Inquiry primary

Summary:

Since 2010 Russia had got a new educational Standard for Primary. It requires: students activity, projects, ICT-competence. There is a course (subject) in primary (2 lessons every week during the hole year) that is called "Surrounding world" – primary science in primary. It is obvious knowledge based. It is not suitable for new standard. The scenario is aimed to design a new content for this course that is based on inquiry. It requires a full reconstruction of the whole subject: new content (more science concepts but on pupils level and with everyday language), new methods (more observations, investigations, experiments, open discussions), new aims, new activities, new tools (digital labs, online lab, computers), new environment (rich material and experimental environments; sets of experiments).

Aims:

Scientific capabilities concerned with gathering and using evidence; scientific attitudes..

Main activities:

Experiments and investigations; measuring with digital labs; discussions; communication in online GlobalLab; problem solving; concepts construction and reconstruction; working in school information environment..

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Narrative:

The case had started in the 2-d class with 25 pupils. Teacher had brought children a new generation of digital labs – Labdisc (www.globisence.com) - wireless lab with 7 fully accessible sensors (5 built in), with intuitive, large LCD digits, built specially for elementary students. It took only 10 minutes for the first instruction – and children were able to do first measurements – the task was to measure the room size. The next problem for kids was already more challenging – how do we can measure our height? Pupils must invent the methods of using tool their self. They had proposed a different techniques, tried these in pairs, discussed and helped each other. Only one lesson – and they already know how to measure with digital lab!

Another module was temperature: how can we define it with our senses and with sensors. It was started with tap water; with question: what is the coldest and the hottest water in our tap? The class was divided into groups and each group had filled three vessels: the hottest and coldest water from tap and their mixing in the middle. First each child could define the temperature of cold and hot water with two hands and afterwards – in the mixing with both hands at once. It was the first surprise! – Each hand feels different temperature in the same water. What is the real temperature? Kids suggested to measure it with our digital hand – Labdisc. They did it and realized that it was about the same. The discussion immediately started with question: Why the hands feel difference? During measuring immediately aroused a number of mathematical problems: what to do with digits after comma? Can we understand the graph of temperature on a computer screen? (The Bluetooth connection between portable and light Labdisc and computer allows to show the data collected and all the results in real time – pupils saw the increase and decrease of temperature during experiment and could afterwards understand the graph.

There were also a number of modules without any digital tools. What is going on when the object sink in the water? – to answer this question kids do an experiment. If there are number of different objects what would differ when they would putted into the water? New experiments but with marker to note the difference. From what come this difference? It depend on what? – Pupils discuss and teacher makes notes on board: size, form, weight… How we can decide what? – Together with children we design new sets of experiments to answer the question. Afterwards came a question: But how water acts on object when it sinks? – Lesson in the pool. The most important experiences: each pupil immerses a ball or basket into the water, and weight his friend in the water and in the air.

The third module connected with online Globallab – the class had chosen a school area for future investigations – it was brought into the Internet community – GlobalLab – a special tool to collect and compare a different data and communicate with other schools around the world. The class described this school area for the whole community. All the data collected about this place (photos, temperature measurements, relief, animals and trees descriptions…) are collected their and open for the community.

End user:
Children grade 1-4 (primary school)
Involved actors:
primary school teachers, researchers, curriculum developers. - City farms
Languages available: Russian
Location: School
Where to find the application or case:
Moscow School of the Future (#2030) and 10 other schools in Pilot project continuous science education leaded by Kurchatov institute, Moscow department of education, Moscow Institute of an Open Education.
Duration: 1-4 years (primary school time); it can also be partly introduced as a set of different independent modules during 2 – 6 lessons.
Evaluation parameters:
This experience had evaluated on big Conference 19.11.2011 "Our new primary school"; it is included in in-service training of Moscow teachers since 2011; it is published this month in Report to Moscow Department of Education. It will be published in "Teachers Newspaper" in 2012.
Connection with the curriculum:
According new Russian educational standards 2010 the content of the primary school must be based on: students activity, projects, ICT-competence from 1st class.

Teachers' Competencies

1	subject matter/content knowledge	x
2	nature of science	x
3	Multidisciplinary	x
4	knowledge of contemporary science	
5	variety of (especially student-centred) instructional strategies	x
6	lifelong learning	x
7	self-reflection	x
8	teaching/ learning processes within the domain	x
9	using laboratories, experiments, projects	x
10	common sense knowledge and learning difficulties	x
11	use of ICTs	x
12	knowledge, planning and use of curricular materials	x
13	Information and Communication Technologies with Technological Pedagogical Content Knowledge	x

Mapping best practices with main principles

PATHWAY

1. Building interest in natural science phenomena and explanations:

Active doing and experimenting, exiting phenomena, paradoxes and experience and their explanation that are self constructed – the content of the scenario – building an interest in natural science phenomena and explanations.

2. Building up informed citizens: Students understanding the nature of Science & Science in society:

The possibility to describe the phenomena with everyday language, constructivists learning, using science tools (digital labs) these are simple and similar to familiar devices like mobile phones brings science and society nearer to each other.

3. Develop multiple goals:

- **understanding big ideas in science including ideas of science, and ideas about science**
- **scientific capabilities concerned with gathering and using evidence**
- **scientific attitudes**

The inquiry method described above if it is repeated many times becomes a habit, an attitude. In constructivist issue and using adequate language and hearing and discussing children's ideas about phenomena of nature brings an understanding. For small kids it could be concepts not ideas.

4. Understanding students' concepts and learning style about of science phenomena:

The scenario uses pupil`s mind as a field where everything goes on – no one concept can come from outside as into the empty vessel. Learning starts with question. Discussion reveals the student`s concepts. Then come an activity of children doing experiments for seeking an evidence for answering the question. Doing an activities and trying to solve the problems each pupils builds its own learning style.

5. Relevance of the content to daily life of students:

Science is everywhere: the world a filled with phenomena whose laws are unknown for small kids. The scenario start from this point – daily objects and experiences which we attentively observing with children.

6. Understanding science as a process not as stable facts. Using up-to-date information of science and education:

Children don`t learn the laws and concepts – they experience the world and construct our own knowledge. They investigate phenomena, discover regularity and constructing the concepts. They solve tasks and problems with children. And children do it as scientist do.

7. Activities for gaining knowledge, not for entertainment, nor for simple imitating of results:

Children don`t play scientists – they do their job and take it honest. Teacher doesn`t know the true answer – he organize our work and help to do experiments, sometimes he put questions also, but pupils find answers their self. They do experiments and measuring and find evidence. They discuss, understand and explain phenomena – not a teacher.

8. Doing science: experimenting, analyzing, interpreting, redefining explanations:

Children do science in this scenario: experimenting, analyzing, interpreting, redefining explanations.

9. Assessment: formative ~ of students' learning and the summative ~ of their progress:

During each activity (experimenting for example) pupils must fill the workshit with tasks and questions. These workshits, the results of projects and also presentations and discussions give formative assessment for each pupil. Once a month after finishing a sertain theme teacher give pupils a summative assessment throw a written test where they must analise a new situation with a help of acquired skills and knowledge.

10. Cooperation among teachers and with experts:

The scenario suppose cooperation between teachers, curriculum developers and experts: developers teach teachers a new activities and tools and help them during lessons as tutors at the beginning. Experts evaluate the process and give feedback to developers and teachers. And big community of the primary school teachers of Moscow periodically looks at the prosess (during conferences and master-classes) and discusses it.