textbook to be not a collection of information and tests, but a form of mediated process of education with ICTs introduced into scholastic process.

The technology of an electronic textbook includes the subject of educational process from its aim to its results and expects the realization of training, development, bringing-up, value-orientation and cultural functions.

An electronic textbook consists of four interconnected components:

- motivating,
- profound,
- operating,
- estimating.

An electronic textbook is built up on the module base, which presents the figurative expression in hierarchic block diagram of a scholastic subject and every section of a textbook apart. Programmers arrange the design of an educational aim as an aspect.

1. Forming a module as a formalized system of knowledge.
2. Making the hypertext as a hierarchic information flow.
3. Presenting the tasks beginning with reproductive and finishing with search-creative using interactive methods of training.
4. Introducing the leading specialists alongside with actual information from the Internet.
5. Testing in accordance with a module.

The creation of an electronic textbook implies 14 stages: organizational, analytical, informational, modulating, making the hypertext, scheduling the tasks, formatting the test, programming, translation of the text, recording, sounding, approbation of the textbook.

Organizational stage expects making the creative group of different specialists: a teacher-consultant setting objectives, a designer, a programmer, an operator, a translator and announcers.

Analytical stage is connected with the study of state documents defining the contents of education: curriculum, scholastic programme, basic textbook, scholastic allowance, methodical recommendations and didactic materials.

Informational stage deals with searching for retrieve in the given. In contrast to traditional textbooks, electronic textbooks cover a big amount of information and illustrative massive.

Modulating stage aims at making modules. The modules are hierarchic systems or "trees" of knowledge, which are built up strictly according to the scholastic programme. While modulating, much attention is paid to the design.

Stage of making the hypertext processes information from where it is now. Setting and forming of necessary information on philosophy characterize the given stage.

Operator stage implies setting of the text, scanning pictures, creating multimedia fragments. Basically, the given stage is of technological nature and is characterized by the involvement of all members of the group. Simultaneously, the hypertext is adjusted.

Stage of scheduling the tasks is realized in accordance with the module and hypertext. The range of tasks is wide – from reproductive to creative research.

Stage of arranging the tests aims at searching of possible variants and methods of testing. There are a lot of different approaches to testing. Difficulty is in programming.

Stage of programming is making the programme shell and writing the programme. It is reasonable to use different programmes providing for variation in perception of information and preventing from tiredness.

Translation of the text may be done in any language, including Kazakh and English. A textbook is in Russian. However, here it is important to provide for the authentic transfer of the text. The texts must be identical.

Stage of sounding is also of great importance in the process of forming electronic textbook. Efficiency of the process of education has been proved for 20%. According to psychologists, it depends on the degree of inclusion of auditory memory. Great power of the word, in this instance live word of the teacher through the speaker, influences a student greatly.

Stage of recording is purely technical.

Approbation of the textbook may be done repeatedly. It is recommended to approbate by different criteria, such as perception of the module, hypertext, performing the tasks, test and, as a whole, electronic textbook.

The main difference of our approach is in forming of an electronic textbook on the pedagogical base, which is module training.

We assume that, first of all, the process of module training implies the creation of a module, its graphic interpretation, then acquaintance with it, collection of information, actualization of this information, its comprehension and, finally, checking. Such technological realization of the scholastic material will help a student become the subject of the educational process, work out the prospect of larval-oriented education and define his/her potential.

As we consider an electronic textbook to be the process of education, we estimate its efficiency from the degree of realization of the pedagogical principle. We think that principles of forming of

the electronic textbook comply with educational principles, but degrees of their realization are different.

Practical value of our research is embodied in the following:

- electronic textbooks on *History of Kazakhstan, History of the Kazakh Literature, Saraychik, Bukeevskaya Horde* and others are based on the pedagogical principles;
- methods of forming of electronic textbooks on system-organizing components — motivating, profound, operating and estimating — are implemented.

Alongside with the created multimedia, the electronic textbooks give students and schoolchildren an opportunity to see unique pictures, museums and theatres, being far away from the cultural centres. Multimedia and electronic programmes show ancient maps, exteriors of museums, exhibitions from the places of the past ages: ceramics, jewellery decorations, dishes, manuscripts, gold, silver, copper coins, which were used by merchants advancing on caravan road *Great Silk Way*, etc.

ICTs introduced into education is a promising system of education. It must incorporate the combination of the latest natural-science and humanitarian knowledge, one of its priority tasks being the formation of qualities, which will allow students to adapt, live and work successfully in the conditions of the coming century. Amongst these qualities are the systematic scientific thinking, ecological culture, information culture, creative activity and high morality. These qualities will facilitate the survival and further sound development of the civilization. That is why they must be the main concern for the system of overtaking education.

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The Digital Derive and Art Education – ICT Developments 1997–2002 in Initial Teacher Training at the Institute of Art and Design, University of Central England in Birmingham, United Kingdom

Introduction

This report considers the structured developmental use of information and communication technologies (ICT) in Art Education in relationship to experimental Post Graduate Certificate in Education (PGCE), Art and Design Education, curriculum workshop action research between 1997–2002 at the Institute of Art and Design, University of Central England, in Birmingham, United Kingdom. The research outcomes provide a substantive body of evidence, which suggests that the Art and Design Curriculum requires restructuring to accommodate new electronic technological tools.

1. PGCE Art and Design Course – Context

The PGCE Art and Design course (secondary 11–19) is a 36-week Initial Teacher Training Course for *postgraduate art and design students. It is the largest course in the United Kingdom with 91 students* from a range of graduate BA/MA courses including fine art, design, three dimensional studies, ceramics, craft, architecture, art history, digital time-based media, computer graphics etc. The course supplies 14% of the secondary art teachers in the UK. School placements are provided through 90 secondary schools and 30 primary schools located in the West Midlands area – of approximately 5000 square kilometres.

Experimental ICT curriculum workshops are timetabled between September and December and provide theoretical/contextual and technical experience for students to develop their teaching practice in a secondary school context/experience during their statutory secondary school term placement, which takes place between January and March (14 weeks in total).

The curriculum workshops offer the opportunity to develop an understanding in applying, integrating and disseminating a range of Art and Design media, in the context of broad thematic starting points. Generic ICT issues are delivered through the core lecture programme by Peter Worrall (ICT Coordinator). These lectures include technological histories, defining digital style, digital post production skills, management of data, the use of time-based media, including animation, video, cinema, the investigation of three dimensional form and space in a virtual context, managing information databases and the interactive use of text, hypertext and multimedia.

The first ICT curriculum workshop was published as *Electric Studio – New Practice in ICT, Art and Design* by Anglia Multimedia in 1997 in a combined paper/CD-ROM format (ISBN 1-84050-060-3). Subsequently, five years of curriculum workshops have been recorded onto CD-ROM as a university digital archive. The ICT course handbook also provides the students with information regarding the use of ICT and digital workshop practice in relationship to the academic programme.

2. ICT Curriculum Workshops – Theory and Practice

There are six different curriculum workshops – ICT, three dimensional studies, ceramics, printmaking, drawing, and art history. All 91 postgraduate students take part in each two-day workshop (15 students per workshop) between October and December. The two-day workshops are based on set design briefs which encourage the students to understand the interface between art and design and digital technologies. Differentiated software support material (created by Peter Worrall) enables students to effectively understand the use of software tools, to respond to the design brief. Students evaluate their understanding of ICT in a written format and present their outcomes using Power Point in a tutorial context at the end of the two-day workshop. It is worth noting that the ICT workshop may be developed further through other workshops, for example an ICT workshop outcome may be extended further in the drawing printmaking or three dimensional studies workshops, if the student chooses to do so, supporting Art/ICT integration models in a school context.

To date 36 workshops have been recorded onto CD-ROM representing 528 student's individual research with the total data recorded between 1997–2003 (text, image, animation): 33,128 files. Every year students receive an individual CD-ROM with all workshop outcomes in December. This CD-ROM allows them to compare and contrast different methodologies related to workshop practice

which may be applied to their teaching and learning during the 14 week teaching programme in school, which takes place between January and March.

All students must integrate ICT within at least one art and design school project during the Spring term. A coursework assignment provides visual textual evidence that students have applied their workshop experience in a teaching and learning context in their school placement. This portfolio assignment is digitally recorded and archived, and it provides further information regarding the use of ICT in the art and design curriculum in school, the total number of school Art/ICT projects (Visual A1 board format) recorded to date is 416.

3. Curriculum Workshop Research Outcomes

This section provides a summary of my analysis of university-based ICT/Art and Design workshop practice and outcomes – 1997–2002.

i) The use of software often results in a recognisable "digital style", particularly with regard to colour and surface manipulation filters.
ii) The World Wide Web provides communication tools, which enable global electronic exchanges and collaborations, particularly in the context of location and cultural identity. Collaborative image exchange/development will provide challenges for existing examination board assessment criteria in the future.
iii) Peripheral devices such as scanners and digital cameras (still and moving image) and sound recorders provide a means of recording traditional art and design processes, ephemeral site, specific installations and performances. In addition digital recording devices provide a stimulus to design and create new scenarios and situations.
iv) Digital time-based media and multimedia provides a new component within the existing art and design curriculum developing higher-level conceptual learning skills in art and design.
v) Recorded digital outcomes require specific post production skills in relationship to interface design, data storage and presentation.
vi) Artists, designers, educators and pupils should adopt a critical approach to using ICT transcending the digital orthodoxy which is promoted by the technology media industries. They should understand the contextual evolution of 19th and 20th century technological developments.

The PGCE students 14 week teaching experience in schools provides further evidence which suggests that the Art and Design National Curriculum (UK) requires restructuring in the following areas:

i) In the secondary 11–14 curriculum ICT should be integrated with existing curriculum practice, so that it develops and enhances conceptual visual understanding, and not only extends traditional outcomes but creates new hybrid art forms – this might include new developments in colour theory, perspective, composition, three dimensional visualization and image reading/ presentation and exchange.
ii) Time-based media and multimedia should be included as a new statutory component of the art and design curriculum 11–19.
iii) There is a need for a range of new electronic media examination courses for pupils aged between 14–19 to enable them to gain employment in the creative media industries.

4. Art and Design – Electronic Curriculum Development in Art and Design and Art Education – National/International Models

The PGCE course has extended its extensive national digital portfolio through collaborative international partnerships with Dr Lucia Pimental, Vice Principal at the School of Fine Art (EBA) in Belo Horizonte, Minas Gerais in Brazil and Jukka Orava, Research Assistant at the University of Art and Design (UIAH) in Helsinki in Finland. During last 6 years our aim has been to "develop an international electronic curriculum interface through the use of contemporary technologies in art and design education".

Our communication through the World Wide Web, at INSEA conferences and through international mixed-nationality workshops has created a dynamic space, in which we have developed a collection of ideas and signposts in relationship to the digital development cultural identities (individual) and the examination of broader national, international and global identities. The effect of an emerging information-centred society and the provision of electronic learning opportunities for disenfranchised societies provides one of our greatest future challenges.

New interface models regarding ICT and new media development depend on senior media experts influencing National Government agenda/legislation, which may be created in response to technological advances. The end users in this cycle of curriculum change are the teachers in schools who are responsible for curriculum development. It is clear that they require a clearer timeline to implement a digital agenda in the art and design education. The most important change to affect *teaching and learning will be the realignment of the role of the teacher as a media expert and* manager or gatekeeper of large databases of interactive knowledge and online conceptual digital tools. The structure and content of Initial Teacher Training courses will also change to accommodate these future developments. General curriculum reform requires a national and international dialogue and an empathy with inter-cultural exchange, so that different curriculum models can be examined. It may be that the Art and Design Curriculum in the future will become a subset of New Media.

Our areas of collaboration and strategic planning through web sites include:

- Birmingham Institute of Art and Design (UCE) – http://www.biad.uce.ac.uk/home.html
- PGCE Art and Design Course – http://www.biad.uce.ac.uk/teaching/
- European School Net – http://eunbrux02.eun.org/portal/index-en.cfm
- Virtual School Art Department project development – http://www.eun.org/eun.org2/eun/en/ vs-art/entry_page.cfm?id_area=28
- Virtual School Art Department – Community area – used for online meetings – http://www. eun.org/eun.org2/eun/community/entry_page.cfm?area=78
  Culture Box Project – http://www.eun.org/eun.org2/eun/en/vs-art/content.cfm?lang =en&ov =8737
  Behind the Screen Project – http://arted.uiah.fi/behindthescreen/
  Wholearthmediamatrix – http://arted.uiah.fi/virtualschool/matrix
- Association of Advisers and Inspectors in Art and Design (AAIAD) – this includes the New Media groups UK monthly electronic newspaper – http://www.aaiad.org.uk

5. Conclusion

Future issues, that require further development, include the teaching of technological histories, the networking of expert groups in a virtual and physical context, developing a global video conferencing agenda, teaching contemporary media literacy, designing intelligent electronic interfaces, creating differentiated navigation systems for different audiences, including digital divide issues within curriculum content, the application of ICT in Special Needs Education, and finally, defining new working practices that embed electronic practice to enhance communication across local, national and international networks.

"We are just beginning to map the surface of the "digital landscape". Fundamental advances in art education, visual literacy and cultural knowledge will take place through exploring the real potential of the emerging creative and intelligent technological agents which lie submerged beneath the surface".