SUTD Library Special Alerts

September 2016

Higher Education Technologies

Internet of Things

Virtual Reality

Internet of Things

The Internet of Things (IoT) is about a number of smart devices interconnected over the Internet that can gather and share data. It is not a new concept, but has gradually hit the headlines in recent years with the wide spread of connected devices and the mass demands of connectivity.

The IoT in higher education is also not new. In the report, resources from different perspectives are provided, including general facts and statistics, professional opinions, teaching and learning experiences, potential issues etc. At the end of the report, Carnegie Mellon University and University of Wisconsin-Madison are selected to demonstrate how these higher institutions are incorporating the IoT technologies.

Contents

- Intro
- Expert Insights
- Better Classroom Experience
- Risks and Concerns
- Collaborations Are Needed
- Pioneers
    - Carnegie Mellon University
    - University of Wisconsin-Madison

Intro

7 Things You Should Know About the Internet of Things
(By Richard Holeton, 6 Oct 2014, EDUCAUSE)

Starting with a scenario of how students adopt IoT and efficiently work on their course projects, the article answers seven questions about IoT, including 'What is IoT?', 'How does it work?', 'what are the downsides?', 'What are the implications for teaching and learning?' etc.

The IoT integrates campus infrastructure, offering a great many possibilities for research and learning. However, in the meantime, it also draws concerns on security and privacy and calls for corresponding policy making and data literacy.

EDUCAUSE Research Snapshot: From BYOD to the IoT
(By ECAR, 27 Jun 2016, EDUCAUSE)

Facts on the advance and ecosystem of IoT and statistics on the institutional deployment and campus infrastructure of IoT show that IoT has already pointed its way to higher education.

Expert Insights

The Internet of Things, Time-to-Adoption Horizon: Four to Five Years
(NMC Horizon Report: 2015 Higher Education Edition, pp. 46-47)

In this 2015 NMC Horizon Report for higher education, the major trends, challenges and developments in educational technology for the next five years are identified, providing rich insights for the education decision-makers.

In the IoT article, an overview of how the whole world is getting along with the technology is introduced, followed by its relevance for the higher education. As many universities are exploring the applications of IoT in learning and the possible benefits for learners, terms such as 'hypersituation' have become the visions of future smart campuses.

The Internet of Things: Riding the Wave in Higher Education
(By Itai Asseo, Maggie Johnson, Bob Nilsson, Neti Chalapathy, and TJ Costello, 27 Jun 2016, EDUCAUSE)

Five experts from the IoT industry gave some insightful thoughts on the impact of IoT on the higher education. They pointed out that as education goes personalized IoT could realize it and provide better and more flexible academic experience for learners. For administrators, much more data on various campus happenings and interactions will be available. While for the negative sides, security, privacy and policies will become the key considerations.

The Internet of Things for Educators and Learners
(By Dina Kurzweil and Sean Baker, 8 Aug 2016, EDUCAUSE)

To realize the great value of IoT in supporting education, educators need to fully understand the technologies first so as to further engage other users, such as faculty, staff and students, into the IoT

ecosystem. Although there existing serious considerations in terms of IoT, there are also endless opportunities that IoT will greatly benefit educators and learners.

---------------------------------- *Back to Contents* ----------------------------------

Better Classroom Experience

Connecting the Classroom with the Internet of Things
(By Max Meyers, 28 Mar 2015, EdSurge)

A Peek at a 'Smart' Classroom Powered by the Internet of Things
(By Eric Horowitz, 11 Aug 2015, EdSurge)

Classrooms equipped with IoT are expected to minimize teachers' roles in administrative procedures, enable users to make effective use of the devices and technologies, and collect and analyze real time data to create better classroom experience for the users.

Construction of Distance Education Classroom in Architecture Specialty Based on Internet of Things Technology

(By Yuqiao Yang and Kanhua Yu, 2016, International Journal of Emerging Technologies in Learning, Vol. 11 Iss. 5, pp. 56-61)

The authors looked into how distance education experience could be improved using IoT techniques, taking architecture specialty as an example. They developed an IoT-based distance education system and examined the rich functionality of the platform, such as broad applications, easy operations, efficient data transmission etc. Using this model, students are able to perform deep learning and teachers are relieved from workload and thus are able to provide enhanced teaching to the students.

---------------------------------- *Back to Contents* ----------------------------------

Risks and Concerns

Internet of Things: Coming to Your Campus Soon
(By Calvin Hennick, 12 Aug 2016, EdTech)

The adoption of IoT on campus generates new demands on IT. How to manage the data collected by the IoT devices? Is the data capacity enough for the entire network? How could we ensure the security,

privacy and interoperability? While discovering new opportunities, we also need to think about the possible risks.

The Internet of Things, IoT Systems, and Higher Education
(By Chuck Benson, 27 Jun 2016, EDUCAUSE)

The IoT systems are different from other technology systems based on the five factors given in the article: 1) numerous devices; 2) various types of devices; 3) lack of standard system language; 4) broad coverage and connections; and 5) management difficulties. Consequently, a thoughtful mind is required when deploying the IoT system on your campus.

Preparing for the Internet of things
(By Kylie Lacey, Aug 2016, University Business)

The unknown volume of IoT devices coming to a campus has made the future of IoT in higher education quite uncertain. In order to get prepared for tomorrow, institutions need to take a variety of issues into consideration, such as security controls, bandwidth capacity, data storage and usage policies, access rights, ethical issues etc.

----------------------------------- *Back to Contents* -----------------------------------

Collaborations Are Needed

The Internet of Things Is Here
(By Florence D. Hudson, 27 Jun 2016, EDUCAUSE)

TIPPSS, the acronym of Trust, Identity, Privacy, Protection, Safety and Security, is all about the concerns regarding IoT. The author believed that higher education, with rich and diverse resources and talents, is able to take the lead in the IoT research and development and shape the future of the IoT business with considerations of TIPPSS.

The Internet of Things: Unprecedented Collaboration Required
(By John O'Brien, 27 Jun 2016, EDUCAUSE)

Crucial issues at the heart of IoT success are again mentioned, such as security, privacy, data ownership and usage etc. To tackle the concerns, collaborations among multiple parties, including different disciplines, departments, institutions as well as industry partners, are essential to the successful IoT implementation in higher education.

Pioneers

Carnegie Mellon University

CMU Leads Google Expedition to Create Technology for "Internet of Things"
(By Byron Spice, 9 Jul 2015, Carnegie Mellon University)

A Look Inside Google and Carnegie-Mellon's IoT Campus
(By David Lumb, 24 Jul 2015, Fast Company)

In 2015, Carnegie Mellon University collaborated with Google and other institutions to establish an IoT platform named GIoTTO, which uses sensors, middleware and other tools to develop applications, facilitate communications, ensure security and privacy, and allow users to customize their own IoT experiences. The university envisioned its campus as a living lab where people explore IoT and apply it to their own research fields.

University of Wisconsin-Madison

Internet of Things 101: Inside the Latest Trend in Higher Education
(2015, Forbes)

Internet of Things Lab
(University of Wisconsin-Madison)

The Internet of Things Lab at University of Wisconsin-Madison engages multidisciplinary collaborations in the research and development of new IoT applications and works together with industry partners to keep abreast of the latest innovations and technologies.

Virtual Reality

Virtual reality (VR) is a technology that integrates realistic images generated by VR applications and other sensations to represent real-world scenarios or just virtual environments, engages its user's physical presence in the scenario or environment, and enables the user to interact with the surroundings.

As a newly emerging technology, VR has already caught the eyes of higher education that some institutions have already started experimenting how teaching, learning and experiencing would be changed by it. However, on the other hand, there still exist barriers ahead in taking advantages of the technology.

Contents

- **Classroom Teaching and Learning**
- **Concerns from Educators**

Classroom Teaching and Learning

College Students Experiment with Virtual Reality
(By Eli Zimmerman, 26 May 2016, EdTech)

Three higher education institutions became the first to throw their hats into the ring of classroom teaching with VR. The institutions provide innovative and unique curricula for students to explore the applications of VR, acquire hands-on practices and case studies with VR, and pilot VR filmmaking exercises.

Virtual Reality Facilitates Higher Ed Research and Teaches High-Risk Skills
(By Jacquelyn Bengfort, 12 May 2016, EdTech)

Some institutions have started to engage high-fidelity simulators in classrooms and labs to create virtual environments that bring real-world to the users, such as the DiVE system from Duke University and the HBX Live from Harvard Business School. These devices allow students to experience immersive trainings and researchers to gather detailed data.

This Virtual Lab Will Revolutionize Science Class
(By Michael Bodekaer, October 2015, TED)

The author proposed that the next quantum leap in science education would depend on the decisions to collaborate with virtual technologies to provide engaging and immersive learning environments for the students. It is found that by blending virtual laboratory simulations into teacher's coaching and mentoring, students' learning effectiveness was able to increase by 101%.

Virtual Reality Invites a New Era of Learning to Higher Education
(By D. Frank Smith, 31 March 2016, EdTech)

It has been heatedly discussed worldwide the endless possibilities that VR is bringing into the field of education, of which the upmost is an innovative visual communication and learning experience. VR is able to "make science, technology and art come alive" and provide an opportunity for educators to create fantastic learning experiences. And such experiences can facilitate students' acquisition of in-depth, comprehensive knowledge.

Augmented and Virtual Reality, Time-to-Adoption Horizon: Two to Three Years
(NMC Horizon Report: 2016 Higher Education Edition, pp. 40-41)

In this 2016 NMC Horizon Report for higher education, the major trends, challenges and developments in educational technology for the next five years are identified, providing rich insights for the education decision-makers.

The article indicates that recent achievements in VR technology have shed lights on new understandings of VR applications in higher education. With augmented and virtual reality technologies incorporated with classroom and online learning, students felt more motivated and confident due to dynamic and immersive learning style, and students also collaborated more thanks to the rich content and easy accessibility of online education.

----------------------------------- *Back to Contents* -----------------------------------

Concerns from Educators

The Promise of Virtual Reality in Higher Education
(By Bryan Sinclair and Glenn Gunhouse, 7 March 2016, EDUCAUSE)

In a conversation between a librarian, an author and a course lecturer, the three shared their opinions on the benefits of engaging VR in higher education as well as the obstacles being faced by educators,

such as financial barriers and technical concerns. They also pointed out that educational VR calls for interdisciplinary collaborations, thus it is able to greatly facilitate interactions and form community, rather than social isolation.

Virtual Reality: Could It Revolutionise Higher Education?
(By David Matthews, 2 June 2016, Times Higher Education)

While statistics show that students do perform better when they are involved in virtual environments, some educators doubt whether students will lose their social skills in the real world, such as teamwork. Unlike the great advantages of VR application in engineering or architecture classes, its use in humanities subjects is also on debate.