

# In search of the keys...

Ivailo Ivanov, Temenuzhka Zafirova-Malcheva  
*Department of Information technologies, Sofia University*  
*5, James Boucher str, Sofia 1164,*  
*iivanov@fmi.uni-sofia.bg, tzafirova@fmi.uni-sofia.bg*

## Abstract

One of the applications of the personal computer people most often use is word processing. The most commonly used device for this activity is the keyboard. Healthy children find learning how to use keyboard quite easy, but it takes them some more time to remember where each symbol is situated on the keyboard. Children with physical and/or mental problems require different, step-by-step practical exercises in order to learn how to use keyboard. This process takes quite long time and is seldom crowned with success.

The paper shows the problems related to teaching children with cerebral palsy how to work with a keyboard.

## Keywords

Keyboard, Children with special needs, Computer skills, Speech, Communication

## 12. Introduction

There are two basic moments in computer education of children with special needs, which depend on the role of computer. Computer can be both a purpose and a tool of education. When the user is introduced to the computer system and work with mouse and keyboard, the computer plays the role of the purpose of education. When computer is used to gain new or assimilate old knowledge, it plays a role of a tool of education. These two stages of education can not be separated. They go together.

For children with special needs computer is a purpose of education when they have to master skills to work mainly with mouse and keyboard. These are the two basic peripherals used for input of, and access to computer data. The child has to master several skills needed for working with the computer, initializing and guiding the flow of processes.

The keyboard is a major device for “user–computer” system communication, not influenced by user interface. The other commonly used device, the mouse, is typical for graphical user interface. In some cases (like for text input) usage of mouse is much less helpful. Hence, it is necessary for children to learn how to use keyboard on the basic stage of the overall computer usage.

Process of this acquisition of these skills is short with healthy children and usually needs no special training programs. However, it is not the same case with handicapped children. With most of them setbacks in fine body motorics are noticed since earliest stages of development. Despite the correcting therapy, which helps to reduce the stage of these hindrances, most of these children need alternative methods of developing the writing speech, because of incapability of forming such personally.

These methods include using typing machines, like typewriters and computers. In this way the keyboard of computer turns out to be a basic mean of development of the writing skills of handicapped children.

### 13. A keyboard or a mouse?

For every user who works mainly with a computer it is obvious that in spite of the existence of a virtual keyboard, which may replace to some extent its physical equivalent, we are talking mainly about work with a **keyboard AND a mouse**.

It is an indisputable fact that mouse offers fast and convenient access to data and applications. After some time the computer mouse becomes the preferable device for interaction with computer and the reasons for its easy mastering are its simple design and little size. Children get used to it easily and quickly, it is little and compact and in its standard variation has only two buttons without symbols on them.

For handicapped children learning to work with the mouse is a harder achievement. Despite its simple design, its mobility makes it difficult to work with. The reason is the hand instability and chaotic movements that are typical for those children (Fig. 1). Using mouse requires stability of movements, exact positioning and holding the hand tightly (Ivanov I Zafirova T and Jordanova N, 2001a). Compared to the static position of the keyboard and its base for the child's hand, the computer mouse has less advantages for handicapped children.

Children with mental problems suffer other problems: they cannot perceive not only the physical connection mouse-screen (two different objects requiring coordination), but also the logical link: move of the mouse – move of the cursor on the screen. The problems facing the children with wrists paresis are in the improper grasp of the mouse, which makes operation with it more difficult (Ivanov I Zafirova T and Jordanova N, 2001a).

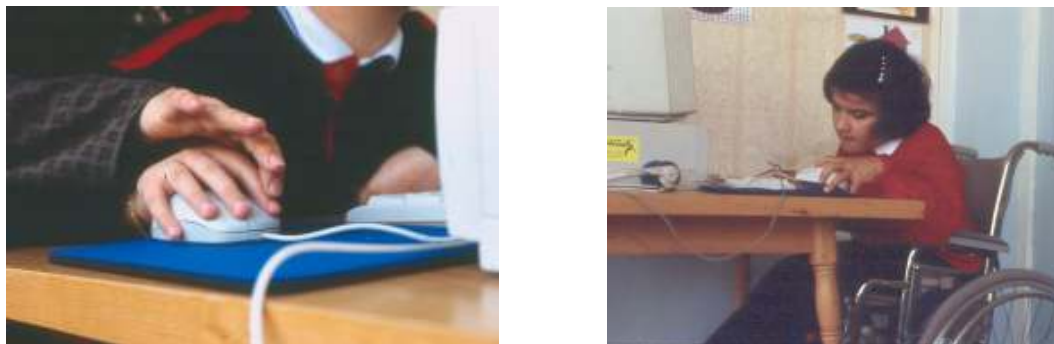


Figure 18. Problems with mouse

Mastering the work with keyboard, we meet other problems, that do not exist when working with mouse, mainly concerned with its construction, design and functioning. Children face a lot of keys, different symbols on them and different functions attributed to some of them. Thus we come to the point for alternative keyboard devices with a less complicated structure, including basic keys (Fig. 2).

### 14. Standard keyboard and its alternatives

The main factors, defining the choice of a keyboard, are the type and the stage of deficiency. Some deficiencies, like blindness and visual imparity, impose the usage of special keyboards (Fig. 2). In other cases it is possible, even recommended to use a standard keyboard.

We shall narrow the number of the discussed cases and stress only on the group of handicapped children we work with, and on 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 with cerebral palsy. Which is a congenital brain malformation. Children who suffer from cerebral palsy have many problems, not all of which related to the brain injury. The developing brain can be influenced by several factors, which affect movement coordination, fine motorics, speech development, perceptions, emotions, etc. Cerebral palsy may be accompanied by other disabilities like epilepsy, deafness, dyspraxia (Valente, J. A. 1983).

In most cases the problems related to learnign how to use keyboard are caused by the paralysis of upper limps and damages of grobe motoric (these children can often use only fingers or one hand) and damages of fine motoric. The difficult coordination of the movements arouses problems in choosing concrete keys from the keyboard.

Preferred usage of standard keyboard with children suffering from cerebral palsy is supported by some factors. Despite the characteristics of the disease, these children have great potential. Despite the difficulties, the problems mentioned are surmountable after continuous training with a standard keyboard. With time every child finds the best position of one's hands and body. Very often only one hand is used while the other provides body stability. In this case the biggest problem is working with shortcut keys. However, every child works out individual solution for every situation, with support from teacher in most cases. What is most important is that (no matter the difficulties) handicapped children are able to use standard keyboards.

Having taught children to use alternative keyboards, we should expect problems when place them in a different environment (at home, at school, at computer club, etc.) where standard keyboard is only available. A child, used to work only with an alternative keyboard, is prone to fail, because of the total dependence on the device he/she is skilful to work with. This change from alternative to standard keyboards may require more extra time and efforts.

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



Figure 19. Special keyboard BigKeys Plus, Keytools Ltd, Price: £99.95

## 15. Problems with keyboard

Although the static position of the keyboard offers advantages of less physical efforts, its utilisation requires other skills and raise other problems (Fig. 3).



Figure 20. Problems with keyboard

More complicated construction of the keyboard requires knowledge for the graphical symbols of letters and numbers, and imposes limitations of the age.

**15.1. Mixed keyboards**

Mixed keyboards allow usage of Latin and Cyrillic letters, which may cause confusion especially when they are not printed in different contrasting colours or font size (Fig. 4). Two problems arise:

- presence of two different letters printed on one and the same key (Fig. 5), and
- having one and same letter printed on two different keys (Fig. 6).

For example: children often wonder which key to press to type “A” when it occurs on two keys (because of the different Latin and Cyrillic keyboard layouts).

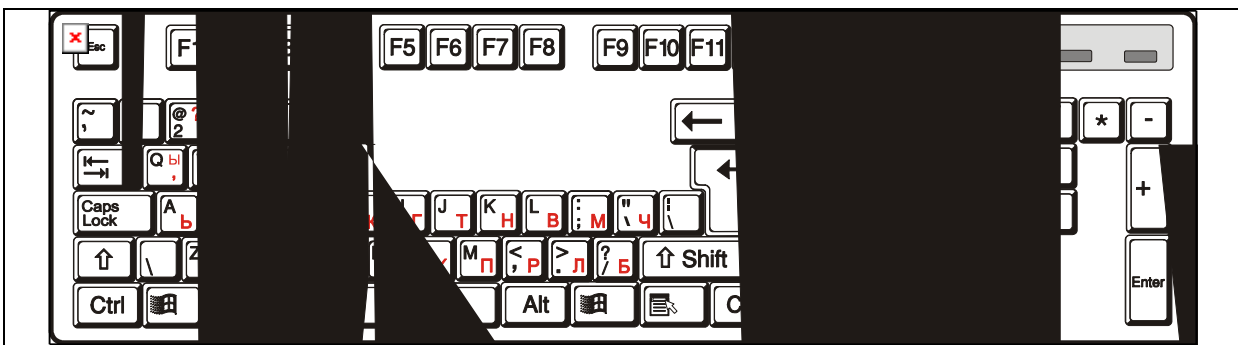


Figure 21. Mixed keyboard



Figure 22. Two different letters on one and the same key



Figure 23. One and same letter on two different keys

### 15.2. Mirror image of the letters

Children with disabilities often replace letters with their mirror images (Fig. 7). They confuse the letter **E** (appearing in both layouts) with the Cyrillic letters **З**, **Э** and number 3, Cyrillic letter **И** with Latin **N** or change Cyrillic letter **Я** with Latin **R**.

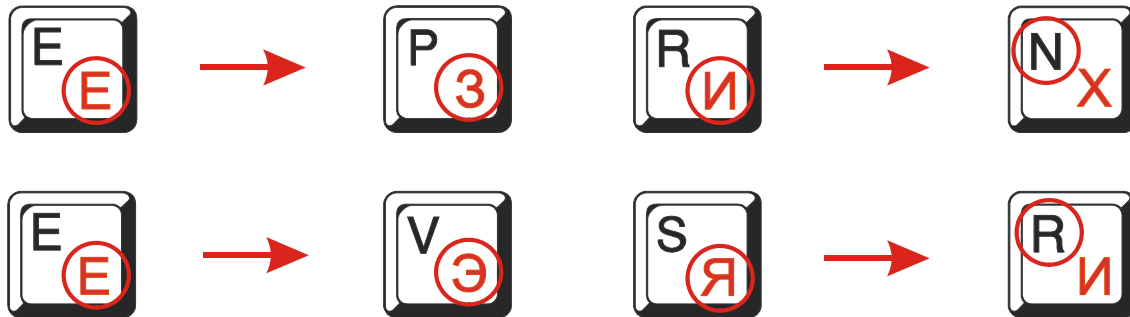


Figure 24. Mirror images of letters

### 15.3. Shortcut keys

Problems arise with the usage of special keys – **Enter**, **Backspace**, **Ctrl**, **Shift**, **Alt**, **CapsLock**, **ESC**. Shortcut keys like **Shift** plus letter (for typing a capital letter) are also difficult, not only for the physical movement (pressing two keys at a time) but also for memorizing the combinations (Fig. 8).



Figure 25. Using the shortcut keys

### 15.4. 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 related to special dispraction of handicapped children. Although in this case we talk about orientation in the keyboard area, not for spatial orientation is using arrow keys (left, right, up, down). Children suffering from problems with spatial orientation or spatial dispraxy exhibit difficulties in coordination between use of keyboard and tracing the symbols appearing on the screen. Apart of locating the arrow keys on the keyboard, children should comprehend the link between the physical moves and their effect on the objects on the screen (pressing an arrow key causes objects' movement on the screen). Children easily understand the meaning of pressing a symbolic key (letter or number), because the symbol appears on the screen. The case with an arrow key is somehow different – it causes the object's movement (whether it is a game character, a picture or the text cursor). Handicapped children find it difficult to perceive it. The reason is the simultaneous use of two objects – arrow keys on the one hand, and the controlled object, on the other hand.

## 16. Conclusion

The keyboard and the mouse are complementary devices and by no means replaceable when working with children with special needs. Which of both will be used depends completely on the type and complication of the illness, the child's individual characteristics and his/her personal preferences.

Overcoming the problems related to mastering the work with keyboard demands special approach, well trained teachers and eligible software (Ivanov I Zafirova T and Jordanova N, 2001b; Ivanov I Zafirova T and Jordanova N, 2005), suitable for the children's needs.

## References

1. Ivanov I Zafirova T and Jordanova N (2001a), *On mice and handicapped children*, proceedings, Eurologo'01: A Turtle Odyssey, Austrian Computer Society, Linz, Austria
2. Ivanov I Zafirova T and Jordanova N (2001b), *Special games for handicap children to get control on the mouse*, proceedings, Eurologo'01: A Turtle Odyssey, Austrian Computer Society, Linz, Austria
3. Ivanov I Zafirova-Malcheva T and Jordanova N (2005), *Let's play with keyboard*, EUROLOGO'05
4. Valente, J. A. (1983) *Creating a computer-based learning environment for physically handicapped children*, USA