

Challenges for Teachers in the Classroom 2.0

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Abstract

The classroom 2.0 is characterized by incorporation of technology into the everyday school life as well as a change of the social life outside school, which changes the way students learn. For teachers, that means challenges in their way of teaching, in motivating students and in rethinking the curriculum. In our competence lab “Classroom of the Future”, we identify the necessities for infrastructures for schools and develop concepts for teaching computational thinking and computer science from primary school to university. Part of our work is advanced training for in-service teachers as well as for university students for teaching degrees. In this article, I will present some of our findings.

Technology in the classroom

Starting in 2009, in cooperation with a local primary school, our group supported the integration of netbooks in a 4th grade class. This was highly motivated by the OLPC project, which provides more than 2 million XO laptops to be used in schools by children and teachers. Seeing that whole countries gave education a high level priority called for action in our own local area. It is save to assume that the students in Uruguay, who get a laptop in primary school, will gain a better computer literacy than the average German student. With the world getting more connected and the job market more globally, this will effect the future opportunities of our country and our people.

We do have computer labs in secondary schools since many years. These labs are usually used for computer science classes and only very rarely for other subjects. In most federal states in Germany, computer science is an elective course, in some, it is not even offered. Also, it depends on enrollment numbers if a course will actually be held. Unfortunately, for example in Saxony-Anhalt, numbers are decreasing and there are less computer science courses each year.

So what are we doing different and why? Our concept for the “Classroom of the Future” starts much earlier, we offer courses in Kindergarden and primary schools. We use the 1:1 concept with mobile devices (laptops), which can be used in different classroom settings and students don’t have to change rooms. It is a very important aspect that the devices can be used any time they are needed just like any other tool. We also encourage the use of an interactive whiteboard together with classroom control systems to allow for collaboration and give teachers the opportunity to guide the learning process. We use this layout in pilot projects in different school types and created a list of

technological requirements for 1:1 computing at schools. We can say that the technical infrastructure is a critical part for the success of using technology in the classroom [1].

Unfortunately, in most political discussions, calls and procurements the aspect of adequate wiring in the classrooms, powerful internet connections or sustainable devices is missing. The same goes for continued maintenance of technology and software. Models of good practice can be seen in other countries like in the U.S., where IT specialists are hired by schools or school districts to handle the technical tasks.

The Role of the Teacher in 1:1 classrooms

With devices available at every time during the school day, teachers need a different approach for their integration into the curriculum. What once was a special course, focusing on the use of the computer most of the time in 45 minutes, now it becomes an add-on of about 20 minutes (or even less for experienced classes and teachers) to do a task using the computer within the 45 minutes course. This also means a shift from focusing on the computer on focusing on the problem you solve using the computer.

When problem solving is the focus, the role of the teacher changes from instructor to coach. The computer itself changes the way students work. A task on the computer often will be more complex than a task to be solved on paper. This has mainly two reasons: the computer needs time to start, it is not efficient to spend 5-10 minutes to start the computer and the needed program and to shut it down at the end if the task for the students is less than 10 minutes. In this case, the school can benefit from other technologies like apps on tablets, which will be ready to use in about a minute.

Another reason for more complexity is the fact that a computer is not just a replacement for pen and paper, but a whole modeling machine. If the computer is used to enhance learning, to offer new ways of experiencing phenomena, other kinds of tasks are appropriate. For example the use of the internet to answer questions on a worksheet is more complex than to use the book to answer these questions. The students not only have to read a given text, before that they have to search for and identify the relevant text. This needs more time, but it also adds the competencies needed for the task.

When a task is more complex, naturally the diversity of the students shows much more, the times needed to complete the task vary between greater ranges. The teacher needs to keep this in mind and to prepare advanced options for students, who finish early and to scaffold the slower students. The computer allows for a more individualized classroom, but it challenges the teachers to put more effort in the planning of the class. The work regarding the content goes into the preparation and post-processing of the class and in the classroom the teachers need to watch the students and give the right hints for them to continue on their own. There is the need for additional teacher training to learn about the opportunities with personal learning environments. We offer a semester-long course

for in-service teachers. But we can only reach computer science teachers and the problem is not yet approached by other faculties in our university.

Technology to help teaching

There is new technology in the classroom which is especially made to help teachers in their everyday life. One of the major changes we can see now in schools in Germany (and which are to be seen around the world even longer) are interactive whiteboards. Unfortunately, most often the decision to start using these devices is not made by the teachers, but by the principal, the school district or other authorities. As with every top-down-approach, the problem is to apply the solution to the level of usage. In schools in Saxony-Anhalt, we have seen many cases where whiteboards have been purchased, but then have not been used with the students.

This is due to three reasons: lack of training for the teachers, lack of interest and motivation by the teachers and technical problems. The strategy we use in our primary pilot school is as follows:

- Several times a week a technician from our team is looking after the boards, reacts to problems or just does maintenance work.
- Another colleague talks to the teachers regularly, asks what they do, helps and encourages them.
- We offer training for interested teachers about 3-4 times per year.

The project started 3 years ago, in one 4th grade class with laptops and one interactive board. The school now has interactive whiteboards in every classroom, both 3rd and 4th classes have their own laptops, and in 2nd grade we do an introductory course once a week. By now, two teachers are working independently in their classes, two others are attending the 2nd graders course for half a year in order to take over the next year. It takes much time and extensive training to build enough confidence for the teachers to use the technology on their own. This cannot be done in a one week training or less.

The training needs to involve the technical usage of different devices, but also pedagogical concepts to incorporate the technology in everyday teaching. There has to be an ongoing communication about examples of good practice and getting feedback from teachers, who used these examples. It is still for most of the teachers a new way of teaching, which was not part of their studies. It needs to be revised and refined to become applicable in a greater range.

To encourage teachers to use the new technology, it helps a lot to point out the benefits. For interactive whiteboards, there is a list of benefits:

- panels from past lessons can be saved and made available for students and parents
- you can not only paint, but display computer screen, videos and content from nearly all sources, including interactive programs to show simulations

- for teachers and students with disabilities: content can be scaled to be better readable, you can use mobile tablets to write on the board (if you can not reach the board otherwise)
- “endless” space and a lot of prepared content like maps
- if you use laptops and a classroom control system: you can show students work to the whole class, you can lock the screens to get attention and you can control another computer to help a student

From our experience, these benefits are not enough to get most teachers started. It is an effort to learn to use the technology, to become familiar with it and to change the way of teaching. To write on an interactive whiteboard feels different and sometimes it will not happen what the teachers intends to. That means more time for a task and to admit a failure or weakness. It needs more benefits to overcome these problems.

Technology to help learning

Ideally, the motivation for a teacher would be to enhance the learning opportunities for the students. If we can show that students can deepen their learning with the use of computers, teachers should be convinced to put in the extra effort to learn to use modern technology.

From pedagogical history, constructionist learning offers better ways for learning than instructional models. There have been good approaches in the past for using computers in the classroom, which have not taken off by now. One reason might be the lack of computers in schools in the past. This will now change with governments spending money on technological infrastructure in schools and students bringing their own devices. It is time to review these approaches and apply them to the modern classroom settings.

These settings are characterized by 1:1 availability of devices, internet or intranet connection and a variety of educational software available for free or open source. That allows for individual and personal learning and collaboration. But what is still missing is the integration of these aspects in a personal learning system. There are initiatives that develop digital textbooks, so computers can replace heavy paper books. But digital textbooks should be interactive, allow for experimentation, provide feedback and help with evaluation. The learning process will be individualized, but it needs a good management to provide the framework for the curriculum. This is a field where still a lot of research needs to be done. Elena Railean has proposed an interesting concept to apply a new didactical model in the development of a learning management system for science, technology and Mathematics [2].

It is very important to highlight the new role of teachers in the classroom 2.0. Studies about the phenomenon of MOOC (massive open online courses) show the problems when trying to teach a

huge number of students using computer-based systems. Students drop out in high numbers because of the lack of direct communication and contact with the teacher (see [3]).

Summary

Summarizing the above facts, there are challenges for teachers in different areas, but not in the maintenance of the technical infrastructure. Schools need industry standard technology, maintained by experts ready to use for the teachers and students. No more outdated, sponsored devices. Not the computer science teachers should do the work of administrators and IT-specialists.

Teachers need professional development in learning how to use the new technology and how to integrate each technology appropriately into their everyday teaching. This can not be done in a one-time course, it has to be an ongoing process for about 2 years with regular feedback and refinement to be successful. At the same time, this needs to become part of university degree programs for new teachers, for every subject. There is educational software available, but teachers need support in finding the right tools for their curriculum. A challenge is still the evaluation of all activities students do on the computer. Teachers will still go and look through individual works, but for both, students and teachers, computer generated feedback would be very helpful.

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