

# In searching the keys...

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## Abstract

One of the most used by people application at the computer is wordprocess. The most common used device for this activity is keyboard. For the normal children the period of learning how to use keyboard is quite easy, but it takes some time for remember where each symbol is situated on the keyboard. The children with any physical problems are required different and step-by-step practical exercises in order to learn how to use keyboard. That process takes quite a long times and is not always with a successful end.

The paper shows the problems related with teaching the children with cerebral palsy how to work with a keyboard. It will be present special development software products that aim to teach the children of the common keyboard activities are also shown. The results of the programs, realized at the Center for treatment and rehabilitation of cerebral palsied children (Sofia, Bulgaria) will be also presented.

## Keywords

Keyboard, children with special needs, computer skills, speech, communications, Comenius Logo

## 1. Introduction

The mouse and the keyboard are the two main peripherals used for input and access data to computer. The child has master several skills needed for working with the computer and initializing and guiding the processes.

The keyboard is a major device for user-computer system communication, not influenced by user interface. The other often used device – mouse is a typical for graphical user interface. In some cases (for inputting text) it is not good idea to use it. This brings the necessary for acquisition of the keyboard usage as a basic stage of computer usage as a whole.

Process of this acquisition is short for healthy children and not is always needed special training programs. It's different for handicapped children. In most of them from the earliest stage of development determines in fine motoric are noticed. In spite of the correcting therapy, reducing the stage of these determines most of these children need alternative methods of developing the writing speech, incapable of forming personal writing speech.

These methods are connected with using typing machines, like typewrites and computer. In this way the keyboard of computer turns out to be a basic mean of development of the writing of handicapped children. This defines the importance of

keyboard – usage acquisition and a special attention showed be paid to computer system.

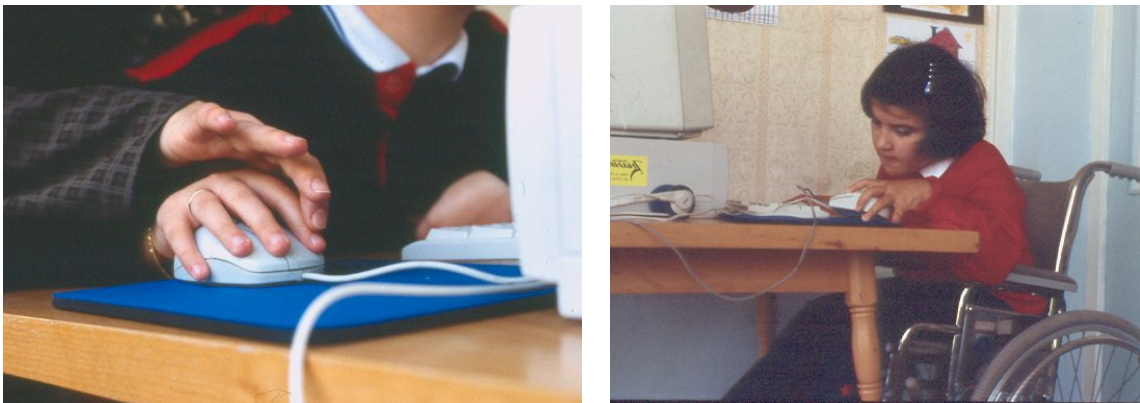
## 2. Keyboard or mouse?

For every user working mainly with computer is clear enough that in spite of a virtual keyboard existence that could replace to some extend its physical type we are talking mainly for work with **keyboard AND mouse**.

The mouse offers a fast and convenient access to data and application. It is indisputable fact. With the time the mouse becomes preferred device for communication with computer. The easy acquisition of its usage because of the simple design and little size has impact on that. We get used to it easy and quickly, its little and compact and in its standard variation has only two buttons without symbols on them.

For handicapped children this acquisition is not easy process. Despite its simple design it mobility makes it difficult to be worked with. The reason is the typical instability of the hand and chaotic movements for those children (Fig. 1). Using mouse requires stability of movements, exact position and holding the hand tightly [1]. Concerning that statically position of keyboard and it's base for the hand it's big advantages for using it by handicapped children.

Different is the problem with children with mental problems: they can't perceive not only the physical connection mouse-screen (two different object requiring coordination), but also the logical link: move of the mouse – move of the cursor on the screen. The problems for children with wrists paresis are in the improper grasp of the mouse, which makes operation with it more difficult [1].



*Figure 1.* Problems with mouse

Acquiring the work with the keyboard we meet other problems, that don't exist when working with mouse. They concern its construction, design and functioning. The children meet a lot of the keys, different symbols on them and differnt functions. Here comes the question for alternative keyboard device with not so complicated structure, including basic keys (Fig. 8). Exploring this question and why we prefer standard keyboard will be discussed lately.

## 3. Problems with keyboard

Although the statically position of the keyboard offers advantages of less physical efforts it requires other skills and other problems spring (Fig. 2).

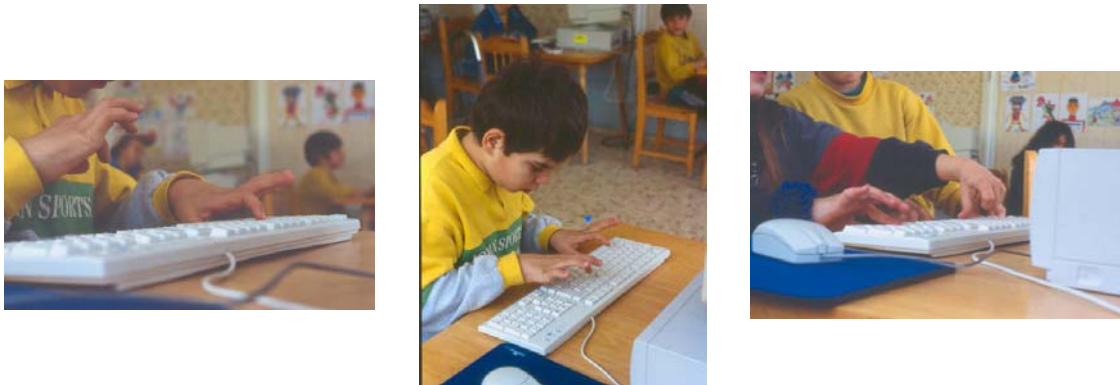


Figure 2. Problems with keyboard

More complicated development of the keyboard requires knowledge for graphical symbols of letter and numbers, limitations of the age is needful.

### 3.1. Mixed keyboard

They allow use of Latin and Cyrillic letters that may cause confusion especially when they are not written in different contrasting colours or font size (Fig. 3). Two problems arouse presence of two different letters on one and the same key (Fig. 4) and typing of one and same letter on two different keys (Fig. 5). For example: often children wonder which key to press to type A when it is on two keys.



Figure 3. Mixed keyboard

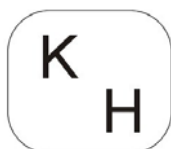


Figure 4. Two different letters on one and the same key



Figure 5. One and same letter on two different keys

### 3.2. Mirror image of the letters

Children with problems often replace letters with their mirror images (Fig. 6). They confuse the letters **E** with Cyrillic letter **З** or **Э**, or change Cyrillic letter **И** with Latin **N**.

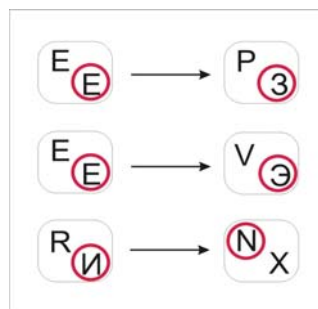


Figure 6. Mirror images of letters

### 3.3. Shortcut keys

Problems are aroused by usage of special keys – Enter, Backspace, Ctrl, Shift, Alt, CapsLock, ESC. Shortcut keys like shift and letter (for typing capital letter) also is difficult, not only the physical movement (pressing two keys at a time) but also remembering these combination and why everyone is used (Fig. 7).



Figure 7. Using the shortcut keys

### 3.4. Orientation skills

Finding and remembering the position of a certain key on the keyboard requires orientation skills – up, down, left, right which is one of the problems connected with special dispraction of handicapped children. Although in this case we talk about orientation in keyboard area, not for spation orientation is using arrow keys (left, right, up, down). Children having problems with spatial orientation or proved spatial dispraxy show difficulty in coordination between keyboard use and following the symbols appearing on the screen. When working with arrow keys except finding their position on the keyboard they should comprehend the link between physical moves with them and their effect on the objects on the screen (pressing arrow key causes movement of the objects on the screen). Children easily understand the meaning of pressing key with symbol (letter or number) – the symbol appears on the screen. The case with arrow key is different – it causes the object's movement (weather it is a game character, picture or text cursor). Handicapped children find it difficult to perceive it. The reason for that is simultaneous use of two objects – on one side the keys, on the other the object controlled by them.

## 4. Standard keyboard and its alternatives

Main factors, defining the choice of a keyboard, are the type and the stage of deficiency. Some deficiencies, like in visually handicapped children, impose using special keyboards (Fig. 8). In other cases it is possible, even recommended, using a standard keyboard.

We should narrow the number of the discussed cases and stress only on the group of handicapped children we work with and the specific problems they have. In this way we are going to support our choice of keyboard for the needs of these children.

The target group consists of physically handicapped children. Children with cerebral palsy have a congenital malformation of the brain, meaning that the malformation existed at birth and was not caused by factors occurring during the birthing. Children with cerebral palsy have many problems, not all of them related to the brain injury. The developing brain can be affected by several factors, which affected movement coordination, fine motoric, speech development, perceptions, emotions, etc. Cerebral palsy could be combined with other disabilities like epilepsy, deafness, dyspraxia [2].

In most cases the problems in acquiring using keyboard are caused by stage of paralysis of upper limbs and damages of gross motoric (very often these children can use only fingers or one hand) and damages of fine motoric. The difficult coordination of the movements arouses a problem in choosing concrete key from the keyboard.

Preferred usage of standard keyboard with children having cerebral palsy is supported by some factors. Despite the characteristics of the disease these children have great potential. During the proceeded training with a standard keyboard the mentioned problems despite the difficulties are surmountable. With time every child finds the best position of the hands and the body. Very often only one hand is used while the other provides stability for the body. In this case the biggest problem is working with shortcut keys. In spite of these problems each child finds individual solution for every situation with teacher's supporting in most cases. The most important thing is that (no matter of the difficulties) for these children is possible to use standard keyboard.

If we teach children to use alternative keyboard, we should expect a lot of problems when placing the child in different environment (at home, at school, at computer club, etc.) where using standard keyboard is needful. A child, used to work only with alternative keyboard, is going to fail. The child is totally dependent of the device he or she has the skill to work with. This change from alternative to standard keyboard will take more time and efforts.

Last but not least, our choice is motivated by the high price of alternative keyboards - from 50 to 400 pounds.



Figure 8. Special keyboard BigKeys Plus, Keytools Ltd, Price: £99.95

## 5. What and how we learn from keyboard?

The first step when starting to use keyboard is to familiarize children with its elements. And how they separation in groups of the keys and their most general functions. Initially they must learn how to use the two main parts of the keyboard – symbolic and numeric pad. Step by step work with other keys and shortcut keys is introduced – quotation marks and symbols, arrow keys, letter + Shift for typing capital letter, Caps Lock for all capital letters, Enter for new paragraph, Esc for close program or dialog window.

We offer software solutions for pre-school teaching of handicapped children, developed in Comenius Logo. Training is based on games. Through them they acquire how to work with symbolic and numeric pad and arrow keys.

Beside the physical skills to work with keyboard these games offer different educational tasks, supporting intellectual development – counting, calculation, reading, logical arrangement, developing spatial orientation. From learning point of view using games follows pre-educational preparation aiming sufficient acquisition of school skills and habits and developing writing skills. A part of them is specially prepared for children with cerebral palsy. Characteristics of the disease are concerned and aim overcoming concrete problems. The other part is meant for children without deficiencies, but they are successfully used with handicapped children.

## 6. The educational games

All games have three or four levels and are developed for acquiring the use of the symbolic and numeric part of the keyboard. The educational aim is to find and remember position of each key on the keyboard [3].

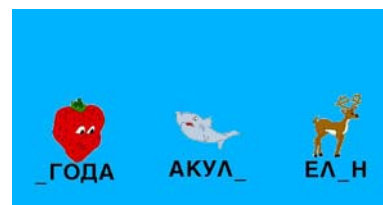
### Letters

The children input first letter in name of object appears on the screen. In different level children has different hint for help.



### Words

The children input missing letter in name of object appears on the screen. Position of missing letter is different in levels.



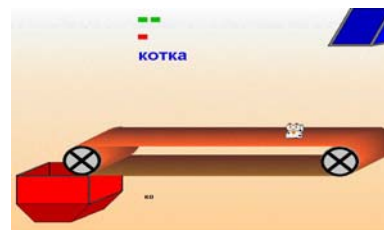
### Numbers

The children input number of objects appears on the screen. There is one and same objects in the first level and different ones in the next two levels.



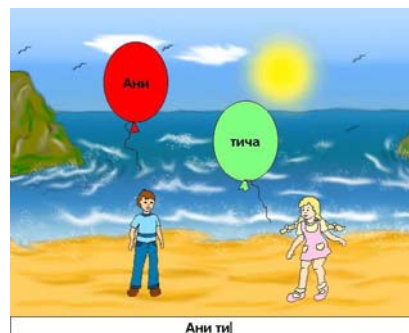
## Conveyers

The object falls down at the moving line. The child have to input its name before the object falls down in the box.



## Balloons

The balloons with words appears on the screen. Each word is different parts of sentence, like subject, verb etc. The user must construct sentence using the words and types it.



## 7. Influence upon children's development by usage of keyboard

Along the work with keyboard with children having cerebral palsy the following advantages and disadvantages were noticed.

Disadvantages appear when children have high degree of damages on the grobe function and when children have both physical and intellectual deficiencies. In both cases motivation for working with keyboard is low. Children find it impossible to acquire the skills as a result of difficult positioning of the hands on the keyboard and lack of abstract- logical thinking.

In the rest of the cases during the work with keyboard the following advantages are noticed:

Owing to Comenius Logo offered opportunities and specially developed training games, improvement on spatial orientation is observed. This is a very important component in educating children, influencing the skill of a child to work sufficiently with a computer.

This reduces frequency of mistakes such as replacing one letter with another and allows almost appropriate control of the games with arrow keys and key pads.

Development of writing through alternative methods influences general education and allows handicapped children to communicate, to express thoughts, feelings and wishes.

Usage of mixed keyboards from children with cerebral palsy and high intellect brings at one and the same time acquisition of using symbol keys in Latin and Cyrillic. This gives a rise to their further professional orientation.

## 8. Conclusion

Development of writing through alternative methods with children having cerebral palsy is based on usage of fine motoric of the child. It is connected to ability for acquiring writing techniques and visual memory that affects the memorization of the letters and combinations that form a syllabus and a word.

Working with keyboard gives opportunity of the children to develop their own writing skills, opening ways for new communication. The skill of using keyboard and a

computer as a whole offers positive perspective for their future development and professional horizons.

## 9. References

1. Ivanov I., Zafirova T., Jordanova N. (2001), paper *On mice and handicapped children*, proceedings, Eurologo'01: A Turtle Odyssey, Austrian Computer Society, Linz, Austria
2. Valente, J. A. (1983) *Creating a computer-based learning environment for physically handicapped children*, USA