

# When I\*Teach means I\*Learn: Developing and implementing an innovative methodology for building ICTenhanced skills

Citation for published version (APA):

Stefanova, E., Sendova, E., Nikolova, I., & Nikolova, N. (2007). *When I\*Teach means I\*Learn: Developing and implementing an innovative methodology for building ICTenhanced skills*.

## Document status and date:

Published: 01/06/2007

## Document Version:

Peer reviewed version

## Please check the document version of this publication:

- A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
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- The final published version features the final layout of the paper including the volume, issue and page numbers.

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# When *I\*Teach* means *I\*Learn*: Developing and implementing an innovative methodology for building ICT-enhanced skills

*Give a man a fish and you feed him for a day. Teach a man to fish and you feed him for a lifetime.*

Chinese proverb

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## Abstract

The paper presents research findings and pilot experiences related to the development and validation of an innovative methodology for building ICT-enhanced skills. The concept of ICT-enhanced skills and the essence of the methodology are explained. The process of methodology validation – via a pilot teacher training course – is presented by offering the reader a dual perspective: that of a teacher and that of a learner. The main insights and conclusions are illustrated by authentic teachers' impressions.

## Keywords

Teacher education, ICT-enhanced skills, life-long learning, active learning methods

## 1. BACKGROUND – THE *I\*TEACH* PROJECT

Studies within the EC programme *Education & Training 2010* [1] identify a broad range of new skills needed for teachers in the knowledge-based economy and life-long learning society. An important part of these skills refer to the competences and abilities of teachers and trainers to design, develop, conduct, facilitate and assess teaching and learning processes aimed at acquisition of productive *soft skills*, supported by ICT.

In response to this demand a pilot project, *Innovative Teacher (I\*Teach)* [2], was launched in October 2005 under the EC Leonardo da Vinci program [3]. Through the collaborative effort of partners from 7 European countries (the Netherlands, Germany, Italy, Poland, Romania, Lithuania and Bulgaria) the concept of *ICT-enhanced skills* was elaborated and a practical methodology and support tools for building such skills were designed. The final goal is to facilitate the day-to-day utilization of ICT-enhanced skills by teacher trainers and teachers in their professional practice.

In a nutshell, the *I\*Teach* methodology is based on the idea of teaching ICT-enhanced skills by applying active learning methods. A Methodological Handbook [4] and pilot teacher training curriculum were developed and tested with teachers.

During the pilots the methodology was validated – teachers developed ICT-enhanced skills through designing and developing meaningful and motivating learning scenarios (*projects, challenges, activities, assignments, and assessments*). To support the implementation of the methodology and facilitate the exchange of ideas and sharing and reuse of scenarios, an online repository and a number of online and offline software tools are being developed.

### 1.1 Identifying ICT-enhanced skill

In order to identify the most essential skills, on which the project should focus, a wide audience of teacher trainers and pre-service and in-service teachers from the participating countries were interviewed by specially developed questionnaire disseminated through the project web site, e-mail and by direct contact. The findings showed a common need throughout Europe for teaching and learning soft skills like: working with information, presenting information, working on a project, working in a team. Since nowadays these soft skills are closely associated with ICT, their acquisition in relation with ICT skills is natural. The result of the interrelation and integration of soft skills and ICT is the *enhancement of the soft skill* by ICT – the acquisition of the skill is facilitated; the task is done simpler, easier, quicker [4]. So, simply said, by ICT-enhanced skills we mean the synergy between soft skills and ICT skills.

### 1.2 Selecting appropriate methods for teaching ICT-enhanced skills

After discussing a number of pedagogical theories, methodologies and practices, the *I\*Teach* partners identified the **active learning methods** as most appropriate instructional approaches for the effective teaching of the selected ICT-enhanced skills. An analytical report [5] on the most relevant active learning methods was produced and a correspondence between these methods and ICT-enhanced skills was established. The following activities were identified as contributing to the acquisition of these skills:

- **Working on specific situation (problem, project)** helps learners build **project working skills**: ability to identify and formulate tasks, divide tasks into subtasks, make a planning, integrate results, keep track of the progress, etc.
- When **researching specific situation (problem)** learners enhance their **information skills**: ability to collect and process appropriate information properly in order to reach a preset goal (determine the information problem, determine the relevance of an information source, search systematically by relevant searching techniques, localize and acquire information, evaluate information, etc.)
- **Working in small groups** during the research contributes to building **team working skills** (communicate internally/externally, give/receive feedback, resolve conflicts, support the team loyally, take responsibility).
- When **presenting the results** produced during the process of active learning the students practice **presentation skills** (select and order information, structure and build a report, make correct citations, design written, oral and Web presentation, select and use multimedia, etc.).

## 2. I\*TEACH EDUCATIONAL SCENARIOS AND THE METAPHOR BEHIND THEM

The methodology for building ICT-enhanced skills is implemented through continuous, repeatable activities and gradually accumulated experiences leading to concrete goals by performing specific tasks. This methodology tries to find the balance between the full freedom of the learners, as one extreme, and the strict following of detailed directions, as another. A series of sample educational scenarios have been designed to support the methodological framework. An *I\*Teach* scenario

represents a composition of tasks (to be implemented in the context of an active learning environment) leading the students to an educational goal by covering intermediate objectives (*milestones* of the learning process). The metaphor behind such a scenario is a *path* (the process) traced by *landmarks* (the milestones) leading to the *peak* (the goal) – Fig. 1.



Figure 1: The *I\*Teach* roadmap metaphor (source of picture: <http://www.skivitosha.com>)

The landmarks are positioned by the teachers in such a way that the students could build a set of ICT-enhanced skills naturally interwoven with the predetermined teaching objectives. The density of the landmarks depends on the students' age and experience – the younger and less experienced the students, the bigger the number of landmarks. At each landmark students are expected to have finished a concrete stage of the product development and mastered a specific set of skills. The stage itself consists of completing a task or a list of tasks. Certain segments between landmarks might split into branches – this corresponds to the flexibility of the students when choosing a way to achieve an intermediate milestone. Below we illustrate these ideas as implemented in a course with ICT teachers.

### **3. *I\*TEACH* META-COURSE WITH IN-SERVICE ICT TEACHERS**

The challenge for us, teacher educators, consisted in promoting a methodology which was very different from what the teachers were used to. Furthermore, in countries, where the mass education is oriented towards covering a rigid curriculum, it is not easy to promote projects consistent with different curricula and standards. What makes it even more difficult, is the old system for evaluating students and teachers.

The problem with implementing active learning methods in a real class setting has been observed by many researchers. Since most teachers (pre-service and in-service alike) are usually educated in the “good old” preaching style, it is too optimistic to expect them to teach in an innovative style. To face this challenge, we decided to teach about the innovative methodology by implementing the methodology itself. In addition, this meta-level should not be obvious for the trainees thus giving them a chance of rediscovering the main features of the methodology. Such an approach creates a sense of ownership – so important when trying out new things. We didn't have a pre-conceived idea of exactly how this would work out. We expected it to be hard but at the same time we enjoyed the novelty and we were ready to face the challenges...

We tried it out with two groups of teachers – the first time with pre-service and the second time – with in-service ICT teachers. Since all of them were already experienced in applying ICT in their own work, it was relatively easy for us, the leaders of the course, to put the accent on developing the soft skills, while the new technical skills were taught “on demand” – exactly when needed, as enhancing the acquisition of the targeted soft skills.

### **The broad theme**

To choose a theme for the in-service teachers who have signed for our course was both, easy and challenging: easy – since it should reflect the needs and interests of teachers, challenging – since it should give room for their imagination and creativity. Let us remind here that the *challenge* is defined as a *demanding or stimulating situation* [6] and we wanted to show the teachers how important it is to care about *lifting the gauntlet thrown*. After some brainstorming we chose a theme that seemed to satisfy both conditions: *School outdoors*.

### **The process**

Below we present the idea of the I\*Teach course by inviting the reader to follow the teaching/learning process from two perspectives – that of the learner, and ours – that of the teacher “trainers” (we call ourselves *trainers* only conditionally – we hoped that our students would accept us as *learners* as well).

#### ***The learner’s perspective***

The audience was prepared for a training course with experienced university lecturers in the frames of an international project. What could be more serious? And suddenly the course leaders appeared with funny New Year hats in harmony with the season (the course took place in the very beginning of 2007). Nobody was quite sure what to think – *innovative*, O.K, but wearing hats like that could make the teachers look like clowns in students’ eyes, right?

#### ***The educator’s perspective***


To be expected to be Mr. All-knowing in ICT is especially demanding and tense in time when most students believe that they are experts in the field. The first educational principle we tried to convey to teachers was *not to be afraid of becoming an object of laughter*. Besides, isn’t the role of the clown one of serving as *psychological grease* when the tension is too high?.

### **Task 1: Non-standard introduction**

We started with a non-standard introduction - inviting all participants, including ourselves, to answer three questions: *In what do you consider yourself an expert? How did you acquire this knowledge? How do you know that you are an expert?* [7]. The spectrum of expertise the course leaders mentioned was very rich – ping-pong coaching, cake-making, scarf-knitting, event-organizing, dress-sewing, providing critical feedback, etc. This had an immediate effect on the teachers who readily expanded the collection of examples. It was a very enriching experience to become aware of the process of learning happening everywhere and with all kinds of teachers, formal and non-formal.

The idea behind this was twofold – on the one hand, we needed examples that *the most important things people learn in life happen not because they are formally taught but because they have to solve problems and interact with others* [7]; that *people learn more and learn better outside of school* [8]; that *we learn best when we use what we learn to make something we really want* [9].

On the other hand, we wanted the participants to demonstrate their skills related to delivering a short oral presentation – the contact with the audience, the level of the language, the style of speaking, the sense of timing, etc.

Task 1 led to the *first milestone*:  **Short oral presentation.**

## Task 2: Generating ideas

After a short group reflections on what learning *is* and what it *is not* the theme we suggested - *School outdoors* – came as a very natural idea. Natural and still very unpredictable with respect to interpretations and associations it might provoke. With more than 20 participants who can imagine the scope of the possible projects fitting the main theme...

The teachers were split in two rooms and they started brainstorming in order to generate possible sub-themes, inspired by the main theme.. After intensive discussion the following sub-themes emerged:

- Learning through media
- Learning through the environment
- Learning provoked by individual interests
- Learning in the street
- Learning in the nature
- Learning at home

Then 6 teams were formed around the identified sub-themes and according to the participants' preferences. The course leaders were spread with the idea to act as partners in the research teams (their *magic hats had made them invisible...*).

Teachers are often faced with students' prejudice that learning is unpleasant duty and depends mainly on the lecturer who transmits information. To address this, we involved the teachers (our students) in activities centered on projects and presented them with challenges to be overcome by our joint efforts (the lecturers being partners in the exploration).

We wanted to draw teachers' attention to the following important aspects:

- brainstorming could be successfully used as an active learning technique
- sub-themes that seem very close, could be further developed in completely different directions, e.g. *Learning through the environment* and *Learning in the street* emerged correspondingly in *Blue school – learning during a cruise* and – *How to behave at Public places*.

We demonstrated that teams could be formed by different approaches - one, by the course leaders, as to assign people from the same school or area to different groups, and another - according to the individual interests of the participants.

Task 2 led to the *second milestone*:  **Formulating sub-themes.**

## Task 3: Planning

Already in small groups, the teachers were expected to come up with more precise formulation of their topic, to give a proper name of the group, to distribute specific roles among the group-members and to develop and present a plan for addressing that topic (Fig. 2). The group whose sub-theme was *Learning provoked by individual interests* chose *games* as a more concrete topic to work on and called themselves *Student-ludens* (student as player) by analogy with *Homo Ludens* [10].



Figure 2. Group discussion and planning

At this stage we wanted to harness the teachers in activities enhancing their skills:

- *to work on a project* - make a plan; identify tasks and divide tasks into subtasks; report results; use the proper tools properly
- *to work in a team* - communicate internally, form sub-teams; give and receive feedback; support the team loyally; take responsibility
- *to work with information* - identify the information problem; judge the relevance of an information source; search by relevant searching techniques; retrieve and evaluate information, use information legally.

Task 3 led to the *third milestone*:  **Written and oral presentation of plans**

#### Task 4: Scenario and products development

The original plan of the *Student Ludens* group was to classify the games, to present a game from each class and to design a game belonging to a concrete class. When this plan was presented together with the plans of other groups, the participants reformulated their themes and plans as to reflect the recommendations and needs of the other groups. The *Student-ludens* team decided that the most suitable games for students going to the *Blue school* would be related to ropes and knots. Thus a new, more specific topic emerged: “*Why knot?*” The members of the group started searching for information on knots in various contexts. Nobody expected that this is such a rich topic – Knot theory in mathematics, knots related to the Hebrew and Chinese alphabets, knot art, knots in sailing, climbing, caving, hiking. The ancient art of string figures passed to us by our grandmothers turned out to be known to the Hawaiians and Indians as well. The interplay between old and new technologies was inspirational – surfing (also on the Internet), trying out life saving knots, solving logical puzzles of *knotty* nature, knitting a cord for an artistic logo of the group, calling sailing experts by cell phone for advice, to name just a few (Fig. 3). The enthusiasm of the participants was such that all of us continued to work after the session and exchanged e-mails with newly found links on the topic.



Figure 3: Technology enhanced learning about sea knots

The next day started with preparing of a presentation of a Knot Scenario – the next milestone. Of course working on products prototypes, e.g. a manual for games with string figures, a website for sea-knots, an introduction to knot theory in mathematics, etc. were more exciting than describing a scenario behind such activities. But the milestone ahead was tying us down.

Task 4 led to the *fourth milestone*:  **Presenting scenarios and prototypes**

Note that the definition of *scenario* is recursive (Task 4 refers to *scenario* as well). Still at this point the meaning of *scenario* was rather colloquial. Its refinement in terms of the I\*Teach methodology occurred a little later when we presented to our trainees the roadmap metaphor of the course scenario and asked them to look back at the road segment corresponding to their particular Task 4 and present it in a similar way – in terms of the I\*Teach methodology (Fig. 4).

An interesting observation for us was to realize that even after the topic of classifying games was well formulated, the team didn't stick to it. Rather a topic related to the ropes and knots emerged as being more relevant to the topic launched by another team.

Thus several new ideas were conveyed to the participants:

- Formulating the topic allows for certain flexibility
- Giving and receiving feedback is important within the team as well as among teams
- Discussions among the team members could be enhanced by means of ICT
- External communication could be very effective when used properly
- Keeping the track of the progress is an essential part of the process
- Integrating the results of explorations of the team members in a single product is difficult but rewarding task
- When presenting a team product every member should be given credit for his/her contributions



Figure 4: Presenting sailing knots







- our trainees were expected to meet us again in three weeks and report if implementing the methodology in their class setting was easier or more difficult with “real students”. We, the organizers of the course, were ready to face different attitude and experience after its initial phase, even worse – that some participants would give up the next phase. (Let’s remind here that the course was not obligatory for these teachers and the certificates they would receive at the end were a matter of honor mainly). But what happened proved a slight modification of our motto: *Teach a man to fish, and he'll invite himself over for dinner*. We were glad to find out what a great number of teachers were eager to be *invited for dinner* – during the following three weeks they were sharing virtually and face-to-face with us various ideas for scenarios. And not only, many had tried out these ideas with their students. Three weeks later **all** the teachers having participated in the first phase of the course appeared ready to report their experience as *innovative teachers*. They had tried out the *I\*Teach* methodology in wide variety of contexts: ICT, video design, mathematics, chemistry, physics, sociology. It was also interesting to see that there were three different realizations of the theme: *preparing problem sets for peers*. Here are some answers to the question: *What was the most surprising thing for you when implementing the methodology?*

**Vladimira** (ICT teacher of 12<sup>th</sup> graders): *To see the enthusiasm of my students when they worked on a problem involving processing of data about themselves.*

**Irena** (ICT teacher & teacher trainer): *I had implemented many different methods before with no great success. When trying out this methodology with in 5<sup>th</sup> –6<sup>th</sup> . graders and with 9<sup>th</sup> -10<sup>th</sup> graders I realized that the main difference this time was that the work was driven by the interests of my students and they were ready to face challenges.*

**Boris** (ICT teacher of 12<sup>th</sup> graders): *I gave my students an assignment to make a film about our school. They split in teams, distributed their roles and started working in a team. Even though I was prepared for an enthusiastic work, what happened really surpassed my expectations. Working in a team turned out to be a great method for these students.*

**Marina** (Math&ICT teacher of 6<sup>th</sup> graders): *I asked my students to prepare a set of math problems for a test together with warm-up problems and to provide their solutions. The result from mathematical point of view was that they prepared for the test in an enjoyable way. In addition they started appreciating the difficult task of the teacher. And they learned to work in teams.*

**Galia** (Primary School Teacher): *I asked my 3<sup>d</sup> graders to review the topic The man and the society in the style experienced in the I\*Teach course. The students told me after that: “We want to study like that all the time”.*

Most of the elements surprising for teachers were well known to the researchers. The fact that they surprised these teachers showed that it was for a first time they had taken the courage to implement them. And (as they shared later with us) that was mainly due to the educational style we ourselves adopted – **teaching about the methodology by implementing it**.

Another important observation was that some projects already tested in practice could be re-thought in terms of the *I\*Teach* methodology and shared with colleagues

**Ralitza** (ICT teacher of 9<sup>th</sup> graders): *I had the chance of re-thinking my experience and sharing it with the rest of the participants. For me, this methodology works.*

**Sylvia** (ICT expert for the Ministry of Education): *I would encourage more people to share their scenarios in the repository (in Bulgarian the term literally means “the treasure box”).*

Other impressions imply that the methodology could be implemented in wide range of ages. Teachers tried it out successfully with 10-19 year-old students as well as with university students:

Of course, we could claim that the methodology is applicable for in-service teachers as well.

## 5. CONCLUSIONS

### What did the teacher educators learn

Our hypothesis was proven: if we would like the teachers to be innovative, then we, the educators, should be innovative as well. Using the methodology during the training course made teachers feel more comfortable and confident to apply it.

**Boris:** *It was unforgettable experience*

**Nelly:** *I got the courage of implementing some of the active learning methods we used during the course here.*

The teachers got the sense of ownership – given the chance of rediscovering some of the main attributes of the *I\*Teach* methodology they felt co-authors of its core and were really motivated to apply it in their practice

**Irina:** *I got many new ideas influenced by I\*Teach*

**Marina:** *I got new motivation to implement my ideas*

Preparing such a course required plenty of time and coordination efforts. We (a team of six educators) prepared that course through several face-to-face meetings followed by intense e-mail discussions.

Coming to a clear and well-formulated idea as a main focus of the course was one of the key issues. That is why having a repository of numerous working ideas is really having a treasure.

The joint work of the team of educators played extremely important role both during the preparation and the training phase:

- In the process of preparation it was very useful to share ideas and to receive a feedback often leading to a better idea. Thus we had the genuine sense that the final theme was born thanks to *collective intelligence*. This type of intelligence was illustrated by Bernard Cornu [11] interestingly enough in terms of “fish”– when facing a big challenge a school of small fish would take the form of a much bigger fish as a self-defense.
- During the course it seemed easy and natural to appoint one “special member” to each group of trainees. In fact, it turned out to be very difficult: to direct your group (staying “invisible” or at least “in shadow”) so as to give your team members the chance of exploring and discovering; to encourage them to share their needs and to help them in such a way that you wouldn’t deprive them of the joy of the discovery and of their self-confidence.

Not to be in the center of the events and still to hold the learner’s attention in hand is a very challenging and surely innovative phenomenon for educators trained in a traditional manner. We have still a lot to learn in this direction...

### 5.2 What did the teachers in the role of students learn

The **challenge** was one of the most important elements during the course: **the process was driven by learners’ interests** and the learners were put in demanding and stimulating situations. Then they were motivated to work hard on their knowledge but they experienced this work as being *hard fun*, too.

The **chance of expressing yourself**, of sharing ideas within a team, of working on project and producing results, of presenting them to others, turned out to be another stimulating feature of the methodology. Our trainees realized that what matters most about using ICT and teaching about ICT is using them to learn about everything else and to express better ourselves. Teachers felt that **they were not alone** (when solving a problem, when sharing ideas and insights).

**Marina:** *I felt that I could rely on real support when I decided to implement it in class. When working in a team you contribute to creating a collective intelligence.*

### 5.3. What do we expect the learner to learn after all

We believe that the real results of the *I\*Teach* methodology could not be seen immediately. But let’s see Diana’s observations after giving her 18–year-old students the topic: *The knowledge society and my professional realization*. The

more active students started working with enthusiasm (they liked the new style), however some of the students who were used to more traditional methods reacted at first reluctantly. After some time **they realized that their real problem** in fact was **not knowing what to do in life**.

We expect many more students and teachers to learn “to fish” in the style of the I\*Teach methodology. We believe that the sooner this happens the bigger their chances of *feeding the world*.

#### 5.4. What next

The next challenge our team is facing is to explore the possibilities of developing ICT-enhanced skills via the technological environment provided by the Six Framework European Project *TenCompetence* [12]. The *I\*Teach* methodology has been chosen among several others to be integrated with the *TenCompetence* platform and tested in a pilot experiment during the summer and autumn of 2007.

#### Acknowledgments:

The work on this paper has been partly sponsored by the Leonardo da Vinci project *Innovative Teacher* (I\*Teach), BG-05/PP/166038, by TENCompetence Project funded by the EC 6th Framework Programme, Contract No 027087 and by the Kaleidoscope Project that is funded by the European Commission's 6th Framework Programme, priority IST/Technology Enhanced Learning.

Our deep gratitude to Gabriela Dodero, a member of the I\*Teach Italian partner, for the fruitful discussions and suggestion for presenting the training process in dual mode.

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## Biographies



**Eliza Stefanova** is chief assistant professor at Faculty of Mathematics and Informatics at St. Kliment Ohridski University of Sofia. Last years she concentrated her research on technology enhanced learning and especially use of ICT in secondary school. Her efforts are put on emerging science and practice - powerful research ideas and best practices in education to be adopted as wide as possible. She was among initiators of Innovative Teacher (I\*Teach) project.



**Evgenia (Jenny) Sendova** is a senior researcher at the institute of Mathematics and Informatics at the Bulgarian Academy of Sciences. Her interests are in using informatics and IT for teaching mathematics, languages, music, science and arts. Her thesis was on developing Logo microworlds and models for integrating learning and creative processes. For more than ten years Jenny has been involved in working with students highly motivated in mathematics and science.



**Iliana Nikolova** is an associate professor in informatics, head of Department of Information Technologies and chair of MSc in e-learning at the Faculty of Mathematics and Informatics, University of Sofia. She has a PhD in Computer Science and an MSc in Educational and Training Systems Design. Coordinator of a number of national and international projects in the area of Logo, ICT in education and training, e-learning, virtual collaboration, ICT for community development (community telecenters).



**Nikolina Nikolova** is a teacher in informatics and ICTs at National High School of Mathematics and Science. Working with talented students, her interests are directed to improvement students' motivation and quality of education in these subjects. As a PhD student at Faculty of Mathematics and Informatics at St. Kliment Ohridski University of Sofia she works also on using ICTs as teaching tools for effective and efficient learning.

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