Creativity and creative learning in the context of electronic communication networks:

A framework for analysis of practice and research

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Abstract

This paper presents and discusses creativity and creative learning in the context of the following main theses:
- Modern times demand more creative persons;
- Thinking and learning are closely linked with a creative function of communication;
- A key question in the analysis of communication tools is whether it is possible for students to create new meaning and share it in a common space (newspaper, network, CD).

This paper considers the ideas of creativity and creative learning mediated by electronic networks in the context of these theses. In exploring this further, illustrative examples of the implementation of specific electronic networked projects in the Russian context are being presented.

Introduction

The process of creativity is an integral part of human interaction with social and ecological systems. Interestingly, the speed of social evolution has soared over the past decades. Cultural character itself has changed greatly as a result. The process of scientific data accumulation, inventive activity, and the speed of elaboration of new technological approaches have quickened. The world has entered a new stage of its evolution where cultural phenomena are regarded as a process of communication and knowledge acquisition. The fact that scientific work and creativity are no longer possible without considerable changes in the ways in which we communicate and think was made evident in the works of the founders of the cybernetics movement toward the middle of the last century. Bush (1945) describes a new possible way of thinking with the help of mechanical aids. He says:

But creative thought and essentially repetitive thought are very different things. For the latter there are, and may be, powerful mechanical aids.<…> **Presumably man's spirit should be elevated** if he can better review his shady past and analyze more completely and objectively his present problems. He has built a civilization so complex that he needs to mechanize his record more fully if he is to push his experiment to its logical conclusion and not merely become bogged down part way there by overtaxing his limited memory. (Emphasis added.)

According to Flusser (1992, pp. 30-31) new digital technology may free our brain for more creative tasks:

. . .we shall no longer attempt to store those pieces of information within our brain, but that we shall instead feed those pieces of information into the electronic memories. By this means, our brain will be freed for other tasks, such as the processing of information. **This processing of information is called 'creativity'**: we may expect a varitable explosion of human creativity, once we have freed ourselves from all mechanizable aspects of thinking. (emphasis added)

Turchin (1993, p. 268) sees creativity as a metasystem transition. He asserts that machines will transfer human activity to a new level of creativity.

For what is creativity? Above all creativity is constructive action, action that leads to an increase in the level of organization in the world. The same action may be a creative act when it is done for the first time and mechanical repetition of the past when it is done according to established, known rules, by applying standard procedures. Nothing that is produced within the framework of an already existing system of control, whether it is work by a computer or the composition of stereotyped articles, is creativity. Creativity always goes beyond the framework of the system; it is free action. Creativity is a metasystem transition. <…> Machines will rid the human being of that sort of work and transfer human activity to that level of the hierarchy which is still creative at the given moment.

Since the beginning of the 1990s, the discussion of social consequences of the development of media became of relevance due to the appearance of the World Wide Web, a networked communication system creating the possibility for exchanging and generating knowledge by people throughout the world. As social processes for growth and development have changed in response to the advent of an increasingly complex and ubiquitous role of technology in social systems, new challenges and opportunities have arisen for creative interaction with a changing world (see also J. Visser, 2001, p. 453, who refers to "constructive interaction with change" as the ultimate purpose of human learning).

Recognizing the dynamic and networked nature of modern society, researchers are considering a number of different ways in which the social ecology can be represented and understood in a systemic manner. One such framework presents the human society as a single whole superorganism (Heylighen F., 1999). In this perspective, society can be thought of as resembling a complex organism, comprised of cells, tissues, and organs. Within such a superorganism, social organs and cells are functionally autonomous, but they are intimately integrated into a self-regulated network. Organizations and individuals are thus increasingly dependent on the social environment. This new way of living demands more independence, responsibility, and creativity. The situation requires a person with a highly developed and highly flexible disposition toward creativity and toward increasing that creativity continually.

Formal education systems throughout the world now find themselves charged with an integral role in the development of members of society who have such a creative disposition. As such, it is the role of education to support the development of the creative mind, and to enable the development of the critical skills and desires to creatively engage with an increasingly complex and networked society. Most changes in the goals and values of modern education are linked to the development of a creative individual who is willing and able to constructively interact with members of networked groups. Nowadays, successful creativity – where it is defined as the activity of producing new, unique and effective results - is rarely possible outside of the context of networked communities that use telecommunications and involve intellectual agents providing an opportunity for creativity on a higher level.

Creativity and learning as components of communication

The simplest act of communication can be described in terms of a model of information delivery from a sender to a recipient (Jakobson R., 1964):
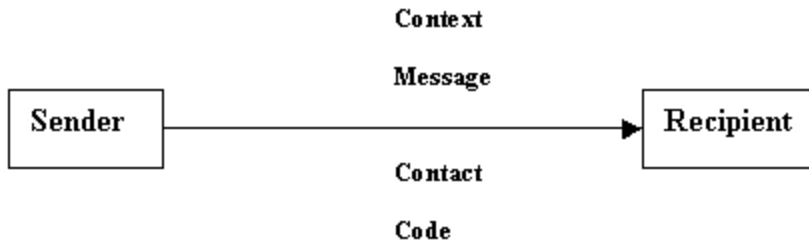
Context

Message

| Sender | ——————————————▶ | Recipient |

Contact

Code

Figure 1: General scheme of of Communication

In this model, the process of communication supposes that the sender and the recipient use the same code (symbol system), that all interference is regarded as negative, and that the text of a message has only one function - the transmission of meaning. It is important to make this observation as, according to Estonian semiologist Lotman (1977), the function of a text is not limited to the transmission of a given meaning:

> The second function of text is to generate new meanings. In this respect a text ceases to be a passive link in conveying some constant information between input (sender) and output (receiver). Whereas in the first case a difference between the message at the input and at the output of an information circuit can occur only as a result of a defect in the communications channel, and is to be attributed to the technical imperfections of this system, in the second case such a difference is the very essence of a text's function as a "thinking device". What from the first standpoint is a defect, from the second is a norm, and vice versa.

Reflecting on the conditions necessary for creativity, Lotman (1988) generated the idea of a *cybernetic model.* Within the framework of this model, creative perception is seen as an intellectual tool, able to produce new messages and new meanings. Messages are reckoned as new if there are no possible ways to deduce them with the help of an algorithm given in another message. From this perspective, the classical communication model where the text *T1* is transmitted through the code *K* to the text *T2*, does not give way to creativity (Figure 2).
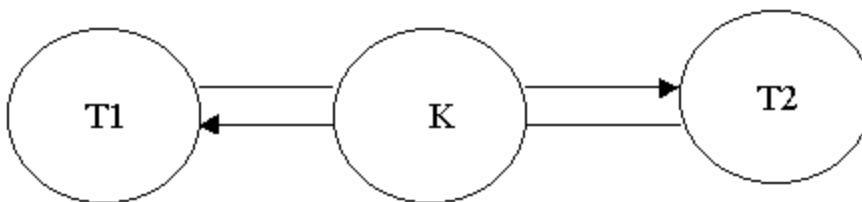
T1 ◀——— K ———▶ T2

Figure 2: Communication as transmission of meaning

An adequate, literal translation within an act of communication between two different people speaking a natural language is not possible just if they have used the same language. Such a situation proposes that both people use the same code. But this is impossible because they have different histories, different experiences of life.

In the case of artistic translation, the translator and the reader (the sender/transmitter and the recipient) use related but not identical codes *K1* and *K2*. In a real situation, any communication does not only have to communicate the meaning intended by the sender, it must also generate new knowledge. The sender has a set of codes K1, K2, ..., Kn, each of them being a complex range of tools, engendering a variety of texts which are more or less appropriate to the original intent of communication (Figure 3).
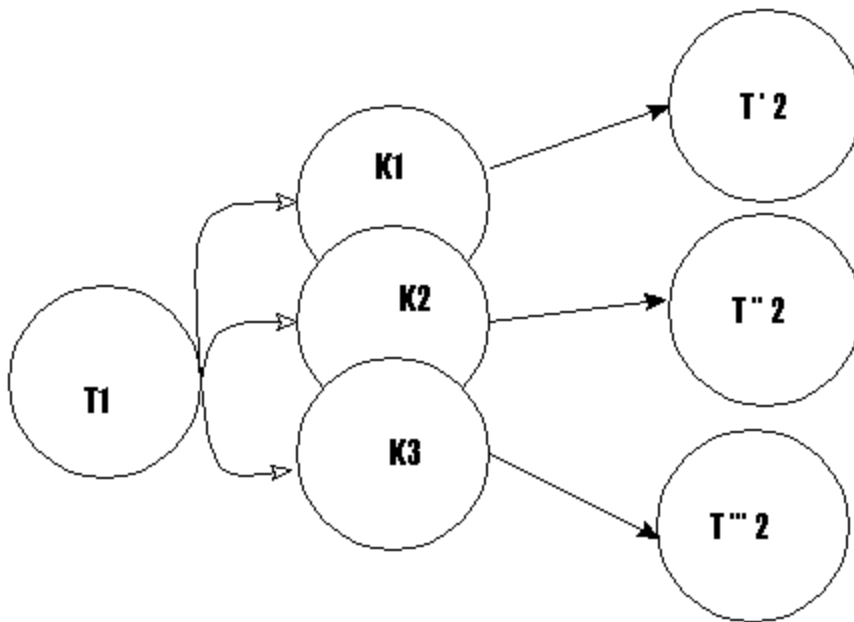
Figure 3: Scheme of real communication

For Lotman (1977), the "true" act of cultural communication is not a simple transmission, but a translation of some text from language of my "I" to language of your "You." Lotman shows that even when talking to ourselves, taking notes, or writing in a diary, we have a dual orientation. It is in fact this dual orientation that helps us to clarify what we mean. According to Lotman any thinking device with only one language is impossible.

Lotman's model regards creativity and sense-formation as a phenomenon of communication; it proposes that the process of translating from one genre to another, and from one area of expertise to another, generates a very fruitful knowledge increase. Within the framework of this model different types of human thought (resulting from generating different meanings in the interpretation of communication) are seen as an integral source of cultural evolution.

As we consider that any text not only communicates information but also has a creative function, we may distinguish two types of education:

(1) Education as information transmission/communication activity. In this case a considerable amount of attention is paid to adequate translation and narration of information acquired by students. Every modification of the information is regarded as distortion (Figure 4).
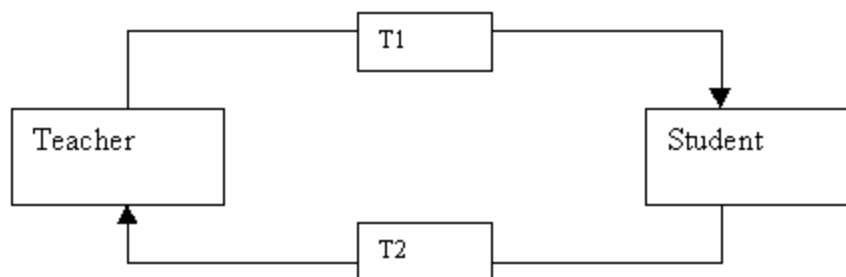

Figure 4: Education as a transmission of information from teacher to student

(2) Education as creative translation. The student's ability to make new contents out of original text is highly regarded and central to the purpose of the learning process (Figure 5). It must be emphasized that a complex battery of codes – K1, K2, ..., Kn – is involved in this process.
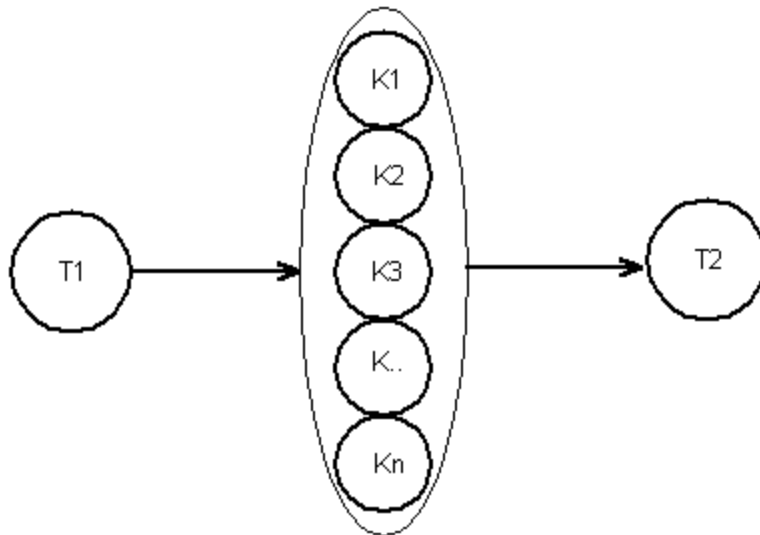

Figure 5: Education as creative processing of information

Theorists and researchers in the areas of human development and learning have often recognized the key role of communication in the development of the human personality. Lev Vygotsky (1962) mentioned that we remain ourselves with the help of others, showing them what we have, first of all our ability to creatively translate information obtained from outward things by available methods.

This perspective of education as creativity – where the focus is on cognition and the building of thought structures – emphasizes the role of creative learning. The literature in educational research provides examples that evidence creative translation as a ubiquitous and integral aspect of meaningful learning. Most noteworthy is Perkins's (1986) approach, where knowledge is regarded as design. Perkins asserts that meaningful learning comes about by penetrating deep within the essentials of knowledge, translating that knowledge into one's own notions, and presenting one's understanding to others.

Media tools

It is vital for humans to not only consume information but to be actively involved in an activity and to reap the fruits of their labor. This necessity was noticed by Henri Laborit (1974) in his model of a semiotic bubble surrounding everyone as a personal semioshere. When people are drawn into the worldwide communication space, their consumption sphere widens, but the sphere where they can successfully perform creative operations shrinks. (Figure 6).
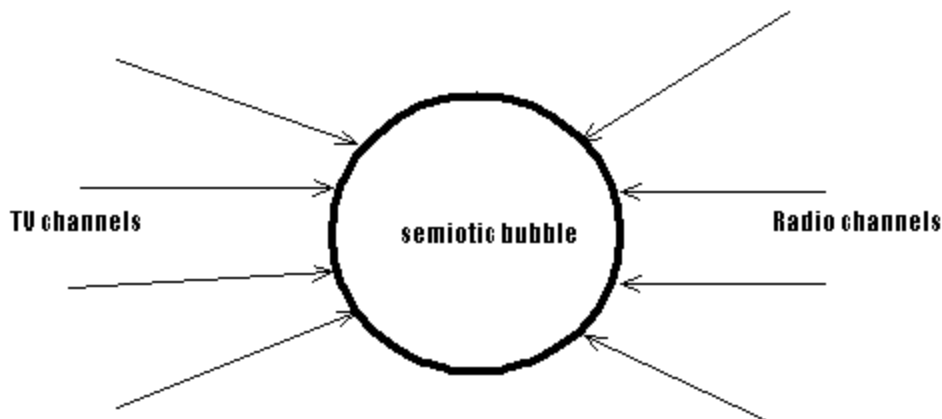
Figure 6: Personal semiosphere

A work by Ivan Illich (1973) is wholly devoted to proving the necessity of convivial tools. According to Illich, people need to have an opportunity to use tools in the way they choose to, and to transform these tools according to their tastes and needs. Illich refers to this as conviviality. More specifically, he states:

> Some institutions are structurally convivial tools. The telephone is an example. Anybody can dial the person of his choice if he can afford a coin. If untiring computers keep the lines occupied and thereby restrict the number of personal conversations, this is a misuse by the company of a license given so that persons can speak. The telephone lets anybody say what he wants to the person of his choice; he can conduct business, express love, or pick a quarrel. It is impossible for bureaucrats to define what people say to each other on the phone, even though they can interfere with – or protect – the privacy of their exchange.

Consider radio, cinema, telephone and television as examples of the conviviality of different kinds of media. Within the framework of Illich's classification the telephone will be more convivial than the radio. It is always difficult to foresee consequences of choice of this or that community support tool. On their own these tools could be used for good or evil purposes. Illich (1972) developed the principles of construction of a learning web, and detailed the resources that are necessary for its functioning. Analyzing the construction of communication channels in Mexico, he flayed state investments in public television channels. It would be possible to organize for much less money a system using cassette tapes that could be recorded and played in regional centers. This would allow the rural population to exchange cassettes and in that way maintain and develop a local learning network, which would be much more efficient than the centralized one. Or, quoting Illich directly:

> The money now tied up in TV installations throughout Latin America could have provided every fifth adult with a tape recorder. In addition, the money would have sufficed to provide an almost unlimited library of prerecorded tapes, with outlets even in remote villages, as well as an ample supply of empty tapes. This network of tape recorders, of course, would be radically different from the present network of TV. It would provide opportunity for free expression: literate and illiterate alike could record, preserve, disseminate, and repeat their opinions. The present investment in TV, instead, provides bureaucrats, whether politicians or educators, with the power to sprinkle the continent with institutionally produced programs which they – or their sponsors – decide are good for or in demand by the people."

Years later, Jean Baudrillard (1994) described a real system, based on the exchange of video tapes, similar to what was conceived by Illich in the 1970s, as an example of how a telecommunications project could fail. Propagation of knowledge about rational land tenure in arid regions was planned within the

framework of this project. Videotapes were used as a basic method. All the participants of the project got video recorders. The local mafia immediately took advantage of the opportunity to open a new market and began to use the network for spreading videotapes with obscene content. This example confirms the "conviviality" of the means, everyone could use it in the way they liked.

The first attempts to analyze the pedagogical value of media within an educational network were made by Celestin Freinet (1949), who developed and organized a school press network where learners shared their texts and pictures. To make learners elaborate their own language for communication with other people, Freinet proposed the use of the communicational potential of music records, photographs, phone calls, radio, films, and television broadcasts. Freinet paid particular attention to the ways a tool could be used for presentation of information, rather than for the reception of information. There is a key question in his analysis of communicational tools, namely: Is it possible for students to create new messages with the help of these tools and present these messages in the school press network? (See Figure 7.)
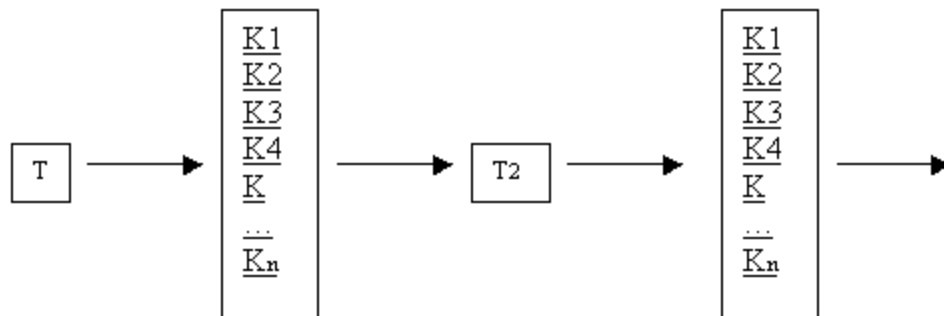

Figure 7: Processing of information within the framework of a school network

According to Freinet a typewriter, a tape recorder, or a camcorder are valuable tools for students' independent research and creativity. With the help of a tape recorder, for example, learners can independently record voices of their classmates. Interestingly, radio and cinema do not meet Freinet's requirements, because in his time they did not allow students to work on their own and there were no ways for such different media to converge within the framework of the common shared space toward the middle of the last century.

The development of telecommunications provided a common platform for human interaction. Computers and computer networks integrate all possible kinds of media. Modern computer tools allow for the integration of a number of different techniques for creativity and expression within the context of a single project. These technologies easily facilitate the integration of texts, graphics, animation, sounds and video. Furthermore, a multimedia network project is able to integrate numerous activities not related to computers, such as dance, performance, and artistic modeling. While the notion of multimedia does not often extend beyond the framework of the computer, such activities can also become important elements and expressive tools of a creative project.

Case studies of creative networked learning projects

Creative network projects support those types of joint student activity in which the goal is the creation of a new common electronic object, such as a multimedia presentation or a common Web site. The rules of the contests framed around creative network projects (ThinkQuest and Virtual Classroom as examples) will often include a list of conditions such as:
- the members of a team should be students of different schools and cities;
- communication between the members of the teams takes place via the Internet or via an Intranet;

- the result of the teamwork is a new product, which is subsequently placed in the shared computer space (Intranet) or shared Web space (Internet).
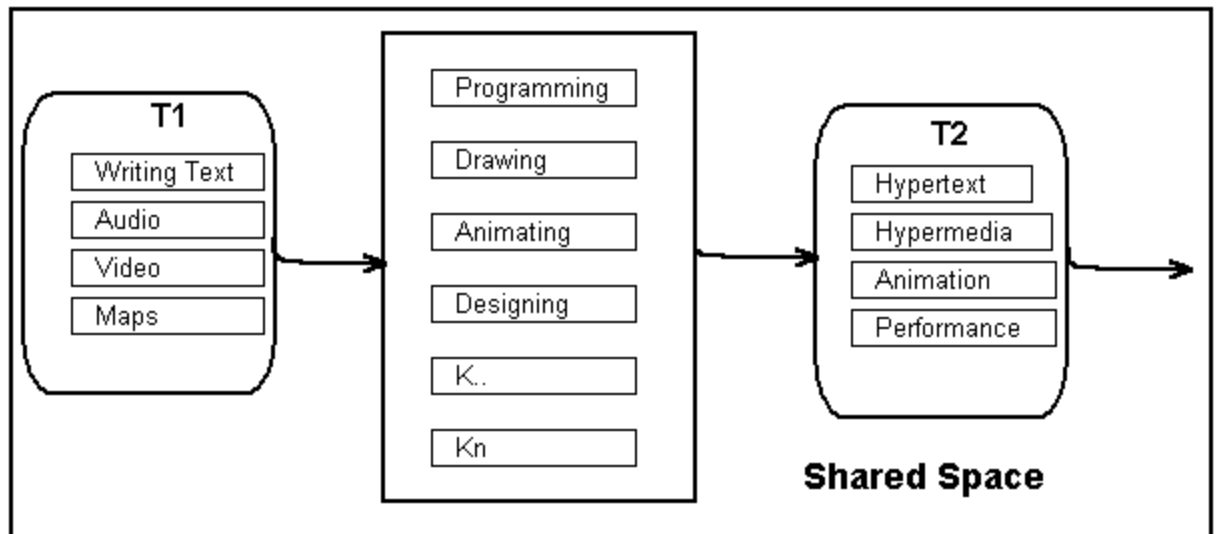

Figure 8: Creative project on the network space

To illustrate this further, let us consider the case study of the building of hypermedia conceptions in children in a summer computer school program in 1990. This will serve as a context for the comparison of the creative potential of different environments. During the summer school program in question, students worked using LogoWriter - a special microworld environment. The inner structure of the microworld is described at length elsewhere (Patarakin & Travina, 1994) In the context of this article we are interested in the application of the microworld to the children's efforts at translating from plain narrative text into animated cartoon films. Working inside this environment, each student was responsible for constructing a story about one of the characters in the microworld. In advance they were told that the characters being developed by other students would have an opportunity to visit the Web pages each student was developing on their assigned character. Through the initial implementation of this activity it was found that students developed more interesting and profound content on their LogoWriter pages whenever other characters from the microworlds were mentioned. On the other hand, in the instances where the LogoWriter page was dedicated to only the description of the assigned character – without connection to other characters – the LogoWriter pages tended to result in a kind of deadlock with no way out. Later on, students' attitude to the texts changed. Each participant tried to make his or her story richer by integrating contents of the common project. As a result, students became more attentive to their peers' activities.

A theatrical project "Prince Arthur's Horse" is an interesting example of this extended notion of multimedia within the context of creative networked projects. This project took place in Pereslavl-Zalessky in 1991. It is an example of integration as well as the possibility of subsequent translation from one expressive tool to another. A total of 16 students between the ages of eight and 14 years participated in the project. The students in this project organized a theatrical community that created and performed plays. Each student chose a role that he or she would like to play in the production. Next, the students each described their respective heros. Every character chosen by the students had to be connected with other characters in the production. The intrigue, and the interest of the students in it, took shape before their very eyes as they defined and described their roles. The process took place as shown in the following example:

-"I will play the part of Prince Arthur," said the first student.
-"I will play the king, his father," responded another student.
-The next student added: "I will be the king of a hostile kingdom."
-...

That was a role chat where separate dialogues were mediated by computer program "talk". The dialogues were subsequently transformed into actions and illustrated with computer scenery. In the process, the scenario was assembled in the Quide environment and transformed to multimedia format. Multimedia presentation mechanisms were used as decoration of the stage where the creators of the performance played. Thus, text, graphics, and multimedia were transformed into a new genre.

In addition we taught our students the skills to categorize information and to conduct independent research work. The psycological activities were based on the G. Kelly's theory of personal constructs and on the test of repertory grids developed by Kelly (1955). Each participant was asked to rank all the characters with the assistance of a computer version of Kelly's Repertory Grid Test. The students were told to complete this activity by looking at the world through the eyes of the characters that they played in the performance. These personal construct systems were open to discussions, and they were more personal since the students were not responsible for their choice. Thus, within the framework of one learning project we could see a number of passages from one expressive tool to another.

A next example of a creative learning application is the experience of the summer computer schools teaching projects (Patarakin, 1993). In these projects, students created animation programs illustrating things such as the behavior of ants and the origin of Japanese hieroglyphics. Through these activities, students not only mastered new tools; they were also continuously engaged in negotiating their understanding of the subject matter.

In particular, it should be noted that network contests suppose only two ways of communication between the members of a team (Figure 9). To share information, the participants can use electronic mail, chat rooms, and dedicated chat programs such as ICQ. However, in the course of international projects, especially those where participants do not share a common language, communication is based on changes that are made by participants in the shared computer space.
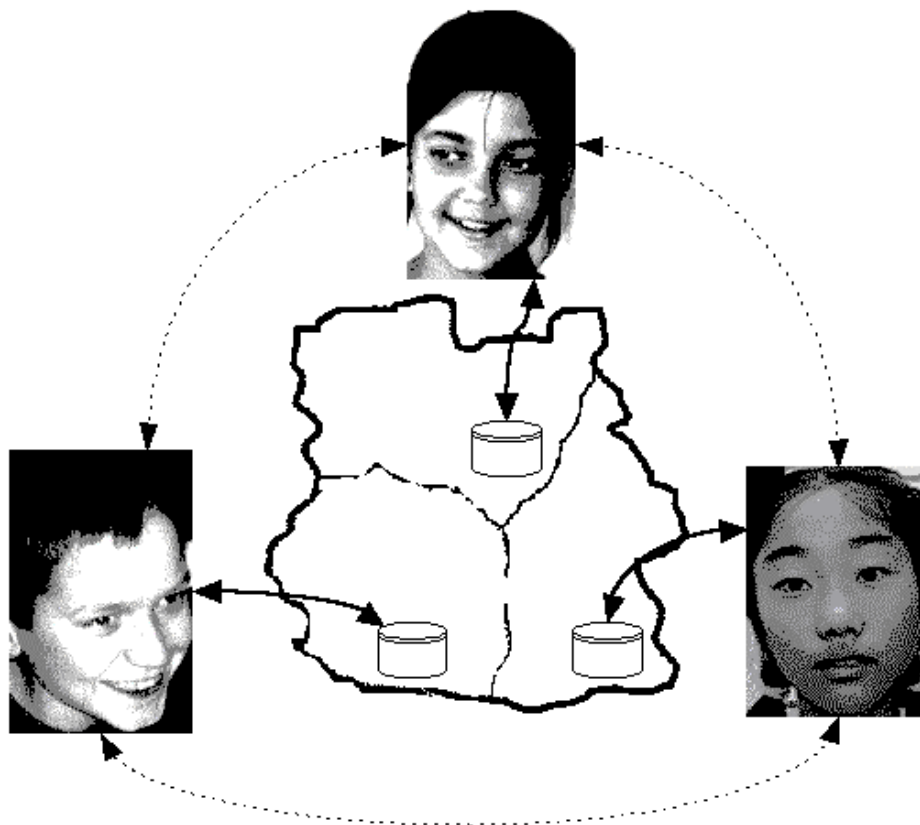

Figure 9: General scheme of a network project

The project "Our common island" (Virtual Classroom Contest '98) is an example of multiple translation. Within the framework of the project, students of an elementary school of Pereslavl constructed a Web site together with students in the United States and Japan. The goal of the project was to populate an empty island according to a legend (key) that was provided. It is noteworthy that the students didn't speak each other's language, nor did they share a common language for communication. They couldn't therefore efficiently communicate via email.
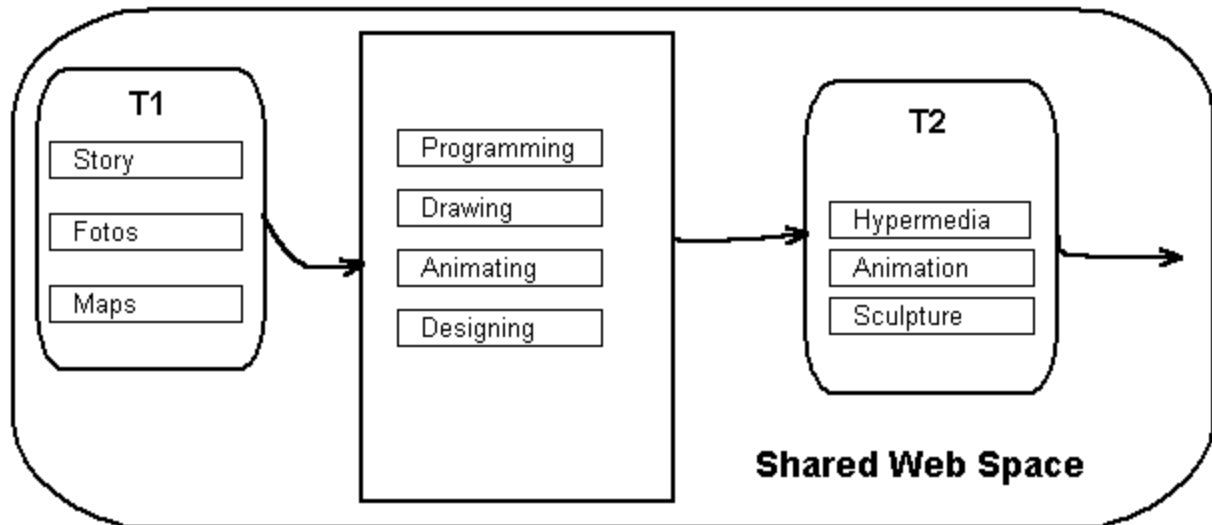

Figure 10: Transformation of story

The creative learning process that took place as a result of these conditions is worth considering in more detail. After American and Japanese students decorated their island with photos of plants and animals from their homeland, the Russian participants used the pictures that had been added to the project to make paintbrushes for the graphics editor Gimp so that all the participants could draw with the help of new tools. Working on the project, children did not limit their exchange to messages, images, and animated graphics. They also shared, for example, different artistic techniques. To make inhabitants of the island, Russian children scanned their drawings and made collages of different vegetables. When the Japanese students put animals on the island by using the same artistic techniques, we understood that we had been working with real partners.

A similar technique of passage from plain text to drawings, from drawings to sculpture, from sculpture to digital pictures and animation was used in the project "Ten" (1994-1996). The participants created animals to form a stable community in a limited space - an island, a desk, or a computer screen. The children used written texts, watercolors, clay models, photos, computer graphics and animations in the LogoWriter environment. The main idea of project "Ten" is to create a community of imaginary animals. The students are learning to work with different media and to develop a better understanding of the biological properties of living creatures. Through creative activities children acquire basic notions of ecological balance and intricate interconnections between different species. Every participant has done the following things:
- he or she drew an imaginary living organism (plant or animal);
- made a plasticine sculpture of the animal or plant ;
- wrote a story about the relations between the different non-existent species.

Another project "Takeda San's Letters" was carried out in 1995. In this project, the Russian, English and Japanese languages were used. Takeda San corresponded with Russian students. In his letters he told them that he had been in Soviet captivity for several years. His letters were written in English and were

translated into Russian. The project supported the communication between people of different ages, nationalities, and attitudes toward war. Common ground and creativeness appeared when children drew pictures to illustrate Takeda's stories. The project was not one of an exclusively informative nature, because students did not only read letters and ask questions through an interpreter. Instead, they reflected on the information they were learning, and expressed their interpretations and reactions through artistic expression. Most of the pictures were made with pencils and watercolors and were scanned onto a Web site. Thus, the project was not a translation from Japanese into Russian but a passage from plain text to graphics and computer graphics and a common multimedia Web site.
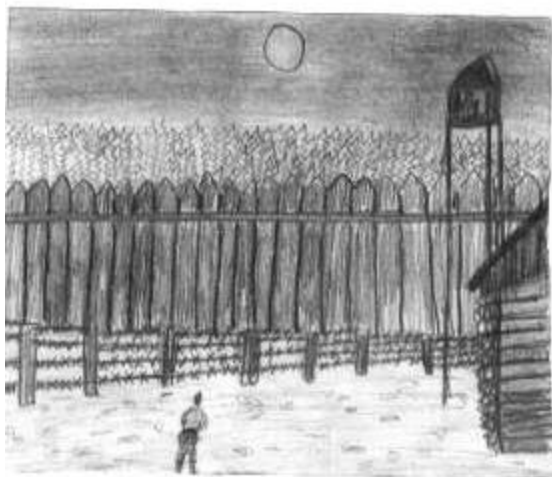

Figure 11: Takeda-san thinks about Japan. In a motif of the picture of Sato Kiyoshi

The project "Granny's Tales" (Virtual Classroom Contest '99) was devoted to enabling cooperation and mutual understanding of people separated by time rather than by distance. Pupils of elementary schools from Russia, the USA and Japan got photos and stories from their grandparents, and used these as an input for drawing computer pictures and cartoons to illustrate the stories. Texts, photos, students' drawings and animation were transformed to a multimedia format to give a sense of wholeness within the community of participants.

The joint Russian-Irish project on foreign language learning (O'Laoghaire, Patarakin, 1996) did not follow the framework of the projects described above. Instead of translating text into graphics, students in this project translated maps into text, and then the text back into maps again, thereby collaborating on a creative activity for sharing and generating new knowledge and understandings. Learners were involved in translating news and stories received from their partners (located in the other country) and in filling in a schematic map of their partners' city with new details.

An interesting illustrative project with passages from one genre to another in the context of dance is the joint 1997 French-Russian project IMUTE. While the initial phases of this project were carried out through an electronic network, the completion of the project took place on the stage of an Italian theatre. The rehearsals for the production resembled a structure of a "samba school" as described by Papert (Papert, 1980) as the most indicative model of future learning communities. It is important to note that a community built in terms of dance has a definite purpose. Communication in the community takes place in order to achieve a common goal – the goal being a successful performance. Within the framework of a learning project the very dance technique ensures that participants become disposed to a more convivial way of communication, which exerts influence upon their interaction. The classes and training sessions with professional dancer Kitsou Dubois in the course of the project IMUTE are illustrative of this phenomenon. Training sessions were organized for all the participants in the project, irrespective of their role and functions within the production. The classes contributed to furthering mutual understanding and successful cooperation among the members of the network. Permanent dance, control of robots, video fragments,

computer graphics, network dialogues, and chats were part of the stage and environment during the performance.

The project "Network and Internet Projects for Summer Schools 2000" focused on regional ecology and culture. The projects were conducted in different forms. The participants of the project "Springs and Rivers" (which took place in Pereslavl and Mikhalenino) did not limit themselves to exploring the rites and customs related to the local rivers and springs. Instead, the participants also carried out descriptive activities and research work. As a result of their work, they made a Web site representing photos and descriptions of rivers and brooks of the Pereslavl region. The activities of the same summer school program in Gorintsy can be likened to a film shooting program where children and adults made an ecological and ethnographical slide-film called 'Fire balls". A portion of the activities took place in a 19th century izba (a traditional Russian wooden house). Young explorers didn't only make their film, they also sang for the inhabitants of the village. They sang the songs collected in that region that were forgotten by its dwellers. A digital movie was the result of their expedition. The project conducted in Staraya Pustyn is of interest, too, as it was a unique experience in which the metaphor of theatrical production merged with the process of conducting research. In this project, students had to confirm or disprove the hypothesis that there were "active spirits" around the biological station. In doing so, the students conducted research work by gathering information about the Svyato lake, surveying the region day and night, and by drawing up schemes, tables, graphs, and reports. The activity resembled a theatrical performance put on the stage of folkloric exploration. Interestingly, every new school that became involved in the project started their work with the analysis of the results that had been completed by the previous group (Figure 12).
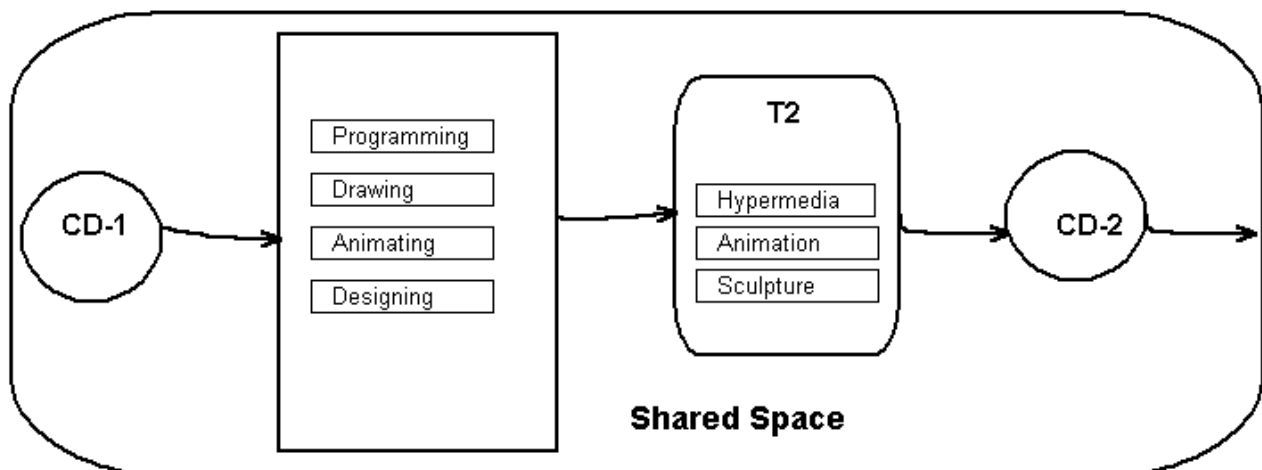

Figure 12: CD-exchange

As such, the activities of all the groups were focused on the translation of prior findings into a new form, thereby constantly creating new knowledge and understandings by building on the achievements of earlier efforts.

Concluding remark

This paper analyzed a variety of instances of both creative and collaborative learning. In doing so, it simultaneously developed and presented a framework for analysis of practice and research in these areas. We live in times that require high levels of creative thinking and elevated personal and social responsibility for the citizens of the planet to work together. Fortunately, we also have powerful tools that can help facilitate processes of creative and collaborative learning. In line with what Illich wrote as far back as 1972, we may still ask ourselves: "What kinds of things and people might learners want to be in contact with in order to learn?" The likely answer now is that there is a great need for communication tools and shared spaces in which people can collaborate.

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