

EXPLORING WITH LOGO

Use of Colours, Drawing tools and Predefined figures by Children

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Abstract

One of the first basic actions, during which children create their own product, is drawing. The possibilities, that a computer offers, for this action are much richer and more provocative than that of the white paper and drawing paints. The work with colours, lines, form and predefined images builds combining talents, develops the aesthetic taste and stimulates the child's thinking and imagination. Which colours and shapes are most often used by children? To answer this question we provide the following experiment. We create an environment in Logo to calculate the colours, drawing tools and predefined figures used by children. The experiment was done on children grade 3rd to 6th from one and the same school and lasted for 5 months. In our calculations we also took into account the children's age and sex. The results of the experiment are discussed in the paper. Similar to the discussed Logo environment, other environments could be developed by Logo teachers to investigate other aspects of child's behaviour.

Keywords: Comenius Logo, exploring, children experience, colours, drawing tools, predefined figures

1. Introduction

Some of the main features, which can be noticed in the development of the software products during the last decade are extension of the sphere of possibilities and actions, related to the application realm and extension

of the area of problems and tasks, that can be solved with them. Parallel with them, the developers aim to lighten the interface of their products (regarding structure, as well as design), in order to extend the potential users. As a whole the main idea around which software evolves and will continue to evolve in the future is that the software should be as reach as possible in capabilities and as little as possible demanding towards the knowledge and skills of the user. This is an idea that has been integrated in Logo from its creation – “a language without boundaries”.

The development of contemporary Logo environments doesn't diverge from the above mentioned tendencies. Today the “turtle” world processes not only environment for teaching students computer science but also other realms of human knowledge. The Logo environments have great instruments, which make them a development tool for software engineers. This allows the creation of programs with different areas of application of computer systems for conducting learning in a unilateral environment. The interface and navigation of every new application will be similar to that used by the child in other applications developed with the same Logo environment. This will imminently reduce the adaptation time and make easier the physiological adaptation of the child to the new application. In this way the learner can concentrate on specific tasks and reach better end results. The openness of the Logo environments for developing applications allows the system to keep track of the sequence of steps that a child does when working with a specific application. In this way special applications for following the progress of the child and his perception can be developed. The collected data can be analysed by a teacher or an expert, and be used for correcting the learning process and for stressing the individual approach in it.

Which colours and shapes are most often used by children? To answer this question we provide the following experiment. We create an environment in Logo to calculate the colours, drawing tools and predefined figures used by children. The experiment was done on children grade 3rd to 6th from one and the same school and lasted 5 months. In our calculations we also took into account the children's age and sex. The results of the experiment are discussed in the paper.

The paper contains four parts. In the first we present Comenius Logo as a modern multimedia computer Logo environment. In the second we analyze drawing as one of the first computer activities in which children use and work with colours and figures. In the third part we describe the provided experiment with students. The last part analyzes the obtained results.

2. Comenius Logo is much more “learning by exploring”

Comenius Logo [2] is one of the versions of the language Logo, which received wild proliferation in Europe under different names (Super Logo, MegaLogo, Multi-Logo). The main learning principle, which lies in it, is “Learning by developing”. The reach palette of tools and its open environment allows the creation on an application, having all multimedia capabilities of one contemporary computer system, which would provoke children for intensive and productive work (for example: MATCH [3]). In Comenius Logo along with the traditional turtle and its movement in Decarte co-ordinate system, the user processes a number of commands and operations for processing lists of all types, including graphical ones. In addition to animation and text box turtles, MCI commands extend the multimedia capabilities of the environment and make it an attractive tool for software development. These characteristics can be used for creation of applications, which help experiments on children's sensors and imaginations. In this way to the main educational principle of Comenius Logo the additional “Exploring children's abilities by working with Logo” can be added.

3. Drawing with computer – an easy and rich activity for children

One of the first basic actions, during which children create their own product, is drawing. The possibilities, that a computer offers, for this action are much richer and more provocative than that of the white paper and the drawing paints. The work with colours, lines, form and predefined images builds combining talents, develops the aesthetic taste and stimulated the child's thinking and imagination [4].

Colour is fundamental for our perception of the world. Colour and geometric figures introduce and develop children's awareness of shape and space – an important first step in mathematics [1]. It is a well-known fact that almost all cultures have specific significance for certain colours. It is a well-established fact that each person perceives colours in a slightly different fashion. Colour palettes are often strong indicators in

authorship. As an example, El Greco during his Italian period painted several very fine copies of art works that he studied. These art works are often recognised by their palette colours. Affiliation to different colours is related to social and personal factors. In the pictures of Van Ghog the dominating colour is yellow. The work of Picasso can be separated into two periods: blue and rouse. Based on the colour palette the works of Velascas and Sezan can be uniquely distinguished.

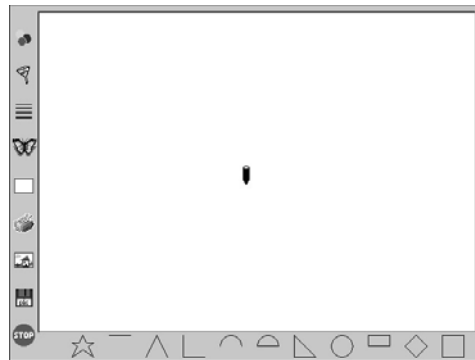
The basic activities, that children exercise during computer painting are: colouring, contrasting, free hand drawing, combination and processing of predefined images. In the work process children use different colours, lines and forms in building the images, which they have in their minds. In this way they express their minds using the computer. Thus children develop and build sense towards the use of colours, lines and forms.

4. The Experiment

The aim of the experiment was to find out how children use colours, drawing tools and predefined figures in the process of creating their own pictures.

4.1. Experiment tool: "Pictures" – a model of drawing application, developed in Logo environment

The main tool for the experiment was a specially developed software system based on Comenius Logo for graphics creation. In the developed system the screen canvas is divided into three parts, called work place, tool bar and component bar. In the work place the user can colour, construct, and draw free hand. In the tool bar the current tool that will be used can be selected. The system's capabilities are shown in Table.1



	Choice of pen colour		Clear the screen
	Choice of pen with		Print the screen
	Select background image		Save the screen as an image file
	Prints a selected from a image library picture		Exits the system
	Choice of fill colour		

Table 1: Function of the main tools in the application

The geometric figure that will be displayed in the working area can be chosen from the component bar (Table 2.).

1x	The chosen figure is show in the normal size	5x	The chosen figure expands five times
2x	The chosen figure expands twice	6x	The chosen figure expands six times
3x	The chosen figure expands three times		The chosen figure is rotated 90 degrees to the right.

4x	The chosen figure expands four times	↶	The chosen figure is rotated 90 degrees to the left
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Table 2: Function of element in the component bar

4.2. Experiment group

The experiment was held with 69 students from the private school “St. St. Cyrill and Methodius”. They study information technology for a second year. During the last year the pupils worked with the Comenius Logo system. The 11-12 year old students were engaged with programming, the others used demo programs. They all have basic knowledge of working with graphics and colours. They have created their own images and have stored them.

4.3. Experiment period

The weekly occupation for the nine-ten year old children is one hour and for eleven - twelve year old – two hours. The development application was used during the period of five months.

4.4. Experiment activities

During the experiment the children were involved into the following activities:

- Colouring a choir, car and wardrobe;
- Painting and Colouring of a house and an animation character;
- Construction of a car and a clown from basic elements.

They showed enthusiasm in doing the specified tasks. Stereotype decisions for using colours and shapes were seldom used. The main pictures that they created are on the following topics: “The Arab town”, “The train”, “The space”, “The buildings” and “The masks”.

5. Results from the experiment

The results of the held experiment can be classified by use of colours, use of drawing tools and use of geometric figures.

5.1. Use of colors

The use of the colours according to children’s age and sex are given in Figures 1 and 2.

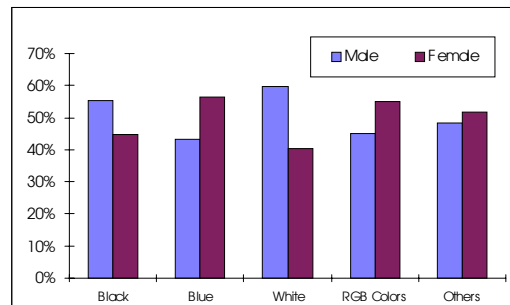
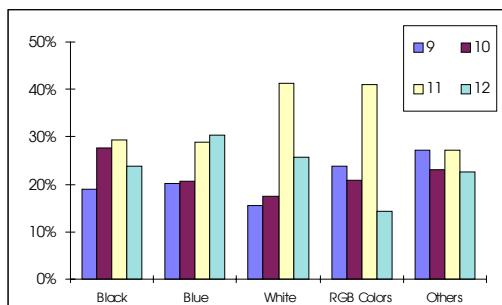


Figure 1. Colours distribution by age

Figure 2. Colours distribution by sex

The children have special preferences to the use of the black colour. The reason, most likely, is that it gives the best contrast, when used with other colours. In this way the pictures, which the children have created, are with clearly distinguishable figures and colour accent. The second place is taken by blue, followed by white.

5.2. Use of drawing tools

Regarding the use of drawing tools, the colouring tools take prior place, followed by free hand and printing geometric figures (Figure 3 and 4).

Working with the whole picture. Regardless of the age, all students have the same attitude to saving their work and using freehand drawing. The stamping of a picture from a library with images for making the painting richer is an usual practice for most of the students. As it might be expected the capabilities for combing forms, lines and colour are not developed in the younger age group.

Working with tools for drawing a picture. When compared according to their age the smallest children are much eager to use colouring tools and use less predefined elements in their pictures.

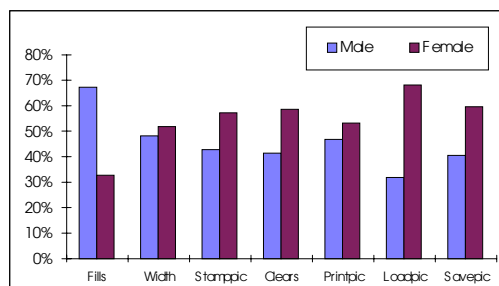
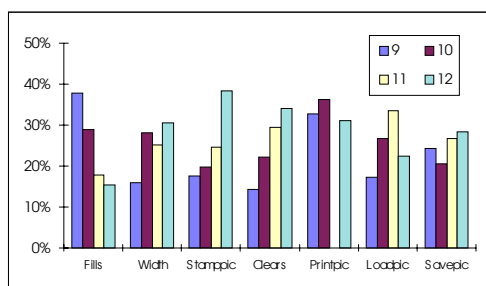


Figure 3. Drawing tools distribution by age

Figure 4. Drawing tools distribution by sex

As a whole girls work more with predefined elements in their pictures, while boys prefer the creation of own elements. Colouring is one of the favourite activities for boys. At the same time, boys don't like much saving their pictures. On the other hand girls often make mistakes in their work and often clear their pictures.

5.3. Use of geometric figures

The used figures in our experiment were: 1 – Square; 2 – Rhomb; 3 – Rectangle; 4 – Circle; 5 - Triangle; 6 – Polycircle; 7 – Catenary; 8 – 90° angle; 9 - 60° angle; 10 – Line; 11 – Star. Regarding the use of geometric figures and the building of own pictures, the analysis show that the circle, the rectangle, the star and the square are the most often used figures. The reason is probably that those figures are part of the children's everyday life. The children know them and that's why they experiment with them.

An interesting fact is the contrasting difference in the use of geometric figures from boys and girls. Especially clear it strikes regarding the figures: square, rhomboid, half circle, half arc, the right and 60° degree angles. As it can be seen from the diagrams boys are more likely to use geometric figures, which they are not familiar with. Girls, as a whole, are more conservative and prefer to use elements that they are familiar with.

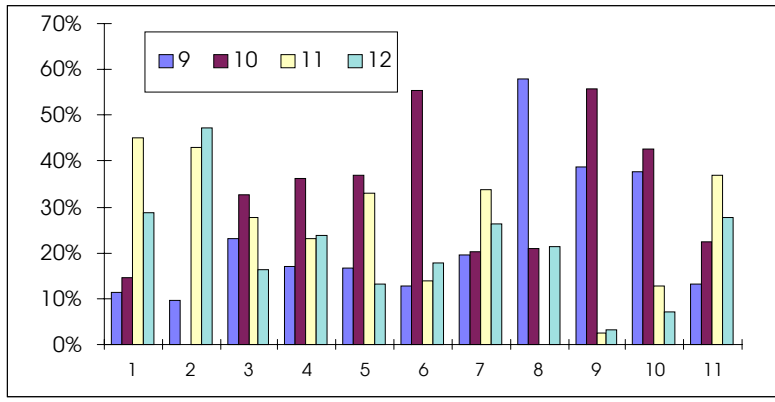


Figure 4. Figures distribution by age

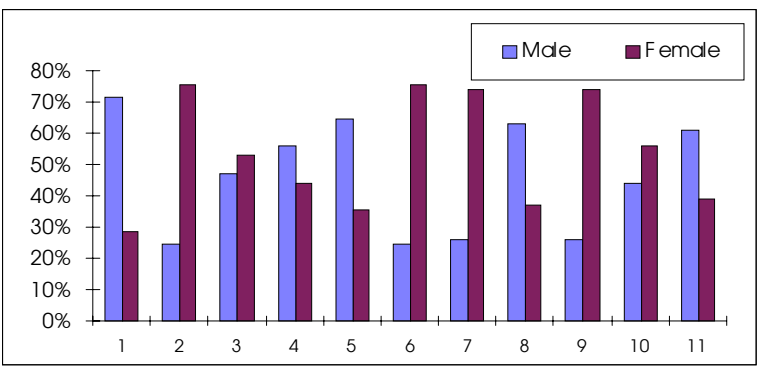


Figure 5. Figures distribution by sex

6. Conclusions and future work

The obtained results can be used from specialists in different fields. Pedagogy and physiology could use the results to determine the learning level and the degree of perception of children, regarding the use of colours, drawing tools and geometric figures. Software designers could extract the necessary information for the user interface of their application in order to get closer to the users and extend the lifetime of their products. Parallel with that, the teachers can determine the main activities concerned with work with graphical information, that are attractive for children according to their age groups. On the basis of this information teachers can change the learning plan aiming at more fuller and deeper understanding of the learning material.

The model of graphical application and the held experiment show that the environment Comenius Logo can be successfully used to investigate children’s perception and knowledge, aiming at improving and correcting the weakness in the development of the child.

7. References

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