

## Important Developments in Educational Technology for Higher Education

Each of the six developments in educational technology detailed in this section were selected by the project's expert panel using the Horizon Project's Delphi-based process of iterative rounds of study, discussion, and voting. In the NMC Horizon Project, educational technology is defined in a broad sense as tools and resources that are used to improve teaching, learning, and creative inquiry. While many of the technologies considered were not developed for the sole purpose of education, they have clear applications in the field.

The technologies, which the members of the expert panel agreed are very likely to drive technology planning and decision-making over the next five years, are sorted into three time-related categories — near-term technologies that are expected to achieve widespread adoption in one year or less; mid-term technologies that will take two to three years; and far-term technologies, which are forecasted to enter the mainstream of education within four to five years. Each technology topic opens with an overview of the topic.

The initial list of topics considered by the expert panel was arranged into categories that were based on the primary origin and use of the technology. The potential applications of the technologies featured, specifically in the context of global higher education, were considered in a series of online discussions that can be viewed at [horizon.wiki.nmc.org/Horizon+Topics](http://horizon.wiki.nmc.org/Horizon+Topics).

The expert panel was provided with an extensive set of background materials when the project began that identified and documented a range of existing technologies used in both education and beyond. The panel was also encouraged to consider emerging technologies whose applications for higher education institutions may still be distant. A key criterion for the inclusion of a new technology in this edition was its potential relevance to teaching, learning, and creative inquiry in higher education.

In the first round of voting, the expert group reduced the master set, shown on the next page, to 12 technologies that were then researched in much greater depth by the NMC staff. Each was then written up in the format of the *NMC Horizon Report* and used to inform the final round of voting. Technologies that do not make the

interim results or the final report are often thoroughly discussed on the project wiki at [horizon.wiki.nmc.org](http://horizon.wiki.nmc.org). Sometimes a candidate technology does not get voted in because the expert panel believes it is already in widespread use in higher education, or, in other cases, they believe the technology is more than five years away from widespread adoption. Some technologies, while intriguing, do not have enough credible project examples to substantiate them.

There are currently seven categories of technologies, tools, and strategies for their use that the NMC monitors continuously. These are not a closed set, but rather are intended to provide a way to illustrate and organize emerging technologies into pathways of development that are or may be relevant to learning and creative inquiry. The list of seven categories has proven fairly consistent, but new technologies are added within these categories in almost every research cycle; others are merged or updated. Collectively, the categories serve as lenses for thinking about innovation; each is defined below.

- > **Consumer technologies** are tools created for recreational and professional purposes and were not designed, at least initially, for educational use — though they may serve well as learning aids and be quite adaptable for use in universities and colleges. These technologies find their ways into institutions because people are using them at home or in other settings.
- > **Digital strategies** are not so much technologies as they are ways of using devices and software to enrich teaching and learning, whether inside or outside of the classroom. Effective digital strategies can be used in both formal and informal learning; what makes them interesting is that they transcend conventional ideas to create something that feels new, meaningful, and 21st century.
- > **Enabling technologies** are those technologies that have the potential to transform what we expect of our devices and tools. The link to learning in this category is less easy to make, but this group of technologies is where substantive technological innovation begins to be visible. Enabling technologies expand the reach of our tools, make them more capable and useful, and often easier to use as well.

- > **Internet technologies** include techniques and essential infrastructure that help to make the technologies underlying how we interact with the network more transparent, less obtrusive, and easier to use.
- > **Learning technologies** include both tools and resources developed expressly for the education sector, as well as pathways of development that may include tools adapted from other purposes that are matched with strategies to make them useful for learning. These include technologies that are changing the landscape of learning, whether formal or informal, by making it more accessible and personalized.
- > **Social media technologies** could have been subsumed under the consumer technology category, but they have become so ever-present and so widely used in every part of society that they have been elevated to their own category. As well established as social media is, it continues to evolve at a rapid pace, with new ideas, tools, and developments coming online constantly.

- > **Visualization technologies** run the gamut from simple infographics to complex forms of visual data analysis. What they have in common is that they tap the brain's inherent ability to rapidly process visual information, identify patterns, and sense order in complex situations. These technologies are a growing cluster of tools and processes for mining large data sets, exploring dynamic processes, and generally making the complex simple.

The following pages provide a discussion of the six technologies highlighted by the 2015 Higher Education Expert Panel, who agree that they have the potential to foster real changes in education, particularly in the development of progressive pedagogies and learning strategies; the organization of teachers' work; and the arrangement and delivery of content. As such, each section includes an overview of the technology; a discussion of its relevance to teaching, learning, or creative inquiry; and curated project examples and recommendations for further reading.

**Consumer Technologies**

- > 3D Video
- > Drones
- > Electronic Publishing
- > Mobile Apps
- > Quantified Self
- > Tablet Computing
- > Telepresence
- > Wearable Technology

**Digital Strategies**

- > Bring Your Own Device (BYOD)
- > Flipped Classroom
- > Games and Gamification
- > Location Intelligence
- > Makerspaces
- > Preservation/Conservation Technologies

**Internet Technologies**

- > Cloud Computing
- > The Internet of Things
- > Real-Time Translation
- > Semantic Applications
- > Single Sign-On
- > Syndication Tools

**Learning Technologies**

- > Badges/Microcredit
- > Learning Analytics
- > Massive Open Online Courses
- > Mobile Learning
- > Online Learning
- > Open Content
- > Open Licensing
- > Virtual and Remote Laboratories

**Social Media Technologies**

- > Collaborative Environments
- > Collective Intelligence
- > Crowdfunding
- > Crowdsourcing
- > Digital Identity
- > Social Networks
- > Tacit Intelligence

**Visualization Technologies**

- > 3D Printing/Rapid Prototyping
- > Augmented Reality
- > Information Visualization
- > Visual Data Analysis
- > Volumetric and Holographic Displays

**Enabling Technologies**

- > Affective Computing
- > Cellular Networks
- > Electro vibration
- > Flexible Displays
- > Geolocation
- > Location-Based Services
- > Machine Learning
- > Mesh Networks
- > Mobile Broadband
- > Natural User Interfaces
- > Near Field Communication
- > Next-Generation Batteries
- > Open Hardware
- > Speech-to-Speech Translation
- > Statistical Machine Translation
- > Virtual Assistants
- > Wireless Power