

## THE USE OF CALCULATORS AND PERSONAL COMPUTERS IN SECONDARY AND HIGH SCHOOLS

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### **Abstract**

*By implementing the 1998 updated curriculum, the calculator and the personal computer were given a place in school. So parallel to implementing other new elements, the use of pocket calculators and personal computers is also introduced. In my paper, I would like to present some decisions and guidelines regarding the introduction and use of calculators and personal computers to secondary and high schools.*

### **CALCULATORS**

The main focus or feature of the introduction of pocket calculators is its systematic approach, and the fact that they are implemented particularly as a tool for calculations and partially as a cognitive mean.

Ways of introducing pocket calculators:

- The use of pocket calculators is introduced at the 6<sup>th</sup> grade of learning.
- In secondary school a standard type of pocket calculator is recommended.
- At the moment graphic and symbolic calculator are not in use.
- Pupils are first systematically taught to work with pocket calculators (checking, evaluation, consideration of precedence of mathematical operations, finding about divisibility, calculations of the value of expressions, calculations with signed numbers etc.).
- The use of calculators within math lessons is limited to certain lessons; **at the same time**, the importance of the knowledge of written and oral algorithms is emphasised.
- Every math classroom should be equipped with a set of pocket calculators.

## WAYS OF USING POCKET CALCULATORS

### **Pocket calculator as an educational mean:**

The pocket calculator is used as an educational mean in introducing and composition as well as for illustrating expressions and procedures. In this case, it is possible to pursue various cognitive goals. With the help of a pocket calculator, numbers and the relations among them can be investigated. With this type of activities pupils learn to discover, to hypothesise, to substantiate and similar processes.

### **Pocket calculator as a calculation tool:**

Pocket calculators are used as a calculation tool when calculations are carried out that are already well understood and adopted. In the simplest case, it is used as a device for basic calculations or as a substitute for calculation tables. It can also be used for checking the calculations that were previously carried out without a calculator. If with certain contents calculators are used, the attention can be focused more at cognitive aims.

For efficient use of pocket calculators, it is important to teach the pupils and make them aware of the possibilities offered by the use of a pocket calculator in at least three fields:

#### **1. Familiarise with pocket calculators and its operation**

In the new curriculum for the nine-year secondary school a systematic introduction of pocket calculators is anticipated in special classes, where pupils should become familiar with the use of pocket calculators and get to know the possibilities offered by them (for example, precedence of mathematical operations, bracketing, memory, use of constants, possibility of rounding up to a certain number of decimal places, rounding up of numbers in general, searching for roots, 2<sup>nd</sup> and 3<sup>rd</sup> degrees of numbers (instead of tables), random etc.).

## **2. Deliberate use of pocket calculators**

Pocket calculators are used in secondary schools especially when teaching algorithms is not the primary goal, serving to ease the learning process of other contents.

### **When to introduce pocket calculators in class?**

Pocket calculators should be introduced in class when calculating algorithms is well understood and when they are required as a calculation tool. **Gradually in our schools, pocket calculators are increasingly used also as a cognitive mean, and the lessons, thanks to pocket calculators, are problem oriented.**

### **Getting to the matter and the scope of it**

Since performing calculations with the help of a pocket calculator is quicker and easier, more actual data can be used in exercises, the problems can be more complex. The time gained can be used for problem analysis and better understanding.

## **3. Teaching with pocket calculators offers also the opportunity of reaching those cognitive goals that could not be reached without them.**

The pocket calculator is used also as a tool for reaching other cognitive goals that can not be reached without a pocket calculator (the pocket calculator provides the possibility to carry out more measurements, calculations), and this way pupils gain their own experience, they themselves get to certain cognitions, since the solving of a problem is not burdened by calculation algorithms. If with certain contents calculators are used, more examples can be discussed, they can be more realistic thus gaining more experience, and first of all, the attention can be focused on the discussed cognitive goals. When testing the proficiency and evaluating

it, pocket calculators, as a rule are not used, except when dealing with specific contents or upon special assessment of the teacher.

### **PERSONAL COMPUTERS**

In secondary school, the curriculum anticipates the use of personal computers in connection with spreadsheets. It is also anticipated that the pupils are already familiar with the operation of a personal computer, this means that the familiarisation is not part of math lessons. During math lessons, they only learn how to use spreadsheets. Such lessons, of course, have to take place in a computer classroom.

Very interesting are programmes for learning geometry, Derive, programmes for calculation skills training.

The use of such programmes is at the discretion of the teacher. The same is true for the possibility of using a dedicated "class" PC, be it as a demonstration tool or for the individual work of pupils.

The National Educational Institute develops didactic methods in teaching mathematics with the help of PCs. The individual schools in cooperation with the National Educational Institute develop different approaches and solutions in using PCs in math classes within the framework of innovative projects. Most widely used is the Derive software and software for learning geometry.

### **References**

- Magajna Z., Žakelj A., Introducing Calculator to secondary school, Matematika v šoli, 2000
- Gowland D., 1998, Calculators, Help or Hindrance, Mathematics in School, January, 26-28
- Porkess R., 1998, The Proposed Calculator Ban, Micromath, Autumn, 22-27
- Jakob M., 1996, Težave pri uporabi žepnih računal na srednjih tehniških šolah, diplomsko delo, Pedagoška fakulteta, Ljubljana