First outcomes of Designing the future classroom

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Abstract — **This is the second paper presenting the iTEC project, we have first introduced at the ICETA 2011 International conference. The research is based on 5 cycles of testing learning stories and activities while using new innovative technologies in classrooms. Meanwhile the project has come to its middle point; the 3rd cycle of testing learning stories and activities is implemented in hundreds of classrooms of 17 countries this school year. The article discusses first international results from cycle 1, brings outcomes from cycle 2 on national level and presents new approaches coming with cycle 3. The project is focusing both on innovative pedagogies as on innovative technologies used in education. The iTEC project is funded by the European Commission.**

I. INTERNATIONAL RESULTS (CYCLE 1)

In Cycle 1, two Learning Stories (LS) were piloted:

• The Outdoor Study project requires teams of learners to collect data (scientific, multimedia) outside the classroom.

• The Bring in the Expert project requires teams of learners to collaborate with outside experts via communication technologies.

Each was underpinned by 4 core Learning Activities (LAs): teamwork, recording team, newsflashes, peer feedback and mental notes about learners.

In Cycle 1, 231 teachers and 278 cohorts of learners from 17 countries participated in the evaluation of these two Learning Stories.

Teachers were very positive about the experience and enjoyed opportunities to experiment and take risks. Most teachers implemented the Outdoor Study project. Teachers were confident both LS could lead to innovation in the classroom. Other benefits were the adoption of new pedagogical strategies (particularly collaboration and group work), increased student autonomy, increased use of digital tools in the classroom, positive impact on teacher and student attitudes, perceived potential to impact positively on a range of learning outcomes.

Unsurprisingly, ICT infrastructure, training and in-house technical support were considered essential for scaling-up. Enablers included teacher experience, teacher motivation, the support of colleagues, iTEC resources (the Learning Story guidance, and a widget for forming groups called TeamUp, training and support, intuitive technologies, digital tools for communication and collaboration, and school ethos/culture.

Challenges included insufficient ICT infrastructure (access to ICT, reliable Internet provision), time for planning and implementation, ICT compatibility problems, and students adapting to unfamiliar pedagogical approaches.

The three most important enablers were student motivation, ICT infrastructure and teacher motivation. Others included the support of colleagues, communication and collaboration tools, iTEC resources (Learning Story documentation, TeamUp) and the support of the National Pedagogical Coordinator, school ethos/culture and parental support.

Challenges included: insufficient time for planning and implementation, insufficient ICT access, unreliable Internet access and restrictions, site registration issues, a lack of teacher ICT skills, and organizing groups.

In terms of benefits, teachers felt that increased student motivation was an important benefit in both cycles. Of course, this could be attributed to the Hawthorne effect.

Teachers also expressed positive views about their experiences, suggested that implementation led to new pedagogical approaches, increased student autonomy and collaboration. In Cycle 1 engagement with experts and outdoor learning were identified. This is not surprising given that the LS focussed on these.

II. CASE STUDIES IN SLOVAK PILOT SCHOOLS (CYCLE 2)

In Cycle 2, three Learning Stories were piloted:

• Mathematics in a multicultural setting: This scenario uses the language of mathematics to improve participation and communication in a multicultural setting. Groups explain mathematical concepts linking to online resources via a wiki using their own language and link to other group's explanations in native or other languages.

• Embedding exam preparation in learning activities: The scenario provides both teachers and students with useful and innovative ways of using technology to build a bank of resources that can be used for ongoing learning and revision. Students create resources for homework such as podcasts, puzzles, questionnaires, notes in wikis. Students also arrange ad-hoc collaborative sessions with other students nationally and internationally.

• Students creating (science) resources: Students support one another to learn difficult concepts in science or other subject areas. They create exhibits (for example, posters, podcasts, simulations) for younger students to teach a concept from the curriculum, with mixed-experience teams focusing on different concepts.

The Learning Stories were underpinned by two packages of Learning Activities: package A focusing on learning in teams, and package B focusing on learning individually.

The specific activities were: ad-hoc collaboration, learning oriented browsing, reflection, peer feedback, information grouping and prepare results.

We have decided to implement Embedding exam preparation in learning activities in Slovakia. Twelve classrooms finished the piloting and their teachers filled in questionnaires as for feedback.

Case studies were held in three classrooms in different schools, two of the level ISCED2 and one of the level ISCED3. The case studies included observation of the activities, interviews with teacher, group of students, ICT coordinator, headteacher and collecting the relevant documentation. Two case studies were elaborated in the form of narrative and one case study raw data were transcript and sent to the evaluators.

Case study 1: The teacher was familiar with the TeamUp and Teacher Community from the Cycle 1, she said that the training met her needs; she became familiar with the learning story and activities. The technology used was very interesting; she was impressed by Telepresence videoconferencing technology which was used for the Cycle 1 training and WebEx technology for Cycle 2. Teacher admired that she was a part of teacher community and is not alone in the project. There were two teachers involved in the same school and they supported each other. The training was provided as lecture and perhaps if it was f2f workshop focused on the iTEC technologies, perhaps these technologies would be more used. Teachers do not have enough time to study new things on their own. She did not used much teacher community environment, because she has only passive knowledge of English, so she was just reading the forum and some other parts and she followed thread in Slovak language.

The teacher was teaching Physics and Informatics as two separate subjects to her students. She had 2 lesson periods (2x45 minutes) per week of Physics and 1 lesson period (45 min.) per week of Informatics. She taught her usual topics according her plans but she had to include some new activities due this project. The students usually do not work in teams, so they are not used to group work. They were working on developing tests and quizzes with the help of online software iankety. They used TeamUp for grouping of students to teams and for reflecting on their work. The students were very active and they enjoyed working with online tools. They found it very innovative. Even they use computers every week on several lessons, they use it individually, not in teams and they usually use it for writing or presenting, neither for reflecting their work nor for developing tests. Usually they use text editing tools. In this activity they had to search for information on the internet. Teacher does not see that this fits well with school plans, because 45 minutes lesson is not enough to work on the project. The teacher would prefer to have block of hours in order to organize such activities. She thought that without combination Physics and Informatics lessons she taught weekly in this class, she could hardly implement the LS.

She reflects that students who already knew the TeamUp from previous cycle 1 started to use it to form the teams straightforward to her surprise.

Principal said that the school has introduced informatics as a special subject from the early age of students (grade 1) and also they use ICT through curriculum in subjects. He perceives LS as innovative and he supports initiatives and trainings of teachers to learn new approaches. He said: "We try to engage teachers to external training to use ICT if available and they always bring a lot of innovative approaches with them."

The teacher perceives positive impact and outcomes only from clever children. She said that the less clever children did not benefit from these activities. The teacher perceived that all her work was changed. She said: "Everything I did, I did differently as I am used to. We work rarely in teams. It is also problem to assess teamwork." Some teams worked efficiently, they were able to support each other, and other teams were not able to do anything. The big benefit was the autonomous learning and working in teams.

The principal thought that the students learn a lot when using computers and seemed to be very open to innovative teaching and learning. The principal believes that students see the digital technology helps them to learn and this feature motivates them. The principal said that this way is new way and it is more acceptable for students. Students said that they enjoyed making recordings and they considered lesson less stressful, and it was very creative. They enjoyed learning by themselves, active learning, browsing the internet. They benefited from learning on their own pace. Students said: "We learned a lot with software, but we learned not only Physics but also how to learn."

Not all students benefited from this teaching. Less clever children were unable to follow and were unable to prepare tests even in teams for themselves. In this LS the students have significant outcomes differences because of the different pace.

The principal sees problems if some children do not have computers at home, because not all families can afford to buy one for its child or families do not have access to internet.

The recording on TeamUp took students a lot of time, they spent whole lesson on it. They could not record at the same time, because they disturbed each other. They wanted to have good recordings they were not satisfied with the first recording and they wanted to record it the second or third time. The teacher thought it is worth to give them this experience, so she gave them extra time to practice, but then it was time-consuming. But it was big difference with the class who already had experience with TeamUp from the Cycle 1 who were more efficient in their recordings in comparison with the class where the students came to this software for the first time. Also was drawback for the students who were not familiar with TeamUp to experience forming the teams. Students need some time to custom because it was new to them. In the teacher´s opinion it was also good experience but also time-consuming. Another problem is that the teacher had to prepare technology (to charge notebooks). The biggest problem was when technology did not work properly, which was the case of TeamUp. One lesson they could access to the server, next lesson they could not. This problem occurred mostly in the morning sessions, everything was OK in the afternoon, but then the students were not available. Students prepared scripts and they made recordings and everything seemed to be OK, but when they wanted to access it next lesson, everything disappeared. The students then refused to repeat the work second time.

The biggest enablers were students, who started to be enthusiastic, motivated and in favour of new pedagogic approaches and curriculum. The principal is proud to have 5 computer labs at school. The labs are used permanently, not only for informatics education but also for foreign language teaching and other subjects. The labs are used also in the afternoon for free time activities. Some students were very motivated and they wanted to be engaged in these activities. But there were also teams who were not motivated; they wanted to work in the traditional way. Teacher has support from other colleagues.

The biggest barriers are the timetable and the content of the Physics. There is too much to learn. Another barrier is that students are not used to work, where there is team work and some of them are not yet able to work as observer, developer of test or reflector of what they do. The teacher said that the ad hoc collaboration was not organized, because she did not have much time to spend on the topic. When the students fulfilled the tasks, they learned from the quizzes, they had to start new topic and it was not time to reflect on the quizzes by students from another class what was planned activity. Principal said that the teachers must have willingness and time.

The teacher would need another model of time allocation for teachers. (45 min. lessons are too short)The principal and teacher said that some computers are becoming out dated and they would need to buy new ones. But the problem is lack of money for spending on infrastructure.

The principal said teachers are usually against any new ways of teaching and they resist the changes, what is normal. But he believes that the barriers will overcome with trainings and when more and more teachers will teach in a new way.

The teacher did not realized that learning by themselves is so difficult and that especially low achievers would have even more troubles with learning as usual. She neglected that there are so big differences between students. The students made effort to learn and they failed. They did not have enough experience to learn, they do not know how to learn. We use different ways in teaching and in this learning story the differences showed to be more significant. Some students were in panic, they did not know what to record.

Case study 2: The teacher was not present at the virtual workshop provided for pilot teachers, due to technical problems to be connected. But she was a pilot teacher in the cycle one and was familiar with Teacher community and TeamUp. She was self-confident and did not use any help. She was supported by the NPC during the pilot and she was advised to use social bookmarking for her implementation of the learning story. She was very autonomous teacher.

The teacher was asking the students to find resources for topics from Biology on the internet and students were looking for online tests. They learn Biology in English so they found appropriate resources on the web, than they shared the links by ishared bookmarking network and on classroom Facebook site. Students also shared their notes made by handwriting, they scanned them and put them on the Google docs and shared the links among each other. The students found this way for learning very positively, they said that they never share their notes and it was very helpful especially when they were not present at school.

One student said: „I had many visits to physician this term and if not for this sharing notes and web tests, it would be very difficult for me to follow with my classmates." The students perceived the sharing of notes as very interesting and of big benefit. Two of them said that they did not use Facebook at all, never even for private, but because it was so useful for school purposes, they started to use it. They used the Facebook site for sharing information when would be the test and what they had to learn and they shared their own individual notes. They were preparing notes on different topics and they could learn then what they were supposed to. The principal was very enthusiastic, that the teacher did not use only software for presenting information; but that the students were preparing for exams using technology and she perceived this as very innovative. She said, that students are not keen to do their homework and they do not prepare properly for exams, so if this is way how to motivate students to learn and better prepare, she will support this at her school.

The students found it very good, that they did not need to ask other students to scan them their notes. It would be also very difficult to divide the work among students. When the teacher organised the work and facilitated them to share the load than they were able to prepare their part and to share it with others. The teacher said that there are lessons for exam preparation so she did not need to change anything on planning her lessons. The students were able to use the necessary technology and she was only facilitator. She cannot claim any better results on exams, but she thinks they learned a lot not only from Biology but from soft skills too.

The main drawback is lack of time and lack of technology at school. The students do not claim any drawbacks. Principal does not see any problems with access to computers, because in her opinion preparation for exams is part of homework. She claims only very low status of teacher and very low salary of teachers as the biggest problem. She also said that students are learning less or not at all and that they do not like to make any homework.

The enablers were motivation of students. It was stated by teacher and also by students themselves. The principal said that they have one quick scanner in open space at school for students.

The biggest barrier for students was access to computers.

The students would prefer to learn more using technologies. Teacher would prefer to have ICT coordinator who can support her directly at school when she needs to work with technologies. The principal was not aware that the students can be motivated and enthusiastic for doing their homework and preparing them for tests. The teacher had only few hours with students so it was not possible to make comparisons if the students have better outcomes because of the different learning practices.

III. LEARNING STORIES AND ACTIVITIES (CYCLE 3)

Next set of learning stories are all about design. We will present here very shortly one out of 4 stories. All stories piloted and much more you can find on the project website.

Design a concept for the future school is the topic of the learning story. Students have to consider authentic and

practical experiences. They have to think about the space to learn, space to have regular meetings for teachers, school library, newspaper and a video news channel, place to settle student enterprises, place for cross-curricular projects, shops, services. Students have to consider all people who will potentially use their design. If necessary students can narrow their context, objectives and challenges addressed with the design. They can create a spatial design, a concept and test of an activity or process, etc. The part of the story is considering the views of teachers, students, parents, principals, city employers, grandparents, alumni etc. In Redesigning school story students have to come with spatial design and take into account needs of people in this space. The second learning story is about visualizing the planet surface. It can be map for tourist, the students have to come with spatial design and consider the needs of tourists coming to visit the place.

Each of these Learning stories is underpinned by 6 core Learning Activities: Design Brief, Contextual Inquiry: Observation, Product Design, Participatory Design Workshop, Final Product Design and Reflection.

The third story is to design a physical simulation. Students are expected to benchmark several videos, which describe the studied phenomena. Students have to use software and kits to design a new simulation of their own.

The forth story is on designing a math learning game. Students are expected to benchmark several math games on internet, communicate with students who will have to play the game for their reflections.

Each of these Learning stories is underpinned by 6 core Learning Activities: Design Brief, Contextual Inquiry: Benchmarking, Product Design, Participatory Design Workshop, Final Product Design and Reflection.

In time of article preparation we do not know which learning stories out of this four will be piloted in 40 classrooms involved in the iTEC project. During the pre-pilot phase, one teacher has implemented the first story of redesigning the school. The students were of the ISCED 2 level. The group of students studied the new technology Google SketchUp with the help of teacher and videos on YouTube. They were able to observe and measure the necessary items in the school yard and come with a new design of it in 3D model with visualizations. The teacher said that the students were motivated, enjoyed the design, worked hard to understand the physical measures, to gain skills to grasp the technology and to communicate to get feedback on their ideas. Not all learning activities were performed, e.g. the students were not writing documentation at all. They worked in team for their first time. The teacher was impressed by effort of students during the work on the project and is also highly motivated to perform the same project again with this positive experience.

IV. Software Tools Available for Teachers

Technology plays important role in future classroom education. The iTEC project has an ambition to collect existing educational software solutions and enable them to use at schools. Also some new tools were developed and now are tested in pilot schools. In the iTEC technical vision, iTEC environments are defined as environments that are based on a shell that allows the teacher to tailor a learning environment, i.e. to set it up with services or functionalities in the form of tools, applications, content etc. that support the activities of a given lesson plan. For these reasons new terms were defined, e.g. shell and widget.

The iTEC environments consist of the following tools and services (some were developed within project):

- The iTEC Cloud and UMAC (User Management and Access Control)
- The Composer
- The Widget Store
- The People and Events directory

as well as the following shells:

- Moodle
- dotLRN
- Promethean ActivInspire and Planet
- SMART Notebook and Exchange

A. SHELLS

Shell is a software tool which allows inserting of external and internal content, offering it to end users in accessible on-line form. It could contain editing, authoring and publishing tools. Typical representatives of such shells are Moodle, dotLRN, Google sites, etc. The most important aspect of an iTEC shell is that it must be capable of displaying widgets.

B. MOODLE

Moodle is a learning management system (LMS), system that comes with a lot of functionality tailored specifically for educational environments and needs (testing, students' management, grouping, etc.). It is a highly flexible system that allows you to set up most functionality depending on your needs. In this way Moodle is a good example of an iTEC shell in that it allows you to easily set up learning environments with only those elements that you need − or to have problem/subject oriented environment.

The environment of Moodle is based on the pages that contain resources or activities. Apart from course-related content and activities, Moodle also has a special type of content container called a block. Standard content is typically located in the central part of the page, whereas blocks are located to the left or right of the central part [4].

Figure 1 Configuring Widgets in Moodle environment

Moodle blocks typically contain information or functionality that is general to the system as such or the community of the user rather than specific to the current course content [4]. There are blocks that display navigation menus, calendar information, latest news, status information on who is online and so on. In terms of functionality blocks can be compared to widgets: they provide a specialized con-tent or functionality that can be added to pages in a Moodle system.

Moodle is structured around courses. Users are either teachers or students, apart from the system administrator. Teachers, if they have the rights of course creators, can create courses, and users can enroll in one or more courses. The starting point for all activities is the course [4].

C. dotLRN

DotLRN is a learning management system very similar to the better recognized Moodle LMS. DotLRN (like Moodle) provides a wide range of built-in applications or functionalities such as calendar, grading, questions and tests, learning resource library, problem-based learning, a SCORM player etc.

Figure 2 iTEC dotLRN environment

The DotLRN system is community based platform. Provides a collaborative space where users can communicate and collaborate using built-in applications tailored to learning needs as well as learning resources. Communities can be created on different levels: schools, classes, courses or even (sub) groups of students.

The communities can have their own tailored start page, the community portal, where different kinds of content may be displayed based on the needs of that particular community [5].

D. The iTEC Cloud

The iTEC Cloud and the User Management and Access Control, in short the iTEC UMAC, is a key service in the iTEC vision. As the name says, its purpose is to create a common, integrated user management and access control system across the various other technical tools, services and functionalities provided by the technical partners in the iTEC project [6].

E. Composer

The composer is a key tool in the iTEC vision. From a technical point of view it is a key tool in so far as it integrates a number of other technical services and functionalities.

From a pedagogical or user perspective it is a key tool in that the composer will make it easier for teachers and ICT advisors to develop, specify, and set up highly tailored learning stories and accompanying environments with a limited amount of technical knowledge and work.

In its current (under development) state the iTEC Composer is a tool that supports teachers as well as technical and pedagogical coordinators in accomplishing three main tasks:

- composing learning activities and learning stories (within given scheme),
- managing resources such as applications, content, devices, and events (adding and managing is allowed),
- administering people, organizations and their technical settings [7].

F. Widget Store

The key vision of the iTEC project is to enable teachers to configure tailored learning environments based on the functionalities and content needed for a specific learning story.

A key part of this vision is the development of an iTEC educational Widget Store. The aim is to create a 'one-stop shop' for widgets that can be used in iTEC learning stories and in this way easily integrated into iTEC learning environments [8].
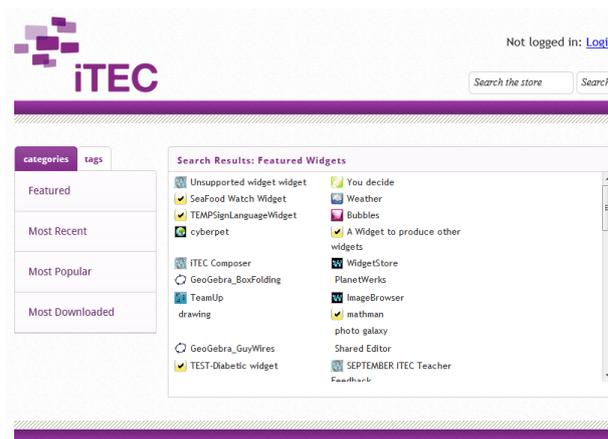

Figure 3 Widget Store landing page

The Widget Store allows the user to search widgets on categories, easily scroll through the widgets, look in more detail at a specific widget and select that widget for direct inclusion in a shell or for download [8].

G. People & Events directory

The purpose of the iTEC People & Events directory is to provide teachers with a directory of:

- people who can contribute to the realization of iTEC learning stories and activities
- events around which learning story implementation and learning activities may be organized.

The People & Events directory deals with information gathered about those two types of resource: people and events. Information about those two resource types is recorded in and can be retrieved from the People & Events directory [9].

H. TeamUP

TeamUp is web based software tools which helps teachers to form teams of students based on the skills, strengths and interests they have. Students can suggest topics for teams and vote on them. TeamUp forms teams that will satisfy the requirements of a teacher and needs of the learners at the same time. Students are identified not only by name but also their hobbies, mood, or relationship with other in groups could be added.

TeamUP tools allow creating small (one minute in length) videos which captures progress in task the group is solving. All learners have same rights to see what others did. By limiting length of recording it is not time consuming for teacher to see all videos of all groups in a class. Class is identified only by name which has to be unique, access is not limited by password or login. User interface is as minimalistic as possible. Team forming, content creation is in drag-and-drop style [10].
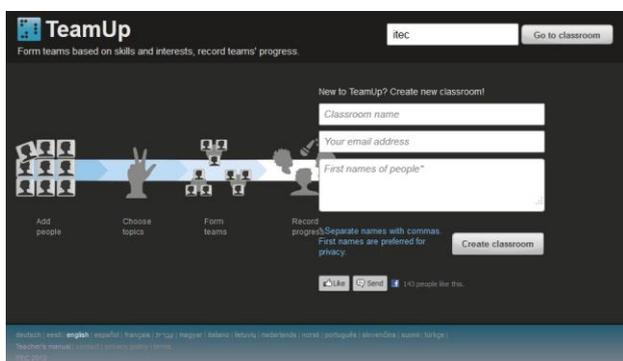

Figure 4 TeamUp tool landing page

CONCLUSION

What are the benefits for teachers to be part of the iTEC project: to be part of design of innovative learning scenarios, to experience creative learning activities in the classroom, to share and exchange experience with other iTEC colleagues via blogs, presentations, discussion forum or workshops to take part in face to face or online trainings, webinars, to undertake new approaches in teaching and learning, to have enthusiastic active students.

Even the students are keen to learn in a new way, many teachers still resist doing so and the biggest burden does not seem to be lack of technology, low salary or lack of digital literacy. According teachers the biggest burden.in implementing the changes seems to be time.

This brings our first recommendation to policy makers to give teachers more time necessary in order to facilitate students when working with technology on real world/life problems.

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