Collaboration in modern education

Dealing with technical, educational and linguistic barriers in collaboration

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Abstract

In spite of the fact that many schools and children are now properly equipped and connected into huge virtual network, intensive and efficient *collaborative learning* is still more dream and vision than reality. We all believe in great power and challenge of ICT in making such creative collaboration possible, however we lack good examples and deeper understanding of this phenomenon – most probably due to serious technical and management problems, language and cultural problems, and also a *shortage of innovative ideas*, inspiring environments, efficient tools (and maybe also a shortage of good will to learn about other cultures and respect them).

The CoLabs Minerva project (see more details below) aims at this topic. Our goal is to design and develop *virtual laboratories for cooperation and collaborative learning – collaboratories*. We want to provide groups of children – either in one classroom or far apart, even living in different language regions – with opportunities to work and learn together. We are studying different forms of collaboration and their possible contribution to the learning processes.

Within the project we are making use of the Imagine environment as far as it allows us (beside all "traditional" features of a powerful computer environment for learning) to build interactive on-line interfaces for collaborative explorations. Imagine provides a modern version of well-known Logo language with multiple objects, parallel independent processes and intuitive support for developing Internet applications. We make use of Imagine in different roles, namely as:

- an authoring tool for building professional interfaces for on-line cooperative learning,
- an environment in which children and their teachers can develop, explore, modify and use different small activities (microworlds) and share them synchronously or asynchronously.

To facilitate such large communication and collaboration, we have been building an educational portal – a CoLabs portal as a space for working together, sharing resources, ideas, presenting children's work and supporting their teachers.

One of the major tasks of the project has been to identify – and solve if possible – problems that hinder children from working together *in spite of the distance, different languages and cultures*. We are tackling three groups of problems: technical, educational and linguistic.

Within the CoLabs project we are developing several computer environments for exploiting and better understanding the concept and different roles of collaboration. In my presentation I will illustrate three of them: *Creative Writing* for early school years, *Visual Modelling with Logo* for upper secondary students, and *Visual Fractions*, an open authoring environment for building and discovering essential concepts and relations in mathematics for 8 to 12 years old children. This is our attempt to build a kind of new culture in modern tangible mathematics education by providing teachers and children with highly interactive sets of visual building blocks which can be combined

and explored by a group of children standing in front of a common learning space – an interactive white board or a screen of a computer.

CoLabs Minerva Project

The CoLabs project explores the power and challenge of ICT in making efficient collaborative learning possible. Our goal is to design and develop virtual laboratories for cooperation and collaborative learning – we call them *colaboratories*. We want to provide groups of children – either in one classroom or far apart, even living in different language and cultural regions – with opportunities to work and learn together. We are studying different forms of collaboration and their possible contribution to the learning processes.

Partners of the CoLabs project (ELTE Budapest; Logotron Ltd., Cambridge; Cnotinfor Ltd., Coimbra; OEiiZK, Warszaw; Comenius University, Bratislava; Cnotinfor, Brazil) are educators and computer scientists who design and implement innovative technology for the goal of improving learning, then empirically explore the benefits and usefulness of the technology with real users – pupils of primary and secondary schools. Within the project we are interested in:

- inventing new kinds of computer-based media,
- creating tools to make media composition and sharing easier,
- helping users to learn how to compose media,
- developing collaborative supports for reviewing, critiquing, and composing,
- evaluating our tools and methods in practice.

To meet these goals, we are running the following work packages:

- defining *learning strategies* for CoLabs,
- developing e-learning platform for attractive and efficient collaboration among pupils,
- developing 'active web' material,
- running local and international experiments and evaluation,
- developing guidelines for users and teachers,
- localizing and disseminating the results and products created in the project.

Our aim is to create a kind of "collaborative dynabooks." The original vision of the Dynabook (what we now call a colaboratory) is that the computer can be a tool for composing and experiencing dynamic media, for the goal of learning. Creating the Dynabook was the vision that drove the Xerox PARC Learning Research Group who produced the first object-oriented programming language, Smalltalk, and created the first personal computers. Nobody argues today that you can learn through experiencing dynamic multimedia. But creating media that truly utilizes the power of the computer is hard, because computer is our first meta-medium. It is a medium that can be almost any other medium. The computer is a painter's canvas, an animator's cells, a composer's staff, and a programmer's code, all at once. We don't know yet what truly interactive, dynamic meta-media will look like, because even the best of today's computer-based work doesn't utilize all of what's possible. Our project shares the original vision of the Dynabook, but we extend it with an *emphasis on collaboration*.

Imagine as the CoLabs Project Platform

In the CoLabs project we are making use of Imagine as a platform for our research and development work. (We introduced Imagine's early version at the XVI Konferencja Informatyka v Szkole, Mielec 2000, see *Blaho, A., Kalas, I. and Tomcsanyi, P.: Imagine – nowa generacja środowisk twórczego uczenia się*.) The reason for this choice is that Imagine environment supports

us considerably in building interactive on-line interfaces for collaborative explorations. We make use of Imagine in two different roles, namely as:

- an authoring tool for building professional interfaces for on-line cooperative learning,
- an environment, in which children and their teachers can develop, explore, modify and use different small activities (microworlds) and share them synchronously or asynchronously.

Out of the features of Imagine we make here intense use of its programmable shapes, object-oriented paradigm, parallel independent processes, networking support (access to Internet and on-line communication among N computers) and strong multimedia support.

Educational Research

Our educational research concentrates on studying the questions: Who will cooperate, how and why? What kind of learning is taking place – around one computer, i.e. within one group of collaborating children, between several groups, within the classroom, through Internet and through different linguistic and cultural barriers? Why does this happen (or not) and how? Which problems will be encountered? What kind of support is needed (for children, for teachers and for developers)?

Technical, Linguistic and Educational Barriers

One of the major tasks of the project has been to identify – and solve if possible – problems that hinder children from working together in spite of the distance, different languages and cultures. We are tackling three groups of problems: technical, educational and linguistic.

Within the technical layer of problems we have further extended the networking support of Imagine. It has already been possible to create a kind of "channel" (an on-line connection) between 2 or N computers, to activate it, to send data, objects, instructions or to save for Web (and later run the result with an Imagine plugin). In the project we have enhanced this functionality by implementing uploading and downloading files from the Net object through the HTTP protocol. We have also provided continuous technical support to all developers within the project.

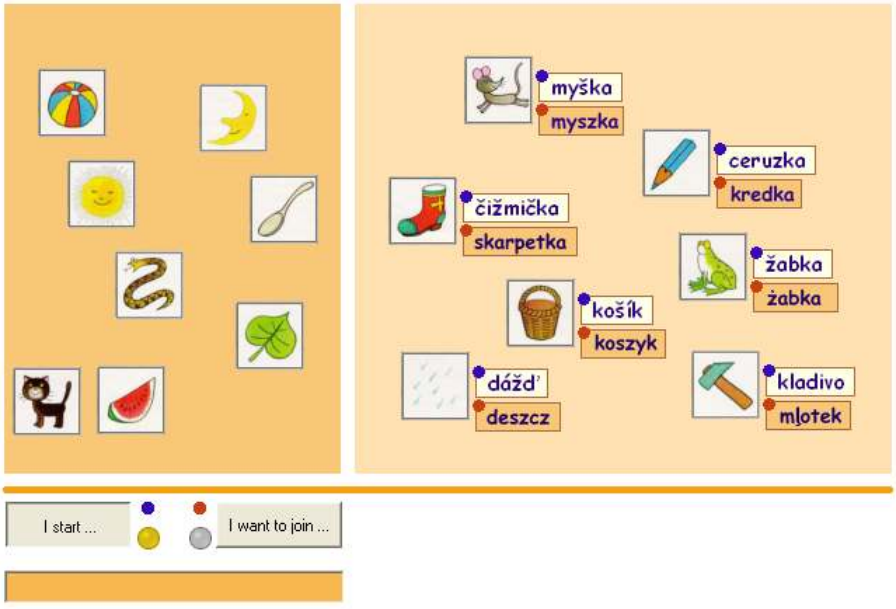

Figure 1: We are running small international experiments to test our technical solutions, solutions of linguistic problems and further develop some innovative educational ideas. The figure illustrate experiment in which children from two different language environments are building small picture dictionary

Within the linguistic layer of problems we have traced several sources:

- to make international collaboration possible, children need to run Imagine projects written in different versions of Imagine. To overcome this problem, we have developed an IMP translator for Imagine projects, which provides a kind of semi-automatic translation,
- the projects which are developed for international collaboration are using different languages and different char sets. The authors of such projects must know how to program them in order to achieve correct transfer and display of the texts, which are "foreign" for the receiver. The guidelines for writing such projects are currently being developed.

Within the educational layer of problems we have traced two groups of factors:

- developers of educational activities are not well experienced in exploiting networking support,
- there is an obvious shortage of innovative ideas with clear educational goal, inspiring environments, efficient tools, which exploit proper networking functionality.

To improve this situation we are developing a methodology, how such projects should be built, how to avoid “dangerous places”, how to make it easy to build them correctly and efficiently and how to localize them in different languages.

Tasks in the CoLabs Project

Within the CoLabs project we are developing several computer environments for exploiting and better understanding the concept and different roles of collaboration. These environments then serve as an experimental basis for national and international experiments. These are:

- *e-learning platform* – a virtual space to facilitate large international communication and collaboration,
- *scientific modelling for mathematics*, including visual modelling with Logo,
- *creative communication*, that is, tools that facilitate communication (and learning) through pictures,
- *creative writing*, a multimedia and multiuser virtual space for very young learners. This environment develops skills to express, skills to think and reflect, skills to analyze thoughts and emotions,
- *visual fractions*, see below.

Visual fractions

One task of the CoLabs project is to create open learning space for discovering mathematics – for and by children aged 8 to 12. We decided to develop it as an *open authoring environment* for building and discovering essential concepts and relations in the area of factions. This is our attempt to constract a kind of new culture in modern “tangible mathematics” education by providing teachers and children with highly interactive sets of visual building blocks which can be combined and explored by a group of children standing “in front” of a common learning space, for example in front of an interactive white board or a screen of a computer.

Our visual building blocks present different representations of fractions and relations among them. The environment allows children to combine these visual tangible objects and thus model and explore dependecies between fractions. Thus, each object can play two roles – being either a kind of independent fraction (an input value) or depending on another fraction object or operation – being an alterantive representation of a fraction or being a result of an operation, a visualization of a value on the number line etc. We believe that the Visual fractions environment offers new approach to modern mathematics education built on collaboration and exploration.

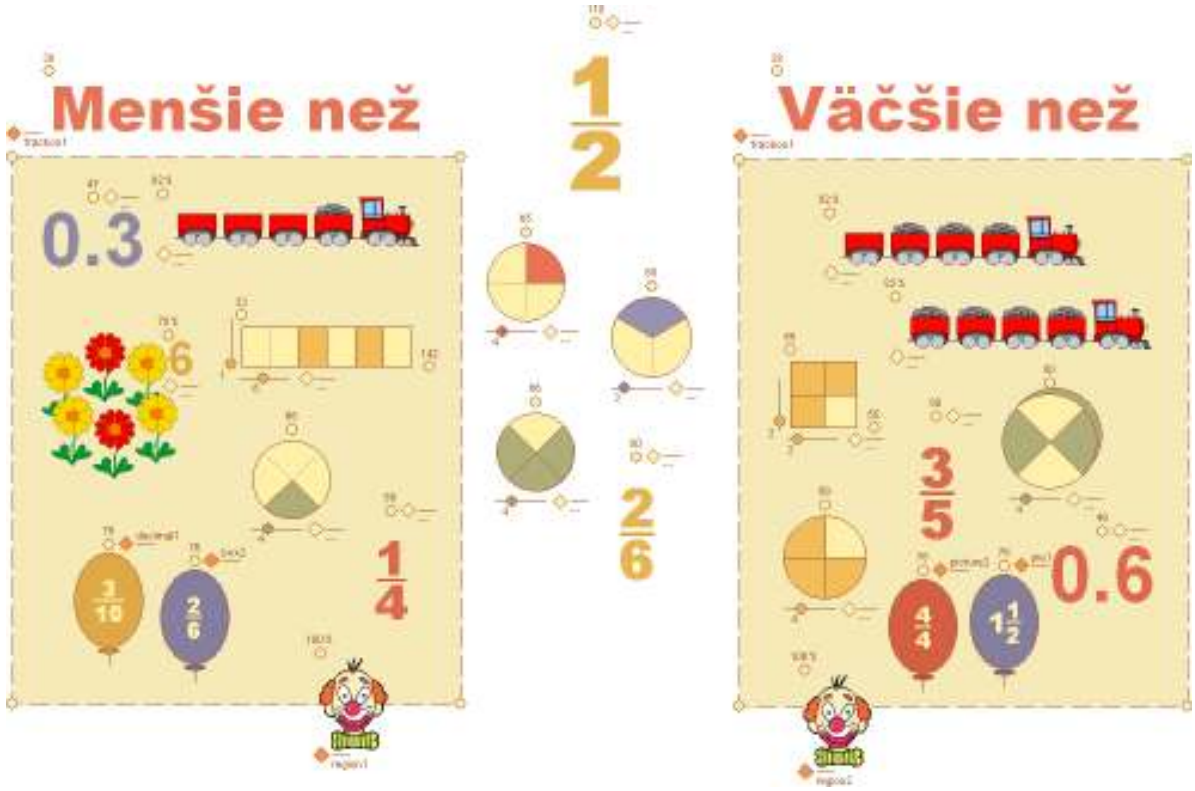

Figure 2: Children or their teacher can use different visual representations of fractions, they can specify dependencies between them, they can apply operations like + etc., or logical relations like <, = etc. This figure also illustrates regions – areas with pre-specified conditions (like: each object inside me should be smaller that one half).

Conclusion

We all feel that cooperation and collaborative learning is becoming one of the key competencies in modern education. Educators and developers of interactive interfaces for learning see big potential in modern ICT as a vehicle for collaborative learning. We consider this to be productive way how to encourage international communication and cooperation among children from different linguistic and cultural settings. However, good examples and experience is still rare. The CoLabs project wants to contribute to this challenging shortage.

Short Biography

Ivan Kalas is an associate professor at Comenius University, Bratislava. He is a member of the steering committee of the national Slovak InfoAge project, which has already integrated all 3200 schools in Slovakia. Ivan is a head of the Department of Informatics Education, which is responsible for pre-service education of future teachers. He is author or co-author of several books and textbooks. Ivan represents Slovakia in IFIP TC3 Committee for education. In 2000, he worked as visiting researcher at the Institute of Education in London. He has read several invited lectures in UK, Brazil, USA, Hungary, Poland, Bulgaria, Czech Republic, Denmark and Portugal.

Ivan is a co-author of SuperLogo: Learning by Developing, which was published by Logotron, UK in 1998 and has been translated to two other languages. He is also a co-author of educational software environments, which are being used in more than 20 countries. These educational tools aim at developing creativity, logical and algorithmic thinking, communication and co-operation. Together with Andrej Blaho and Peter Tomcsanyi they developed SuperLogo and in 2001, together with Lubo Salanci they released Imagine, new generation of computer environment for learning.