



Royal Flemish Academy of Belgium  
for Science and the Arts

# Thinking about blended learning

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A paper for the Thinkers in Residence programme

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## 1. Introduction

The aim of the project as defined by the KVAB is: *the development of a systemic vision on the optimal exploitation of ICT and the Internet for the new learning of the 21<sup>st</sup> century.*

We were asked to produce a broad long-term vision paper on blended learning, including hypotheses, possible models and future scenarios, on three levels: micro (learner, teacher, class), meso (institution, school) and macro (the policy makers, e.g. the educational networks and the governments).

The thinking articulated in this document is the result of the many conversations with my co-thinker, Pierre Dillenbourg, the members of the KVAB Expert Group, and the staff of the universities we visited over the past year. It has been a great opportunity to think, rethink, and then think again – and I hope we will all continue to do that, because our changing technology environment demands us to do so.

A simple definition of ‘blended learning’ is “the thoughtful integration of classroom face-to-face learning experiences with online learning experiences” (Garrison & Kanuka, 2004). It blends the campus-based with the online. It must be ‘thoughtful’ because technology is complex and continually changing. It must be a thoughtful ‘integration’ because the digital is not a supplement, and does not simply replicate aspects of the conventional – each should enhance the other.

Blended learning means respecting the true value of conventional methods – such as seminars, tutorials, projects, labs, field trips, physical materials. And it means acknowledging the extraordinary power and flexibility of digital technologies. How can the two be thoughtfully integrated to give education the power and flexibility it needs in order to play its proper role in 21<sup>st</sup> century life?

So my slightly modified definition of blended learning is: *the thoughtful integration of conventional and digital methods of teaching and learning as the means to achieve our greatest ambitions for 21<sup>st</sup> century education.*

## 2. Why is it important to think about ‘blended learning’?

The integration of digital technologies with conventional methods of teaching and learning is already a feature of higher education (HE). Integration is increasing rapidly, primarily because of the ubiquitous presence of digital technology and the increase in the digital skills of both students and teachers.

Digital technologies are bringing powerful changes to education systems, none of which are under the control of the academy. The increases in access to devices and communications, in students’ digital literacy, in private providers’ development of learning environments, and in free online resources, change the ways in which students access and learn concepts and skills. These are powerful forces and they will change education with or without the involvement of academics. Better that the academy engage and lead than avoid and perish.

So we have to think about blended learning.

What is there to look forward to if universities were to embrace the practice, and succeed in optimising it? If we can imagine a better future HE system, how different would it be?

We could be setting a challenge for digital technology to meet. It is powerful, after all, it attracts massive investment, it evolves fast, and it generates major changes. If the academy takes the trouble to engage with digital technology, we are entitled to dream.

What are our greatest ambitions for the future of universities? University mission statements everywhere include high ambitions, as do those in Flanders:

**KU Leuven's** vision of teaching and learning emphasizes the close link between research and education: study programmes are research-based, thus enabling students to acquire academic competences, ... Moreover, students integrate these academic competences within a broad ethical, cultural, and social formation... This enables them to assume their social responsibility as committed citizens.

**Hasselt University** aims to widen participation, addressing all talents, and inspires its students and staff to develop their full potential in a dynamic environment.

**The University of Gent** wants a creative community of staff, students, and alumni connected by our common values commitment, openness and pluralism... to contribute to society from a unique scientific expertise.

**The Vrije Universiteit Brussel** offers high-quality education and research... research teams are internationally recognized in many disciplines of fundamental and applied research. ... Thanks to this expertise and its strategic location, the Vrije Universiteit Brussel is an ideal partner for prestigious research and education with an outlook on Europe and the world.

**The University of Antwerp** is an academic community of students, lecturers and researchers in who help each other acquire new scientific insights and develop skills... and enhance their own learning and so are able to contribute to the well-being of our society.

They all position the university as working at the highest level of intellectual achievement, and contributing to their social environment. And as we discovered when we visited the five Flemish universities and the neighbouring Belgian university UC Louvain, all of them already use learning technologies in their teaching, and have central units with the expertise and willingness to support their academic teaching in this kind of innovation. But the impact could be so much greater. That is what we have been thinking about.

Digital technology works on the large scale and handles it well, so if we want to challenge what it can really do for university education, we should begin with those high ambitions, and take them to the large scale.

As we talked with and listened to the experts, academics, students, and senior managers we met, there were many immediate local problems needing solutions.

But as we consider the near-term changes we could make to improve the quality and scope of HE we should dream as well. In the end we should be able to articulate what we really want for the future of universities, and harness the technology to help us achieve it.

### 3. A systemic analysis of innovation in HE

Higher education is a complex system of national, local and institutional stakeholders, public and private institutions and forces, and a broad range of professionals. It takes responsibility for conducting every student through the formal education that should enable them to attain their learning potential, for the benefit of both individuals and society. The complexity of this system means that developing and embedding any radical change requires a clear understanding of how it operates, because its complexity makes it highly resistant to change.

To gain some traction on this complexity, it is useful to think in terms of how the professionals in the field prioritise their work and practice, because the comparative strength of all the competing influences determines the success of any one initiative for change and innovation. Figure 1 shows this in terms of the principal 'drivers', i.e. the elements of the HE system that determine how the academic teachers and leaders are likely to prioritise activities. Unfortunately, innovations in blended learning are not demanded by most of the drivers. These are, roughly in order of decreasing power (though not necessarily importance):

- funding imperatives,
- assessment requirements,
- stakeholder demands,
- quality assurance,
- strategic plans,
- curriculum requirements,
- students' individual needs and skills,
- teachers' career opportunities (Laurillard, 2013).

If, for example, there were a funding imperative to be innovative in teaching, then this would become a priority for academics.

The drivers in a system define the influences a professional cannot ignore, so they will act to prioritise activities that respond to them. But they are not sufficient for effective action without the 'enablers', i.e. the mechanisms the professional cannot do without if they are to respond effectively to the drivers.

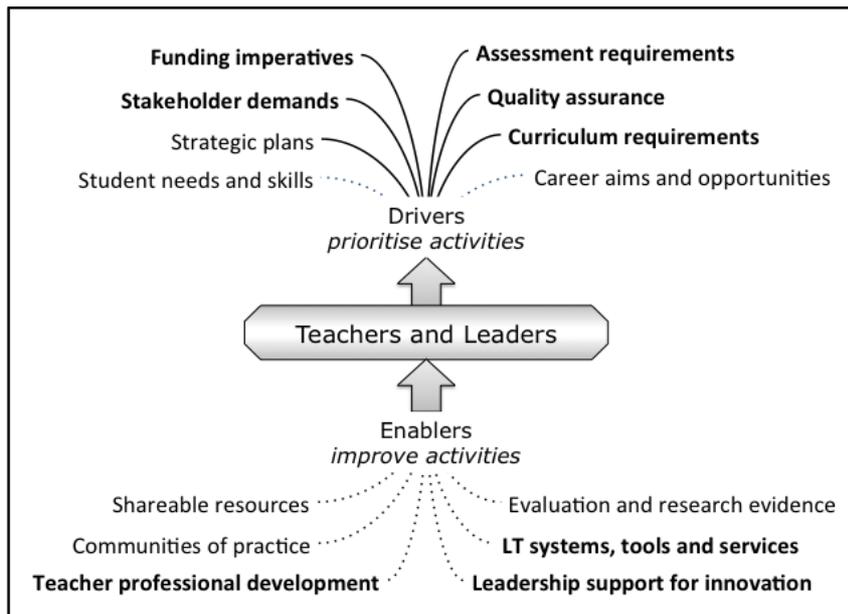


Figure 1: the drivers of professional activity in the HE system balanced against the enablers for innovation in learning technology (bold indicates the more powerful ones).

If we consider the balance between drivers and enablers for the case of innovation in learning technology, the relevant enablers are those that best support teachers and leaders in the change process. These are, in order of decreasing effectiveness:

- leadership support for innovation,
- teacher professional development,
- learning technology tools, systems and services,
- communities of practice,
- shareable resources,
- evaluation and research evidence.

The question is: are the drivers sufficient to prioritise innovation in learning technology, and the enablers in place to support it?

The same analysis can be applied to all sectors of education, including schools, vocational education and lifelong learning. The drivers and enablers are the same, although the agencies and their comparative influence are different.

### Drivers of change

The responsibility for the drivers in the HE system in any country is usually distributed across independent agencies and institutions, none of them wholly under the control of the universities. This makes it difficult to develop a unified system-wide strategy of change to make the best of learning technology. Few of these critical drivers are being adjusted to accommodate the idea that the system needs to make optimal use of learning technology.

These are the questions that could be asked at any level, from institutional department head to Minister, and in any sector, primary through to adult learning:

- **Funding imperatives** – There is often a drive for lower unit costs, but do funding imperatives use viable costing and investment models for online teaching and scaling up?
- **Assessment requirements** – Do the types of summative assessment of students, and the attainment levels they define for knowledge and skills, take account of the potential of technology-based assessment?<sup>1</sup>
- **Stakeholder demands** – Employers, citizens, students, policymakers, and governments are likely to demand changes that recognise the digital world, but do they expect these to happen without investment in change?
- **Quality assurance** – Could university performance funding relate to the quality of teaching, or degree of teaching innovation, as well as to research?
- **Strategic plans** – Do the government and institutional aims and objectives that are used to prioritise professional activity specify clear targets and investment in teaching innovation?
- **Curriculum requirements** – Are the digital skills required for graduates, given the changing environment and stakeholder demands, being updated across all degree programmes? Are the 21<sup>st</sup> century skills being embedded across all curriculum areas?
- **Students' needs and skills** – Are institutions responding to the diversity of students by using assistive technology for special needs, and online technology for flexible access? Are they using students' considerable digital skills to help them develop the skills of digital learning?
- **Career aims and opportunities** – Are the standards expected and rewards offered for teaching excellence dependent on effective use of learning technology? Do they reward the personal motivation of the academics who wish to redesign and improve their teaching?

None of the principal drivers of action in HE demand that academics prioritise teaching innovation. There is certainly no consistent driver for innovation in effective blended learning, and no expectation that academic teachers and leaders should keep abreast of new opportunities with each new technological innovation.

Here is a powerful way for the HE Minister to promote change, therefore:

to require each agency responsible for these drivers to report on how it would change its approach to ensure that academics prioritise innovation in blended learning.

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<sup>1</sup> Apart from multiple choice questions forms of assessment, which are widely used.

## Enablers of change

The most relevant enablers identified as being critical for successful innovation are common to all sectors of education, and applicable also to HE. Academic teachers report on the need for all these to be strengthened, as a recent UK survey showed<sup>2</sup>. Again, these questions could be asked at every level and in every sector of education:

- **Leadership support for innovation** – do leaders provide the vision, strategy and resources to give academic teachers the time and encouragement to innovate?
- **Teacher professional development** – is there continuing professional development to update skills and knowledge of learning technology?
- **Communities of practice** – is there support for teachers to exchange teaching ideas and practices, ways of using new technology, and opportunities for peer evaluation and review of innovative practice?
- **Learning technology systems, tools, and services** – is there sustainable provision for open, education-oriented learning technology infrastructure, tools and resources, with good technical support?
- **Evaluation and research evidence** – is there funding for studies to provide evidence, design principles and results to inform practice?
- **Shareable resources** – is there access to open education resources and learning design tools, to reduce the costs of innovation, and to enable teachers to build on each other's work?

The learning technology innovation that has taken place to date in HE has been done by individual academic teachers and leaders, rather than through a coherent national or institutional strategy. These education professionals had the vision, and gave the time to innovate, develop, test and share what they have done. However, the successful innovations remain patchy and localised, not systemic and sustainable.

All these enabling mechanisms remain starved of funding, and with little or no strategic priority for developing and sustaining them. They will continue, and given the absence of any clear drivers for blended learning innovation they will remain its main source in the future, but being so localised, they cannot be a force for system change.

## What would make a difference?

This systemic analysis suggests two systemic actions:

- Update the principal drivers in the education system to harness digital technology and so drive the development of new practices.
- Develop the enablers to make the new practices effective.

The alternative is that the system will continue to rely on piecemeal local innovations in teaching and learning that have no large systemic effect. At

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<sup>2</sup> <https://www.alt.ac.uk/sites/alt.ac.uk/files/public/ALTSurvey%20for%20ETAG%202014.pdf>

institutional level and at national level, education leaders must consider their own responsibility for innovation.

Updating educational drivers and enablers to keep pace with the digital world could be sustainable and progressive over the long term, and would make innovation affordable as a natural part of how institutions operate.

## 4. Teaching and learning

### How will blended learning change learning?

Blended learning does not really change what it takes to learn. Formal education requires students to learn concepts and skills that they will not be able to learn for themselves. There are ways of thinking and practicing that very intelligent people have spent hundreds of years developing, and they are not easily learned. That is the point, and the value of education.

There are several theories of what it takes to learn, including instructivism, constructivism, guided discovery learning, problem-based learning, collaborative learning, and others. In combination the types of learning activity they emphasise can be synthesised as learning through (Laurillard, 2012):

**Acquisition:** reading, watching, listening

**Inquiry:** using resources to develop an evidence-based output

**Discussion:** debating, questioning, answering, negotiating ideas

**Practice:** acting, in the light of feedback, to achieve a goal or output

**Collaboration:** working with others to achieve a joint output

**Production:** making something for others to evaluate against agreed criteria

Both conventional and digital technologies enhance and support all these types of teaching and learning, while formative and summative assessment require some form of production from the student or group.

Blended learning combines conventional and digital methods to achieve an “optimal exploitation of ICT and internet” integrated with the conventional technologies of physical material, and co-presence in space and time.

The value of blending the two is that digital methods offer much greater personalization, flexibility, inclusiveness and efficiency than conventional methods can, but they have to be used appropriately, for example:

**Personalisation:** A digital environment can use individual performance to adapt the level of content, or difficulty of activity to the individual’s needs, though at present this is remarkably rare in educational software. It can also adapt to individual preferences, but the value of education is to *extend* rather than satisfy an individual’s preferences, so the personalisation of the commercial world is inappropriate for education. Adapting to learning needs has far more educational value.

**Flexibility:** Online provision allows access to study at any time from any place, but scheduled deadlines are also important to avoid student procrastination. Flexibility in the curriculum is easier to provide online because students can co-produce the knowledge by interpreting theory in terms of their own localised case studies, not just those provided by the academics.

**Inclusivity:** Assistive technologies, such as those for learning disabilities, emotional problems, physical disabilities, and language needs, open up access to education to even more people. We must be aware of, and ameliorate, the *digital divide*, but equally must recognise the *digital bridge* that extends opportunities to millions of students who would otherwise have no access at all.

**Efficiency:** Technology reduces the cost of delivery and communication if it works with large numbers to achieve economies of scale. It reduces the cost to the student of attending campus-based courses, depending on their access to technology. Recording and analysing student data increases a teacher's ability to monitor and respond to students' needs. Teachers can collaborate and build on each other's designs and resources to reduce their own development time.

If we made full use of these properties of digital methods, blended learning would enable more learners to achieve a higher level of attainment than is possible with conventional methods. All education sectors can point to local successes, but if blended learning is to realise its full potential to improve learning, we need much more leadership, planning and investment than we have seen so far – in any country.

### Blended learning and the teacher

Teachers who move to online teaching will be aware of a significant increase in their workload, if they are setting out to make optimal use of the technology. It involves several new kinds of teaching activity:

- Planning for how students will learn in the mix of the physical, digital and social learning spaces designed for them
- Curating and adapting existing digital content resources for learning through acquisition (reading, listening, watching)
- Selecting the online tools and resources for all types of active learning (inquiry, discussion, practice, collaboration, production)
- Designing and developing the independent learning activities for all these types of learning
- Developing the personalised and adaptive teaching that improves on conventional methods
- Scheduling for flexibility in blended learning options
- Managing the tutor role in online discussion groups
- Using technology to improve the efficiency of qualitative feedback
- Designing the means to guide and nurture large cohorts of students

- Designing, monitoring, interpreting and using the new and more sophisticated learning analytics, which can give the teacher a clearer representation of where the teaching needs to improve.

These are the high-level complex skills that make teaching a form of ‘design science’. They are not well researched or understood because the teaching community is still discovering how to do them. There are several resource repositories but very few tools to support teaching design, and teachers in all sectors are given no time to develop these skills. A professional design scientist – one who builds on the work of others, designs, tests, redesigns, and shares the results – helps to build the practical knowledge of their field (Laurillard, 2012). As a professional community teachers could be building our practical knowledge of how to optimise teaching with technology.

However, building the knowledge of how to optimise teaching with technology takes time, and this time will not be given from research time. We therefore need a redistribution of how academics spend their teaching time, to allow for this new requirement. We must make time for the development of professional teaching knowledge.

For the teaching community to become proficient in the effective use of learning technology we need to rethink what it means to be a professional teacher. Some are full-time teachers, some spend only a fraction of their time teaching, but everyone who teaches will need to agree on a shift to greater professional responsibility for evidence-based and collaborative innovation in the use of digital technologies. What might that mean in terms of workload distribution?

A better understanding of how teachers might spend their time to best effect would lead to a rebalancing of proportions of time spent, such as the example in Table 1.

*Table 1: A potential shift in the distribution of teaching activities*

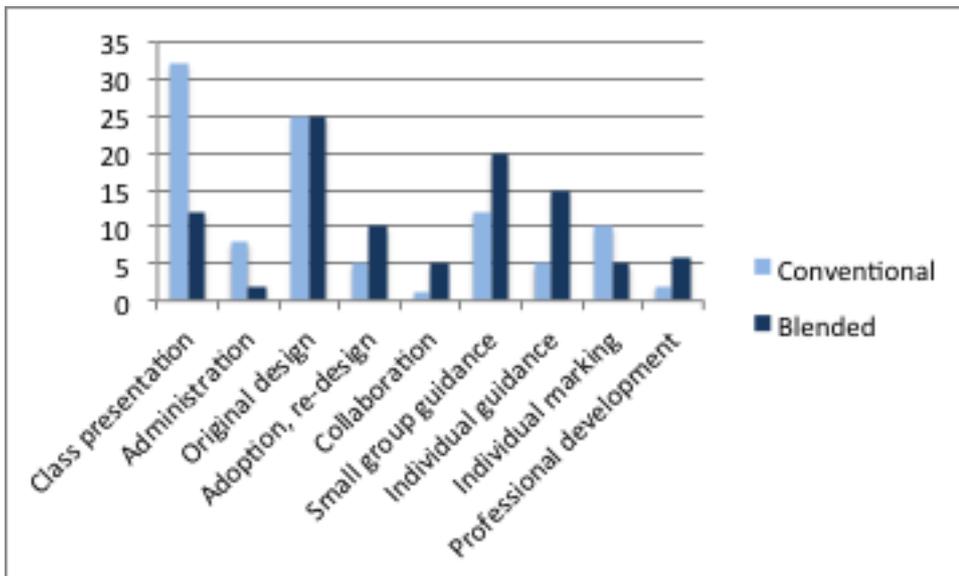
<b>Reducing</b>	<b>Increasing</b>
Original design and preparation of all learning activities and resources	Collaboration on evidence-based development Specialist original innovative design Generalist re-design of activities and resources
Presentation	Tutor-based individual guidance Tutor-based group guidance
Summative assessment	Peer-based formative assessment Automated formative assessment
Administration	Professional development Teaching evaluation with learning analytics

If we assume that the total amount of time spent on teaching remains the same (a significant assumption, that could be challenged), then we could explore

different ways of distributing the total teaching time for the conventional and blended models.

In Figure 2 the horizontal axis represents the range of teaching activities that could be done by any teacher, and the vertical axis is the percentage of time spent on each. The blended learning data represents a possible redistribution of the conventional teaching time, according to the following principles for optimising the use of technology:

- Preparation as original design is in the academic’s specialist area and explores innovative use of technology, rather than covering all their teaching.
- Most preparation involves more adoption, re-use, re-design and collaboration, using materials developed by peers, and accessed from online repositories, design tools, and teaching communities.
- More professional development allows teachers to update on learning technologies and the use of learning analytics, and to share findings and new knowledge.
- There is less time spent on class presentation, as this will shift to more online presentations, and inquiry activities.
- There is less time spent on summative marking and more time spent on formative guidance.
- There is less administration because this is done more efficiently through the better deployment of IT systems.



*Figure 2: A possible redistribution of teacher time to provide more for innovation in learning technology and student support*

Less time for marking presupposes that we achieve better methods of automating summative assessment. More time on individual guidance could be supplemented further for students if they had the benefits of computer-based formative assessment and peer assessment (see next section).

Reducing administration is probably the greatest challenge here, because it has increased so much in recent years as the proportion of administrators in

universities has risen and generates far more administrative work for academics to do. Universities invest in IT systems with the promise to reduce administrative costs, but this typically shifts a great deal of the work to academics. There is no reason why the move to blended learning should reduce this. Instead, we should phrase it as a strategic management goal: for university leaders to achieve a substantial shift in academic teaching time from administration to the core activities involved in teaching itself.

This redistribution also proposes that the academic does their original teaching design in their specialist area, taking the time needed to produce a high quality and durable technology-based learning resource that is very well designed and tested, and can be adopted and reused by others. The time for 'original design' could be similar, but more focused than in conventional mode.

The rest of their teaching will shift to more adaptation of others' resources. It should become easier for academics to adopt and re-design existing resources, such as open education resources (OERs), using online design tools and environments, and design templates. It is important for academic teachers that they should be able to adapt whatever resources they adopt.

The patterns of distribution may be different for each department. Certainly, within the average distribution for a department there will be different patterns of teaching time distribution across its staff.

This approach would make use of the enablers of *using shareable resources*, *joining communities of practice*, and *doing professional development* (see Figure 1). It would also allow more *evaluation and research* data to be collected and shared. But it does not address the driver of *career opportunity*. Teachers also need recognition and reward for their evidence-based innovative and effective learning designs, honed through evaluation until they are good enough to be adopted by others. They also need to be incentivised to adopt the innovations of others. Recruitment, selection, appraisal, quality assurance and promotion practices rarely act as incentives to be an innovative and effective teacher. The culture of the teaching community in all sectors is to care more about students than about management targets, but the latter always win, because they affect careers far more than students do.

One of the student voices in our Symposium on Blended Learning said: "Stop trying to be progressive ... we want you to make us progressive". It is an arresting thought. Should we stop wasting time on trying to turn the promise of technology into a reality? Should we return to books and dialogues with our students, guiding them to make their own progress? Why did I turn away from lectures all those years ago, and seize on the fledgling digital technologies as the promise of progress? Well it was because it was so clearly such a waste of time for those students, 70-100 of them at a time, from many different countries and qualification systems, each struggling with a different perspective on my single description of a mathematical concept. How could such a system possibly enable me to help them think for themselves? After discovering the utter pointlessness of the mass lecture, for maths at least, I tried many other ways of teaching them, not always successfully, but at least some worked surprisingly well. This is what

teachers do. Teaching really is a design-test-redesign process, and we should encourage that, and then the sharing of those small local discoveries. Digital technologies are just a wonderful addition to the possibilities that one might try.

No, we cannot stop trying to be progressive. If every student is to achieve their learning potential, then we must keep pushing the digital technologies to make teaching more personalised, flexible, inclusive and efficient. But certainly, our students should be able to see the results by now.

Teachers would benefit from membership of a collaborative professional community that develops and builds the evidence-based understanding of teaching with digital technologies. As researchers we have this. As teachers it does not exist, so we do not progress our knowledge and understanding of teaching.

### **Assessment, exams, and evaluation**

It would be of great benefit to both students and teachers if technology could increase the amount and value of formative assessment. Students need it and want it, but for teachers it is time-consuming and laborious, especially as double marking is important for quality and reliability.

Digital technologies contribute to all three challenges of assessment, exams, and evaluation, in ways that could result in some radical changes for universities:

For formative assessment (giving feedback to help the student improve their work), they offer automated feedback and grading, and support peer assessment and grading.

For summative assessment (giving a grade of the quality of the work, sometimes with feedback), they support peer grading and computer grading.

For course evaluation they offer learning analytics, which track student performance in a way that provides feedback to the teacher on the quality of their teaching and course design.

### **Automated feedback and grading**

Digital technologies have led to widespread use of programs that do automatic marking of quizzes of different types, especially multiple-choice questions (MCQs). They are used for both formative and summative assessment. These techniques greatly reduce the variable (per student) costs of marking. However, automated marking necessarily neglects the concepts and skills that are hard to measure this way.

Computer-based assessment has far more potential value than we have explored so far. For subjects where MCQs are appropriate their value could easily be improved by suppressing the possible answers to the question until the student has submitted their own answer, i.e. 'concealed' MCQs, or CMCQs (Laurillard, 2002). When the options are revealed the student has at least done their own thinking, and can improve on their answer. And the software has collected the range of possible student answers, which can be analysed to create algorithms for potentially recognising student answers.

For subjects that concern human and physical systems that can be modelled by a teaching program, the student can be invited to manipulate the parameters to achieve a specific output – requiring a deep understanding of the relationships and behaviour of the system, but one that can be directly assessed by the model itself. The value of such systems is that they are ideal learning environments as well. Automated testing of the operation of computer models is reliable enough to use for summative assessment, where it is a viable solution.

Experiments with automated essay marking have shown that a comparative linguistic analysis of the student essay and selected readings can direct the student to issues they have not covered, or inaccuracies in their wording. This can be of real value as formative feedback on a draft essay, although not yet viable for summative assessment.

Investing in research and development of automated summative assessment methods is now essential.

### *Peer assessment and grading*

MOOCs have led to an increase in work on peer assessment, due to the assessment workload created by large cohorts, and the dissatisfaction with automated assessment. Students are given a rubric to guide the production of their own assignment, as in conventional assessment, but here they use the same rubric to evaluate their peers' assignments to give them a grade and feedback. There are several ways of attempting to quality assure this process:

- Students go through a training phase of grading assignments until their grades match those given by the tutor.

- Academics carry out spot-checking of peer grading.

- Several students grade each assignment.

- Grading by comparative ranking of several assignments.

There is considerable pedagogic value in peer assessment because students learn a lot about their own work by assessing others'. So we can make the valid argument that it has high value. It is harder to convince them that it is fair. Certainly peers cannot offer the same quality of feedback as a tutor. A recent evaluation report for a MOOC showed that 'Doing a peer review' received 85% approval, whereas 'Receiving a peer review' received only 78% approval – still high enough to be of some value, although this was on a CPD course, where peers could be trusted to have some knowledge (Laurillard, 2014b).

The technology can support the process of peer assessment by ensuring that every assignment submitted is graded by N students, where 'N' is defined by the teacher. The system can also support the process of training a student to grade in the same way as a teacher. However, relying on good quality peer grading would not be acceptable for high stakes summative assessment.

### *Learning analytics*

The amount and quality of data available to teachers and students using blended learning could greatly enhance course evaluation.

Students using digital systems, tools and resources leave traces of their actions - learning analytics data - that can be tracked and represented to teachers as information about student performance. Interpreting this information is not straightforward, but it does offer the potential for a much better understanding of the relation between what teachers provide and what students do. The number of posts to discussion forums can identify which topic holds the greatest interest for students, but to find out why takes further research. Scores on tests can identify which topics are the most problematic for students; finding out what teaching works better takes further research. Evaluation data from students' perceptions are therefore also essential for helping teachers improve the course. Then the new performance data may be important for identifying that improvements have been successful. In this way, the digital systems now in use for teaching and learning have the potential to bring much more rigorous evaluation methods to teaching and learning.

Students can also derive great value from learning analytics, because the comparison between their own behaviour and that of their peers can tell them, for example, that: the social networking within their group is not as well connected as other groups; their current scores are not on a trajectory that typically ends in a distinction; their current engagement in discussion forums does not match the engagement of a good student, etc. Institutions that use learning management systems to track all student performance data can help students understand and work towards behaviour that is more likely to help them succeed.

When a student challenges their summative assessment score, the tracking data from their performance during the course can help to demonstrate why they achieved a low score.

These are the tools a professional teacher should have at their fingertips, along with the training and support to use them effectively.

## **5. The external role of the Institution**

The senior leadership of an institution has the responsibility to create the conditions for it to be the kind of learning organisation that continually adapts to its changing environment to serve its stakeholders. Stakeholders external to the institution include schools, citizens, employers and government.

This section looks at how blended learning models could change the way HE works with schools, and in providing new forms of lifelong learning, professional development, and free public education 'pro bono', with alumni, and on the global stage. These are activities that universities currently engage in, but if the scale increases due to online access then we have to consider affordability and the degree to which the costing models of education change as we move to blended learning. And what does that mean for how institutions work with each other – do they compete or collaborate?

## Interaction with schools

As we talked to universities in Flanders one repeated current issue was the transition from school to university. Students arrive unprepared for the level of work and the rigours of independent study. There is high bandwidth connectivity between schools and universities now, and the imagination of the teachers and students can be used to build the bridges that will improve student readiness.

One example is to redesign subsets of online courses and resources as ‘taster’ courses for school students, in any subject area, and especially those who are not taught at school. Universities will use these techniques to showcase their top lecturers and specialist courses, but could also cooperate to enhance applicants’ capacity for high-level independent learning, which all universities need.

Other ideas involve school learners in the work of university students, e.g. as recipients of student project presentations to test their communication skills, or as assistants in collecting data for science projects.

Teacher professional development is devolving much more responsibility to schools, so the ideas and information can go both ways. One example of the co-production of knowledge in an online course is where academics supply the formal knowledge and trainee teachers supply the evidence and reality of the application of theory in practice. The same idea could be used with the many university students who could contribute their experience to the wider understanding of taking theory into practice.

## Open and Distance Learning and Lifelong Learning

The new production of knowledge, foreseen by Michael Gibbons and colleagues in the 90s, recognises both the formal, codified knowledge of the traditional disciplines, and the informal, implicit knowledge created by communities of practice (Gibbons et al., 1994). Our online courses can now bridge the two. They provide access to the formal knowledge, but can also develop those communities of practice, where mature students, teachers, and working professionals share their experience of theory in practice, of taking the formal into the workplace and testing it there. Teaching in this context is nothing like the traditional idea of transmission or delivery, but is a theory-informed dialogue about practice that in turn co-produces a collective understanding. With open access to such courses, why should undergraduates not be engaged in those same communities?

Graduates and academics alike are aware of the rapid developments in the production of knowledge, fostered by the immediacy and universality of online communications. Lifelong learning is now essential for every employee and citizen, if they are to maintain their capacity to contribute. Open online courses will therefore increase in importance and value to every individual. Universities should be planning to respond to this increasing demand, whether it is their main focus, as for the open universities, or is a by-product of their campus-based undergraduate and post-graduate courses.

Universities could be creating more opportunities for lifelong learning with other institutions to foster innovation circles, entrepreneur start-up networks, and workplace learning opportunities for students and graduates.

A university's own alumni will be an obvious community who would benefit from access to updating courses for their professional development. In addition, they could be collaborators. There would be great mutual value in linking alumni to the current students in their field, as a source of workplace learning and ideas for projects. Open online courses would broaden into open online communities of mutual learning and development. The alumni network, as co-producer of knowledge and skills, would be a real and practical force for progress.

We could imagine different sections of a university engaging in, on the one hand, the production of broad knowledge and understanding through interaction between large groups of teachers, learners and professionals, and on the other hand, engaging some of those groups in specialized scientific research, concentrating on very narrow areas. Both belong to the essential tasks of the university.

### **MOOCs and socio economic education models**

MOOCs have done the great service to blended learning of raising the profile of online learning, and what it can do for the quality, scale, and reach of higher education. The idea has also generated some exaggerated claims and unfortunate myths about the nature of education and online learning, for example:

- 'Content is free' – It is not; it always costs time, and education is not merely delivery of content; the content of courses must be carefully curated and the activities relating to it carefully orchestrated by the teacher.
- 'Students can support each other' – They can, but a course format that copes with large numbers by relying entirely on peer support and assessment is not an undergraduate education; education is not a mass customer industry, it is a personal client industry.

The claim that MOOCs provide a new socio-economic model for education ignores their reliance on delivering knowledge by video, quizzes, and forum chats, which is not sufficient support for undergraduate learners. They have developed no cheaper way of managing the labour intensive costs of a university's summative assessment, so they cannot yet accredit at HE level. They are estimated to cost around \$50,000 for a 6-week course (although the range is very wide), but even with tens of thousands of registrations the current income per student is far too low (at around \$50), given the take-up (~1% of registrants pay for the certificate), to ever meet that cost. Universities clutch at the straws of 'reputation', 'marketing', and 'it's really for the benefit of innovation for our undergraduates', as if this had not been possible before.

The marketing value is difficult to estimate because universities often do not know the profit margin for their individual courses. A \$50,000 'marketing campaign' is very high cost. If this brought as many as 25 students to the related fee-paying course, and such cases are rare, the course would have to be making a

profit of \$2,000 per student for the campaign to break even. If it were, it would not need a marketing campaign.

Nonetheless, the high numbers of students taking MOOCs attract the attention of senior teams, and suddenly it becomes possible to commit major investment for innovative online courses, even with no clear expectation of financial return. By these essentially irrational means, we are at last seeing innovation in learning technology that could eventually benefit the fee-paying undergraduates. First we have to learn from this experience, because the current delivery model of MOOCs is inadequate for undergraduate education, unless it used as just a component of a normal course.

The typical MOOC pedagogy matches very well what is typical for professional development courses, however. Professionals need to know the latest information, ideas and thinking, they derive great value from talking to each other, exchanging experiences and ideas, and they do not require anything other than a certificate of attendance. The great majority of MOOC participants (85%) are professionals with degrees, not aspiring undergraduates (Grainger, 2013).

The MOOC model therefore provides free education to highly qualified professionals. This is not, in itself, a progressive socio-economic model, and it has not allowed us to learn how to provide even low cost education for undergraduates.

However, if we were to set our sights high, for example: 'to prepare graduates to assume their social responsibilities', 'to widen participation', 'to contribute to society from a unique scientific expertise', 'to promote humanist values'... then it is possible to imagine ways in which MOOCs could use professional development courses to reach into the areas of the world with greatest need of education. Consider the case for teacher professional development (TPD):

- UNESCO estimates that 1.6m new teachers will be needed by 2015 to achieve universal primary education
- One recent TPD MOOC reached 4000 teachers from emerging economies
- Each of them could run a national course, using the MOOC resources, to train 50 students as teachers
- Each of those teachers could use the same resources to support village support groups to train 8 teaching assistants

That multiplies up to training 1.6m teachers. We have the technology. MOOCs have demonstrated that. And with the political will we could achieve that within a year or two.

A viable way forward would be to create a professional development MOOC for academics in all the Flemish universities, which orchestrates and supports their collaboration on developing a school-oriented 'HE preparation' MOOC, to assist in the transition to university study. The MOOC would model the optimal pedagogy so that the academics experience online learning as they participate on the course. The large-scale online courses they then go on to develop for undergraduates, professionals, employers and the wider public, could be incentivised in the same way as research collaboration. Competitive funding

would promote the discovery of the pedagogic innovation and new models that will ultimately create the differentiation factor in comparison with other universities. In this way the universities build their understanding of how to run large-scale online courses for undergraduates, in the same way as we typically build knowledge through research and experimentation.

### How will blended learning change the costing models in education?

MOOCs are about the large scale, and they enable us now to imagine solving the largest problems education has, in an affordable way. Teachers do not typically think through the issues of the costs and benefits of teaching and learning. Conventional teaching works on the very small scale of one teacher to a few 10s of students, whatever the sector. Blended learning demands that we now think on the large scale, and we cannot simply repurpose the financial models of the pre-digital world. This section starts afresh.

The teaching costs of the full range of educational technologies vary greatly, according to the fixed and variable costs of different teaching methods (Laurillard, 2011):

- The *fixed* cost of design and preparation (of materials, resources, activities, tools, learning environments) is the same, no matter what the size of the student cohort.
- The *variable* cost of teaching and support (for tutoring, discussing, advising, counselling, guiding, formative feedback, marking) is the same for each student, and will increase with the size of the cohort.

**Reducing the variable costs is our greatest challenge**, because student support has to nurture and guide the capability of the individual according to their needs. The less well prepared they are, the more support they need. Open courses recruit students with greater needs than those that require a certain level of prior attainment.

Courses can be modelled and their viability estimated and compared by varying the cost-related parameters of: learning time, period of study, teaching-related income, teacher time costs, teaching design time, teaching support time given students' readiness, number of students, and students' prior attainment. The learning benefits can be modelled by defining the properties of each of the selected teaching, learning, and assessment activities in terms of the types of learning it supports, and the student group size<sup>3</sup>.

While conventional technologies support several course formats for different types and numbers of students, they are constrained by the limitations of physical resources, scheduled time and location. The greater flexibility of blended learning supports a much greater variety of course formats for different types of students, and larger numbers of students, at different levels of cost and benefit.

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<sup>3</sup> The Course Resource Appraisal Model is open access and free to download at <http://web.lkldev.ioe.ac.uk/cram/index.html>

Therefore: blended learning frees up the conventional formats of resource-limited, time-constrained, and place-based education to offer a much wider range of formats, to a wider range of students, at a much larger scale of provision, and with very different cost structures to those of conventional learning. It is essential that universities develop a better understanding of these different cost structures.

It can be difficult to achieve the widely expected efficiencies in teacher time if we attempt to maintain a high quality learning experience for students. Modelling the teaching costs and learning benefits of a recent Coursera-based MOOC for teacher professional development showed that with a typically low proportion of students opting to pay the fee, and a low proportion of the fee coming to the institution, it is very difficult to make even a low-cost course, with no tutor assessment, break even (Laurillard, 2014a).

The analysis was carried out for the costs and income over three runs of the course, using the known data for the first run. We concluded that if we could double fee-paying participants on the next two runs, the course could just break even. However, typically, these courses attract far fewer students to later runs.

MOOCs have yet to deal with this conundrum:

To persuade students to pay a fee to offset the costs of production and support it will be essential to offer properly accredited certification.

To be able to do that the course has to meet the normal standards of assessment validity. We cannot yet automate assessment for most types of learning outcome. So these costs remain high.

For MOOCs to be viable in the long term, therefore, we need much more sophisticated design tools for supporting peer collaboration and assessment, automated assessment, and efficient tutor assessment. The teaching community could be engaged in this exploration, but so far have not been given the time, the incentive, or the support to do so.

An essential part of the role of institutions is therefore to take responsibility for understanding the new cost structures, learning benefits, and likely returns involved in developing and running large-scale open, online courses.

### **Inter institutional networking – national and international**

National and international networking by universities has been slow to deliver the benefits of collaboration on the production of high quality teaching resources.

The OER movement has had some success but not the take-up envisaged. International networks such as Universitas 21, eMundus, and OER Universitas have the intention to share course resources, to improve quality and reduce costs.

The MOOC movement has led to these open resources being reused in other universities, which is seen as one of the potential sources of future income for MOOC producers.

However, none of these networks are seen as a strategic priority for the institutional members, all of whom focus more on inter-institutional competition than collaboration. It is too early to be sure that this is likely to change in the near future. The Flemish universities would lose nothing by joining such networks, but they cannot yet be seen as a major force for progress.

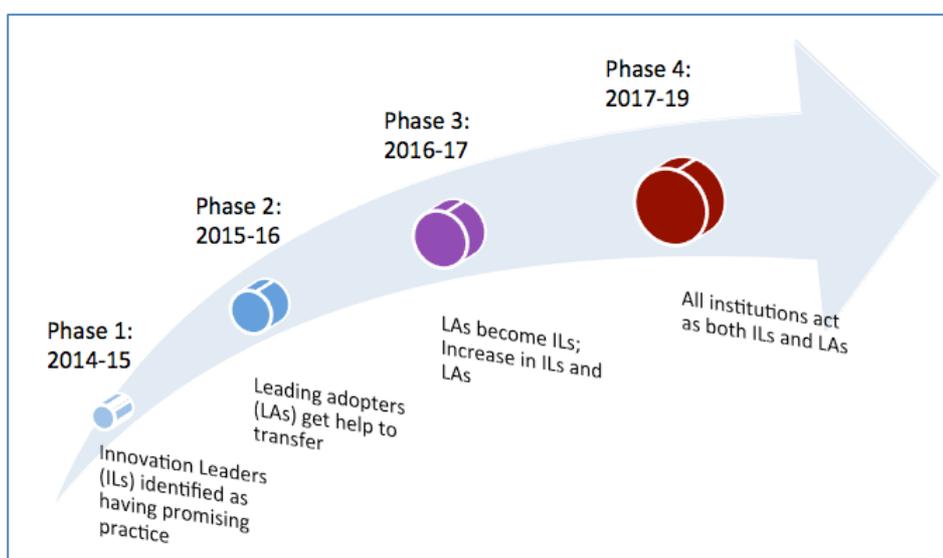
## 6. The role of government and official bodies

Academic institutions are running on ever tighter budgets, so find it hard to invest. This is a situation that is mirrored in many countries, for every level of the education system, from national government, to local, to institution, to department, right down to the individual student - who manages this difficulty by borrowing in order to invest in their future.

This is what our expensive courses demand of our students. It is what every self-respecting organisation does: it invests in its core business. In addition to research, our other core business is teaching. We cannot ignore the imperative to invest in it, especially when learning technologies present such impressive opportunities for improving the way we conduct that business.

So at every level of the education system its leaders must imagine ways to invest that will drive innovation forward in a way that creates sustainable models for conducting education, and achieves all our ambitions for wider participation, higher attainment, collaboration with industry, and pro bono offerings.

Figure 3 imagines a rolling programme of innovation and adoption, at every level of education, building towards a system in which **every institution, and every teacher, is both specialist innovator and generalist adopter**, enabling education to become a learning system that can adapt to what will certainly be an ever-changing environment.



*Figure 3: Timeline and milestones to integrate BL in a sustainable way*

Teachers and institutions need the signal from government and official bodies that it is important and valuable to invest their time and energy in blended

learning innovations. At present the drivers they are responsible for prioritise the conventional, and have not adapted to prioritising the new and the digital. The ideas and innovations will develop bottom-up, but the recognition, incentives and rewards can only be top-down.

### **Potential for development cooperation**

Universities compete in research, where collaboration is incentivised through research funding. They compete for students on the basis of their research, not their teaching. They could be incentivised to collaborate to improve the cost-benefit model for teaching and learning. Organisations like EADTU, EDEN, ICDE, and OER Universitas, for example, are working to promote collaboration, but it will not happen on the large scale without governing bodies promoting it.

The model for teacher professional development MOOCs could be replicated within a university and across universities, to orchestrate and support collaboration on the development of courses. This could be incentivised in the same way as research collaboration, with competitive funding for pedagogic innovation and new models for others to adopt. This is how Phase 1 of the rolling programme in Figure 3 could begin.

## **7. What are the challenges for HE and how could technology help?**

For people to engage in innovation and change they must be able to see the difference it makes to their current practices and concerns. We collected many issues, problems and challenges from our discussions with the universities and the Expert Group, some of which are listed here. For each one there are ways of using digital technologies to contribute to solutions.

Transition to HE is poor for many students

- Extend access to HE online resources and activities to schools; adapt undergraduate online courses as 'taster' courses for school students to choose and prepare for university study; use cross-university collaboration to develop 'HE preparation' courses that will benefit all universities.

Demand for quality HE is not being met on the current model

- Use large-scale orchestrated student collaboration, peer review, and new digital pedagogies that can reduce the per student costs of quality HE.

Employers are dissatisfied with graduate skills

- Use online collaborative projects to enable employers to influence the curriculum, and to enable students to link to the workplace.

Academics are interested in research rather than teaching

- Link teaching to the existing online communities and practices in research to engage students in helping with research as an aspect of their study; reward innovation, exchange, and evidence of effective online teaching in a similar way to rewarding research.

Alumni need flexible continuing professional development

→ Extend access to HE online resources and activities to alumni; create alumni networks to collaborate and co-produce current knowledge and skills.

Whatever the strategic priorities a university leadership team develops, they should always ask ‘how could technology help?’ because it is so ubiquitous, and so versatile in its capabilities, that it can probably always make a significant contribution (Dede, 2013). Every senior team should have at least one member whose role is to advocate and investigate technology-based solutions.

## 8. Thinking it through

The KVAB wanted ‘*the development of a systemic vision on the optimal exploitation of ICT and the internet for the new learning of the 21<sup>st</sup> century*’. This paper has attempted to provide a systemic analysis. The systemic vision implicit in that analysis is to aim for

Education to be a learning system that is capable of continual sustainable adaptation to an ever-changing environment.

This must not be another short-term reaction to a possibly disruptive technology. It may be that MOOCs survive, or disappear, or spawn many varieties. They will do something interesting, but whatever it is, there will continue to be new online technologies and digital tools capable of improving teaching, learning and assessment. For 20 years we have had these technologies and they kept improving, but we did not adapt in any significant way. Universities must now move to a new way of operating that allows us to keep renewing the way we use technology, just as books and writing allowed us to move on from oral methods of teaching.

What to do? Governments want more students achieving higher levels of attainment, at a lower unit cost (Henderikx, 2014). Technology promises that kind of efficiency upgrade for most industries, but frequently fails to deliver. Certainly, over the decades of technology innovation it has proved to be remarkably difficult to detect resultant increases in productivity, at least in the service sectors (Gordon, 2000).

Education is a different kind of industry, not a manufacturing industry that merely delivers content, not a service industry that puts its profit margins first, but a personal client-oriented industry that is centred on developing individuals to their highest capabilities. And it cannot be turned around by academics doing radical innovative design alongside the day job.

We have to imagine the education ‘industry’ as it needs to be – the vision of an adaptive learning system, for example – and then think through what it takes to get to that. In the KVAB’s Ethical Forum meeting they asked the Thinkers in Residence to address the question “Will university professors and universities become completely redundant in the near future as they can be replaced by Personal Computers and MOOCs?” My answer was “No, but the future of universities depends on our response to the challenges of digital technologies.

The academy's response to blended learning will not be moral panic but *moral responsibility*". The teaching role of professors and universities is, ethically speaking, as important as our research role, so our teaching must be equally as innovative and goal-oriented as our research. We have a moral responsibility to think through what it takes for HE to be an adaptive learning system.

Here are some thoughts, following through from the analysis in this paper:

1. Focus on the education challenges, and then demand the most imaginative solutions from the technology, being aware of what it can do, and dreaming of what it might do.
2. Invite the HE Minister to require each HE agency to update the principal drivers in the education system to harness digital technology and so drive the development of new practices.
3. Create a Flemish university network to develop the enablers of leadership, TPD, communities of practice, technology-based tools, research evidence and shareable resources that will make the new practices effective.
4. Use academics' membership of a collaborative professional community to build the evidence-based understanding of teaching with digital technologies.
5. Use funding and quality drivers to require each level in the education system to invest in continual teaching and learning innovation, against expectations of returns
6. Invite every level of education to articulate how and why it uses technologies, as part of its accreditation and quality assurance, in terms of improvements in personalisation, flexibility, inclusion, and efficiency.
7. Create a time-dependent nationally accredited professional certification of teaching at all levels, in line with other high-skill client-service professions.
8. Create competitive R&D funding for blended learning innovation, part sponsored by the IT industry.
9. Create a professional development MOOC for academics in all the Flemish universities to develop a school-oriented 'HE preparation' MOOC, to assist in the transition to university study.
10. Use competitive funding for MOOCs to promote the discovery of the pedagogic innovation and new models that will ultimately create the differentiation factor in comparison with other universities.
11. Set up a national exercise to improve the understanding of the costs and benefits of conventional and digital teaching and learning methods and accreditation, Inviting institutions to present new financial models for teaching and learning.
12. Bring students and their representatives into the policy debates on the future of education, because it is their future.

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