

Building Modern Informatics as a Subject and a Culture

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In my presentation I will concentrate on two points: In brief I will describe the recent situation concerning the Informatics education in Slovakia – and there really is a lot to say, and within this picture I will elaborate on how our department takes its part in this process. Honestly, I can say – we are trying our best to build new Informatics not only as a proud and equal partner of other subjects, but probably as something new: new door opened to modern pedagogy, modern relations between all actors involved in the process (including parents), new culture in (slowly) transforming school in the digital age.

Below I list some points I want to discuss. When being read in a quick or shallow way, they may evoke the impression of a clear and big success. Well, yes they are. However, we will very openly reflect also on some key and serious problems, which hinder us – and schools – from complex development of the field and subject...

- Informatics has rather long tradition in Slovakia as a subject, and specially in our Faculty of Mathematics, Physics and Informatics: we started to offer future teachers of Informatics education in 1982 as the first university in former Czechoslovakia. At that time already we succeeded in building a kind of advantage over other universities in the whole state and we keep trying to *run in the first position* since then – probably also because of the fact that we are a rather numerous team of people who devote most of their professional time to developing pedagogy of Informatics, developing textbooks and supplementary teaching/learning materials, developing in-service teachers' capacity, developing educational software and recently with significantly growing effort also building our education research capacity as partners of broader international projects or by ourselves in our doctoral and related research activities.
- But we can go even further into history of Informatics or Computer Science as a subject at the upper secondary level: I myself graduated in 1976 from a “gymnasium” with an experimental class specialized in computers – such as they were at that time. I did not belong to first graduates of that class, at that time it was already being run for several years...
- However, I do not want to present here the history of Informatics as a subject. Instead, I want to try to characterize what was typical at that time for Informatics and which process of transition it has undergone since then. At that time it was typical and significant that such new subject was implemented as an upper secondary subject – all in all, it was a simplified version of computer science of that time: we were being taught by external specialists from real computing centres and they were telling us (in a simplified way) exactly what they were doing in their work time. We had a real lot of mathematics and we were trying to program similar problems they had to program in the languages of the 70ies.

- Later, at the end of the 80ies the second age of Informatics started, probably ignited by mass dissemination of a new operating system “for everybody” (MS DOS) and growing palette of user-oriented software applications, including MS Office and similar tools. This unfortunately resulted in considerable decrease of interest in popular (educational) programming and *user-oriented approach* became a slogan of the period.
- The same time, the end of the 80ies was an important period for our group at Comenius University, fortunately with completely opposite trend: we intensified our hobby involvement in developing educational software. Our effort in 1990 and 1991 was rewarded by surprising success – first national, then international – of our new and complex version of Logo language titled Comenius Logo (with various names in other countries like Super Logo in English speaking countries).
- The success of our after work hobby considerably contributed to the prestige of our group and in mid 90ies lead to formal establishment of a new department – Department of Informatics Education. We accepted the responsibility for the future Informatics teachers study and got the chance to develop new Informatics curriculum for upper secondary schools.
- In the 90ies a kind of “Comenius Logo educational culture” was gradually built (as an integrated part of general Logo culture), nourished by teachers, students and our professional partners in approximately 15 countries including Brazil. Those cooperations, however, had an even more important consequence for us: through our international academic relations and cooperations we had the chance to learn directly from the leading personalities of the field of Constructionism, and later also TEL (Technology Enhanced Learning) and new methodology of education research – design-based research. Thus we won new insight into modern education and productive learning and started (in very small steps) to influence or at least interfere in our traditional, close-minded, mostly instructional and centralized educational system. Our new concept of Informatics curriculum declared its effort to address every upper secondary student with attractive content, prioritizing the development of complex digital literacy, learning by discovering, learning by constructing and promotion of open-minded personality and meta-cognitive competencies.
- Although it may look like a contradiction, but within our vision of Informatics as a modern subject for every girl and every boy we still find programming an inherent and inseparable component, we consider it a tool for thinking about problems. However, especial attention must be paid to what kind of programming this is, with is the motivation so that students find it attractive and useful. The time of programming mostly mathematical tasks without any clear connection to real and interesting everyday problems is over. Or – more openly – it should be over, but at present we are evidently loosing positions in this battle. Only few teachers understand and accept this approach: the majority either stick to their traditional pedagogy or (what is even worse) they cannot program and thus declare that programming isn’t interesting and natural part of Informatics subject.

After giving a short overview of the process of building Informatics as a subject from long time perspective, let me now briefly present some facts concerning the most recent development within this field in Slovakian schools:

- We succeeded in extending the subject extensively – from upper secondary also to lower secondary and quite recently also to primary education. For two years now it holds that

each child will start with Informatics as an obligatory subject at the age of 7 and this will continue until she/he is 17. Official educational policy specifies mandatory minimum number of classes per week, which is rather low (in some grades only 0.5 or 1), however school can extend this number if they decide to.

- Thus, for the first time in the Informatics subject's short history we don't need to worry about students starting too late with the corresponding topics. And finally we can strive to build one complex Informatics curriculum going through the whole compulsory education. It is even more important than ever before because (out of many reasons here we put forward only two): (a) nearly each student has her/his computer at the age of ending lower secondary education at home, so can be creating wrong opinions or mindset about using the computer, and (b) it is often true that *the digital divide goes through their families*, dividing digitally illiterate parents and *digital natives*, the children. Thus the parents are not able to help them, guide them or protect them properly in the virtual digital world (like they do in so many other aspects).
- In fact, the reality is even better in that particular aspect: since 2009 we succeeded in initiating a national project oriented to modernization of the pre-school (kindergarten) education. Within that project we are running a stream form developing digital literacy of the pre-school teachers, we managed to equip 3500 kindergartens with computers, digital cameras and digital toys (namely, bee-bots). In this and next year thousands of teachers are taking part in an initial digital capacity building program of 6 working days. The program concentrates also on creative and productive integration of digital technology into the learning process with the goal to support the key competencies development of children aged 4 to 6.
- In the primary stage Informatics starts in the second grade. Our colleagues managed to publish the textbook for that grade and plan to continue writing also textbooks for higher grades. The book is highly innovative and stimulating, creating modern contexts and mediating Informatics in an appropriate, complex way. However, the book relies on a series of dedicated software microworlds. The development is still waiting for being funded. (Have you noticed the first dark cloud on the Slovak Informatics sky? Yes, there will be more... just stay with me.)
- For this new Informatics in the primary stage there has hardly been any proper preparation, that is why there are no qualified teachers. Usually the subject is being taught by a teacher of other subjects who has certain level of digital literacy and/or was appointed by her headmaster. Fortunately, in 2009 we managed to start a huge national project with quite complex, one-year in-service study program for 700 hundred primary teachers all over the country. The program is completely innovative and modern, with the main goal to make use of that fantastic opportunity to build new Informatics in the best possible sense. To support the program we have written and published 18 booklets for the teachers. The project is being run by five Slovak universities.
- For the subject Informatics at lower secondary level we have developed a series of study materials (textbooks) titled Creative Informatics (one of them we analyzed and presented in detail at the ISSEP 2008 conference). Currently there are 6 of them, the total number will be 12 books with completely new concepts – through those teaching/learning materials we make every effort to open the school door to modern forms of teaching and learning processes, to push our schools and teachers a bit from the instructive to constructive approach, to help modify the relations between teachers and students, to help

create opportunities for productive communication and collaboration, for learning by discovering... etc.

- At the upper secondary level we have three more years of obligatory Informatics. However, in the times of transition in Informatics education, this is (and will be for a couple of years from now) most unstable part of the process: every year children with other level of Informatics will enter this stage, in two years there will be first graduates from lower secondary with four years of Informatics experience. In next two years there will be graduates of lower secondary who have already completed primary Informatics and lower secondary Informatics and will be rather critical to the contents of upper secondary Informatics and their teachers.
- As I mentioned earlier in my talk, we are also heavily investing into the development of educational research. Fortunately, our research field has won an official recognition in our country. Our department offers doctoral studies in the *theory of Informatics education* and our faculty won the right to give professor degree in that field.

All those bullets may seem as a clearly successful story, and to a certain degree it is true. However, I have to mention the reverse side of the reality as well:

- First and most acute problem is the lack of qualified teachers of Informatics (and other subjects), long term problem with no solution within view. Social status of Slovak teachers reached the bottom, in big cities many teachers left for other opportunities, economically they are far from sustainability.
- For our top policy education doesn't really mean any priority (although the opposite is often declared). The way how our schools look and how they are equipped, how our research and education is funded, illustrates the low respect of the society (often including parents) for education, teachers and knowledge.
- Too many universities have been established in my country in the last 20 years. On one hand, teacher education is totally unattractive, on the other hand one can choose from 15 to 20 universities to take a teacher study program (for example, in Informatics). The main point is that most of these universities have no experts in the field of corresponding didactics and research.
- There is also another paradox: the whole area of informatics and informatization of all aspects of society (especially education) is personally underestimated. If we had bigger personal capacity, I believe that through all of the activities mentioned above (and through many more, like the Beaver competition for thousands of children, the Infovekacik educational portal for primary level children, which is extremely popular among teachers and children... and some others) we could take much bigger advantage of the opportunity provided by the Informatics subject. We could better exploit that opportunity for attractive, productive and more efficient face of formal education.

I am sure that some of the problems listed above will be solved (or partially solved) within next years. This would provide a space for us and other partner institutions to fully engage the potential, which I sense in modern Informatics – if we are brave enough not to stick to old myths, inertia and old truths but look for new contents, new forms and new educational goals, more compatible with the needs of the 21st century society.