On Top-Down Design and Bottom-Up Construction Of A Digitalized School
--A Case Study of Beijing National Day School

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Abstract: Computers began to be utilized in city schools in China in mid-80s, with the development of computer-assisted instruction to web-based learning and teaching. At the threshold of new information and communication technology in education, Chinese schools are facing a new area of digitalized school construction, which needs a new strategy of top-down design and bottom-up construction. In our research project, we are beginning to employ Rich Internet Applications for the building of a digitalized world of distance and collaborative leaning.

Keywords: digitalized school, top-down design, bottom-up construction

1. Brief of evolution of ICT in education in China

It is right after the Three-orientations put forward by the great designer of China’s Open and Reform, Mr Deng Xiaoping, in 1983, computers were beginning to come into schools as the main infrastructure for Computer-Assisted Instruction. By the end of last century, many schools had built up school intranets to store information for teaching and school management. While teachers and students are accessed to more and more internet resources and references helpful to their teaching and learning. During the first few years of this century, new technologies have been emerging rapidly and applications have become popular in many fields by schools. Schools, at the same time, have experiencing tremendous transformation in curriculum, classroom teaching and student learning. Researchers and practitioners in some areas like Shanghai have found out the needs for new ICT to support new style of teaching and learning. While most schools are still using the traditional school intranets which are lack of interaction, timely feedbacks and collaborative learning, to name a few, there’s a call of change from outside and inside schools that user-oriented, RIA-based, open-ended and living resources for education must
come to support school improvement in the new century. Digitalized school construction has thus been a bold exploration to update Chinese schools.

We recognize this is the chance for schools. So in Beijing National Day School where school intranet was installed ten years ago without much updates by now, we are carrying out a postdoctoral research project to top-down design the future of a digitalized school that will bottom-up construct a brand-new teaching and learning environment.

2. Top-Down Design based on school mission

Top-down design, according to Wikipedia, is primarily a technical term in computer programming, which means the program starts from high-level structures, that is, to break down a system to gain insight into its compositional sub-systems. In a top-down approach an overview of the system is first formulated, specifying but not detailing any first-level subsystems. Each subsystem is then refined in yet greater detail, sometimes in many additional subsystem levels, until the entire specification is reduced to base elements. But as an effective strategy, top-down design is not limited to software programming, it can be extended to other areas of thinking, including whole-school planning.

At the top of a school is the mission, goals and objectives for teachers and students to obtain. For Beijing National Day School, the mission is Quality-Faculty-Welfare-Harmony. This mission is the highest level of the structure for digitalized school design.

To accomplish this, the school has adopted several strategies, some critical elements for success that involve digitalization. They are teachers, students, funds, culture and digitalization. Interestingly, digitalization is added to the list of critical elements nearly one year after the others have confirmed by teachers and leaders of the school. The new principal suddenly finds that in an era of blossoming ICT outside the school, teachers and students inside are living in a poverty of information resource. He realizes at the top of our school that a school can’t be great without high level of digitalization.

The digitalization of the school is to construct a user-oriented, open-ended and interactive mode of schooling facilitated with new ICT. Teachers and students will freely access to friendly sources of knowledge, interact with each other in a safe and resourceful system. The school will become a flattened classroom. Thus the school is digitalized in such in infrastructure as following:
3. Rich Internet Applications for school

Under such names as Remote Scripting, X Internet, Rich (web) clients, Rich web application[2], or possibly some other titles, Rich Internet Applications represent a new mode of internet applications. It is about web applications, with a B/S structure. It’s been widely used in many fields of industry.

RIA for school will change the traditional settings for ICT use in schools. Teachers and students will be able to interact directly on the webpage, real-time and distance communication. That means ICT is now becoming user-centered and open-ended. This will make a breakthrough of the Single-Island-of-Information to connect data flows from teachers, students and parents. In such new environment of ICT, teaching, learning, service and management can be accomplished with digital formats.

We have been trying to make an assembly of RIAs for community-school-family collaborative system as follows:
4. Service-Oriented Architecture for school RIAs

It is as important as top-down design to implement the construction of digitalized school in bottom-up approach. If top-down design is a method of ultimate thinking, bottom-up approach leads us to the very beginning, the cornerstone of this building. At the baseline of digitalization is the needs and expectations of the teachers and students in the school, the parents as well. School provide services to students with knowledge and capacity building. It is so-called a market of knowledge transition.

It must be a long and gradually progressing course for school RIAs to be fully implemented. At the beginning, we have designed a structure that is SOA-based:
In conclusion of this paper, we would like to emphasize our standpoint that China’s schools are at the threshold of ICT updating. At the core of this restructure is RIAs adaptive to SOA. In order to achieve our goal for a successful construction of a digitalized school, the possibly best strategy is both top-down design and bottom-up construction.

Reference