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## COMPUTER - INFORMATICS LITERACY AND POSSIBILITIES OF COMPUTING EXTRA-CURRICULAR ACTIVITIES

## INFORMATIČKA PISMENOST I MOGUĆNOSTI RAČUNARSKIH IZVAN-NASTAVNIH AKTIVNOSTI

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### *Abstract*

The following article analyzes some of the results of investigation "Present State and Trends of Using Computers in Slovenia Primary and Secondary Schools". This work is elaborated by the author every two years for Ministry of education and sport and national project "Informatization of Slovenian Educational System". Article analyzes some didactic criteria of teaching computer science and first of all performing computing extra-curricular activities at primary, secondary and boarding schools in sense of improvement on computer – informatics literacy.

### *Sažetak*

U ovom radu, predstavljen je pregled rezultata istraživanja »Stanje i trendovi korištenja kompjutera u slovenskim osnovnim i srednjim školama«, kojeg je autor izveo za potrebe Ministarstva za školstvo i šport i projekta »Informatizacija slovenskog obrazovnog sistema«. Rad analizira didaktičke i opće rubne uvjete učenja računarstva i informatike s posebnim osvrtom na mogućnosti vannastavnih djelatnosti tog područja u svrhu bolje računarске - informatičke pismenosti.

### 1. INTRODUCTION

Extra-curricular activities are an integral part of the curriculum of primary and secondary education. The attention of extra-curricular activities is to discharge pupils of school, but it is also one of the means how to expand and build up general and specific knowledge connected with the aims of programs that are executed by individual school and with social environment, where the school operates. Pupils can discover areas that are not defined in their education program. They can realize and develop their talents and preserve their specialty or diversity. Because of the free choice between individual activities pupils' should change their attitude towards work and their responsibility for their own decisions.

The number of extra-curricular activities is defined in the curriculum. On average, extra-curricular activities are being performed 30 hours in 30 or 35 weeks per school year. They are organized

differently. It depends on the number of pupils, characteristics of activity and the program itself.

Every extra-curricular activity is performed according to the program, which is prepared by the mentor of activity in collaboration with pupils. Programs should include those pupils, who already attended activity in the previous year and the new ones.

Besides regular school program and optional program of computer science or informatics computing extra-curricular activities are important for gaining basic computer or informatics knowledge in the primary, secondary and boarding schools. Computing extra-curricular activities are poorly represented in primary and in secondary schools. Let us concentrate on these activities. The results of the research or analysis about the state and possibilities in the last decade show that these activities do not have the position they should have in Slovene primary, secondary and boarding schools!

## 2. TEACHING INFORMATICS AND PERFORMING COMPUTING EXTRA-CURRICULAR ACTIVITIES IN SECONDARY SCHOOLS

Let us begin with the question about popularity of informatics in secondary schools. As shown on Figure 1, the majority (66.1%) of secondary

schools believe that the subject is popular, 18.6% of schools believe that it is moderately popular and 15.3% of schools believe that it is very popular. No school answered that Informatics is less popular or unpopular.

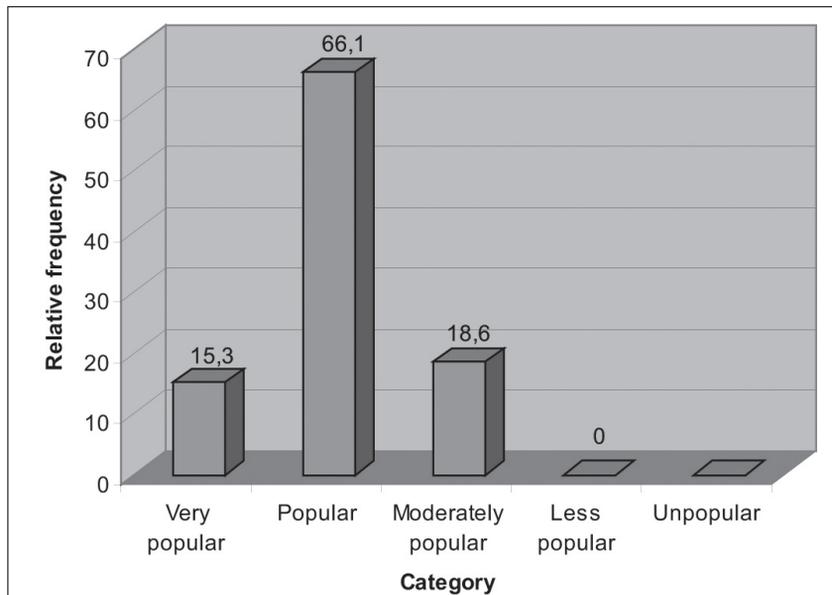


Figure 1: The popularity of informatics.

The fact, that **computing extra-curricular activities** in secondary schools are performed extremely seldom, surprised us (the average is beyond 20% of schools). The most frequently it is performed in the first (37.2% of schools) and in the second year (26.9% of schools), very seldom in the 3<sup>rd</sup> and in the 4<sup>th</sup> year. Table 1 shows us the types of extra-curricular activities, which are performed by secondary schools.

We cannot be enthusiastic over the results. If schools perform extra-curricular activities, they are performing it on the area of applicative computer science and regular program of informatics. The most frequent extra-curricular activities are text editing (36.9% of schools), work with graphics software (32.6%), web page editing with tools like FrontPage (36.9%) and web page editing with web languages (e.g. HTML, PHP, VRML, etc.) (34.3% of schools).

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science and regular program of informatics. The most frequent extra-curricular activities are text editing (36.9% of schools), work with graphics software (32.6%), web page editing with tools like FrontPage (36.9%) and web page editing with web languages (e.g. HTML, PHP, VRML, etc.) (34.3% of schools). Secondary schools seldom perform other activities that are interesting for pupils (e.g. multimedia, robotics, computational measurements, creating educational programs). It is a loss and a great didactics and professional deficiency. A sharp depression of any kinds of programming is of particular concern. If frequencies would be a little bit higher we would understand that all work in secondary schools is done massively at applicative area, but schools should not comply at an extremely important area of computer science, and this is programming. Just a few data for the insight: JAVA programming is performed /1/ in 7.8% of schools, Visual Basic Programming in 10.5% of schools, Delphi programming only in 10.8% of schools and C++ programming only in 9.1% of schools.

**Table 1:** Types of extra-curricular activities, which are performed by secondary schools.

Extra-curricular activities	Very frequently	Frequently	Moderately frequently	Rarely	No	$\Sigma$
	f (f%)	f (f%)	f (f%)	f (f%)	f (f%)	f (f%)
JAVA programming language	0 (0.0)	5 (5.6)	2 (2.2)	10 (11.2)	72 (80.9)	89 (100)
Visual Basic programming language	1 (1.2)	5 (5.8)	3 (3.5)	8 (9.3)	69 (80.2)	86 (100)
Delphi programming language	1 (1.2)	3 (3.6)	5 (6.0)	7 (8.3)	68 (81.0)	84 (100)
C++ programming language	3 (3.4)	2 (2.3)	3 (3.4)	4 (4.6)	75 (86.2)	87 (100)
Web page editing with tools (e.g. FrontPage)	9 (9.5)	26 (27.4)	15 (15.8)	18 (18.9)	27 (28.4)	95 (100)
Web page editing (with web languages, e.g. HTML, PHP, VRML, etc.)	13 (12.7)	22 (21.6)	17 (16.7)	10 (9.8)	40 (39.2)	102 (100)
Text editing	17 (18.3)	17 (18.3)	16 (17.2)	5 (5.4)	38 (40.9)	93 (100)
Work with graphics software (software for painting, drawing, etc.)	11 (11.2)	21 (21.4)	20 (20.4)	13 (13.3)	33 (33.7)	98 (100)
Multimedia (sound)	6 (6.5)	8 (8.7)	27 (29.3)	9 (9.8)	42 (45.7)	92 (100)
Multimedia (animations)	5 (5.4)	6 (6.5)	22 (23.7)	20 (21.5)	40 (43.0)	93 (100)
Multimedia (video)	8 (8.7)	9 (9.8)	17 (18.5)	18 (19.6)	40 (43.5)	92 (100)
Computational measurements	1 (1.1)	4 (4.4)	7 (7.8)	11 (12.2)	67 (74.4)	90 (100)
Robotics	2 (2.2)	5 (5.6)	3 (3.3)	5 (5.6)	75 (83.3)	90 (100)
Creating educational programs	0 (0.0)	1 (1.2)	3 (3.5)	8 (9.3)	74 (86.0)	86 (100)

This situation transmits casual-consecutively on extremely low attendance at all kinds of computer science competition for students. There are only 10.2% of first year students, 17% of second, 17.2% of third and 10.8% of fourth year students that attend these competitions.

Schools' evaluation about the attendance of optional program and extra-curricular activities of informatics give us a bit of optimism. It is presented on the Figure 2. Both subjects are pretty stable and have adequate growth rate.

To handle our issue we need schools' opinions about which skills and knowledge should pupils gain

till the end of secondary school. As we presumed, very positive answers are frequently /2/ related to the following areas (Table 2): how to use WWW for learning, practical assignments and communication (99.1%), basic computer skills (using a keyboard, using a mouse, saving and searching files, printing, etc.) (97.3% of schools), writing documents with text editors (96.5%), communicating with teachers and other pupils via e-mail (85.1%) and understanding the importance of security in e-communication (84.9%).

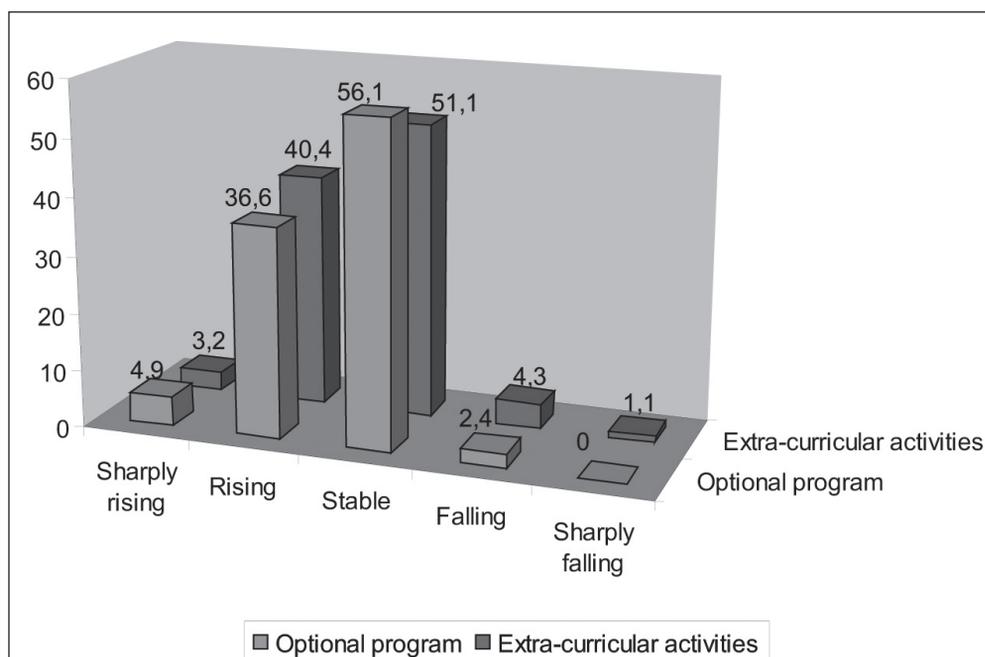


Figure 2: The attendance of optional program and extra-curricular activities of informatics

Following skills or knowledge is judged less, but still positive enough: calculating with tables (making tables, using functions – formulas) (73.4%), making pictures with graphics software (62.8%), using multimedia (sound, animations, video) (62.3%), presentation software (e.g. We were surprised by the

greatest number of negative answers /3/ or opinions (Table 2) that students do not need skills for simple programming (e.g. with traditional programming languages like Delphi, C++ etc. or web languages like HTML, PHP, JAVA) (61.4%).

PowerPoint) and database software (56.8%).

**Table 2:** Which skills should students gain till the end of secondary school

Area	Entirely	To appreciable extend	Partly	Rarely	Nothing	Σ
	f (f%)	f (f%)	f (f%)	f (f%)	f (f%)	f (f%)
Basic computer skills (using a keyboard, using a mouse, saving and searching files, printing)	99 (86.8)	12 (10.5)	3 (2.6)	0 (0.0)	0 (0.0)	114 (100)
Writing documents with text editors (typing, editing, designing)	82 (71.9)	28 (24.6)	4 (3.5)	0 (0.0)	0 (0.0)	114 (100)
Making pictures with graphics software	26 (23.0)	45 (39.8)	36 (31.9)	5 (4.4)	1 (0.9)	113 (100)
Using multimedia (sound, animations, video)	24 (21.1)	47 (41.2)	39 (34.2)	4 (3.5)	0 (0.0)	114 (100)
Calculating with tables (making tables, using functions – formulas)	31 (27.4)	52 (46.0)	26 (23.0)	4 (3.5)	0 (0.0)	113 (100)

Using presentation software (e.g. PowerPoint) and database software	25 (22.6)	38 (34.2)	31 (27.9)	15 (13.5)	2 (1.8)	111 (100)
Writing simple programs (e.g. with traditional programming languages Delphi, C++ and web languages HTML, PHP, JAVA)	4 (4.0)	10 (9.9)	25 (24.7)	38 (37.6)	24 (23.8)	101 (100)
Communicating with teachers and other students via e-mail	62 (54.4)	35 (30.7)	11 (9.6)	5 (4.4)	1 (0.9)	114 (100)
Using WWW for learning, practical assignments and communication	72 (62.6)	42 (36.5)	1 (0.9)	0 (0.0)	0 (0.0)	115 (100)
Understanding the importance of security in e-communication	51 (45.1)	45 (39.8)	14 (12.4)	3 (2.7)	0 (0.0)	113 (100)

### 3. COMPUTING EXTRA-CURRICULAR ACTIVITIES – MODEL

As we have already stressed, computing extra-curricular activities are besides regular school program and optional program of computer science or informatics an important form for gaining basic computer or informatics skills in secondary schools. On the one hand, it pleasantly widens and deepens general and specific knowledge about information and communication technology. On the other hand,

students can discover areas that are not defined in the program of computer science and informatics. They can realize their talents, develop them and preserve their specialty or diversity. Let us look the variant solution of the global program of computing extra-curricular activities. An analysis has been done and on the basis of the structure of extra-curricular activities, aims realized in secondary school and contemporary and interesting themes for students we suggest following computing extra-curricular activities (Figure 3):

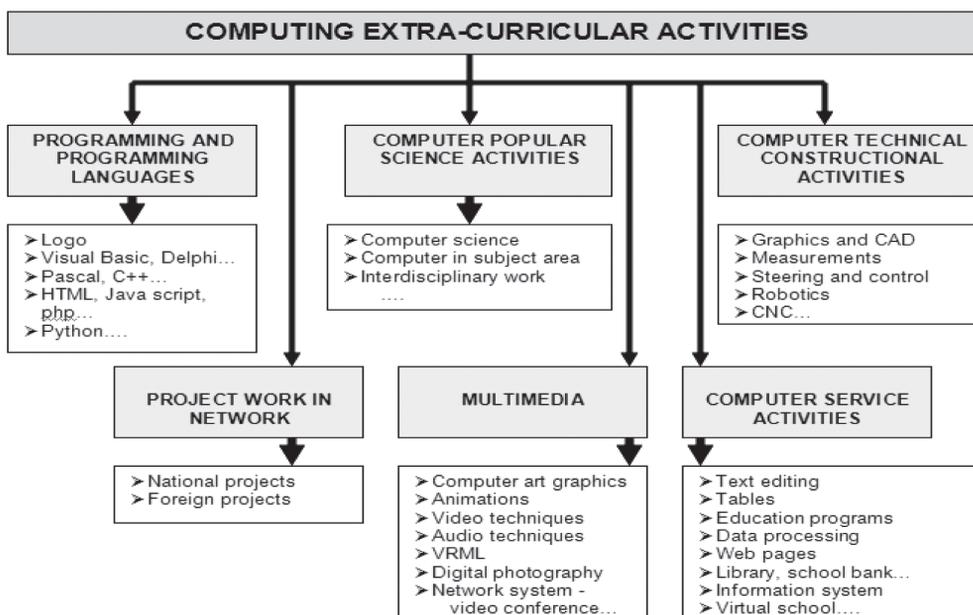


Figure 3: The model of computing extra-curricular activities

- programming and programming languages,
- project work in network,
- computer popular science activities,
- computer technical constructional activities,
- multimedia and
- computer service activities.

When computing extra-curricular activities were introduced in our schools, especially in secondary schools, **programming and using programming languages** was performed the most frequently. Computer competitions, summer schools, camps, etc. encouraged it at all levels of education. Teachers were teaching programming languages like LOGO, Basic, Pascal (on home and personal computers) and C or C++. In modern time object-oriented languages (Visual Basic, Delphi) and web languages (HTML, JavaScript, JAVA, PHP, VRML, PYTHON, etc.) were taught. We should awaken this area again to ensure necessary workers for the future in our or in the European information communication technology.

#### 4. CONCLUSION

According to several computing extra-curricular activities there are basically two:

extra-curricular activities outside the school, organized by the school itself (Figure 3) and

**out-of-school activities**, organized and directed by other organizers (boarding schools, associations, clubs, unions, summer schools, etc.) with or without an agreement with the school.

The out-of-school activities that are not organized by schools themselves are an important factor for obtaining the computer and informatics

knowledge. That is why schools have to encourage their students to participate in activities and help outsourcers with its implementation. Out-of-school activities complement the program of school activities and connect the school with its near and far surroundings. Computing extra-curricular activities in boarding schools are especially important. They can imply a partial or the whole structure of the model in Figure 3.

#### References

- /1/ ... Joint categories: very frequently, frequently and moderately frequently (Table 1).  
 /2/ ... Joint categories »entirely« and »to appreciable extend«.  
 /3/ ... Joint categories »rarely« and »nothing«.

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