

GENEXIS Platform and Products

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Abstract - GENEXIS is an e-learning solution specially developed to give teachers a power of modern software applications for creation of learning content, sharing of content with other teachers and educating their students in a manner that corresponds to the modern internet-saturated life. GENEXIS provides content editing, training, printing and testing services as well as allows creation of courses. GENEXIS innovative technology of content generation introduces the new way of e-learning. Any teacher can use this innovative tool to create exercise templates with changeable parameters. The article explains in more details the innovative process of exercise creation, application of the GENEXIS functionality and utilization of the GENEXIS platform in Latvia, Slovakia and other EU countries.

Keywords: Education, E-learning, Training, Testing, Exercise Generation

I. INTRODUCTION

The name 'GENEXIS' is formed from two words "generate exercise". And these two words represent the principle which was introduced in the late 2007 through GENEXIS v.1. It contained the first prototype of the exercise editor based on content generation principle. This principle gave birth to a multitude of innovative ideas for systems' application in educational processes.

GENEXIS v.2. was developed in 2008 and its approbation was performed as a part of Leonardo da Vinci Transfer of Innovation project "Computer based Exercise Generation and Evaluation System for Mathematics, Physics and Chemistry Subjects – GENEXIS" (2008-2009). The testing and evaluation of GENEXIS was carried out in vocational education and mainstream schools in 5 different countries – Latvia, Slovakia (Elfa s.r.o), Lithuania, Estonia and the United Kingdom.

Currently GENEXIS is in the process of being adapted also in Italy, Spain, Greece, Sweden and Turkey as a part of another LdV project 'E-learning Exercise GENEXIS System – EEGS', lead by the Italian company "Docusys srl".

Based on the GENEXIS platform, public educational portal "Uzdevumi.lv" was built and introduced at the beginning of 2009 in Latvia. At the moment it is already used by 20% of Latvian schools. Portal is supported by the Municipality of Riga City and it has been integrated with leading school e-journal system in Latvia – 'E-klase'.

Starting from 2010 GENEXIS is also being used in Slovakia as software for modernisation of educational processes in schools within the framework of the project 'MVP Slovenska' (modernizaciavzdelovania.sk).

II. MAIN FEATURES AND ADVANTAGES OF GENEXIS

GENEXIS is an e-learning solution based on exercise generation engine that makes the learning process more efficient, attractive and engaging. It is based not only on „just-in-time” and „just-for-you” principles but also on „learning-by-doing” principle.

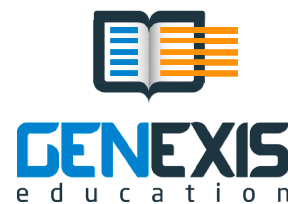
The initial idea of GENEXIS was to resolve two great problems of teaching and learning process:

- Costs for development of the exercise database and support;
- Inefficient consumption of teaching time on student knowledge evaluation and monitoring.

It has been done by providing an attractive, engaging and simple learning and teaching environment that reflects the modern internet-saturated life.

A. What can GENEXIS offer right now? What are its advantages and benefits?

- By using GENEXIS, teachers can produce core skills materials that can be delivered online or on paper;
- Teachers can use readymade materials created by other teachers;
- An exercise created in GENEXIS has hundreds of variations that give unlimited training opportunities to learners.
- GENEXIS can be integrated with Moodle or other WEB portal;
- The system has been created for teachers with the help of teachers for user-friendliness and time economy.



B. What are the main features of GENEXIS? What makes GENEXIS special?

The core feature of GENEXIS is exercise generation. Typically, a student needs to practice repeating the same sort of problem solving activities to understand the logic of the solution. To facilitate this, education materials offer a few variations on each problem type.

GENEXIS is different: in the GENEXIS system any exercise can be replaced with an exercise template which describes a type of problem in general terms. An exercise template is easy to build using the exercise editor and can take as little as 10 minutes.



Fig.1 Transformation of an exercise into a GENEXIS exercise template

The specific content of the exercise template is generated anew every time it is used, providing an unlimited number of variations with no additional effort.

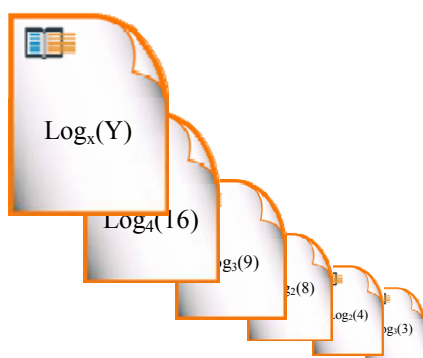


Fig.2. Exercise generation principle

Exercise templates and other related materials can be biased to different vocational areas to make the learning more relevant and attractive to the students. GENEXIS also makes it easy for the teacher to differentiate ability levels within a group using the same exercises.

GENEXIS provides exercise answer evaluation (correct/incorrect) and step-by-step solution for all exercises. When student solves a problem (task/exercise) and submits the answer, GENEXIS automatically checks if the answer is correct. GENEXIS is able to verify different types of user answers. This could be text answer, number and multiple choice answers. Additionally GENEXIS is able to validate answer with mathematical or chemical formulas in it. When answer has been validated GENEXIS shows a step-by-step solution process for the task and provides correct answer.

These features reduce the routine grind of comparing student answers to the answer key as well as enable students to understand problems better and learn from their mistakes.

III. HOW CAN ANYONE USE GENEXIS EXERCISES?

GENEXIS exercises can be used in three different and flexible ways - **a major advantage of GENEXIS over traditional textbooks.**

A. Training

GENEXIS WEB Portal for students provides individualized training and practice opportunities, enhanced with a simple statistics tool showing study progress. Through GENEXIS WEB Portal students can search for available online courses and apply to them. GENEXIS WEB messaging functionality is used to notify student about the activities within the system, e.g., exams, course application status, etc. Students can expand the use of the messaging functionality by sending messages with attachments to teachers and other students within their educational organization.

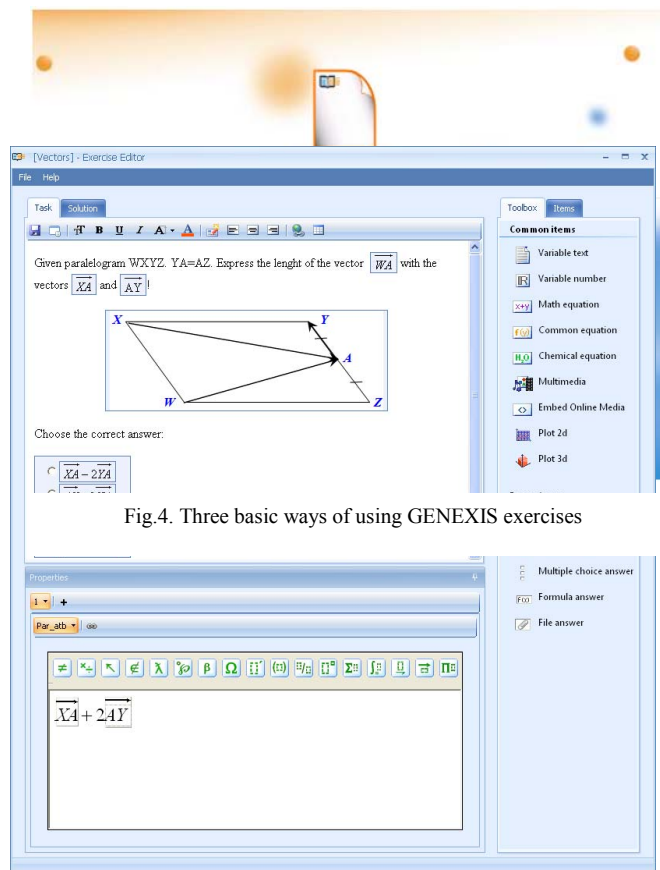


Fig.4. Three basic ways of using GENEXIS exercises

Fig.3. GENEXIS exercise editor

GENEXIS provides advanced way of learning through WEB. The learning is intended as follows:

- **Understanding the theory.** Theoretical material can be given as a part of the course and can contain multimedia materials and links to related materials on WEB.
- **Applying the theory in practice.** This is done by solving the exercises. Exercises can contain task and solution parts. By running the same exercise again student will get another variation of the task.
- **Learning by Doing.** After completing an exercise student receives an evaluation of the answer and full step-by-step solution. This is how student can understand the topic on his own (without assistance). By repeating the same exercise again he can reapply received knowledge.
- **Checking the overall level of understanding the course subject by completing the test(s).**

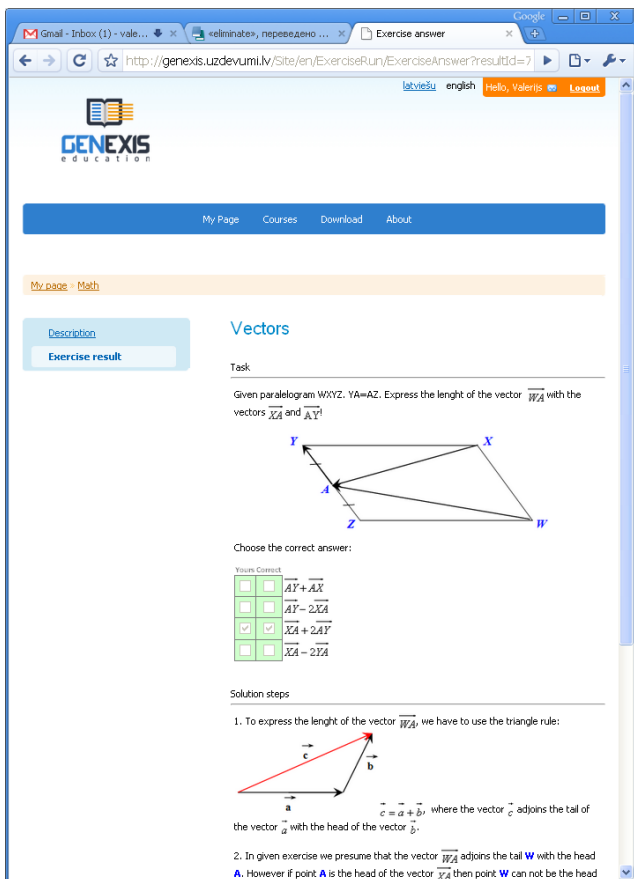


Fig.5. Example of an exercise in GENEXIS WEB Portal for students

B. Courses

Teachers can send invitations to the students from GENEXIS Desktop Application. Invitations to courses are delivered to students via e-mail and GENEXIS WEB Inbox. Whenever a student accepts an invitation to a course, the course content becomes visible on GENEXIS WEB main page. Each course can contain theory, exercises, tests and scheduled control works.

C. Printing

Traditional printed educational materials can be produced using GENEXIS exercises.

A range of printing options support the creation of take-home tests with answers, handouts of solution examples and question sheets for written tests and exams. Teachers themselves admit that printing is one of the most useful and frequently used applications of GENEXIS content.

D. Testing

GENEXIS includes a system of online knowledge evaluation based on scheduled, timed tests. Using exam creation wizard it is possible to create a test fast and easy.

Tasks for the test are generated only at the moment when pupil chooses to run exam. It is not possible to somehow clarify the content of tasks in advance.

After the test has been completed it is possible to see pupil statistics which contain score and time spent on tasks. If pupil was not present on the exam then it will be shown. Teachers are able to see each task, step-by-step solution and result. If it is required teacher could change particular question result and must leave the comment.

When teacher has finished checking exam scores, tests are set as checked and results are available to pupils on WEB. Pupils can see personal scores, score corrections done by teacher and comments.

GENEXIS testing plus exercise generation feature is very useful when it is needed to assess individual progress of students in the group. By using this feature it is impossible to prepare exercise/exam results before the exam or copy them from other students. Also this feature can secure the creation of unique home works for each student.

E. Additional feature: Exchange of content

It is possible to publish content to public library or copy content from it. That's how the content can be spread among the teachers and schools.

It is also possible to send content from teacher to teacher in another school by using special transfer form. This way teachers lecturing on similar or related school subjects can develop their own community and interact with each other through GENEXIS.

IV. MVP SLOVENSKA PROJECT

Starting from 2010 GENEXIS is also being used in Slovakia as software for modernisation of educational processes in schools within the framework of the project 'MVP Slovenska' (modernizaciavzdelivania.sk). During the four project years 7300 Slovakian teachers will undergo the GENEXIS training courses. The specific objective of the project is to upgrade and modernize the content, methods and the outputs of the learning process in the modern school of the 21st century. It is also aimed at increasing the proportion of teachers participating in lifelong learning process in order to obtain and develop competencies needed for the modern knowledge-based society.

During the first 6 months in 2011 several groups of teachers have created 988 exercises that have been used 4889 times. The WEB portal has been used by the 3 086 unique users that have visited 39 376 pages. This shows good GENEXIS application and interest amongst the teachers in using the software.

V. APPROBATION OF GENEXIS IN EU SCHOOLS

Approbation of the GENEXIS system was performed as a part of Leonardo da Vinci Transfer of Innovation project "Computer based Exercise Generation and Evaluation System for Mathematics, Physics and Chemistry Subjects – GENEXIS". The testing and evaluation of GENEXIS was carried out in vocational education and mainstream schools in 5 different countries – Latvia, Lithuania, Estonia, Slovakia and United Kingdom. With the help of partnership organizations – Business Innovation Center of Latvian Electronic Industry (Latvia), KTU Regional Science Park (Lithuania), Baltic Innovation Agency (Estonia), Elfa s.r.o. (Slovakia), Accent International Language Consultancy (UK) – 1 till 5 educational organizations were selected in each country to participate in the approbation of GENEXIS. Altogether there were 21 educational organizations involved in the project.

A. Project 'E-Learning Exercise Genexis System'

The adaptation of GENEXIS on wider European level is currently being done in five other countries as a part of Leonardo da Vinci Transfer of Innovation project "E-learning Exercise Genexis System - EEGS". The

translation of GENEXIS has been done by the project partners from 5 different countries – Italy (Docusys srl), Greece (SQLearn Ltd.), Spain (Fondo Fomacion Euskadi, S.L.L), Turkey (Gazi University) and Sweden (Swedish TelePedagogic Knowledge Centre AB). The approbation process in vocational education institutions and schools will be launched at the end of 2011 and finalized in the middle of 2012. It is planned to involve 50 institutions to test the systems functionality, educational content and user guidelines that are currently being developed.

The main objectives of the project are: to introduce a management system of ICT content in the VET sector of partner countries; to create a network of VET institutions that are using one e-learning portal and share the library of content; to provide teachers and trainers with technical skills necessary for the usage of the system and content creation. The project supports the Leonardo da Vinci Programme’s operational objective to develop innovative ICT based content, services, pedagogies and practice for lifelong learning.

VI. GENEXIS PLATFORM

GENEXIS is used as a base platform for Latvian educational portal www.uzdevumi.lv and Ukrainian educational portal domashki.com.ua. GENEXIS exercise database and exercise generation engine is used to deliver educational content to the public WEB portal, so that any person can use it for self-training.

In Latvia e-learning portal Uzdevumi.lv serves thousands of pupils every day, delivering practical exercises in more than 10 subjects from the school curricula for grades 1 till 12.



All subjects are developed by teachers according to the Latvian Ministry of the Education standards. In summer 2011 the size of educational database had reached 10 000 (Fig.6) exercises, and each exercise had at least 50 variations.

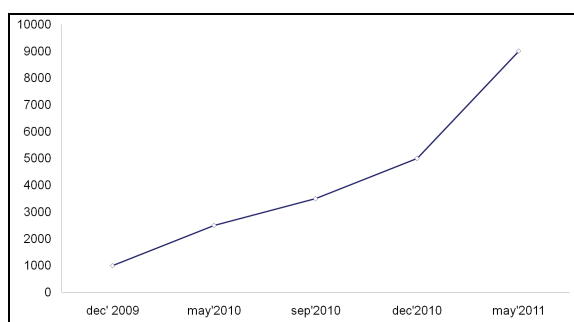


Fig.6. Growth of exercise database

This is the biggest database of exercises in Latvia and one of the biggest in the world. During the study year 2010/2011 portal was actively used by 41 000 pupils, which makes up 20% of all pupils in Latvia. 2 818 000 exercises were solved during that study year.

VII. SUMMARY

GENEXIS is an e-learning solution based on exercise generation engine providing all of the traditional features and benefits of online learning as well as ensuring additional advantages of content generation and online platform.

GENEXIS helps making the learning process more efficient, by generating unlimited random variations of given exercises on any theme or subject.

Using GENEXIS, teacher can produce core skills materials that can be delivered online or on paper.

GENEXIS is designed to help teachers engage students in the learning process so that they can achieve consistent and measurable improvements in their performance.

GENEXIS uses a methodology based on exercise generation which is stimulating, varied and relevant to the vocational interests of the learner.

The system has been created for teachers with the help of teachers to be easy to use whether the student is home-based, work-based or in the classroom.

GENEXIS helps making teaching and learning more productive and less frustrating, benefiting everyone involved in the education and training process.

GENEXIS system has been adopted and tested in nine European countries within the framework of two Leonardo Da Vinci Transfer of Innovation projects.

GENEXIS system is already used by clients from private and public sectors in Latvia, United Kingdom and Slovakia.

Everyday project work still continues on improving GENEXIS functionality and design to make it even better. We have to thank our clients and partners in different countries for their support and feedback. Every opinion is taken into account and it only helps us to make right decisions for GENEXIS future and to set forward new goals that need to be achieved.

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