

Lifelong learning that adapts to you

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Technology enhanced lifelong learning that automatically adapts to the needs of the learner is now in sight thanks to work by EU-funded researchers who have developed an adaptive learning platform that can follow you through school, university, your career and even when you learn a new hobby. The rapidly growing, multi-billion euro e-learning

sector is set to get a next-generation booster shot.

The EU-funded 'Generic responsive adaptive personalised learning environment' (GRAPPLE) project created a system that focuses solely on learning support, with the aim of making it easier for people to acquire new knowledge and skills. GRAPPLE also makes the most of the students' time by tailoring courses to their strengths and weaknesses.

There are huge advantages to this kind of system and it has the potential to dramatically enhance learning in the near future. Imagine a course that is genuinely adapted to the individual, skipping material that has been mastered, and offering remedial courses on those areas where the student is weakest.

The course could highlight and define terminology for one student but not for another, depending on whether they are already familiar with the topic. Advanced tools for adaptive lifelong learning could one day recommend courses that tie in with a user's previous experience to qualify the student for a recognised diploma or degree. In this way, learners could leverage their experience to the fullest.

The key phrase is learning, where students direct their education based on their interest and priorities, rather than teacher-centred approaches where students are taken through a linear course regardless of their needs or wants. For this reason, the e-learning industry tends to describe users as learners, or active participants who study at every stage of their life, and not as students per se.

This is a new departure for 'Learning management systems' (LMS). 'Currently, what an LMS system technically does are things like assignments, tests, grading and access to resources like course material, slides and other information, and it just offers those resources as files to the student. It doesn't really offer any guidance as to how to actually

study the material,' explains Professor Paul De Bra, GRAPPLE Project Coordinator from the department of mathematics and computer science at the Technische Universiteit Eindhoven in the Netherlands. The project received from the EU almost EUR 4 million of its total budget of EUR 5.3 million.

'LMS platforms are great for managing the process of learning and handling administration; right now LMS platforms have not developed any tools to help the actual learning, to make it easier and more productive for students to learn. They support the process but not the learning,' he continues.

'That's where GRAPPLE comes in because we created an environment where you can click to an adaptive course text that you go through page by page, and it gives you a menu of choices. It can offer recommendations based on your previous experience, it can recommend new topics or suggest that you avoid other topics, and it keeps track of your learning.'

Prof. De Bra says the platform works as an embedded adaptive [learning environment](#) within existing LMS platforms. It is designed to be easily portable from one platform to another, and the code for GRAPPLE is open source, allowing LMS vendors to adapt it to their needs.

There are multiple ways to complete a GRAPPLE course. The system offers guidance and there are many links that learners can follow on their own initiative. 'It is really complementary to what a LMS offers,' Prof. De Bra emphasises.

In the GRAPPLE system, learner initiative and curiosity are leveraged to enhance the educational experience. Study becomes much more absorbing when the student can follow their own interests.

Perhaps the most ambitious goal in GRAPPLE's vision is a system that follows the learners through their life; in school, at work and in their hobbies and pastimes. And it keeps track of acquired skills and knowledge. If a user scored, say, 70 or 80 % on a topic, it will not be recommended in future courses requiring those skills, but if the student scored 50 % or lower, remedial course material might be recommended in the future.

The EU-funded researchers designed an integrated platform to enable all this functionality. An 'event bus' coordinates all of the platform's back-end activity, except for the single sign-on facility which is handled by a powerful, globally recognised system, called Shibboleth.

The 'GRAPPLE authoring tool' (GAT) lets e-learning authors create adaptive content and courses. The 'GRAPPLE adaptive learning environment' (GALE) provides the framework for executing courses, while the 'GRAPPLE user model framework' (GUMF) maintains all the information that is known about the learner.

The system architecture is particularly elegant because it separates the logical functions of learning management, content delivery, content creation, user identity and user modelling. As such, it lends itself to adoption of specific elements in a modular way. For example, Prof. De Bra ponders that future versions of GRAPPLE technology could replace Shibboleth with the adoption of the OpenID standard, which is used in social networks. Many learners have an OpenID already.

The GRAPPLE architecture also allows for further work to be carried out on individual elements without having to reinvent the entire system. Prof. De Bra offers GAT as an example. He says GAT simplifies authoring, but it is not as easy as it could be.

'Authors find it really difficult to move from linear course delivery,

where the student is taught, to adaptive [learning](#), where users employ self-directed study,' he notes. 'The big issue is deciding the adaptation rules; under what circumstances and in what way is the material adapted?'

It is a bottleneck in the process, but identifying the bottleneck is a huge advance and Prof. De Bra says that there will be further work on the creation of adaptation rules in other contexts.

GRAPPLE achieved its objectives and has received positive reviews of its work. The platform was tested in a variety of environments, either as a whole or with individual components. At Trinity College, Dublin, adaptive simulated conversations were used as part of a psychotherapy course, corresponding to the responses of the student.

In Germany, it was used by project partner Information Multimedia Communication (IMC) to teach job interview skills and self-management skills to office workers. In Eindhoven, the Netherlands, it was used to learn about hypermedia, and also about GRAPPLE itself. Likewise, all GRAPPLE partners used different topics for experiments. In all cases, the students, from different countries and linguistic backgrounds, were very enthusiastic about the platform and course delivery.

It is a very promising start, but it is just a start and now the work will continue both within individual partner companies and enterprises and in follow-on projects. Ideas from GRAPPLE, and the use of some components are being taken up in new EU research projects, for instance in 'Immersive reflective experience-based adaptive learning' (ImREAL), a EUR 3.22 million EU-funded collaborative project.

The GRAPPLE platform could not come at a better time for Europe. E-learning is a huge business worth EUR 40 billion worldwide in 2010. The market is growing rapidly at around 20 % a year according to

figures by Global Industry Analysts. Europe is trailing the US, but by creating technologies like the GRAPPLE platform the Old World will be able to teach the New World a few tricks.

More information: grapple-project.org/

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