

tETRIS

TETRIS – TEACHING TRIZ AT SCHOOL

Progress Report

Public Part

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Project coordinator: Fabio Tomasi
Project coordinator organisation: AREA Science Park
Project coordinator telephone number: +39.040.3755268
Project coordinator email address: fabio.tomasi@area.trieste.it

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Executive Summary

**Are you interested in creativity and problem solving?
Well, TETRIS is what you are looking for!**

Moving towards a post industrial innovation oriented society requires new skills and attitudes and a change in company organization, culture and educational system. Creativity, problem setting and problem solving will become new essential skills as using a computer or speaking a foreign language. Among all the techniques supporting problem solving activities, TRIZ, the Theory of Inventive Problem Solving created by G. S. Altshuller offers a systematic approach to the generation of solutions. TRIZ produces less ideas than other creativity methodologies but they are more oriented to the objective reducing therefore the cost of testing new concepts and prototypes which is much higher than the cost of developing new ideas.

TETRIS objectives are:

- identifying the learning needs of vocational education systems and trainers. This will improve the efficiency of the courses/initiatives, developing individuals problem solving skills and more specifically introducing TRIZ at school and into professional organizations
- developing a course and training materials to improve individuals problem solving capabilities and to speed-up the learning process of TRIZ philosophy and instruments.

The project partnership is heterogeneous and complemented: in addition to organizations high experienced in teaching TRIZ methodology, vocational training centres and Universities, there are several secondary schools, educational authorities and companies involved in the project. In TETRIS consortium researchers, developers, companies that use TRIZ methodology and representative of beneficiaries work together to assure the developing of training tools that can effectively forcing out the psychological inertia.

The project approach provides for:

- the identification of the different educational requirements between schools and companies and between different countries (educational systems, cultures etc.);
- the identification of an educational model (there are neither programs nor standard on TRIZ);
- integrating handbooks with animations illustrating what TRIZ is in a charming and attractive way (the Triz Tales). A visual representation of TRIZ concepts improves their assimilation since animations are able to summarize in a glance concepts that otherwise would require much more time to be understood;
- a non linear structure of the handbooks contents. The different subjects can be chosen and presented by teachers/trainers according to the specific requirements of the target groups. Permitting an extremely flexible use of the TETRIS training tools;
- testing the training material in school and companies. The feedbacks will be used to improve all the Tetris products.

The project results/products achieved to date are:

- the project web site
- the TRIZ educational requirements report
- the TRIZ tales (5 animations)
- a draft version of the English edition of the handbook

The animations and handbooks will be translated in 5 languages (English, French, German, Italian, Latvian) and adapted to the different educational systems. The testing phase will involve secondary schools and companies in Austria, Italy, Germany and Latvia. Then the educational materials will be revised according to the feedback collected. The final version of Tetris material will be published on the project website and will be freely downloadable by any registered user.

A final conference will be held in AREA Science Park in November 2009.

Project web site: www.tetris-project.org

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1. Project Objectives

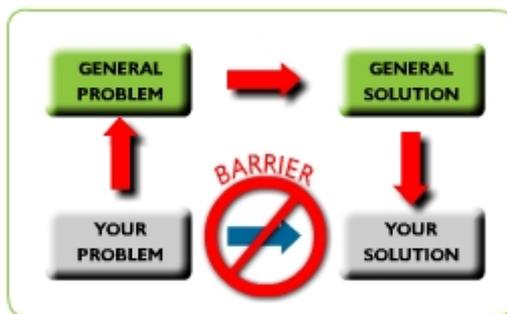
Tetris aims to:

- identify the learning needs of vocational education systems and trainers in order to improve the efficiency of the courses/initiatives aimed at developing individuals problem solving skills and more specifically at introducing TRIZ at school and into a professional organization: a special attention will be dedicated to the identification of similarities and peculiarities of their educational requirements as a resource to establish new forms of cooperation in educational activities.
- develop a course and training materials suitable also for distant learning (lessons with animations, exercises with solutions, tests, handbook for teachers and trainers) in order to improve individuals problem solving capabilities and to speed-up the learning process of TRIZ philosophy and instruments according to the following main directions:
 - o introducing techniques for avoiding psychological inertia
 - o eliminating the attitude to trials & errors in order to improve the efficiency of the innovation process
 - o providing a structured approach to problem analysis and to technical creativity by means of systematic processes to reasoning based on ARIZ (Algorithm of Inventive Problem Solving) fundamentals
 - o introducing fundamentals on systems evolution and on the objective laws identified by TRIZ researchers.

TETRIS is a new way of teaching TRIZ but

What is TRIZ and why choosing this technique to support problem solving activities?

TRIZ is a Romanized acronym for Russian “Teoriya Resheniya Izobretatelskikh Zadatch” meaning “Theory of solving inventor’s problems” or “Theory of inventive problem solving”. It was developed by the Soviet researcher Genrich Altshuller and his colleagues starting in 1946. In comparison with psychological methodology to boost creativity TRIZ allows a better problem definition, takes advantage of solution also from other fields, helps in overcoming compromises and move towards the ideal final result.



The TRIZ approach is quite different from other problem solving methodologies. In most cases the problem you’re facing now, has been already faced by many other people at different times, at different places and in different situation. TRIZ allows to connect your problem to a standard problem and so suggesting a standard solution which provide you the direction to find out the best solution for your problem overriding your psychological inertia. But also in case you must deal with a completely new problem, ARIZ (the algorithm including up-to-date TRIZ tool in a structured sequence) will

provide you an effective path to find out the best solution.

We have chosen the TRIZ among all the techniques supporting problem solving activities, because it offers a systematic approach to the generation of solutions.

TRIZ efficiency can be demonstrated by means of acknowledged experiences reported by well known companies especially in the Far East. Recent studies demonstrate that TRIZ produces less ideas than other creativity methodologies but they are more oriented to the

objective reducing therefore the cost of testing new concepts and prototype which is much higher than the cost of developing new ideas¹.

TRIZ education would require not less than 200 hours courses, according to Altshuller course definition. In all the European countries TRIZ is mostly taught through short 2-5 days seminars, but it is evident that just a small percentage of attendees really benefits from this education. Moreover creativity and problem solving techniques are usually not taught at all at school. Such a situation hinders the development of innovation capabilities among European researchers and designers. The organizations aiming at provide a deep and reliable TRIZ expertise to their employees have to plan an articulated and comprehensive educational program typically not affordable due to time/resources constraints. Moreover, a radical change of mentality is required to managers, designers and technicians with an established background; thus the best educational approach actually consists in performing a preliminary “dismantling” activity aimed at overcoming traditional stereotypes about creativity and innovation which prevent individuals from innovative thinking based on TRIZ philosophy. These traditional stereotypes dramatically decrease efficiency of implementing creative and innovative potential of personality and organizations. Indeed, especially in big companies, education is often perceived by employees as something imposed by the higher hierarchical levels. Thus it is necessary to adopt attractive training material; in order to make the attendees recognize the benefits of the learning process since the first approach to the course.

It has been demonstrated that major benefits can be achieved by anticipating to the high school fundamental TRIZ concepts in order to:

- Reduce psychological barriers before people mind “gets frozen” and improve ability of students to learn new things better and more efficiently;
- Eliminate general assumptions like “mistakes are necessary to generate a strong solution” and all the Trial&Error practices;
- Share fundamental concepts about systems evolution that can be useful as stand-alone cultural elements, but even more as a base for learning TRIZ and TRIZ based tools.

The fulfilment of the project objectives will provide efficient means to support the cultural change provided by TRIZ philosophy and the acquisition of its problem solving techniques. The preliminary analysis of educational requirements and the definition of a comprehensive model for TRIZ integration at school will provide systematic means for the development of the training material.

Thanks to up-to-date educational means based on the adoption of animations, detailed examples and exercises with solutions, the learning process will be shortened avoiding oversimplifications of the theory and resulting attractive as well. The distant learning material distributed for free also by Internet will encourage a wide dissemination, while the train the trainers course will create the conditions for direct interactions in classrooms on a larger scale both at school as well within the industrial world.

The implementation of several test courses, both at school and in industry in several countries and the organization of events aimed at sharing experiences and at collecting feedbacks will provide directions for further improvements. Moreover, thanks to the harmonized composition of the consortium, small companies will have the opportunity to learn best practices from the industrial partners with a deeper experience in the field; on the other hand fruitful cultural exchanges will be promoted between industries and educational institutes.

¹ see for example: D. Cavallucci, T. Eltzer: “**Parameter Network as a mean for Driving Problem Solving Process**” Int. J. of Computer Application Technology, 2007; N. Khomenko, R. De Guio, L. Lelait, I. Kaikov “**A Framework for OTSM-TRIZ Based Computer Support to be used in Complex Problem Management**” Int. J. of Computer Application Technology, 2007, The report “**Life & Health Technologies Sector on the Island of Ireland, Insights into 4 key areas that make your business work**”, InterTradelreland, 2006

2. Project Approach

In order to find out which are the most relevant key factors for a step-by-step, effective TRIZ training course, all project partners, and other external experts, as the Friuli Venezia Giulia Office, of the Italian Ministry of Education were asked to fill in a questionnaire and pass on their past experiences with TRIZ trainings.

Since the project partners of TETRIS are both educational institutions (universities, schools, educational authorities) and companies (industry and SME's) a special attention was dedicated to the identification of the differences between the procedures in schools and companies. A further matter of investigation were the discrepancies among expectations and constraints requested by the schools from different countries.

A brief summary of the main outcomes of this activity is reported in Table 1 of next paragraph.

In order to address the complex task of introducing totally new subjects into the students curriculum also taking into account the heterogeneous and strict demands described in the previous section, it was necessary to perform a careful study of the educational model.

In the 60-ies of the previous century the concept of 'knowledge society' appeared in Europe as a response to the inability of traditional educational systems to meet the necessities and the demands of the society.

The modern understanding of 'knowledge society' was presented by T. Koke as the system of people's social relationships ensuring high level of innovations in which every personality is able to achieve high degree of participation getting, using and developing new knowledge independently.

Longworth [1] defines the basic skills necessary in knowledge society:

- the ability to manage oneself,
- the ability to work with information and interpret it,
- the application of new knowledge into practice,
- studying skills,
- the ability to discourse sensibly and critically,
- management and communication skills, thinking abilities and creativity,
- the ability to adapt,
- the ability to work in team,
- life long learning.

The existing system of education is not able to fulfil the task of preparing the students to live in the knowledge society. It is therefore necessary to change this introducing the teaching of the above mentioned skills.

These skills are attitudes that can be enhanced by the TRIZ way of thinking. The introduction of TRIZ in secondary schools curricula can be achieved in two ways: TRIZ as a separate subject or as a methodology integrated in other subjects.

The traditional way of planning education contents is based on the following process:

- A school develops educational program and includes the list of necessary list of subjects
- The state accepts subject standards
- Teachers develop subject programs which include the list of necessary teaching materials. This means that the teacher chooses from existing sources: course books, literature sources, Internet resources, etc., those which are most suitable to achieve the aim stated in the programme.

Certainly there are cases when there are no course books and the teacher has to develop the teaching materials for the students independently. He/she does it according to the subject programme on one hand and on the basis of subject scientific literature on the other.

The schools belonging to the TETRIS consortium, as well as any other similar educational institution with the aim of teaching TRIZ to their students, do not have any TRIZ skill at the beginning, nor any teaching materials. Therefore the educational materials must be customized to

the specific situation. The main difference in comparison with the introduction of more classical subjects is that **there are neither programs nor standard on TRIZ.**

In facts, the program must be defined in agreement with the system of requirements to be satisfied in the organization of the teaching/learning process. Several factors must be taken into consideration while developing the educational program:

Student factors:

- Human and national values
- Education necessities
- Motivation
- Personal qualities
- Age peculiarities
- Cognitive factors: cognitive skills, creative skills
- Affective factors: sympathy and emotions, their character and strength
- Individual style of learning
- Quantity and quality of the knowledge possessed
- Work and problem solving experience
- Ability to learn
- Ability to cooperate

Teacher factors:

- Human and pedagogical values
- Attitude towards professional activities
- Personal qualities
- Personal culture
- Education
- Experience
- Pedagogical believes and preferences
- Professional knowledge
- Attitude towards the students and the style of socializing
- Creativity

School factors:

- The aim of activities and the development strategy
- Education programmes
- Atmosphere and microclimate
- Corporate culture
- Pedagogical traditions
- Teaching environment
- Resources: material, human, time

Country factors:

- National values
- Social, economic and political development
- Education policy

- Education system
- Education standards

The synthesis of all the abovementioned factors allows to discern which information is understandable/not-understandable, interesting/ uninteresting for the students, if they can learn independently, what tasks are more suitable to their interests and abilities, on the grounds of what pedagogical approaches the learning is going to be more successful, etc. Thus, it would be possible to develop the materials which will be more suitable for effective application to teach TRIZ in a specific school or company. However, even just in the framework of the TETRIS partnership, this would have led to 5-6 different sets of teaching materials.

The necessity (or opportunity) to develop a set of training materials that could be used by the widest range of schools and companies, led us to the development of a single set of training materials.

To develop materials that could fit in different target audiences and in different conditions we developed a single set of teaching material, but it consists of clearly stated structural elements, that can be combined in several set of modules tailored to the needs of different users.

In order to follow the directions of the educational model, i.e. building educational materials into bricks to be combined and adapted according to each specific situation, the handbook authors have defined a common structure for each item of the Body of Knowledge according to the table of figure 1. More precisely, Knowledge items are organized in “cells”, belonging to a sort of three-dimensional space, classified according to three main reference axes:

- different levels of detail (vertical axis): topics, sub-topics, sub-sub-topics...;
- different types of contents (horizontal axis): title, definitions (glossary), theory, instruments (practical directions about how to use the related tools), multimedia, examples, self-assessment resources, references to literature;
- variants of the training contents (3rd dimension of the grey part of the table): mainly examples and self-assessment materials, but sometimes also tools explanations can be presented in different forms in order to leave a wider choice to the teachers.

ID	Title	Definition (Glossary)	Theory (Details)	Tool (How to use)	variant			References
					Multimedia Animation	Example (Problem/Solution)	Self Assessment (Questions, Tasks)	
0	TRIZ							
...								
2	Fundamentals of TRIZ							
2.1	Laws of Engineering System Evolution							
2.1.1	Law of completeness of system parts							
2.1.2	Law of “energy conductivity” of a system							
2.1.3	...							

Figure 1 – Structure of the TETRIS Body of Knowledge and classification of Knowledge items .

It is worth to mention that in order to attract young students to learn TRIZ fundamentals, several animations have been developed to illustrate what TRIZ is in a charming and attractive way (the title of these animation is TRIZ tales). Moreover, a visual representation of TRIZ concepts will improve also their assimilation. Five animations have been developed by the end of 2008 and their contents are described in the following section.

TETRIS animations are a pioneering work since very few attempts have been done until now to depict TRIZ concepts in a visual way. Moreover TETRIS is the first integration of a comprehensive handbook on the topics with multimedia tools.

A part from their didactical value they are also a powerful tool to raise interest in the topic. Many of the project partners that in the past organized TRIZ courses highlighted the difficulty of promoting TRIZ since the methodology and the benefits it can provide to its users are hard to understand at the first glance. The animations are able to summarize in a few minutes concepts that otherwise would require much more time.

As stated above, in order to facilitate the role of teachers at school, their training has been organized so to make them develop examples of each TRIZ concept within their own subject/field of expertise. The development of those examples will constitute a verification of their comprehension and at the same time a means to disseminate TRIZ concepts at school with different perspectives. These teachers were required to fill in a questionnaire and their feedback has been considered in finalizing the handbooks.

In 2009, the TETRIS educational tool kit will be used and tested by the schools involved in the project in three different countries (Austria, Italy and Latvia) and by several companies in Austria, Germany and Italy. The feedback from teachers, trainers, students and companies will be collected by means of questionnaires and the training materials will then be revised and improved according to the suggestions received. Teachers and trainers will be asked in particular if the TETRIS training materials ease their teaching of TRIZ and what was their perception of the students attitude and achievements. Students and companies will be asked about the clearness of the training materials and how they were able to support them in learning and understand TRIZ. Companies will be enquired about the usefulness of the TRIZ tools explained by TETRIS in relation to the company objectives.

All the project documentation and training materials will be published on the project web site freely accessible in five languages: English, French, German, Italian, Latvian. The use of the education material will be totally free just by quoting the authors, the TETRIS project and the Lifelong Learning Programme. Under the same conditions they could be translated in any other language. This will allow a dissemination and exploitation of the project results also in countries different from those originally involved in the project and gives the project a wider European if not world wide dimension.

From the very beginning of the project a particular attention has been paid in communicating project activities and promote the adoption of the TETRIS tool kit by other users. Every partner has actively contributed in promoting project activities.

One target is the TRIZ community. The project has been presented in occasion of the TRIZ Future Conference, the conference yearly organized by ETRIA the European TRIZ association and to other national associations. Since these association are extremely motivated in spreading the use of TRIZ, they will actively the use of the TETRIS kit. The animations presented at the European TRIZ conference have been warmly appreciated and TETRIS is the first educational kit that addresses secondary schools.

The promotion strategy is obviously also addressing the final users i.e. schools and companies. Several presentations have been done and will be organized for schools, educational authorities, companies and industrial associations. These activities will be intensified in the second year when the project products will be available and also the outputs of the first application of the kit in the real world.

A final conference will be held at AREA Science Park conference center to disseminate the project achievements.

3. Project Outcomes & Results

The first outcomes of the project were the project web site and the “Educational requirement report”.

Both of them were available in March 2008.

The project web site (www.tetris-project.org) has been develop according to the following objectives:

1. Create a virtual showcase of the project activities and objectives
2. To spread the project products to the widest number of users
3. Raise the awareness on the potentiality of TRIZ and the importance to improve problem solving skills
4. To support partners communication

The web site has been developed in English and later translated in four languages: French, German, Italian and Latvian.

The heading of the web site include a quotation from Genrich Altshuller (the father of TRIZ): “Creativity is not a born gift. Every engineer can learn to be inventive.” which summarize the philosophy of the project.

The web site includes the following sections:

- Home page (welcome page and web site menus)
- About this project (description of project objectives and activities)
- How TRIZ can help you (a very brief introduction to TRIZ)
- Lifelong Learning Programme (a very brief introduction to the LLP linked with EACEA web site)
- Partners (partners list linked to their web sites)
- Weblinks (a list of suggested links to related web sites)
- News (updates on project activities)
- Animations (the project animations available, on line for registered users)
- Downloads (a container of documents, reports etc.)

Three categories of users are envisaged for the download area:

- not registered users: they can download very few documents (just dissemination materials);
- registered users: they can freely download the final versions of all project outcomes;
- members: they are the project team and EACEA officers; they can view and download all documents (including draft version of project outputs, project management documents, meetings minutes etc.).

From the publication of the project web site to the end of 2008 2.994 different people visited the project web site. A dramatic raise in the number of visitors has been recorded since October (about 50% of the total visits were recorded in the last three months). The reason for such an increase is the publication on the project web site of the first animations.

Visitors came mostly from these countries (in decreasing order): Germany, Italy, Austria, USA, Brazil, Latvia, Canada, Turkey, Hungary, Israel, India, Belgium. The large number of visitors from non European countries witnesses the innovative character of the project and the relevance of its outputs.

The Educational Requirement Report summarize the analysis of the partners previous experiences in teaching TRIZ and the educational requirements outlined by the final users of the TETRIS educational tool kit: companies and schools.

On one hand the analysis compared different way of teaching TRIZ in different contexts and to different targets. Each partners clearly described what worked properly and the weak points of its experience. The outcomes helped the authors of the training materials to avoid mistakes already occurred in the past and collect proven good ideas.

On the other hand the analysis of the final users expectations and needs helped the authors to define in details the educational objectives and to tailor them to the final users needs.

The report has been immediately published on the project web site and can be downloaded by any registered users. A brief summary of the main outcomes is depicted in table 1.

While no relevant differences were highlighted from the schools due to national regulations, the hardest requirement to fulfil is the limited amount of time schools (as well as small companies) can dedicate to TRIZ introduction. Besides, a realistic approach to combine consensus and feasibility is a TRIZ introduction course, where the tools are explained and practised with prepared exercises, followed by the application of TRIZ tools within other real project works (typically implemented at least in any technical or experimental school).

Moreover it was recommended to produce a comprehensive map of the TRIZ Body of Knowledge in order to give a clear overview of what TRIZ can offer and what could be studied at the end of the introductory course.

Topics / Questions	Schools	Companies
What is the goal of the "customer" (school / company) to run TRIZ lessons?	Different thinking approach & creativity method	Problem solving competence
How to increase the interest & motivation of participants? (in a starting session)	Showing with easy examples that the theory works Using multimedia & playing elements	Showing results and outcomes
What should be the content of a TRIZ introduction?	The main sayings of TRIZ Some easy to use tools TRIZ-tools that can also be applied in other lectures Overview about the TRIZ thinking process (ARIZ)	The main sayings of TRIZ Some easy to use tools TRIZ-tools that can be quickly applied for idea generation Overview about the potential applications of TRIZ Overview about the TRIZ thinking process (ARIZ)
What is a good / feasible duration for a TRIZ introduction?	App. 30 to 60 hours	Approx. 2 to 3 days
Important educational elements	Hands-on examples Exercises & Homework Fun (teamwork)	Hands-on examples Templates for easy implementation Benefit of cross-company teams
Overall critical restrictions / circumstances for TRIZ trainings	No (international) standard handbook for TRIZ trainings is available at the moment! Creativity is no "declared" school topic	No (international) standard handbook for TRIZ trainings is available at the moment! No international accepted certification system

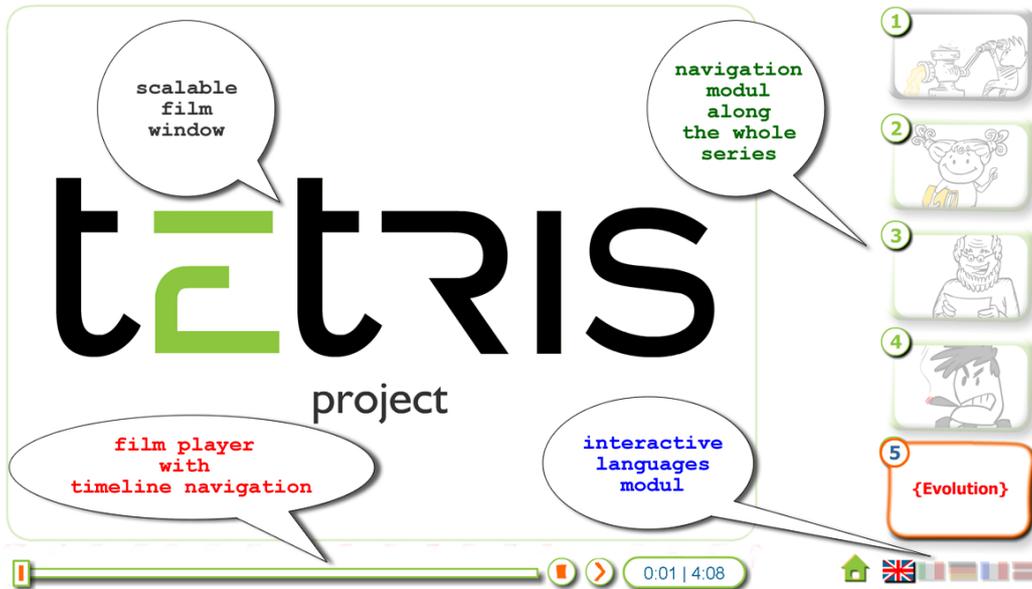
Table 1: Main outcomes of the questionnaires and experience reports from schools and companies.

From October to December 2008 the project animations, titled "TRIZ Tales", have been released on the TETRIS web site.

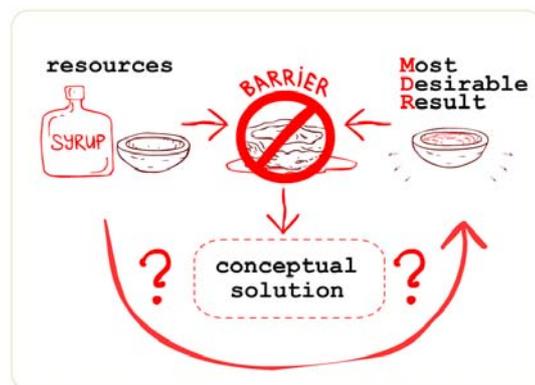
Animations have been initially hand drawn, than they have been digitized using Wacom graphics tablett, assembled with noises and music, animated in Macromedia (Adobe) Flash and the interactions programmed using Flash Action Script. Original soundtracks performed by movie composer Patrick Ehrich, Wasted Music.de, have been composed for the TETRIS animations

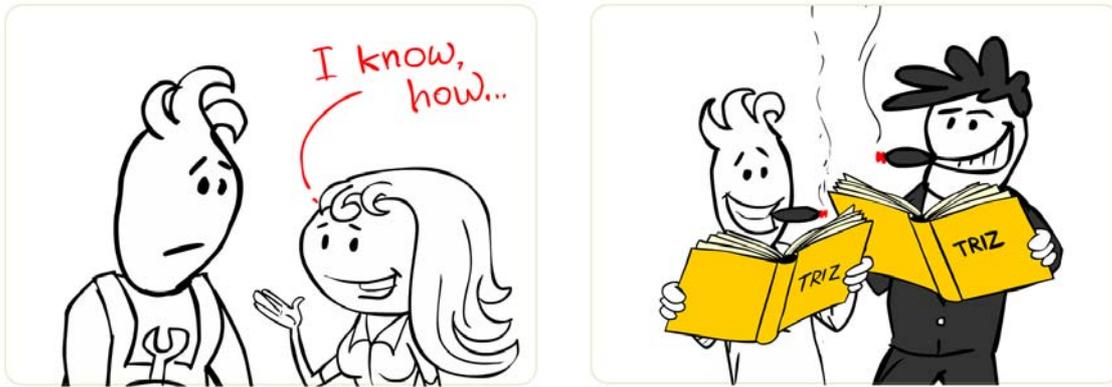
The first version were available just in English. Later on a new improved version as been realised with new features:

- they are multilanguage (English, French, German, Italian and Latvian) and it's possible to switch from one language to the other also during the screening;
- a scroll bar has added in order to stop the screening, going back etc (this is crucial for the educational use of the animations);
- improved sound track.



At all five animations have been developed by the end of 2008. The first one is about the story of TRIZ and what it is. Animations 2, 3 and 4 depicting the adventure of the protagonist Nina at school, university and work explain how TRIZ principles can be used to solve real world problems from the preparation of candies to the design of a virtual room. It has been decided to use in all stories the same principles in order to demonstrate how flexible TRIZ tools are and how they can be applied in very different situations. The fifth animation compare the Laws of Engineering System Evolution with the laws of evolution from biology and illustrate how the 9 windows scheme works.





Some shoots from the animations

By the end of December 2008 the English edition of the TETRIS handbook or book of knowledge has been realized and translation and adaptation to national culture started. At present the handbook is available only for partners and testers (i.e. those who are going to test the training materials and provide a feedback to improve them).

After the testing phase will be over and the training materials improved to their final version the handbooks will be freely available on line to all registered users.

The index of the handbook is the following:

- Why do we need to know the foundations of applied theories?
- Introduction to classical TRIZ
- Introduction to TRIZ for students
- Main models of Classical TRIZ and OTSM-TRIZ
- Introduction to the Laws of Evolution
- Laws of Evolution
- Introduction to ARIZ
- Su-Field modeling and Standard Solutions
- Techniques to solve technical and physical contradictions

The use of the education material will be totally free just by quoting the authors, the TETRIS project and the Lifelong Learning Programme. Under the same conditions they could be translated in any other language (translators are requested to publish their translations on TETRIS web site).

As stated before all project outcomes and products as soon are available in their final version are published on the project web site (www.tetris-project.org) and can be freely downloaded by any registered users.

For more information please write an e-mail to info@tetris-project.org or find the contact details of the partners closest to you on the web site.

4. Partnerships

The Consortium has been set up in order to gather the complementary expertises necessary to develop the TETRIS project. Among the consortium there are partners that use TRIZ (Siemens, University of Florence, EIFER a joint venture of EDF France and University of Karlsruhe) and partners that teaches TRIZ (AREA Science Park, University of Florence, Jelgava Adult Education Centre). The consortium involves also schools (ISIS Malignani, HTL Wolfsberg and Jelgavas 1.gimnazija), a technical University (Fachhochschule Kaernten) and enterprises (Siemens, Stenum and ACC). In order to develop a charming and effective multimedia product, a well-experienced multimedia expert has been also involved in the project (Studio Flosser).

The participation in the project of schools and companies has been fundamental to safeguard the final stakeholders interests and has helped defining at the beginning of the project their needs and expectations.

The partners main tasks are the following:

Consorzio per l'AREA di ricerca scientifica e tecnologica di Trieste (Italy) (project coordinator)

AREA defined the layout of the handbook and it is also planning the procedures of the testing of the training materials and it will organize a course devoted to Italian companies in April 2009. It's also responsible for the dissemination activities in Italy.

University of Florence (Italy)

The university has coordinated the definition of the educational model and the development of the handbooks and the definition of the animations storyboard.

Its experts are in charge for all the TETRIS training activities in Italy

Fachhochschule Kaernten (Austria)

The University coordinated the analysis of the educational requirements and its experts are writing a chapter of the handbook.

The University is also coordinating the training and promotional activities in Austria.

Siemens AG, Sector Industry, Industrial Automation and Drive Technology (Germany)

Siemens provides the project team with its expertise in training TRIZ within the so called Invention on demand and Innovation Tool Academy. Siemens will apply and test the TETRIS training materials.

Harry Flosser Studios (Germany)

The studio designed the project web site and the multimedia animations.

Jelgava regional Adult education centre (Latvia)

The centre contributed at the definition of the educational model and to the definition of the handbook index. It organized a teachers training course in Jelgava. The centre is also coordinating the testing and promotional activities in Latvia.

EIFER - European Institute for Energy Research (Germany)

EIFER wrote a chapter of the handbook and it will test the TETRIS training materials.

Istituto Tecnico Industriale A. Malignani (Italy)

The school will teach TRIZ in some of its classes using the TETRIS educational kit and will provide suggestions and feedbacks to improve the training materials.

HTL Wolfsberg (Austria)

The school will teach TRIZ in some of its classes using the TETRIS educational kit and will provide suggestions and feedbacks to improve the training materials.

Jelgava 1. Gymnasium (Latvia)

The school will teach TRIZ to group of its students using the TETRIS educational kit and will provide suggestions and feedbacks to improve the training materials.

STENUM (Austria)

STENUM will test the TETRIS training materials and will provide suggestions and feedbacks to improve them.

ACC Austria GmbH

ACC will test the TETRIS training materials and will provide suggestions and feedbacks to improve them.

ETRIA, the European TRIZ Association, contributed to the dissemination of the project giving the opportunity to present TETRIS at the TRIZ Future Conference 2008.

The Regional Office of Friuli Venezia Giulia of the Italian Ministry of Education will test in cooperation with AREA the TETRIS training course with the tutors of the ISS National Project (Teaching Experimental Studies).

It must be underlined that the opportunity provided by the Lifelong Learning Programme to realize the project at European level is fundamental to achieve the objectives of the project.

The European dimension of the project gave us the opportunity to summon several expertises, skills and know how in different field. Partners are able to compare previous different experiences in teaching TRIZ in several context.

The different situation in which the educational materials will be used, the different target groups it should address on one hand caused some problems in the definition of educational model on the other hand gave us the opportunity to develop an extremely flexible training materials that can be used in very different situation and to a wide range of target groups (from secondary school students to R&D engineers, from Italy to Latvia).

The flexibility of the training materials will ease the adoption of the TETRIS products also in different European countries.

The schools involved in the project appreciated the opportunity to share know how and expertise with similar schools from other countries and to learn the way leading companies manage the R&D activities and support the creativity and the problem solving skills of their teams.

Also for the universities, the research and the vocational training centres the project gave the opportunity to share knowledge and widen and consolidate their international network.

5. Plans for the Future

At early 2009 the translation and adaptation to the national culture of the TETRIS handbooks from English to French, German, Italian and Latvian will be over and the effectiveness of the educational model and of the training materials will be tested in secondary schools and companies.

Three secondary schools are actively involved in the testing: Malignani – Udine (Italy), HTL Wolfsberg (Austria) and Jelgava 1 gymnasium (Latvia).

The way TRIZ will be taught to students using the TETRIS educational materials will be quite different since the culture, the educational models, organization and rules are different from country to country.

In Italy secondary schools have some days to dedicate to special projects so the teaching of TRIZ will be one of the special projects of Malignani. The whole class will attend to the lessons during ordinary school time.

In Austria all the students of the class will be provided with the rudiments of TRIZ and a group of volunteers will apply it to the project they have to develop in cooperation with a company. This group of volunteer will attend further training and acquire TRIZ concepts and techniques. Moreover some TRIZ principle will be included in ordinary lessons.

In Latvia it's impossible to include new subjects in the lessons. So on one hand TRIZ will be taught to a group of volunteer students in the afternoon by the teachers of Jelgava 1 gymnasium. On the other hand other teachers that took part to the training course held in Latvia in November 2008 will include some elements of TRIZ in the teaching of other subjects.

TETRIS training materials will be tested also among companies. Training courses will be organized in Austria, Germany and Italy. Some of this training courses will be devoted to people from the same companies whereas others will be opened to people from several companies.

The training materials will be tested both in large companies and small companies.

The feedback from the teachers, trainers, students, companies researchers and technicians will be collected and analyzed. It will be possible to check if the objective to develop a single and flexible educational kit that can be used in different situation and cultures has been achieved.

It will be also possible to compare the outcomes of different educational models and way of teaching TRIZ to highlight strengths and weakness.

On the basis of the outcome of these experiments a guide on introducing TRIZ at school will be drawn to share the experience gained in the project with other teachers and school masters. The guide will provide useful hints to avoid mistakes and take advantage of already tested positive solutions.

The guide will be published on the project web site and could be freely downloaded by any registered user.

The feedback collected will be used also to further improve the educational materials and in particular the handbook. The new revised and proven version of the handbook will be then published on the project web site and could be freely downloaded by registered user of the TETRIS web site.

As stated before these materials could be freely used by anyone just under the conditions to quote the authors, the project consortium and the Lifelong Learning Programme. So the dissemination potential is extremely high.

Promotional and lobbying activities have been carried out from the very start of the project but after the testing will be over they will become even more pressing and strong.

The availability of the outcome of the testing phase and of the training materials will make more easy to persuade headmasters and educational authorities on the benefits of introducing TRIZ in schools.

Also companies and industrial associations will be targeted by the promotional campaign and persuaded to apply TRIZ and benefit from TETRIS training materials.

The project outputs and achievement will be presented in occasion of the final conference that will be held in AREA Science Park congress centre (Trieste, Italy) in November 2009.

6. Contribution to EU policies

Developing this project at European level will contribute to reach the Lisbon strategy goals launched in March 2000, which aim to make the European Union the world's most competitive and dynamic economy by 2010. For this process it is necessary, like stated by Commission Communication of 11 March 2003, "Innovation policy updating the Union's approach in the context of the Lisbon strategy", incorporating innovation into the EU's different policies that would help strengthen companies, which are at the core of the innovation process. Staff trained in entrepreneurship would be better equipped to grasp the opportunities offered by the market.

Our project and partnership is working together at European level to provide effective instruments like Tetris educational training materials to help this process of innovation in European companies and school systems.

Relevance towards the strategic issues related to the Lifelong Learning Programme

The project addresses the following key competences of the lifelong learning programme that are a combination of knowledge, skills and attitudes appropriate to the context:

- **Learning to learn:** Tetris project will spread the basic knowledge of techniques and methodologies to enhance creativity, problem setting and problem solving capacity and will help to overcome psychological inertia. Therefore further learning of more advanced methodologies will be much easier and effective.
Moreover an improved capacity of problem setting and problem solving will ease the comprehension and learning of technical and scientific subjects.
- **Mathematical competence and basic competences in science and technology:** Creativity, problem setting and problem solving, the basic principles of TETRIS are also the basic principles of science and technology research.
Moreover TRIZ is a methodology which was originally developed to solve, serious and powerful scientific approach, technical problems and was targeted mostly to engineers.
Therefore TRIZ is particularly complementary to engineering and related disciplines, because it helps transferring the theory learned at school or University into real life and solve practical problems in an innovative and efficient way

Relevance towards the strategic issues of the 7th Research Framework Programme

- **Research and development, Research Framework Programme:** research and development, Research Framework Programme enlarging the number of people with enhanced creativity, problem setting and problem solving skills, TETRIS will contribute in the training of researchers and so to the success of the 7th Framework Programme.
Moreover, in relation with the action Industry – Academia of the People Programme, TETRIS will contribute in networking educational institutions with the business world, creating a course that can be realized both at school and for the initial training of young researchers and product designers in the academic and industry world.

