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Mobile Driven Changes in Education

Introduction

Within a few years mobile devices became wide-spread among students, though they do not really use it in classrooms for learning. But these devices are present in our everyday life so we ought to use them up as many way as we can to fit them into education as well. Universities try to adopt to this situation: re-write their web-pages to mobile optimized ones and create new mobile applications for different pourposes. In 2013 67% of students use mobile devices in high schools according to an experiment [Chen, Denoyelles]. Nowadays we are the witnesses how these devices are transforming the whole education. There are a lot of good practices and experiments in connection with mobile usage in schools, but we think, that there are a lot to do before us [Unesco Mobile…]. As we are teaching programming for several years for future programming informaticians and informatics teachers too we are interested both in teaching programming on a new platform (mobile) and in the usage of mobile devices during the whole educational process. Hoping that this complexity will help us in answering for a few questions.

1. What do we have to teach in vocational, BSC training courses for programmers and what for future informatics teachers about programming mobile devices?
2. How to use mobile programs in education? Use them as a new form of organizing learning groups or to speed up communication between teachers and students or to give additional informations about the learning content or use as unique possibility of learning which can replace classical courses?
3. Can we use mobiles to teach programming in elementary or secondary schools? Do they have to learn programming at all?
4. There is another question: simply buy ready-to-work systems or to try to build your own ones? For example we can think of building a google-style lego-phone [Google, *Lego…*] or creating something from a single microcontroller and a lot of electronic accessories.

Mobile devices

Mobile devices like smart phones and tablets are computers which are quite cheap and lightweight. Meanwhile they all have a working operating system, so there is the ability to install and run applications and they offer internet access

possibility as well. Moreover their resources like memory capacity or processor speed are comparable to the ones built into desktops or laptops. Further adventages of mobiles are the great number of new type sensors which appeared in this devices like giroscope, GPS, touch-screen etc. Due to portability the size of the screen is smaller than usual, so the usage of the virtual keyboard is not too comfortable and meanwhile it hides a part of the screen as well. The smaller size decides the structure of the content too, though you can scroll and enlarge the pictures. But sumarizing the adventages and disadventages of these devices it is understandable and absolutly clear why they spred so wide and so quick. Nowadays mobile devices are not fancy goods any more they are needed for everyday life especially for the youngers.

Programming mobile devices

There are different scenes of education where the question of what to teach from programming appears from elementary schools to university courses.

Public education

Let us examine first the area of public education. Two different concepts are struggling with each other in Europe:

– One idea says: the main goal is in elementary and secondary school to concentrate on teaching the usage of the operating system and the main user applications e.g. Office applications. In Hungary intermediate informatics graduation is just about how to use Office applications.
– At the other hand a lot of specialists are thinking absolutly different. To teach an actual user application is unuseful, because year by year newer and newer versions come, therefore a new version devaluates the gained skills. So the main goal is to teach thinking in the computer enviroment. What does it mean? How can we create a computer program? How the computer architect is working? So as a conclusion we can state that the main goal must be programming.

As the world around us is changed during the last decades, everything is speaking about electronics, computers, smart devices and recently about IoT (internet of things), and the development can not be stopped. So it is evident that we believe in teaching programming as soon as it is possible. We state that we have to strengthen the weight of algorithmic thinking and program coding in informatics subjects. Since motivation in any learning process plays a very important role, sooner or later the mobile programming should be the part of regular informatics lessons in public education too. We should like to cite Barack Obama, who said to children „Not only use your mobile, program it!”. There is a new initiation in Hungary, a private school was founded for teaching programming from the age of 6 till 18. They use the most modern technics: lego-, mobile, Raspberry Pi programming and it is said to be very popular among students [Logischool].

Informatics teachers training

In Hungary teachers has got two main subjects e.g. mathematics and informatics or biology and informatics etc. As many variants as you can imagine. That is why it is specially important to decide punctually the teaching content for them. An informatics teacher must be able to write simple programs for the web, for mobile devices and for smart devices as well. We beleive that sooner or later in public education, here in Hungary too, students will write mainly web and mobile programs instead of desktop applications and they will create their own simple devices. So it is an urgent need to teach for the future informatics teachers the bases of this (just as the bases of creating web-applications).

Vocational, BSC training

In the case of vocational trainings and university courses it is not a question if we should teach programming or not it is an evidence. But the content is always questionable, what to teach since the technologies develop so quickly. There are newer and newer methods and technologies a specialist ought to work with but there is a need to learn the bases of computer science too. We must find the right balance between the modernity and the stability [Bakonyi, Illés Menyhárt 2013]. Fortunately we can say that the base programming theories are not changing speaking about creating a desktop, a web or even a mobile application. There is no need of new paradigmas, but they have to learn the specialities of the devices and the developing tools. As there is a great variety in mobile devices hardware features, their operating systems, their developping tools the situation is not too easy. Do we have to deal each of the different platforms in details, or it is enough to deal with one of them deeply or try to find some common solutions. Naturally there are some special courses about Windows Phone or Android programming, but for BSC students there is no obligatory subject for programming them. In our university each students firstly hear about mobile operating systems in subject Opearting Systems, which is suggested for the 4th or 5th semester, but maybe it is no enough.

Nowadays in a lot of household equipments e.g. in TVs, in washing machines there are programmable microchips, microcomputers. But we are speaking more and more about smart things like smart glass, smart clocks, smart windows, smart heating, smart cookeries etc. The trend of using them in a greater and greater amount is undoubted. Formerly only specialists were able to build a programable device for their own, but for now there are a lot of kits with which one can learn both the bases of electronic and programming. We say that the border between these two things are not so sharp any more. And what can we say about smart device or microcontroller programming? We think that this area is getting more and more important so the bases of it must be the part of the BSC training. That is the reason why it will be inserted into subject

called „Fundamentals of Computers” from the autumn semester of 2015. This is a common subject for programmers and informatics teachers, so all of them will learn about it.

Mobile Academy – MSC training

In ELTE (Eötvös Loránd University, Budapest, Hungary), as in so many other universities too, there were some special courses which delt with this new platform. Here we should like to mention an on-line learning material which was created by us in 2012 about Windows Phone programming [Illés, at all, *Mobil…*]. The students were interested in them highly and we feel the changing of the working market as well. So, in 2014 we decided to start „Mobile Academy” for MSC programming informatics students due to teach the mobile developing [Menyhárt, Illés, Bakonyi 2014]. This is a block of four subjects, which costs 16 credits. At the end of the semesters they have to publish their projects on to the AppStores, so the aim is to achive business-like high quality. Mentioned before there are several mobile platforms (Android, IPhone, WPhone etc.) and usually the goal is to have an application for all of them. During the semesters they have to learn the specialities of the given platforms, then the facts how to write reusable, common codes. They get to know the different developing tools as well. Mobile Academy brings into focus the followings: Mobile platforms; Reusing source code in multiplatform environment; Designing and implementing complex projects; Today’s and future’s smart devices.

Now we finished two semesters and started a new one in this spring. The first, already finished task was to write a mobile application for university schedule based on the official database, which was shown only on a web-page before. One can search for courses, for teachers, there are maps included and the possibility to change between languages. You can find the project on the link: http://tanrend.inf.elte.hu.

Solving this task they must wrote a three-tire application, which client programs were implemented succesfully on each of the main platforms and the service was created in C# running on an asp.net server. To tell the truth the choicement of the task was not random at all. Our goal is to use up all of our works in the university life somehow. The last semester will show the world of smart devices.

Mobiles in education

The usage of mobile devices and applications can be grouped by their content similar to the one we can read in paper [Kismihók].

1. We can mention a group of applications with which one can manage his or her university life, like searching the schedule, using the calendar functions and alarming for written exams, to contact other students etc. (The task of

Mobile Academy for the first two semester fitted into this group. Meanwhile we have to mention here, that we are to rewrite our web-pages to mobile-optimized ones).

2. In to the second group we have to rank applications with which you can help teaching and learning processes like using social networks or some voting systems to strengthen communication between students and the teachers. (There are a lot of interactive mobile systems offered by different universities or companies which gives the possibility of voting, questioning, asking the opinion of the audience during a lecture [https://www.pigeonholelive.com, http://everyslide.com, http://www.voxvote.com]. (At the time of writing this paper the task of Mobile Academy students is to create a program which helps teacher to activate students during the lectures, give some feedback about the right answers and add a „panic" button for a helping explanation just in time. The next project will be to add some new functionality to this application, like downloading the presentations and make some notes about them).
3. The third group will be the group of real m-learning materials which can be used both for additional and for unique learning. The new trends are to offer on-line courses (e.g. MOOC) reducing prices and giving the possibility to learn from everywhere in anytime from the bests. In these cases the question is, what is the difference between an e-learning and an m-learning material. What should be the main directives for the developers in building up the content and the UI [Illés, Ildikó, Bakonyi 2008, Pšenáková, Szabó 2015].

Summary

As we live in the age of computers, mobile devices even in the world of IoT, and we use a lot of applications in our everyday life it is evident that everybody has to understand the bases of programming. The life itself forces us to deal with algorithmic thinking and coding more emphaticly. The popularity of mobiles among children and young people may give a great motivation to teach programming on these new platforms. The use of microcontrollers in teaching informatics has got an advantage of understanding the working of computers, both the hardwares and both the softwares better. Moreover this kind of work shows the children the complexity of the surrounding world. There are not separated knowledges belonging to different kind of sciences, instead of it they can recognize that the solution for a given problem should need several fields of sciences like physics and mathematics and informatics. The importance of multidisciplinary is shown in this case.

As informatics teachers we are in the middle of a great work to find the place of new mobile and smart technologies in our university in teachers and in informatics trainings as well. From one point of view we want to find the proper place and method how and where can we insert the knowledge of mobile device programming and from the other side we are interested in the usage of these

applications both in managing university life better both in helping the learning process. But independently from the details we believe that the future is in electronic and in informatics and they are based on qualitative education!

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Abstract

Nowadays we are living in the fever of using mobile devices for everything. They changed our every day life radically. The infiltration of new possibilities follows usually the Gartner's Hype cycle and that is how it finds its place in education. We all, who work in the field of informatics education have a d uty to make experiments how to use it up in in our teaching process. We review the present situation in public education and in vocational trainings as well and try to find the points where we can deliver new technologies into our practice.

Keywords: mobile programming, smart devices, m-learning, education.