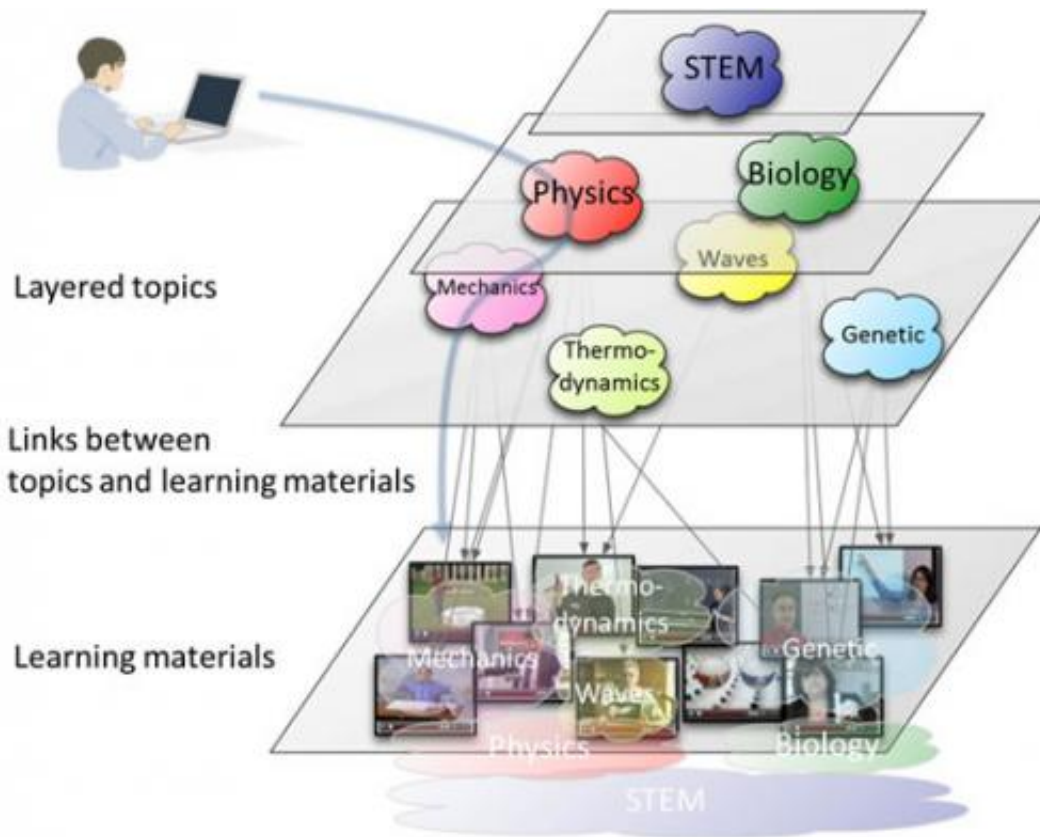


Breakthrough platform technology for improving effectiveness of online learning

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Learning material navigation with multi-layer topics.

Fujitsu Laboratories of America and the Massachusetts Institute of Technology today announced the joint development of a personalized learning platform that enhances the effectiveness of online learning.

In recent years, a wide range of learning materials has become available online. However, traditional online learning systems have not sufficiently utilized learning environments that fully leverage the advantages of ICT, such as the ability to easily organize appropriate learning materials for users from among an infinite amount of disparate content, nor have there been systems to provide personalized learning materials and learning pathways based on users' level of understanding and interests.

Using navigation technology that can organize a massive volume of online learning materials into multi-layer topics, the platform makes it possible to navigate 100,000s of learning materials, which has been a challenge for students. In addition, by developing learning behaviour simulation technology based on an advanced probabilistic learner model, it is possible to predict learning outcomes through simulations without having to rely on actual students, a major problem faced by learning system providers.

Fujitsu Laboratories of America and MIT will move forward on deploying the new platform technology, applying it to the large-scale online learning systems used by colleges and enterprises.

Details of the new technology will be introduced at the Sixth Conference of MIT's Learning International Networks Consortium (LINC), to be held from June 17-19, 2013 in Massachusetts.

The trend toward online learning has grown recently due to the prevalence of Open Educational Resources (OER), in which high-quality [educational content](#) is available free of charge. Additional growth is due to the very recent development of Massive Open Online Courses (MOOCs), primarily at universities in the US, in which courses of 100,000 students may participate at one time. This flexible style of learning, which takes advantage of the Internet to offer education regardless of place or time, is called Open Education and is gaining

attention as a major trend that will transform education in the 21st century.

From 2010, Fujitsu Laboratories of America and MIT have conducted joint research toward realizing a Human Centric Intelligent Society in the educational field based on the efforts of a research team led by MIT's Professor Richard Larson, a world-renown specialist in operations research.

Learners throughout the world now have an equal opportunity to obtain education offered by online learning systems. However, it has not yet been possible to offer a Human Centric learning environment that fully leverages the advantages of ICT, such as the ability to easily organize appropriate learning materials from among an infinite amount of content scattered across the Internet, nor have there been systems to provide personalized learning materials and learning pathways based on users' understanding and interests. Going forward, there is a significant need to evaluate the problems inherent to online learning environments, which are certain to gain widespread use, and then to design and implement actual services that deliver a learning environment that meets the needs of students.

The new platform takes the same personalization features currently found in search engines and e-commerce sites and leverages them in the field of education. The technology is designed as a [learning platform](#) that can provide optimal learning materials and pathways based on the learner's level of understanding and interests. Using navigation technology that can organize massive volumes of online learning materials into multi-layer topics, the new platform makes it possible to navigate 100,000s of learning materials, which has been a challenge for students. In addition, by developing learning behaviour simulation technology based on an advanced probabilistic learner model, it is possible to predict learning outcomes through simulations without having

to rely on actual students, a major problem faced by learning system providers. The features of the newly developed technology are as follows:

1) Navigation of massive volumes of learning materials organized into multi-layer topics

The technology extracts a list of conceptual topics corresponding to the categories found in the learning materials. The topics are then automatically organized by size into multiple layers. Learning materials for each topic are linked to topics, and a single learning material can be linked to multiple topics. For instance, if a calculus student wishes to deepen his or her understanding about derivatives, the technology will recommend materials to the student including differential calculus lecture notes and physics videos covering mechanics. In the example shown in Figure 1, the student can access actual video materials via topics related to physics and mechanics.

2) Technology for simulating learner behaviour in massive online systems

By creating a probabilistic model of a learner's knowledge and the percentage of answers solved correctly, and by performing first-ever simulations with algorithms that replicate complex learner behaviour, Fujitsu Laboratories of America and MIT successfully simulated a realistic representation of student learning processes in large-scale online courses.

Using the newly developed technology, it is possible to navigate 100,000s of learning materials, which has been a challenge for students. Likewise, by developing learning behaviour [simulation technology](#) based on an advanced probabilistic learner model, it is possible to predict

learning outcomes through simulations without having to rely on actual students, a major problem faced by learning system providers.

Compared with traditional keyword search, the learning material navigation system can help learners easily find appropriate learning materials, in addition to helping them deepen their knowledge by accessing materials relating to multiple topics. Moreover, providers will be able to use the simulations to easily evaluate, and recommend, from large-scale online learning systems the best-suited material to provide the most effective education for learners.

In addition to exploring the deployment of platform in the edX project(3), one of the world's most prominent MOOCs, the team plans to move forward with research on the platform in collaboration with the MIT's Office of Educational Innovation and Technology (OEIT) and Office of Digital Learning (ODL), both of which are exploring the future of ideal [learning environments](#). In addition, Fujitsu will apply the technology to the massive online [learning](#) systems of customer companies and universities.

Provided by Fujitsu

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