



## GENEXIS EDUCATION

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**Abstract.** The initial idea of GENEXIS was to resolve two great problems of teaching and learning process: lack of interest in study process among learners and inability of teachers to deliver the most recent and up-to-date educational content in a simple and easy way. GENEXIS is an e-learning solution specially developed to give teachers a power of modern software applications to create interesting content, to share it with other teachers and to educate their students in a manner that corresponds the modern internet-saturated life. Quick and easy content editor provides teachers with an opportunity to create theoretical materials, exercises and tests – all in one place and all easily accessible for students through web. GENEXIS provides training, printing and testing services as well as allows content sharing among teachers. GENEXIS makes teaching and learning more productive and less frustrating, benefiting everyone involved in the education and training process.

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

### 1. INTRODUCTION

Today, in the modern world it is almost unimaginable to study without the help of Internet resources. Almost all students who have computers or access to computers with Internet connection search for information online. Simple and everyday study materials as essays, formulas, graphs are searched through Internet. Online resources help students to avoid useless work and diminish the amount of time they spend on preparation of their study assignments. However the major information source that is still used in schools all over the world is books. Enormous amount of money is spent to prepare the content of normal textbooks, to publish them and to deliver them to the right consumer. Even more money is spent to keep the textbooks up to date with school study programme. Parents also spend money to buy books for their children that might be out of date in less than a year and won't be of any use later on.

Nowadays information and communication technologies change very fast and there is always something new in the world that can be used to contribute to children's education. Currently there are many solutions on the market providing schools, teachers, students and their parents with materials, tools and methods that are considered the latest and best achievements in conveying knowledge to the recipients. But where is the software that would provide functionality for teachers to create the content by themselves? Where is the software that provides option to exchange with content within a network of teachers? Where is the learning environment that can combine all the latest materials from different media and convey it to the students through one tool?

**GENEXIS is a modern e-learning environment that answers all these questions.**

### 2. STATE-LEVEL BENEFITS

In the modern world of information and communication technologies educational materials, tools, methods of teaching change very fast. Each year there is something new to implement in the educational programmes. Yet more it is possible to observe changes in labour market - new professions are created every year and employers require well-educated and professional employees. More and more professions require wider knowledge base that can be obtained only through improved and extensive school programmes. Otherwise all the students that complete their studies can not meet the demands of the modern labour market.

Up to this date we can still observe a trend of textbooks being the main information source used in schools. Books are a source of theory and have very limited potency to provide adequate amount of training options. Books have no means to show the progress of students and they do not allow interacting with teachers. Books - once they are printed - can not be updated or changed. Moreover books are the reason why so many environmental resources go to waste. All of this could be improved.

GENEXIS provides functionality to create, update and spread the latest educational content developed by the governmental services through Internet. It allows creating unlimited amount of training options on any subject as well as gives opportunity to monitor student's progress throughout the study process.

GENEXIS offers an opportunity to make learning process not only more efficient but also environmentally friendly.

### 3. BENEFITS FOR SCHOOLS

Quite often schools struggle with a problem of developing progress and performance overviews for each class or on individual basis. It is also hard to determine which subjects are more interesting for pupils or which ones too difficult for them. Statistical data gathered by GENEXIS allows seeing the full picture of progress and performance results of each class or individual in no time – there is no need for teachers or administrative staff to waste extra time on gathering and analyzing the data.

In comparison to other learning tools or services there is no need to waste money and resources on technical support, because GENEXIS is a service accessible through Internet. Yet more GENEXIS content can be used on interactive whiteboards during lessons and that makes it compatible with other resources and tools schools have already obtained for improvement of their educational process.

### 4. BENEFITS FOR TEACHERS

GENEXIS gives an opportunity for teachers to expand their creativity and increase the productivity of their work. GENEXIS provides a standard environment where teachers can create any content and make it available for students online the minute it is finished. All the options to use multimedia materials, insert files, web links through one simple editor gives teachers new ways to make their educational materials more attractive and engaging like never before.

GENEXIS **public library** gives an opportunity to search for and obtain content created by governmental services or other teachers. Moreover GENEXIS saves teacher's time for preparing and checking tests and control works. GENEXIS allows teachers to see the results of their students and observe their progress. There are also communications services incorporated within GENEXIS that can save teacher's time and provide new ways to interact with the students.

### 5. BENEFITS FOR STUDENTS

By implementing GENEXIS into schools students will receive major benefits that are otherwise unavailable to them from books or Internet alone. First of all, it is an opportunity to learn from personal mistakes (science term "learning-by-doing"). Major difference between GENEXIS and other systems as Moodle is content editor that allows teachers to create exercise templates. Based on these templates GENEXIS generates multiple variations of one exercise. This way each student can receive an individual exercise for homework or test or else can train on one exercise template several times as new exercise variation is generated each time. When student completes the task system evaluates the result and shows the solution process enabling student to "learn-by-doing".

Students also benefit from previously mentioned advantages of the GENEXIS system:

- Modern and always up-to-date content;

- 24/7 online access through web browser;
- Better response from teacher on student's results;
- And less printed books and materials to carry with.

### 6. 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:

- inefficient consumption of teaching time on exercise creation and monitoring;
- lack of interest in study process among learners.

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

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

GENEXIS is an online service ready to be used by anyone irrespective of age, previous knowledge level, specialty and other factors. It provides user-friendly and simple learning environment.

- GENEXIS makes the learning process more efficient.
- GENEXIS is designed to help teachers engage students in learning process.
- Using GENEXIS, the teacher can produce core skills materials that can be delivered online or on paper.
- GENEXIS is based on exercise generation principle that can give unlimited training opportunities.
- The system has been created for teachers with the help of teachers to be easy to use and provide time economy.



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.

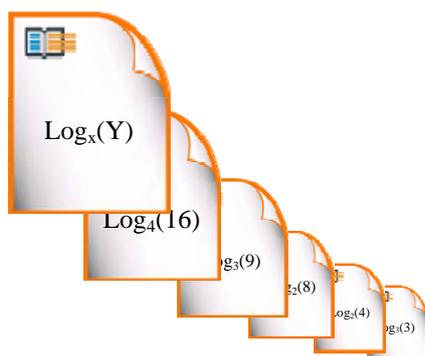


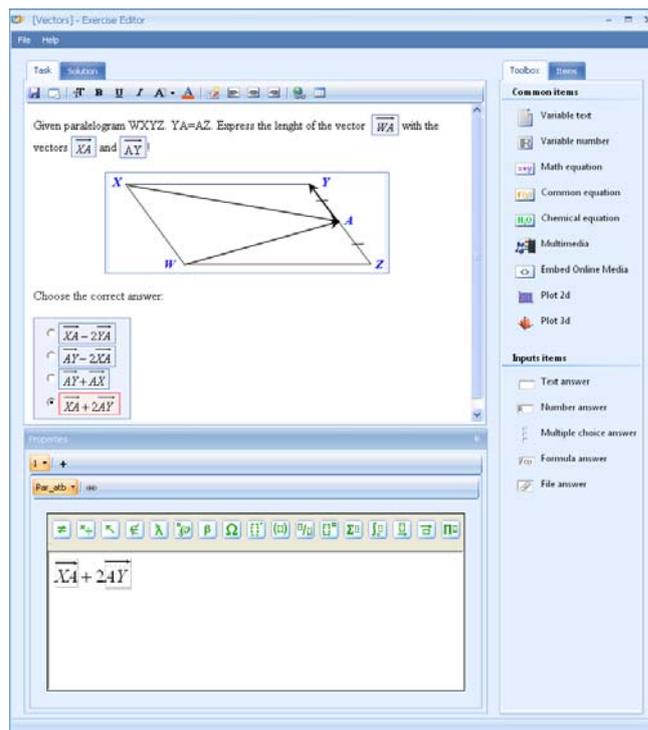
Fig.2. Exercise generation principle

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.

Fig.3. GENEXIS exercise editor



## 7. 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.

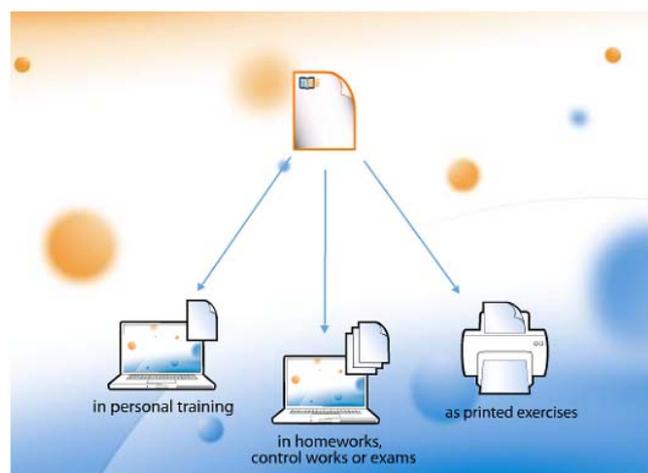


Fig.4. Three basic ways of using GENEXIS exercises

### 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. Alternatively teachers can send invitations to the students from GENEXIS Desktop Application. Invitations to course are delivered to students

via e-mail and GENEXIS WEB Inbox. 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.

Whenever a student has been accepted to course, the course content becomes visible on GENEXIS WEB main page. Each course can contain theory, exercises, tests and scheduled control works.

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. After completing an exercise student receives an evaluation of the answer and full step-by-step solution. By running the same exercise again student will get another variation of the task and he can reapply previously received knowledge.
- Checking the overall level of understanding the course subject by completing the test(s).

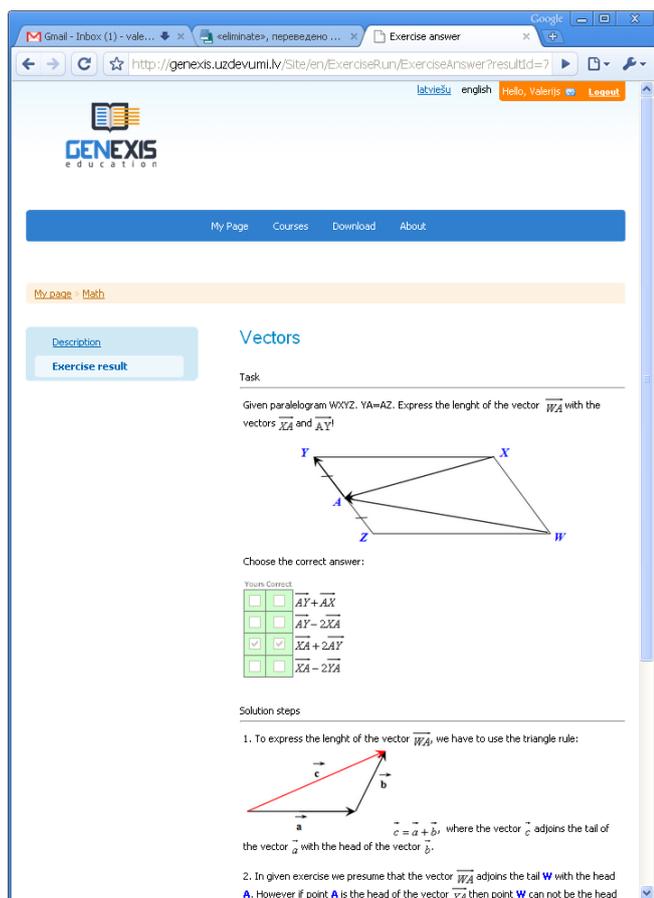


Fig.5. Example of an exercise in GENEXIS WEB Portal for students

### 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.

### 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.

### Additional feature: Exchange of content

Currently 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. All that this process requires is another teacher's e-mail address registered in GENEXIS. This way teachers lecturing on similar or related school subjects can develop their own community and interact with each other through GENEXIS.

## 8. APPROBATION OF GENEXIS IN 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 the GENEXIS system.

Altogether there were and still are 21 educational organizations involved in the project:

- 3 vocational, 1 secondary and 1 primary schools in Latvia;
- 6 vocational education schools in Lithuania;
- 4 vocational education schools in Estonia;
- 5 vocational education schools in Slovakia;
- 1 college in United Kingdom.

The testing and evaluation process of the GENEXIS system involved:

- approbation of GENEXIS functionality;
- assessment of the available content;
- evaluation of the system user guidelines.

As a result of the testing process we have received recommendations and suggestions from teachers for the improvements of the GENEXIS system that will be integrated within the system by the end of this year.

## 9. 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 system of courses.

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 five European countries within the framework of Leonardo Da Vinci project. The partnership organisations participating in the project are:

- 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).

GENEXIS system is already used by clients from private and public sectors in Latvia.

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.

For more information, please visit our web site:  
<http://www.genexispro.com>

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**Valerii Nikitin** is a product manager working in Data Pro Group Ltd. for 2.5 years. His previous work experience has been gained working for 2.5 years in OptumPlus as a developer making enterprise resource planning system Binord; for 2.5 years working in Accenture as a senior developer working on banking (MERIDEA, SAMPO) and telecommunication projects (NOKIA, TeliaSonera), and for 1.5 years working in Global Consulting Partners as analytic in making credit issuing web system for TRUST bank



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