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Author: Learning Technology Team
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Issue

A report exploring the learning technologies which have the most potential to enhance teaching and learning at UEA in the next five years

Recommendation

The recipients are invited to consider the report

Resource Implications

Resource implications are considered in the appendix to the report

Risk Implications

Not applicable

Equality and Diversity

Not applicable

Timing of decisions

Not applicable

Further Information

For enquiries about the content of the paper, please contact Andy Mee, x1541, a.mee@uea.ac.uk

Background

The report was produced at the request of the ISD Education Board

Discussion

The report identifies seven key technologies which have the most potential to enhance teaching and learning at UEA in the next five years. A further four technologies are identified as 'technologies to watch'.

Attachments

TheFutureOfLearningTechnologyWithCosts_v2



THE FUTURE OF LEARNING TECHNOLOGY

2013

The Technologies That Will Most Impact Teaching and Learning at the University of East Anglia within Five Years

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1. INTRODUCTION

The purpose of this report is to consider the technologies which have the most potential to impact or enhance teaching and learning at the university in the next five years. As the UEA Corporate Plan 2012-2016 states that the university will need to focus on aspects of teaching and learning to fulfil its aim of becoming a consistent top-20 university in the UK by 2016, the technologies considered are also those most likely to support the university's corporate aims.

Ongoing consultation with academic colleagues, review of relevant academic literature, and personal observation of the university and the Higher Education sector have informed the technologies selected. Each technology is first defined in the report, potential to impact or enhance teaching and learning is then considered, and finally concrete examples of use are provided from UEA or other Higher Education Institutions.

2. EXECUTIVE SUMMARY

The Learning Technology Team have identified seven technologies which we believe have the most potential to impact and enhance teaching and learning at the University of East Anglia in the next five years. These are: smartphones and tablets, social media tools, screencasts and video capture, audience response systems, virtual learning environments, virtual classrooms, and MOOCs and open resources. A further four technologies were identified as technologies which have the potential to impact and enhance teaching and learning but perhaps not to the same extent as other technologies on our list. These four technologies, the 'ones to watch', are: Learning Analytics, Cloud Computing, Game-based Learning and Gamification, and 3D Printing.

The most striking aspect of our list is that many of the technologies on it are not new to the university. Several technologies such as social media, screencasts and video capture, audience response systems, virtual learning environments, and virtual classrooms are familiar to the team and already established to some degree at the university. These technologies, after carefully considering the scope of our report and the affordances of 29 potential other technologies, still have some of the greatest potential to enhance teaching and learning at the university in the next five years.

The two other technological areas on our list are MOOCs and Open Educational Resources, and smart phones and tablets. MOOCs and Open Educational Resources are problematic in that they have great potential to impact the way we teach and learn at the university in the next five years but, as we are at the early stages of exploring these technological areas, their significance is uncertain at the time of writing. Conversely, the potential and impact of smartphones and tablets is clear. These portable devices are visually compelling, highly portable and convenient, hugely versatile and powerful, and ubiquitous on campus. Smartphones and tablets have enormous potential to enhance teaching and learning at the university in the next five years and add value to many of the other technologies on our list.

3. KEY TECHNOLOGIES

3.1 Smartphones and Tablets

TREND - INCREASING USE OF MOBILE DEVICES

Society is increasingly expecting to be able to work, learn and access entertainment whenever and wherever it wants to. This expectation is perhaps particularly strong amongst young people who have been using mobile technologies at home and at school throughout their teenage years, and are now bringing them into Higher Education. The expectations of our students are also often combined with a need to take a more flexible approach to their studies because of competing time demands from their course, employment, and family. Staff too are increasingly expecting to work flexibly and are blurring the boundaries between work and leisure time. A growing number of robust and affordable mobile technologies are now commercially available and staff are bringing them into the workplace and using them to increase productivity and access resources on university systems.

Many Higher Education Institutions have noticed the trend towards mobile working and learning and have responded. A number of 1994 and Russell Group universities, for example, have released dedicated smartphone and tablet apps to enable staff and students to access learning materials in their virtual learning environment. Others institutions have developed virtual mobile campuses, designed flexible teaching spaces making use of Wi-Fi and other mobile technologies, or are exploring bring-your-own device (BYOD) policies.

TECHNOLOGY - SMARTPHONES AND TABLETS

Smartphones are mobile phones with operating systems such as Apple's iOS or Google's Android and a range of sophisticated features from web browsers to global positioning systems.

Smartphones are ideal for making calls or for when a quick glance at email, social networks, or a productivity tool is needed. Worldwide sales of smartphones to end users stood at 207.7 million units in the fourth quarter of 2012. An increase of 38.3 percent from the same period in 2011.

Tablets such as the Apple iPad, Google Nexus, Kindle Fire, Samsung Galaxy and Microsoft Surface are one-piece mobile computers. These devices come in many different sizes but all tend to offer touch screens and use finger gestures as the primary means of control. Tablets are

ideal for more involved web browsing, reading, and watching videos over a longer period of time because of their larger screen size. Worldwide shipments of tablets were 52.5 million units in the fourth quarter of 2012. An increase of 75.3 percent from the same period in 2011.

Perhaps the greatest driver for smartphone and tablet adoption has been the apps market. There are now hundreds of thousands of specialised, often low cost, software applications available to extend the functionality of smartphones and tablets. People can download and read books, check bank balances, hold real two-way video calls, play games, and a multitude of other activities on these devices. Innovation in app development continues at an unprecedented rate.

RELEVANCE TO TEACHING AND LEARNING IN HIGHER EDUCATION

The potential of smartphones and tablets to enhance teaching and learning at the university is clear; these devices are visually compelling with their touch screens and gesture-based interfaces, highly convenient and portable due to their size, and powerful as a wide range of things can be done with them. Staff and students could potentially use smartphones and tablets in a Higher Education context to:

- check their email and calendar.
- download, read and annotate textbooks and journals in electronic format.
- access materials and tools in virtual learning environments.
- submit, mark, and return coursework and associated feedback.
- take and share notes using tools such as Evernote.
- share files using tools such as Dropbox.
- access resources and materials on the web.
- take, edit and publish photographs and videos.
- communicate with others using social media tools such as Twitter.
- collaborate with others using social media tools such as Google Drive.
- record presentations and lectures.
- take part in two-way video calls or join virtual classrooms.

- install their own apps to build a personal learning or working environment.
- vote, comment, or ask questions during large group lectures.
- search the library catalogue with apps such as LibAnywhere.
- create task lists using productivity tools such as Toodledo.
- bring field trips to life with augmented reality or sophisticated, location and positioning apps.
- receive text message alerts.

EXAMPLES OF USE IN HIGHER EDUCATION

Literature – teaching staff are using iPads to collect and return, annotate and mark, and provide feedback on coursework as part of the Paradise Lost module at UEA. Comments from an electronic marking pilot suggest this can be a more flexible solution for the marker, and result in better quality feedback for the student.

Chemistry - students are using the ResponseWare app on smartphones and tablets to respond to polls during Inorganic Chemistry lectures at UEA. This activity allows teaching staff to gauge understanding and tailor teaching on-the-fly.

<http://www.uea.ac.uk/learningandteaching/staff/teaching/newsletter/Learning+Highlights+Spring+2013>

History - teaching staff are using an iPad to share historic maps, photographs, paintings and other images with students on field trips as part of the Landscape History Special Subject module at UEA. This activity allows content to be viewed in colour, in high-resolution, and without having to carry large bundles of paper.

Art - students are using an iPad and the Brushes app to produce drawings that can be played back as video as part of their Illustrative degree at Plymouth University. This activity encourages discussion and reflection on the drawing process, enables students to contrast technique, and enables students to highlight and correct bad habits.

<http://technologyenhancedlearning.net/ipadsforillustration/>

Biology - teaching staff are sharing images from their digital microscopes with students' iPads through a mobile app at the Department of Molecular, Cellular, and Developmental Biology at

Yale University. Students are able to annotate images and capture them for future use through this connection of digital microscope and tablets.

<http://its.yale.edu/news/shared-visions-yale-students-use-ipads-view-live-microscope-images>

Medicine - an app has been created to quiz medical students on human anatomy and various laboratory scenarios using video and audio clips at the University of Warwick.

3.2 Social Media Tools

TREND - INCREASING USE OF SOCIAL MEDIA

Social media tools have been around for several years and are firmly embedded in society and our everyday lives. This is particularly the case for young people who have grown up with social media tools such as Facebook and Twitter. There were approximately 34 million Twitter accounts and 33 million Facebook accounts at the start of 2013 in the UK. Facebook accounts have increased by approximately 3 million from the same time the previous year. Social media tools are also being used more and more for teaching and learning purposes within Higher Education and at our university. As such, they are much further down the road to widespread adoption than many technologies on our list. We believe the potential of social media to support and enhance learning activities has not yet been fully realised across the university, however, and believe the trend to incorporate social media will continue over the next five years.

TECHNOLOGY - SOCIAL NETWORKING, COLLABORATION, AND CONTENT COMMUNITY TOOLS

Social media tools come in many different forms but can broadly be defined as a collection of web-based tools which allow people to create, share and exchange information in online communities and networks. We suggest three particular categories of social media tools have the most potential to enhance teaching and learning at the university in the next five years. The first category are collaboration tools such as Wikipedia which allow people to co-create content at any time and from anywhere with a web browser and an internet connection. The second category are social networking tools such as Twitter and Facebook which build networks or social relations among people with shared interests, activities, backgrounds, or real-life connections. The third category are content community tools which are built around content. Perhaps the most popular content community tool in higher education is YouTube.

RELEVANCE TO TEACHING AND LEARNING IN HIGHER EDUCATION

Social media tools have enormous potential to support and enhance teaching and learning in Higher Education because they make it easy for students to collaborate and share ideas and information. Moreover, social media tools are almost second nature to many of our students and seem to attract people, hold their attention, and bring them back time after time.

Staff and students can use collaborative social media tools for a number of different activities in a teaching and learning context. These include:

- students preparing presentations in groups.
- students sharing study notes with each other and having discussions around them.
- students keeping reflective journals whilst on placement or away from the university. Academic staff can monitor and comment on these in a timely manner as they progress.
- academic staff creating, and students engaging in, peer and formative assessment activities.
- academic staff, possibly from different institutions or countries, working on research or conference papers together.
- course teams planning and developing modules as a group.
- researchers sharing interim results with colleagues and responding to questions.

Staff and students can also use content community tools for a number of different activities in a teaching and learning context. These include:

- students uploading coursework videos to the web for others to view and comment on. For example, computing students demonstrating games they have developed.
- students accessing videos and resources from other institutions and organisations.

Staff and students can use social networking tools for a number of different activities as well. Examples might include:

- students developing support communities. Perhaps making friends before arriving at university and so easing the transition from Further to Higher Education.
- students developing learning communities. For example, perhaps students learning a language might join a network in that language so as to be exposed to conversational

and colloquial reading and writing, learn about daily life, and establish friendships with native speakers.

- students further developing networking skills which are an important part of employment.
- students and staff keeping in touch while on a placement or away from the university.
- students and staff keeping up-to-date with the latest research. Many leading educational researchers, peer reviewed journals, and popular media organisations make content available through Twitter.
- students and staff taking advantage of 'the wisdom of the cloud'. Perhaps asking questions and gaining different perspectives from across the globe.
- academic staff extending the impact and life span of conferences and workshops. Staff could use social networking tools before, during, and after a conference.
- early career academics disseminating their research to a wider global audience.

EXAMPLES OF USE

Physiotherapy - Twitter is being used, amongst other things, to engage students in current research and contemporary news during their Physiotherapy degree at UEA. Staff are also using Twitter to communicate and collaborate with colleagues in Iran.

Occupational Therapy - students are using Facebook to communicate with each other and teaching staff while on campus and on clinical placement during their Occupational Therapy degree at UEA.

Chemistry - UEA staff are using Twitter to build and further develop professional networks, and to keep in touch with their subject area and the wider educational community.

Education - students are writing a weekly learning journal, reading and commenting on each other's journals, and using these as a source of information for end of module coursework as part of the BA Education degree at UEA.

Allied Health Professions - students are writing reflective journals as part of their Master of Clinical Education degree at UEA.

3.3. Screencasts and Video Capture

TREND - INCREASING DEMAND TO RECORD LECTURES AND OTHER TEACHING AND LEARNING ACTIVITIES

The Learning Technology Team is aware of an increasing demand amongst academic staff and students to record lectures and other teaching at Higher Education institutions. This demand has been particularly strong in the last two to three years and is partly due to changes in the Higher Education landscape and associated educational paradigms. Universities providing more online and blended degrees, developing open educational resources and courses such as MOOCs, and exploring innovative teaching practices such as the 'flipped classroom' are perhaps the most significant drivers at the moment. Many institutions such as the London School of Economics and Imperial College London have introduced institutional lecture recording solutions as a result. Fontys University in the Netherlands has deployed the MediaSite lecture capture solution campus-wide and is recording over 2,000 lectures a year. Similarly, an increasing demand for recording lectures and other teaching has also been observed from all Faculties at UEA.

TECHNOLOGY - SCREENCASTS AND VIDEO CAPTURE

The capture technologies most likely to enhance teaching and learning at the university in the next five years are screencasting and video capture. Both of these technologies are already established in small pockets at the university but are yet to be used widely.

Screencasting software has been commercially available for several years and allows people to easily record the activity on a computer screen, edit it, and publish it as a video. More developed tools such as Camtasia Studio provide advanced functionality allowing audio to be recorded using a microphone, video to be recorded using a camera, interactive tests to be embedded in the video, amongst many other things.

Video capture solutions allow events such as presentations to be manually or automatically recorded and published as videos. Again more developed solutions such as MediaSite, Echo360, and Panopto provide advanced functionality such as the ability to edit recorded video, and to stream events live on the web.

RELEVANCE TO TEACHING AND LEARNING IN HIGHER EDUCATION

Screencasting and video capture tools can be used in a number of ways in Higher Education such as recording entire lectures, recording shorter supplementary resources to lectures, recording events with external speakers, capturing student presentations, and demonstrating specialist teaching and learning software. Examples of how these recordings can be used to support teaching and learning include:

- Students can use lecture recordings to revise prior to examinations.
- Students can use lecture recordings to revisit key concepts, some of which may be difficult to understand at the first time of hearing, in their own time and at their own pace. This may be particularly helpful for students with learning difficulties or for whom English is a second language.
- Students can use lecture recordings for note taking purposes as recordings can be easily repeated, paused and rewind. Note taking after a lecture allows students to concentrate on the information within a lecture rather than concentrating on the process of writing notes. Again recordings may be particularly helpful for students with learning difficulties or for whom English is a second language.
- Students can use lecture recordings to catch-up on sessions they have missed. This will not replace the experience of the lecture but may provide a better learning experience for students than deciphering the notes of other students who did attend the lecture. This may be particularly helpful for mature students, and students with families, who sometimes find it difficult to attend all lectures. It may also help postgraduate students who need to attend professional development sessions but cannot because of teaching responsibilities, study visits, or because they study part-time.
- Academic staff can use teaching recordings to deliver more flexible courses than the traditional full-time, campus-based, undergraduate degree. Recordings could help expand Continuing Professional Development courses, post-registration courses, and blended and distance learning degrees for example.
- Academic staff can use lecture recordings to explore innovative teaching practices such as 'Flipped Classrooms'. 'Flipped Classroom' refers to the practice of making videos available for students to view outside of lectures, so allowing the lecture slot to be used for more interactive teaching.

- Academic staff can use teaching recordings to use teaching time more effectively. Recordings perhaps allow some induction and study skills sessions to be removed from lecture slots.
- Academic staff can use lecture recordings for professional development purposes. Recordings of lectures, for example, can be used for peer and self-evaluation activities.
- Academic staff can use recordings to provide formative feedback on coursework and assignments. This may improve both quality and quantity.
- The university can use teaching recordings to improve student engagement and meet student expectations. Recordings are a positive contributor.

EXAMPLES OF USE IN HIGHER EDUCATION INSTITUTIONS

Chemistry - most first year lectures have been recorded using Camtasia Studio and made available to students through Blackboard at UEA. Academic staff are also exploring the notion of 'flipped classrooms'.

<http://www.uea.ac.uk/learningandteaching/staff/teaching/newsletter/Learning+Highlights+Spring+2013>

Environmental Sciences - academic staff at UEA have been using Camtasia Studio to record lectures for students who live away from campus and find it uneconomical to travel for isolated sessions.

Humanities - personal and professional development sessions within the Humanities Faculty at UEA are being recorded for postgraduate research students. They are not always able to attend because they are conducting research away from the university or have timetabled teaching responsibilities.

3.4. Audience Response Systems

TREND - INCREASING INTERACTION IN LARGE GROUP TEACHING

The Learning Technology Team have noticed a pedagogical trend towards making lectures and other large group teaching more interactive and engaging at our university and at other Higher Education Institutions. Academic colleagues are increasingly exploring technologies which support this interaction through the use of audience response systems such as TurningPoint,

web-based voting tools such as PollEverywhere, and the backchannel aspects of social networking tools such as Twitter. Audience response systems seem to be gathering particular momentum across the university with a centrally bookable system available and several Schools owning their own system.

TECHNOLOGY - AUDIENCE RESPONSE SYSTEMS

Audience response systems typically consist of a number of voting handsets (sometimes referred to as 'clickers') which participants use to cast votes or make comments, a vote receiving dongle which plugs into a laptop or computer, and software which displays the results of the vote. Leading audience response systems such as TurningPoint also enable participants to cast votes from a web page or from a smartphone or tablet app. It is these more developed systems, which enable learners to participate with their own portable devices but do not exclude learners without them, that hold the most potential to support teaching and learning in the next five years. These second generation solutions not only allow more sophisticated forms of interaction during teaching sessions, they enable students to use familiar portable devices, and they reduce the logistical barriers associated with traditional voting handsets.

RELEVANCE TO TEACHING AND LEARNING IN HIGHER EDUCATION

There is significant evidence in the academic literature that audience response systems can support and enhance teaching and learning activities in Higher Education. Potential uses include:

- students using the immediacy of feedback from audience response systems to benchmark themselves against their peers.
- academic staff using audience response systems to engage learners. The attention of students can wander during lectures and audience response systems can be used to re-engage those whose attention has been lost.
- academic staff using audience response systems to make larger teaching sessions more interesting and fun.
- academic staff using audience response systems to encourage discussion between students, and between themselves and students.

- academic staff using audience response systems to gauge the understanding of students and giving themselves an opportunity to adapt their teaching during the session. This might involve changing the direction or speed of the session.
- academic staff using audience response systems for formative and peer assessment.
- academic staff using audience response systems to encourage learners to actively consider the material being presented. This may improve the depth of learning.
- academic staff using audience response systems to increase participation by providing anonymity.

EXAMPLES OF USE IN HIGHER EDUCATION INSTITUTIONS

Biology - students use audience response systems to test their understanding during revision lectures on the Microbial Biotechnology module and the Biofuels, Bioremediation and Bioproducts module at UEA.

Allied Health Professions - the TurningPoint audience response system is used to reinforce knowledge and test understanding during stroke rehabilitation lectures at UEA.

Chemistry - students are able to vote, using either voting handsets or a smartphone and tablet app, during traditional and 'flipped' Inorganic Chemistry lectures at UEA. Students are also able to use Twitter to respond during sessions.

<http://www.uea.ac.uk/learningandteaching/staff/teaching/newsletter/Learning+Highlights+Spring+2013>

3.5. Virtual Learning Environment

TREND – WIDER AND DEEPER ADOPTION OF VIRTUAL LEARNING ENVIRONMENTS

Virtual Learning Environments (VLEs) have featured heavily in the educational technology landscape for a number of years. In that time, young people have grown up using VLEs in their primary and secondary schools forming a part of their student expectation when entering universities. The need for universities to provide a supportive, secure and evolving learning environment for their students has been well recognised in Higher Education.

VLEs have had to grow and develop in ways that respond to the needs of 21st century learners, at a time when the pace of technological change is rapid. Mobilisation, texting, video, desktop video conferencing and social media are all starting to be incorporated into VLEs and VLEs themselves are opening up to be able to deliver social media content such as YouTube, Flickr, Twitter and Facebook.

UEA first implemented a VLE (Blackboard) in 2001; use is now widespread and it is used extensively by some teaching staff. We believe that the trend of widening and deepening the adoption of the VLE within the University will continue over the next five years. We will continue to understand the VLE as a growing, mission-critical system that has a far reaching impact with the majority of UEA students.

TECHNOLOGY – VLES: BLACKBOARD & MOODLE

VLEs can be defined as environments that contain or enable other technologies rather than being a technology in themselves. VLEs draw together a range of tools and activities within a secure environment to support student learning, this includes content delivery (both academic and student generated, static and multimedia), communication tools, collaboration activities, assessment (both in-system activities and submission of assignments) and student management.

The UCISA TEL survey 2012 reports that VLEs have remained in the top five items for Higher Education Technology Enhanced Learning (TEL) teams; the two VLEs holding the most significant market share in Higher Education in the UK are Blackboard and Moodle.

Implemented well a VLE can provide a virtual administration and information “home” for students and enable communication and community for each subject. The VLE becomes an integrated part of course delivery.

Analytics packages and other measurements are being applied to VLEs to discover areas of poor (and good) engagement to inform strategy and target support more effectively.

RELEVANCE TO TEACHING AND LEARNING IN HIGHER EDUCATION

VLEs have massive potential to enhance learning and teaching in Higher Education but this has not yet been fully realised across the university. Part of this is about understanding what tools are offered in and by the VLE and what activities can be supported by the VLE.

The other part of realising the potential is for academics to be explicitly considering course design, interaction and collaboration, assessment and learner support when developing VLE module sites.

There are a range of available tools and activities that a VLE can offer, including:

- Student-generated content can be created within VLEs using blogs or wikis, or it can be created elsewhere and uploaded.
- Using the discussion boards, students can share ideas and thoughts or debate questions set by their tutors.
- Students can collaborate in groups, share files and information with each other and produce combined pieces of work using a wiki or a group blog.
- Students can work through formative assessments using the Tests tool in the VLE receiving instant feedback on their progress.
- Students can keep a reflective journal while out on placement or during the course of study by using the private blog (journal) tool.
- Students can work through learning modules that academics have created as learning activities, these can make use of adaptive release in VLEs – meaning that content is only released when certain criteria have been fulfilled e.g. taking a test at the end of section one releases section two.
- Students can engage with self and peer assessment that is organised and automated by a tool in the VLE.
- Students have easy ways to communicate with fellow students and their lecturers whether on campus or anywhere in the world, through discussion boards, emails, desktop video conferencing and instant messaging (where those tools are enabled).
- Some VLEs are engaging with social learning whereby students can connect to other learners across the world from their VLE providing a personalised learning experience.
- Academics can make standard course materials available to students, accessible anytime and from anywhere with an internet connection. This becomes even more powerful if the VLE is fully accessible on mobile devices.
- Teaching staff can use the VLE to post lecture recordings, create videos in the VLE or upload videos or audio explanations to support a range of learning needs.

- Academics can communicate easily with students by posting announcements in the VLE and by using the module email facility.
- Academics can look at retention risk factors and student engagement to be able to help students when they first start to show signs of falling behind or disengaging.
- Academics can link to the wealth of material on the internet providing an easy way to signpost students to key sources. They can also bring in certain third party content into VLEs e.g. YouTube, Twitter streams.
- Calendars in VLEs can be used for timetabled and other events and can be downloaded to Outlook and Google, making them powerful administrative tools.
- VLEs often make use of profiles and news feeds (as seen in social networking sites) making it easier to connect with people within the institution.
- VLEs can be used by administrative functions at universities too, particularly with the ability to run course evaluation and enterprise surveys.

EXAMPLES OF USE

The VLE is used extensively across nearly all schools at UEA; the following are just a few examples:

Medicine – at UEA the VLE is being used in a first year research methods module where the face to face teaching time was reduced by 50%. The course design includes learning modules which are packages of documents, links, screencasts, teaching capture and quizzes created within the VLE. The learning module is designed in a linked and progression based way, utilising adaptive release, to support students not just in terms of information delivery but also by providing interaction and communication.

Business – at UEA the VLE is being used to present students with a number of learning activities about academic skills development created elsewhere and imported into the VLE. They are then linked up with diagnostic assessments so that the students themselves, Norwich Business School and Dean of Students office can identify students who need additional help.

Chemistry – at UEA the VLE is used to provide a series of tests, each of which is only available once a certain level in the previous test is reached. Other modules have used the VLE to give students access to lecture capture recordings, student generated recordings and module Twitter streams.

Education – students are using the VLE tools to write a weekly learning journal, read and comment on each other’s journals, and use these as a source of information for end of module coursework as part of the BA Education degree at UEA.

International Development – at UEA VLE tools are being used to address questions around providing quick, personalised feedback, how to get students to reference sources properly and how to facilitate collaborative work and assess groups fairly. The self and peer assessment tool was used for formative assessment, allowing the students to hand work in online, the tool redistributes the submissions automatically among the class (60-90 students), with each students being asked to give feedback on the work of a few classmates, as well as reflecting on their own performance. The wikis proved an effective platform for both formative and summative assessment of group work.

3.6. Virtual Classrooms

TREND - INCREASING DEMAND FOR VIRTUAL TEACHING AND MEETING

Real-time online communication tools have been around for several years and are now firmly established in society. Skype, for example, is widely used and boasts 280 million users across the globe (Microsoft). Tools such as Skype quickly filtered through into Higher Education, and gained a foothold, but demand has been low at UEA until relatively recently. The recent increase in demand may be related to other trends in the sector. The increasing move towards distance and blended learning, increasing interest in new models of delivery such as MOOCs, increasing environmental awareness and commitment to being a low carbon university, increasing drive to support a more diverse student population, increasing uncertainty around funding, and increasing use of mobile devices may all be contributing to demand.

TECHNOLOGY - VIRTUAL CLASSROOMS

The term ‘virtual classroom’ is used here to refer to a group of educationally focused technologies that allow staff and students to communicate on the web using real-time audio and video. More developed tools such as Blackboard Collaborate also provide additional functionality such as text chat, shared whiteboards, and interactive polling. Some tools even provide dedicated apps for smartphones and tablets so online classes can be joined from anywhere with an internet connection.

RELEVANCE TO TEACHING AND LEARNING IN HIGHER EDUCATION

Virtual classrooms can contribute positively to the university's carbon reduction policies, enable savings for staff and students in terms of time and money through not having to travel, and extend the university's geographical reach to anyone with an internet connection and a computer or mobile device. Examples of how virtual classrooms can potentially be used in a Higher Education context include:

- students using virtual classrooms to meet online prior to arriving at the university so as to support the transition from Further Education into Higher Education. This can develop a sense of community.
- students using virtual classrooms to collaborate on group projects.
- academic staff using virtual classrooms to deliver lectures, seminars, tutorials, and other teaching sessions as part of a distance learning, work-based learning, or blended learning degree or course.
- academic staff using virtual classrooms to meet and support students while on placement. Virtual classrooms can also be used to meet with placement providers.
- academic staff using virtual classrooms to meet with postgraduate students while conducting research away from the university.
- academic staff using virtual classrooms to join conferences remotely, or deliver remote conference presentations themselves. Academic staff can use virtual classrooms to extend physical conferences as well.
- academic staff using virtual classrooms to take part in online professional development webinars.
- academic staff using virtual classrooms to include external experts in teaching sessions.

EXAMPLES OF USE IN HIGHER EDUCATION INSTITUTIONS

Allied Health Professions - students are using a virtual classroom to meet and discuss ideas as part of a postgraduate Leadership and Management in Practice module at UEA. This module is for post clinical registered professionals who study part-time and at distance due to work commitments.

Language and Communication - students at UEA used a virtual classroom to discuss the Falklands War with students in Argentina. A veteran from the Falklands War was also interviewed.

Art History and World Art - academic staff organised a Climate Change in Prehistory Network event. A virtual classroom tool enabled five experts from America, Canada and Australia to present and take part without the expense and time needed to bring them to UEA.

Education - staff and students substituted a virtual seminar for a face-to-face seminar when snow made getting to the university problematic for the BA Education degree at UEA.

3.7. MOOCs and Open Educational Resources

TREND – INCREASING IN ONLINE LEARNING AND THE USE OF OPEN CONTENT

There is a growing chorus of students expressing frustration about what they are actually getting — and not getting — out of Higher Education for their money. The recent increase in UK tuition fees has led to many students questioning the value of a traditional university education and instead seeking alternative less costly ways to continue their studies, such as through freely available online courses and open content.

According to the NMC Higher Education Horizon Report 2013, Openness — concepts like open content, open data, and open resources, along with notions of transparency and easy access to data and information — is becoming a value. “Open” continues to be a buzzword in education, and it is often mistakenly equated only with “free”. Open education advocates are working towards a common vision that defines “open” as free, copyable, remixable, and without any barriers to access or interaction.

Open content is the current form of a movement that began nearly a decade ago, when institutions like Massachusetts Institute of Technology (MIT) began to make their course content freely available. Today, there is a tremendous variety of open content, and in many parts of the world, open content represents a profound shift in the way students study and learn. According to the 2010 NMC Higher Education Horizon Report, the open content movement is a response to the rising costs of education, the desire for access to learning in areas where such access is difficult and an expression of student choice about when and how to learn.

An online course is a programme of study undertaken online via the Internet. It can be self-paced, asynchronous learning or may be instructor-led, synchronous learning. Since the course

is provided online it enables students to study from anywhere in the world as long as they have an internet connection. Some examples of different types of online courses are: Distance Learning Courses, Continuing Professional Development Courses and Short Courses. Whilst the majority of these courses may be delivered solely online, they may also contain some instances of face to face interaction, known as a Blended Learning Courses.

A Massive Open Online Course (MOOC) is a specific type of online course aimed at large-scale interactive participation and open access for anyone to join via the Internet. In addition to traditional course materials such as lecture slides, videos, readings, and activities, MOOCs provide interactive user forums that help build a community for the students and academic staff. MOOCs are a fairly recent development in distance education, they originated around 2008 and often use open educational resources (OERs).

Open educational resources are digital materials that can be used, re-used and repurposed for teaching, learning and research, made freely available online through open licenses such as Creative Commons.

TECHNOLOGY – MOOCS AND OPEN EDUCATIONAL RESOURCES

The technologies that enable the workflow of MOOCs vary within the different models, but the common thread is that the tools used are readily available and easy to use. MOOCs make use of a variety of emerging pedagogies and tools, including blended learning, open educational resources and crowd-sourced interaction. MOOCs often draw upon cloud-based services such as WikiSpaces, YouTube and Skype, among many others, to foster discussions, create and share videos, and engage in all the other activities that have become essential to teaching and learning in a modern online learning environment.

For three of the biggest MOOC providers, Coursera, edX, and Udacity, course materials are located in a central repository and they all use automated software to assess student performance through quizzes and homework assignments. MOOCs need to strike a fine balance between automating the assessment process while delivering personalised, authentic learning opportunities. The social structures of these three major MOOC projects are also similar, with students participating in online forums and study groups.

Many of the original MOOC courses were based on connectivist theory, emphasising that learning and knowledge emerge from a network of connections. This is a model that emphasises knowledge production over consumption and that the new knowledge generated

helps to sustain and evolve the MOOC environment. However, many current MOOC models still largely mirror traditional lecture formats. Coursera emphasises video, with students watching recorded lectures from field experts as the main substance of the courses.

Open educational resources include a varied range of digital assets from course materials, content modules, collections and journals to digital images, music and video clips. Open educational resources also include things such as Re-usable Learning Objects (RLOs). RLOs are small, 'bite-sized' chunks of online learning focussing on a particular topic. A primary motivation for many people developing learning objects is their reusability across learning platforms. There are a number of freely available open source products that enable easy creation of RLOs by following the standard templates provided. Xerte, created by the University of Nottingham, is particularly popular amongst users in Higher Education Institutions.

At the centre of many discussions of open content are the challenges of sharing, repurposing, and reusing scholarly works; related to those discussions are concerns about intellectual property, copyright, and student-to-student collaboration, but work has been done by groups such as Creative Commons, the Academic Commons, Science Commons, and others to address many of the concerns voiced.

RELEVANCE TO TEACHING AND LEARNING IN HIGHER EDUCATION

MOOCs are designed to provide online learning, at scale, to people regardless of their location or educational background. MOOCs are becoming increasingly popular amongst learners as they promise high quality education at little or no cost. MOOCs are also becoming increasingly popular with Higher Education Institutions because of their potential to reach a previously unimaginable number of learners. According to the NMC Higher Education Horizon Report 2013, MOOCs have enjoyed one of the fastest uptakes ever seen in Higher Education, with hundreds of new entrants in the last year. The NMC report predicts that MOOCs will see widespread adoption in Higher Education over the next 12 months.

Many Higher Education Institutions are exploring Massively Open Online Courses from the perspective of them being an alternative, or supplement, to traditional courses. MOOCs are increasingly being suggested as an alternative to credit-based instruction. The prospect of a single course, achieving enrolments in the tens of thousands, is prompting serious conversations in Higher Education Institutions around ideas such as "micro-credit". Other Higher Education Institutions are interested in exploring Massively Open Online Courses from

perspectives other than as an alternative to credit-based instruction. UEA, for example, is in the early stages of planning courses as part of the FutureLearn initiative and is interested in the potential of MOOCs to support and enhance outreach, enterprise, marketing, and engagement activities amongst other things. This is a very different flavour of MOOC.

The notion of thousands of students participating in a single course, working at their own pace, relying on their own style of learning, and assessing each other's progress has changed the landscape of online learning. In many current models, Massively Open Online Courses present opportunities for learners to freely experiment with a variety of subjects and acquire new skills that may not be associated with a degree programme at brick-and-mortar institutions. MOOCs enable learners not to be confined to a single pathway.

The emergence of MOOCs, open content, and free online courses also raises the question of who is considered the expert. Academic staff are increasingly being seen as providing mentorship and connecting students with the most effective forums and tools to navigate their areas of study.

Key relevancies of MOOCs to teaching and learning in Higher Education:

- Altruistic – for HEIs to give something back to the wider community – “education for all”. Many universities now consider making their course materials available to the public a social responsibility.
- Marketing and increasing the brand awareness of a Higher Education Institution (HEI).
- As a taster, to encourage students' enrolment on a full paid course for credit towards a recognised qualification.
- MOOCs offer the possibility for continued, advanced learning at zero cost, allowing students, life-long learners, and professionals to acquire new skills and improve their knowledge and employability.
- Potential for new, innovative and informal ways for learners to demonstrate their knowledge. Peer review systems, student gurus, badges, and other forms of assessment are currently being explored where no formal credit is offered.
- Allows learning together with a large group of people with an interest in the same topic – an event, around which people who care about a topic can get together worldwide to work/talk/learn about it in a structured way.
- Provides the ability to engage learners from across the globe as they can access and start taking the course whenever they like and follow it at their own pace.

Key relevancies of MOOCs, OERs and Online Courses to teaching and learning in Higher Education:

- OERs – reusable, customisable, mutually beneficial and often supported by established communities of practice.
- Open content provides a response to both the rising costs of traditionally published resources and a cost-effective alternative to textbooks and other materials.
- Students undertaking online courses are learning not only the material, but also the digital literacy skills related to finding, evaluating, interpreting, and repurposing the resources that they are studying.
- Online courses provide the opportunity to attract a greater number of students to study since geographical location is not a barrier.
- Online CPD courses – potential to gain revenue – online courses are attractive to employers (e.g. NHS) as it enables employees to complete courses with minimal time away from the workplace.

EXAMPLES OF USE IN HIGHER EDUCATION

MOOCs

Coursera, edX & Udacity are three of the largest and established MOOC providers that together total hundreds of thousands of users. According to the 2013 NMC Higher Education Horizon Report, Coursera has over two million students enrolled in 200 courses, while edX and Udacity have reached around 500,000 students, across 23 courses and 19 courses, respectively.

FutureLearn - In late 2012, the UK's Open University launched a British MOOC provider, FutureLearn, of which the University of East Anglia is a member institution. Futurelearn will bring together a range of free, open, online courses from leading universities, in the same place and under the same brand. <http://futurelearn.com/>

CourseSites - The VLE provider, Blackboard, provide their own platform, Coursesites, which is host to a variety of MOOCs and a catalogue of available courses can be accessed online. <https://www.coursesites.com/webapps/Bb-sites-course-creation-BBLEARN/pages/mooccatalog.html>

OERs

Open Exeter - OER project at the University of Exeter - A JISC-funded project to release existing learning resources under a suitable license for open use and repurposing. <http://as.exeter.ac.uk/support/educationenhancementprojects/pastprojects/openexeter/abouttheproject/>

OER Programme - The Higher Education Academy and JISC are working in partnership to support phase 3 of the HEFCE-funded Open Educational Resources programme. <http://www.heacademy.ac.uk/OER>

OpenLearn is the UK Open University's contribution to the OER project. The Open University launched the OpenLearn website in October 2006 to provide free access to its educational materials throughout the world. OpenLearn offers anyone the opportunity to join a study group while working through the course. OpenLearn practices a method known as “supported open learning” in which students work through content at their own pace with help and guidance from a tutor. <http://www.open.edu/openlearn/>

RLO-CETL has developed a number of high quality learning objects that are designed to be pedagogically rich and reusable. <http://www.rlo-cetl.ac.uk/>

Business - At UEA, Andy Vassello in the Norwich Business School is using an RLO via the Blackboard VLE in order to help educate his students about plagiarism and referencing. The RLO was originally created by London Metropolitan University.

MIT OpenCourseWare - The Massachusetts Institute of Technology publishes lectures and materials from most of its undergraduate and graduate courses online, where they are freely available to anyone, anywhere, for self-study. <http://ocw.mit.edu>

OTTER - The University of Leicester's OTTER project (Open, Transferable and Technology-enabled Educational Resources) pilots and evaluates systems for releasing educational content under an open license. <http://www.le.ac.uk/otter>

Online courses

Medicine - The Norwich Medical School at UEA has been running an e-learning Master of Surgery degree in Oncoplastic Breast Surgery since 2011. <https://esurgery.uea.ac.uk/>

Nursing - At UEA the School of Nursing Science and School of Allied Health Professions have been delivering online MSc modules in Leadership and Management in Practice and Stroke Recovery, via the Blackboard VLE.

4. TECHNOLOGIES TO WATCH

The following technologies are 'ones to watch'. These technologies were considered at length but, although they have the potential to impact or enhance teaching and learning at the university, it was felt they would not have as significant widespread impact at the university in the next five years.

4.1 Learning Analytics

Learners participating in online activities, or activities about which data is electronically recorded, leave a trail of data that can be used to personalise the learning experience and measure performance. Learning analytics is defined, for the purposes of this report, as using data on a large scale and from multiple sources for learning enrichment. It is 'big data' in an educational context. The Learning Technology Team believe that interest in learning analytics exists and will continue to increase but, unless resources are made available in this area, impact at the university will not be as significant as for other technologies in the next five years.

4.2 Cloud Computing

The move towards cloud computing, for the purposes of this report defined as the use of software and hardware as a service over a network, is a significant trend in information technology at Higher Education Institutions and elsewhere. Several universities and higher education providers have now moved, or are considering moving, core services such as email and file storage to the cloud to reduce infrastructure costs, reduce maintenance costs, and realise other potential benefits. Cloud computing is certainly changing the way we configure, use, and conceptualise software and file storage in Higher Education. Cloud computing has not been included on our final list, however, as it's potential to enhance teaching and learning is not considered to be as significant as other technologies on our list.

4.3 Game-based Learning and Gamification

Gaming culture is growing. The introduction of networked gaming, and the introduction of mobile devices such as smart phones and tablets, have revolutionised an already well-established recreational game industry and given it fresh impetus. Gaming has also increased in the commercial and the educational sectors as well with game playing increasingly being used,

amongst other things, to scaffold key concepts and simulate real world experiences. The Learning Technology Team believe that gaming can support and enhance teaching and learning in Higher Education, but it is the gamification of learning which has perhaps the most potential in a Higher Education context. Gamification is essentially about introducing elements of gaming such as rewards, leaderboards, and badges into non-game situations like learning. Game-based learning is not on our list because it is unlikely to have significant widespread impact at the university in the next five years. Gamification is considered to be at a nascent stage and also unlikely to have widespread impact in the next five years.

4.4 3D Printing

3D printing refers to technologies that construct physical objects from three-dimensional digital content such as computer-aided design files. Potential uses in a higher education context may include activities such as organic chemistry students printing models of complex proteins or molecules, geology students printing out fossils and artifacts, and medical students printing anatomical models based on the images from MRI and CAT scans, amongst many other things. 3D printing has not been included on our list as it is unlikely to have as widespread an impact as other technologies within the next five years.

APPENDIX - COSTS

Indicative costs are provided below for each of the technologies mentioned in The Future of Learning Technology 2013 report. It should be noted that additional Learning Technologist resource (£50,000 per post) would be needed to implement many of the technologies.

Technology	Trial	Full
Smartphones and Tablets	FOC or minimal cost	FOC or minimal cost
Social Media Tools	FOC or minimal cost	FOC or minimal cost
Screencasts and Video Capture	FOC or minimal cost	£140,000 capital £60,000 p.a. revenue
Audience Response Systems	FOC or minimal cost	£10,000
Virtual Learning Environment	-	-
Virtual Classrooms	Open Source	Open Source
MOOCs and Open Educational Resources	FOC or minimal cost	£50,000 capital £160,000 p.a. revenue
Learning Analytics	£50,000 p.a.	£250,000 capital £50,000 p.a. revenue
Cloud Computing	FOC or minimal cost	£80,000
Game-based Learning and Gamification	FOC or minimal cost	FOC or minimal cost
3D Printing	FOC or minimal cost	£5,000