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Present role of informatics teachers in view of applications

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Abstract

Six years after major political changes, and following many years of heated discussions, the Hungarian National Curriculum was finally created in the latter part of 1995. The new regulation identified a compulsory curriculum for informatics, specifying basic requirements at different school levels, as well as the use of applications in other curriculum areas to support learning skills, thinking, self education, exploration and problem solving. Seeking to match the general requirements of the National Curriculum with regards to application systems, this paper describes the goals for informatics teacher training planned through some topics of taught courses.

Keywords

Elementary education, secondary education, teacher education, curriculum development, informatics as a study topic, national policies

1 INTRODUCTION

According to the 130/1995 (Hungarian Gazette 1995 No. 91) government decree, our new National Curriculum has finally been agreed and produced. The new regulation was much awaited, for it was anticipated that it would provide a more flexible background for the development of individual school curricula, breaking away from the line of centralised regulations of the past. It states only those requirements that will provide an equal minimal base, both in terms of content and proportion, for all national schools (irrespective of different school type). On the other hand it allows a great deal of freedom for developing differentiated individual curricula, adjusted to particular circumstances and aimed at the pedagogical values of schools, parents, and students.

2 GUIDELINES

The flexible requirements are achieved through the following guidelines:

- The total requirements are formulated to enable schools within average settings to fulfil the tasks in 50-70% of the total time prescribed in the educational regulation, allowing complementary activities according to individual choice and values.
- The contents and requirements are formulated in terms of general cultural fields and sub-fields rather than by subject, to facilitate schools in developing and grouping the contents of their subjects individually.
- Requirements are not defined by grades, but build on the characteristics of age groups who require different teaching-learning strategies, divided accordingly into periods which end in the 4th, 6th, 8th, and 10th grades, thus providing guidance towards the requirements of the basic cultural knowledge examination at the end of the 10th grade.

The new National Curriculum not only allows the use of different educational books and materials, but encourages the individual preparation of such aids by schools.

The cultural fields and sub-fields specified in the National Curriculum can be seen in the table below. These fields and sub-fields can be grouped into subjects in several ways, according to the amount of compulsory and non-compulsory course hours in individual school policies. Hence, the hours required in each field can only be expressed in approximate proportions (see Table 1).

Table 1 Required hours for different cultural fields

Cultural field	**school grades (value in %)**			
	1-4	**5-6**	**7-8**	**9-10**
Native language and literature (Hungarian language and literature; language of ethnic minorities and literature)	32-40	16-20	11-13	11-13
Living foreign languages	-	11-15	9-12	9-13
Mathematics	19-23	16-20	10-14	10-14
Man and society	4-7	5-9	10-14	10-14
Man and nature (science experience; physics; chemistry; biology and health education)	5-9	8-12	16-22	15-20
Our earth and surroundings	-	-	4-7	4-7
Arts: music; dancing; drama; visual culture, movie and media culture	12-16	12-16	9-12	9-12
Informatics: computer science; library use	-	2-4	4-7	4-7
Life style and practical knowledge: technical; domestic science and management; career orientation	4-7	5-9	6-10	5-9
Physical training and sports	10-14	9-13	6-10	6-10

The National Curriculum states requirements by dividing them into three categories:

- material to be taught to master and develop particular skills;
- requirements for the development of competencies;
- minimal requirements for passing specified grades.

Table 2 Material to be taught within specified periods

	Till end of 6th grade	Till end of 8th grade	Till end of 10th grade
Basics of computer science	Computers and their surroundings. Introduction to basic issues of informatics. Using calculators. The sense of orders of magnitude.	Handling computers and accessories. Basic issues about informatics. Historical review of computers. Informatics in Hungary.	Types and characteristics of hardware equipment. Tools of textual and graphical man-machine interaction. News, information, and data types.
Use of operating system		Use of operating systems: Basic knowledge of operating systems used in schools. Use of utilities.	Use of operating systems: Solving problems on the level of the operating system; use of utilities. Getting acquainted with the role of networks. The basics of networks.
Running programs		Use of computers in learning and acquiring knowledge through educational programs.	
Converting to algorithms	Composing algorithms in text and diagrams, and understanding them.	Developing algorithms through text and diagrams. Coding a simple algorithm.	Developing algorithms and coding. Knowledge of a few commands in a programming language.
Computer aided problem solving		Logical games. Simulating random events. Modelling simple natural and economic events.	Modelling processes. Optimisation. Fine-tuning existing programs in order to solve problems.
Constructing, editing text and pictures		The meaning of text and picture construction, editing. The basic handling of a word processor and a drawing tool.	A more thorough view of the functions of word processing and picture editing. Knowledge of the main functions of a word processor and a picture editor.
Databases and spreadsheets		Introduction to databases and spreadsheets: Simple search problems. Connection between data.	Function of spreadsheets. Entering and editing data. Basic ideas of functions, graphs, diagrams, histograms, connections and differences. Problems of searching and queries in databases. Maintenance of databases.

For convenience, the table of requirements presented here (in Table 2) encompasses a short abstract of the first categories only. The field to be investigated is that of informatics, including the ability to access, process, and transmit information, as well as the legal and ethical issues of information handling.

Educators of all subjects have to use materials, taking several common concepts into consideration - among others, the craft of learning, thinking, self education, exploration and problem solving using all available tools. Most of the information that reaches us today is transmitted not by natural means, but through artificial channels. Students have to master the ability to sort out the important pieces from the mass of information poured on them. The field of informatics thus represents a major part in education, even if the proportion in the table does not reflect this emphasis. The versatility of the computer in itself, and as part of a wide network, provides a new tool that is increasingly available, thus having to be accounted for in sophisticated problem solving that is of concern to various fields.

The main source of today's learning is centred in modern libraries, thus the importance of searching, finding, abstracting, and handling information according to needs has to be mastered through the sub-field of library informatics.

With younger age groups, the main issues of traditional library use are investigated: printed and non-printed document types and their characteristics; tools used for direct and indirect orientation; writing up on a theme using library materials and documents; information centres, libraries, databases; the ability of using libraries to search for information; main steps and methods in independent information acquisition; and the need for proper form and ethical references.

With older age groups, the tools for orientation in libraries have to include knowledge about: data storage and advanced forms and techniques of information processing; computerised catalogues, bibliographies and other library related databases; techniques of intellectual work, independent acquisition of knowledge, acquiring and deepening knowledge about library use and its complex role in problem solving.

3 BACKGROUND OF TEACHER TRAINING IN HUNGARY

There are three other universities besides Loránd Eötvös University (ELTE) in Hungary that are involved in the training of secondary school teachers: Attila József University of Arts and Sciences (Szeged), Lajos Kossuth University of Arts and Sciences (Debrecen), and the University of Veszprém (Veszprém). There are five colleges in Hungary that are involved in training elementary school teachers: Gyula Juhász College of Education (Szeged), Dániel Berzsenyi College of Education (Szombathely), György Besenyei College of Education (Nyiregyháza), Károly Eszterházy College of Education (Eger), and the Teacher Training College-Level Faculty at ELTE (Budapest).

Continuous consultations and coordination over the past few years led to two systems for the development of graduation requirements being equally accepted and put in place recently (one at university level and the other at college level). The next step in this co-ordinated system should look at how attained credit levels in subjects can facilitate the mobility of students, enabling them to complete part of their studies in one university and part in another.

At present, the number of informatics/computer science teachers who have already graduated or are presently studying is about 2,800 to 2,900. Among these, 1,710 students graduated from the Loránd Eötvös University and Lajos Kossuth University and the number of students presently studying there is about 800. At Attila József University, the University of Veszprém and at the teacher colleges, the graduation of informatics teachers goes back historically only two years, with a very small number of students graduating each year (between 15 and 30 per year). The first informatics teachers graduated about 10 years ago. Since then 2 to 3 generations of computers have changed in schools, not to mention the changes of software. About 2 to 3 informatics teachers per school is the target aimed at, which means that about 10 to 15 thousand teachers of informatics are necessary, far more than can be trained in the near future.

Another possible path to provide for an adequate IT application in education is through teachers of subjects other than informatics. Librarian informatics is a new subject that can be chosen only very recently, thus the graduation of such teachers can only be realised in the future. Basic IT education for other teachers is in an even worse situation.

4 CONCEPTS IN TEACHING APPLICATION SYSTEMS

Concentrating on basic IT concepts, the aim of teaching lies in its uses in everyday life. Thus the tools of IT, both hardware and software, have to be considered as a single unit, providing a solution for a targeted job. Their possibilities and limits of use reflect the value of their application. This value, however, does not mean the range of technical tricks attainable, but the path of possible solutions regarding the problem itself (Turcsányi-Szabo, 1995). A teacher of informatics looks upon application systems with a technical mind and not through the emerging problems that life produces, so, the inner values of solving the problem proper are not thought about. But teachers dealing with an individual subject and its underlying philosophy could see a more realistic solution for adoption, deepening subject knowledge through sophisticated means. Let us investigate a few examples.

Transmitting information

Computer related tools help in transmitting visual and verbal information through artificial channels to humans. The dimension of information and its information content determines its value. The form of the message determines primarily the emotional value of perception (Moles, 1958). Regardless of the final form of presentation (paper or electronic), readability and formal emphasis adds great value to the interpretation of information.

The most general form of transmitting messages is through writing. Developing written information incorporates all functions, starting from the emergence of need to the achievement of the final version, including composition, checks, formulation, and illustration (Williams, 1991). Tools should provide a flexible environment for development, while methods should involve a deeper insight into composing and representing information, including: sophisticated techniques of composition; aesthetics of the final product; illustrations; the ability to emphasise information properly; the techniques of accessing, searching, selecting, processing electronic

information in databases, arranging, sorting documents, and making one's way through the vast amount of information available.

Linguistic structures

The use of spelling, language, and stylistic checkers can only be valued realistically if the underlying mechanism of the tool is well understood. The modelling of language helps in understanding our own language structures as well as understanding the boundaries of interactive question-and-answer systems and programming languages (Turcsányi-Szabo, 1993).

Drawing and picture editing

The choice and use of the proper drawing tool, be it either bit or vector based, does not primarily require the mastering of the techniques of software, but the understanding of visual perception and the aesthetics of development. Graphical user interfaces help manoeuvring within systems, electronic books, accessing information and invoking events, which require the basic understanding of symbols, icons, and pictograms.

Spreadsheets, and the visualisation of quantitative information

The visualisation of quantitative information through spreadsheets and graphing tools might not only need the techniques of how to use the software, but the understanding and proper use of visual symbols and aesthetics of representation (Tufte, 1983).

Multimedia

Voice addition enhances user interfaces and multimedia products, adding a new dimension of value. Voices and tones play a large role in non-verbal communication. Thus, it is necessary to become acquainted with the forms of symbolic expression through sounds. It is likely that animation adds a great deal to a presentation, giving dynamism by changing pictures parallel to sound effects. The animation of processes helps the understanding of aspects otherwise unexpressed.

Modelling

Developing models through a simple programming language facilitates the understanding of computer mechanisms, as well as a means of accepting the boundaries and possibilities of its extension.

5 CONCLUSION

Teachers of informatics should not only look upon application systems with a technical mind, but also with an eye for the emerging problems that life offers, providing inner purpose for solving a problem proper. Teacher training programs in subject areas other than informatics are urged to include IT usage, to deepen subject knowledge. Meanwhile, the mission of informatics teachers should be extended to developing their knowledge for other teachers in schools.

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7 BIOGRAPHY

Márta Turcsányi-Szabó received both B.S. and M.S. degrees in Computer Science from Loránd Eötvös University (Budapest, Hungary). She started working on research before graduation in 1979, and since then has gone on to teach as well. Devoted to the use of Logo since 1982, she has written several educational materials and programs on the subject. Her present research field includes application systems, educational use of computers, and design of educational programs. Her research area is focused on developing educational microworlds for children which give motivation to the study of different subjects.