

1 Didactical material about the method of introducing Imagine and co-laboratories into local learning settings (EN, to be used by project partners).

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Professional background of our group

Professional background and interests of our group have three sources:

- (a)** informatics (computer science),
- (b)** developing educational software, tools and platforms, and
- (c)** future teacher training.

Our **Faculty of Mathematics, Physics and Informatics** is responsible for computer science studies, and for pre-service education of future teachers of mathematics, physics and informatics for both primary and secondary schools (lower and upper) in Slovakia. Our **Department of Informatics Education** have 20 years' experience with experimental learning environments, and have implemented several computer systems for students of all ages. We have experience with designing interfaces for children, open and interactive tools for creative computer activities. Due to this expertise, we have been involved in several national and international projects devoted to exploring modern teaching/learning strategies and tools. We directly transform all outputs and experience obtained in these projects into our courses and seminars with students and teachers. As far as our university plays leading role among other universities in our country, our educational conception, curriculum and educational materials usually influence many other similar departments, universities and schools in Slovakia.

Comenius Logo – learning by developing

In 1994 we developed modern version of Logo – titled Comenius Logo with the ambition to make use of all the powerful features of the Windows environment and to provide complete support for turtle geometry, enhanced Logo data structures, multimedia, multiple turtles, complex and easy graphics handling. Since then Comenius Logo had appeared in more than twelve national editions throughout several countries (titled SuperLogo in UK, the Netherlands and others, ComeniusLogo in Central Europe, MultiLogo in Greece and MegaLogo in Portugal and Brazil).

Our experiments within Comenius Logo with children and students (up to the university level) have provided us with a source of experience and have influenced considerably our conception and more recent developments. We have examined possible applicability of Comenius Logo from the learner's side, from the teacher's side, and from the aspect of the developer of educational software. We have come to a conclusion that these roles need not and should not be strictly separated. Learners want to develop, more than to use. Teachers are often developing their own applications and microworlds or they are tailoring existing material. Teachers of Informatics are always learning new material. Developers

are often university or secondary teachers. Future teachers of Informatics have to learn how to develop educational environments.

This is the reason why we decided at that time to develop strong computer environment suitable for all of them, suitable for *developing* and suitable for *learning by developing*. At the same time we decided to firmly keep the traditional Logo educational philosophy. Comenius Logo user interface for traditional Logo language has enabled children, teachers and developers to take full advantage of Windows environment. Adding abilities to handle graphics and to handle turtles' shapes in a new way has resulted in amazingly strong exploratory and development tool and open teaching/learning environment, which considerably extended traditional Logo activities.

Imagine – new platform for learners

At the end of 90s we decided to develop a version of our Comenius Logo environment, which would better reflect the actual state of the knowledge and practise in programming methodology. However, we also decided to be very strict in keeping original educational conception of Logo although the language and the environment themselves are considerably extended by new features and new metaphors. Based on our previous experience in teaching Comenius Logo, in teaching with Comenius Logo and in developing dozens of quite complex Comenius Logo microworlds (and also based on the experience of our partners from many countries around the world) we decided to:

- Simplify (from the child's point of view) the work with animations. We have managed to unify the concepts of so called traditional Comenius Logo turtle and animation Comenius Logo turtle. The planning of Logo animation agenda is now automatically done by Imagine Logo itself (however, the user can control it by himself or herself if there is a reason for it). The complex information necessary for animation of shapes is now saved within the graphical data objects themselves (time delays, frames, angle sections, states etc.).
- Engage the OOP metaphor into traditional Logo philosophy in a way, which wouldn't restrict the "traditional" Logo user on one side, but could be easily and creatively used by students who know nothing about OOP theoretical background. This goal turned to be the most difficult and fundamental in our recent development.
- Offer an open hierarchy of graphics screens (beside a hierarchy of Logo objects), that is, a hierarchy of independent panes (drawing areas) inserted into other panes and pages.
- Allow creating and modifying the hierarchy of objects in a dynamic way. An object (together with its variables and procedures) may be considered a behaviour and may be dynamically attached to other objects, thus temporarily extending and/or modifying their own functionality,
- Support parallel independent processes.
- Support common tools for direct painting into any page or pane (like lines, ellipses, rectangles etc.),
- Extend the repository of direct manipulations possibilities (however, always supported by Logo language equivalent).

- Extend the palette of tools to be applied to graphics data objects; accept different graphics formats, which are often used when working actively with the Web. Enhance the possibilities to work with the turtles' shapes so that several interesting activities with shapes could be achieved easily. Extend the set of possible behaviours in the situations when turtle reaches the borders of its drawing area (window, wrap, fence, bounce).
- Facilitate publishing Imagine projects for the Web due to Imagine plug-in.
- Remove several technical restrictions of Comenius Logo.
- Offer strong possibilities to customise the environment: toolbars, dialogues and menus should be Logo objects re-definable by a user. It has been our goal to define the whole environment directly in Logo language. When the user starts Imagine, he/she will be faced with one possible instance of customisation.

We believe that Imagine Logo is a new kind of integrated educational software, see [1] or [2]. Comprising a richly connected and layered set of tools and frameworks, it is designed to integrate with and extend all areas of learning – and can be used by pupils of all ages and ability. It is a modern computational system for learning with ambitions to support and stimulate emergence of new cultures of constructing, exploring and understanding.

What are essential properties of Imagine, which we want to profit from within our Colabs project? We think that (beside others) these are:

- programmable pictures,
- direct manipulation tools,
- events,
- object oriented structure,
- parallel independent processes, and
- strong support of networking.

With these features we find Imagine to be a proper platform to be utilized in exploring innovative possibilities of the cooperative learning.

Our current strategies for proper integration of Colabs

- Exploring **technical problems** of communication & cooperation within the platform
- Exploring **language problems** of communication & cooperation within the platform
- Exploring **educational problems** of communication & cooperation within the platform
- Transferring expertise obtained in 1, 2 and 3 to our Colabs partners
- Transferring experience obtained in 4 to Slovak teachers and learners
- Integrating expertise obtained in 5 into future teacher education at our department
- Integrating Colabs into our national InfoAge Project
- Enhancing the platform (Imagine) to better support Colabs
- Supporting all partners in their WP2 developments
- Co-author development of the Fraction microworld

1 Exploring technical problems of communication & cooperation within the platform

Imagine platform makes it possible to create instances of the **Net** class and thus establish

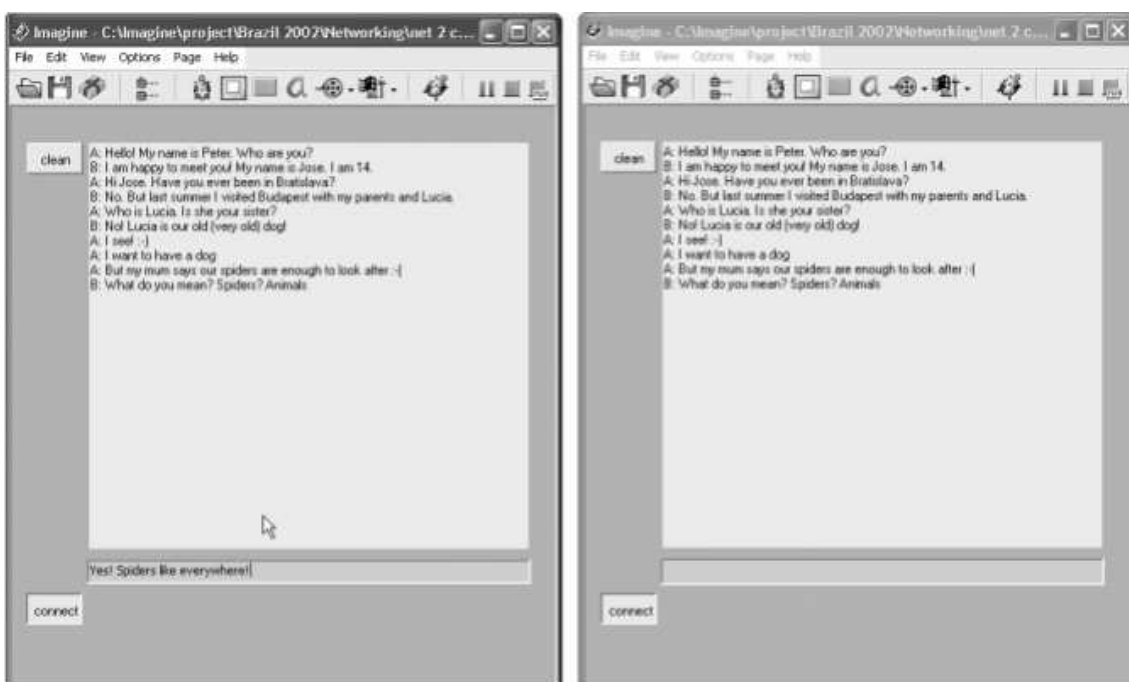
an on-line communication between the Imagine user and one or several Imagine users located anywhere on the network. This net communication makes it possible to send and receive texts, data, instructions or Imagine objects. To initiate a communication, an active net object must be created in one Imagine environment. Its user then declares this environment to be a server. Those who know the name of that server or its IP address, can then create their own net objects and connect them to that server. In the Imagine net communication each participant can communicate with another participant or with several of them in parallel. (One and only one of the participants, however, has to play the role of a server.)

- If you send a message (a text, an instruction, any piece of data or an object) to another participant, an **onReceive** or **onReceiveObject** event will be run in his/her net object, which will process the message.
- Each Imagine environment can create several net connections (net objects **net1**, **net2**, **net3** ...) with different servers.
- If you send a message, you specify an addressee. It may be one of the net communication participants, several of them or even all of them at once.
- You can create net objects only if your computer is set up to be connected to the network (that is, it must have a network card properly installed and activated).

To create a net object and make it active, you type in the instruction:

```
? new "Net [ ... settings ... ] ; The name will be net1.
? net1'connect
```

Net objects make it possible to develop and run Imagine network projects, where, for example, two users play one game over the net, or they have a conversation, or they develop joint project etc. Following figure illustrates a simple chat project developed in Imagine. Two or several Imagine users may connect into an on-line conversation. The most interesting part of this project, however, is the fact that chat project is so simple that teachers and students can either create it by themselves or open it and modify.



The chat project consists of two buttons, a pane (to display the history of the communication) and an input text box with single line. This text box has a key menu attached: **[Enter [net1'mySend]]**. There is a net object – named **net1** – which is responsible for the entire communication. It consists of two very simple procedures:

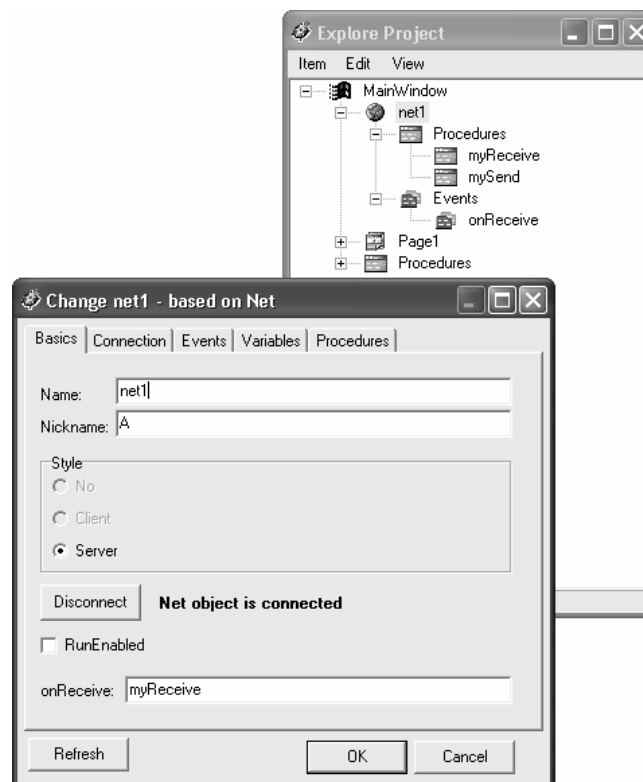
```
to mySend
if empty? text2'value [stop]
send users text2'value
text2'setValue "
end
```

```
to myReceive
let "M (word sender "|: | message "\13\10)
text1'setValue word text1'value :M
end
```

So, Imagine offers exceptionally strong technical support for:

- using on-line communication, and
- building projects for on-line communication.

However, there are still lot of possibilities how to improve this mechanism, how to make it more user-friendly, more robust, more intuitive etc. As an example of the most recent development, below you can see new Change Me dialogue which offers a kind of wrapper around several technical issues.



Our strategy here is to observe all on-line communication developments within the Colabs project (and be involved in them as well, see all other strategies explained below) and improve the quality of the technical support (the Net object and its interface) as much as possible.

2 Exploring language problems of communication & cooperation within the platform

Beside technical problems, international communication and cooperation (within any programming platform) certainly hits the language issues. Our strategy here is to explore carefully all alternative solutions and provide tools and methodology for reducing them as much as possible, see the document Language issues in Imagine, and also first version of the translation tool. On the other hand, we don't consider language issues to be a problem only. In fact, in the Colabs project, these issues present a challenge. We want to learn how to help children cooperate within multi-language European environment (due to our Brazilian partner, in fact, it is intentionally more than European environment).

3 Exploring educational problems of communication & cooperation within the platform

Exploring technical problems and language issues will only help us to approach the most interesting (from the project's point of view) and the most challenging problems – i.e. educational problems of communication & cooperation. Although everybody within the educational research area believes that ICT supported platforms for communication and cooperation of children offer exceptional teaching/learning opportunities, intensive research must be invested in this direction. We want to explore these opportunities and we want to support our partners in doing this as well.

So far we are aware of different roles and different interactions between teachers and learners when exploring possible forms of collaboration, see the table below. We want to match these forms against different levels of cooperation within Imagine, see Communication and Cooperation in Imagine (Classification and Specification Of Levels).

Forms of collaboration

Teacher with teacher	• Sharing ideas	• Sharing materials	• Sharing experience
Teacher with learner	• Evaluating and Debugging	• Supporting	• Motivating
Learner with learner	• Doing together	• Presenting results	• Giving & receiving feedback

4 Transferring expertise obtained in 1, 2 and 3 to our Colabs partners

Experience and expertise gained within implementing strategies 1, 2 and 3 must be effectively transformed to all our Colabs partners. We want to implement this transfer through on-line communications, workshops, shared materials, international Imagine projects – run and/or developed together.

5 Transferring experience obtained in 4 to Slovak teachers and learners

Not only the results of 1, 2 and 3, but also our experience gained in implementing the transfer mentioned in 4 must be efficiently transformed into our national settings as well. Through very close cooperation with many educational institutions, we want to mediate the experience of building/developing/implementing cooperative laboratories (colabs) for learning to our teachers and learners.

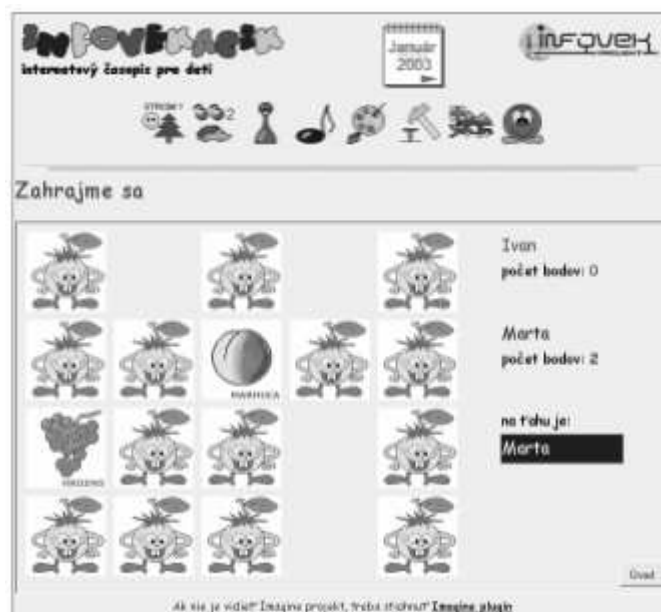
6 Integrating expertise obtained in 5 into future teacher education at our department

We also want to implement all projects, materials and experience into our future teacher education. Our Department of Informatics Education is involved in future teachers education. Therefore we directly transform all outputs and experience obtained in all national and international projects into our courses and seminars with students and teachers. As far as our university plays leading role among other universities in our country, our educational conception, curriculum and educational materials usually influence many other similar departments, universities and schools.

7 Integrating Colabs into our national InfoAge Project

In Slovakia there are 25 faculties of universities where future teachers are being educated (pre-service teacher training). All of them are connected to our national InfoAge Project with the aim to integrate ICT into schools and modern education. One of the roles of these faculties is to considerably increase the digital literacy of future teachers. There are 2500 primary schools and 800 secondary schools in our country. Out of these, nearly 1000 will be involved in the InfoAge Project by the end of this year (i.e. 2003).

We want to implement experience and outcomes of the Colabs project into Slovak schools and other educational settings through very close cooperation with the InfoAge project. The impact of this mechanism is impressive. One of the activities already being run by our group is publishing an on-line journal for children, see below or see <http://infovekacik.infovek.sk>. It is a collection of rich active web materials making use of the Imagine plug-in. By developing this material, our group will gain wise experience with developing and running collaborative learning activities and will establish a strong group of local contacts with teachers and children.



8 Enhancing the platform (Imagine) to better support Colabs

When Colabs Imagine projects are being developed, tested and implemented into learning settings, several types of problems may arise. Some of them may be technical networking problems or limitations, others may result from other mechanisms, limitations or bugs of

Imagine platform itself. Our strategy here is to observe (and co-author) the process and enhance the platform itself if there is good reason and evidence to do so.

9 Supporting all partners in their WP2 developments

As far as our group has rich experience in applying Imagine Logo for developing educational projects, we will support our partners in their WP2 developments. We want to create several guidelines, web materials and other supportive tools to facilitate the development, to build good practice, to make the process efficient and productive. We will run workshops and courses on building networking colabs projects for our partners and teachers/authors involved in the project.

10 Co-author development of the Fractions microworld

We will co-author the development of the Fractions microworld. We want to create a kind of open library of building blocks for different visualisations of fractions. Our strategy is to develop an open set of building blocks or tools to make it possible for a teacher to build his/her own activity (microworld, working sheet or active web page) with fractions. Moreover, we want to organize this process in such a way that the fraction tools and microworlds are already being developed in an experimental cooperative way. We want to combine different forms of communication to reach the goal. We hope that such experience may enrich our understanding of the roles of communication and cooperation within the learning process.

References

- [1] <http://www.logo.com/products/imagine.html>
- [2] Ivan Kalas and Andrej Blaho: Imagine... New Generation of Logo: Programmable Pictures, Proc of IFIP WCC ICEUT, Beijing 2000, pp. 427 – 430, ISBN 3-901882-07-3
- [3] Molly Watt: What is Logo? *Creative Computing*. October 1982