

RETHINKING LEARNING & TEACHING IN THE DIGITAL AGE

TEN KEY DEVELOPMENTS CHANGING THE DYNAMICS OF UNIVERSITIES AND COLLEGES

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In documenting the key developments, we are not suggesting these are the only developments occurring or the order in which these are presented represents any kind of ranking or prioritization or each one applies in all contexts. Rather, these are developments which we see as having the potential to impact the strategic plans and actions of colleges and universities around the world in different ways.

Here are the ten key developments:

1. Student Expectations and Requirements are Changing.
2. Flexibility is Shaping New Ways of Delivering Programs and Courses.
3. Competency-based and Outcome-based Learning are Growing Quickly – expanding into fields which long resisted this move, especially for universities (colleges are already engaged in competency-based education (CBE) for a considerable time).
4. Technology is Enabling New Approaches to teaching, learning, assessment and administration.
5. MOOCs are Offering Expanded Routes to the Delivery and Recognition of Learning, including for K-12 and college based students.
6. Assessment for Learning and Assessment of Learning are Changing – using video, simulation, virtual reality, as well as new forms of paper-based assessment.
7. Governments are Rethinking Quality and Accountability.
8. Equity Remains a Challenge, Despite Massification.
9. e-Portfolios Are Emerging as Critical Resources for Students.
10. The Roles of Faculty are Changing.

Let us now look briefly at each in turn.

1. Student Expectations and Requirements are Changing

Demand for higher education from recognized, quality assured institutions continues to grow, but where is this demand coming from and what do students expect to change significantly. In particular:

- More mature students are seeking flexible learning options. This in turn requires programs to provide varied routes to completion, including more prior learning assessment, work-based learning accreditation and short programs, which carry credit. Some 60% of college students are mature students.
- More seniors are seeking opportunities to learn, but not necessarily for credit or credentials.
- More expectations for the use of technology-rich environments for learning, for access to resources, and for communication and collaboration with instructors and other students.
- More local and international students, having started programs

elsewhere, are seeking credential completion, but not willing to start again. This demands effective prior learning assessment and recognition (PLAR) and better methods for the recognition of foreign credentials through national and transnational qualification agreements, as well as partnerships and alliances and joint programs.

- More local and international students are seeking credentials from colleges and universities.
- More students are seeking programs that offer knowledge and applied workplace skills, as well as high-level skills in group work, communication, project leadership, etc.
- More students are seeking shorter programs, which are skill-based and work-ready – the demand for flexible, short, credit carrying courses will grow as will post-degree college programs and college:university partnerships.

2. Flexibility is Shaping New Ways of Delivering Programs and Courses.

The University of Wisconsin offers a competency route to a degree based on competency assessment. Courses are not required, but rubrics for competency are very clear and explicit, making learning focused and direct. The University suggests appropriate learning resources for learners to use to support program completion, in this “flex option” program. Students can use the mentoring and coaching services of the University when they feel the need of assistance, but pay a fee for these services. When ready, the student calls for a mastery assessment. Such a program is similar to [Western Governors University's](#) (WGU) competency-based degrees.

Wisconsin and WGU are not alone in developing these flexible routes to degrees. In the US, Southern New Hampshire University, Capella University, Kaplan University and Walden are all offering this same route to a degree. In his call for free college education in the United States, former President Barack Obama recognized these developments as “game changers” for learning and skills¹.

Colleges are partnering with universities to offer joint programs (joint degrees and joint programs with colleges offering after degree applied training). Colleges are also partnering with private sector organizations, as they have always done, to offer greater recognition for learning undertaken in the workplace.

3. Competency-Based and Outcome-Based Learning Are Growing Quickly.

Many K-12 school systems are moving from a broad knowledge-based curriculum to a skills- and competency-based model for learning.

1. Speech in Buffalo, New York, August 22, 2013

A review of developments in Australia and New Zealand, Asia, Europe and North America suggests outcome-based and competency-based learning are dominant forces in curriculum redesign in many national school systems. This work is leading colleges and universities down the same path – a path, which colleges have taken since they were created.

In part, this is driven by the new emphasis from governments on skills and bridging the gap between what employers are seeking and the skills of graduates of post-secondary education systems. In part, this is linked to globalization and the global war for talent. But critically, it is linked to the reality that universities and colleges need to be seen as critical producers of highly qualified people that can drive socio-economic development and foster innovation.

The move to competency-based learning is also evident amongst professions, which demand graduates of universities to complete competency- and skills-based professional assessments as a prerequisite for entry into a profession. This is the case for nursing and accountancy, to give just two examples.

4. Technology is Enabling New Approaches to Pedagogy.

The technological landscape is in a constant state of evolution; some would say revolution. Handheld devices now surpass desktop computers in terms of ownership and use. Growing access to broadband (still not universal) changed access to knowledge, information, services and support. The emergence of online learning transformed access to learning for a great many students and changed the dynamics of higher education, particularly in the classroom.

The following five developments, driven by technology, are having and continue to have an impact on teaching and learning:

- Artificial intelligence and machine intelligence generates new ways of assessing and supporting students, using adaptive learning systems and automated assessment. Such developments may also lead to a growing use of robotic technologies to support learning and student services.
- Enhanced simulations and games using augmented reality will permit life-like laboratories in science, engineering, music, art and other disciplines, but also make remediation for struggling learners more effective when combined with adaptive learning technologies.
- More visual and aural learning is available. With the growth of voice and gesture recognition and an increase in computing power, learners may make more use of audio, video, graphics, gesture and 3D imaging in their study and in their assignments.
- More personalized and differentiated approaches to teaching and learning use adaptive learning and analytics. As the technology becomes more ubiquitous, then learning can shift from batch-

processing (classes with an instructor) to a more individualized and self-paced experience.

- Far more extensive use of open educational resources by both learners and their instructors, because of ease of access, low cost and quality assurance being attached to such resources.

Student behaviour and the growth of private providers for higher education in some jurisdictions is leading more colleges and universities to adopt these technologies not simply for competitive advantage, but also for better teaching and learning.

5. MOOCs Are Providing Expanded Routes for the Delivery and Recognition of Learning.

More people signed up for massive open online courses (MOOCs) in 2015 than in the previous 3 years combined. In total, some 35 million learners registered for a MOOC, with Coursera securing 7 million new registrations in 2015, and now occupying some 50% of the MOOC market. The Open University affiliated FutureLearn is now the third largest MOOC provider - they secured 275% growth in 2015. Around 1,800 new courses were announced in 2015, bringing the total number of courses announced since the inception of MOOCs to 4,200². Over 500 universities and colleges around the world, not to mention other organizations, now offer MOOCs - they are here to stay.

A new set of credentials to recognize knowledge, competency and skills secured through the completion of MOOCs is developing quickly. Learners have more options and choices about how they demonstrate mastery, including badges, specializations, nanodegrees, XSeries MOOCs and HBXCORE.

We can expect to see more creative, flexible credentials and platforms linking badges, nanodegrees and other forms of recognition of learning through e-portfolios. As competency-based learning expands from schools, colleges and universities to occupational qualifications sponsored by employers, and as more employers demand proof of competencies, these forms of recognition for learning will grow in scope, quality and relevance.

What has not yet happened, but will, is the needed renaissance in assessment (Hill and Barber, 2014)². Rich assessments, based on demonstrating understanding, showing skills in action through simulation or immersive challenges, will be needed to further refine the move towards a more holistic form of skills assessment – assessment which is more authentic, as well as secure.

² Hill, P. and Barber, M. (2014) Preparing for A New Renaissance in Assessment. See <https://research.pearson.com/articles/preparing-for-a-renaissanceinassessment.html>

6. Assessment for Learning and Assessment of Learning Are Changing

Technological developments are enabling a rethinking of how, how often and where students are assessed. There is a distinction drawn between assessment and review intended to facilitate the next stage of a student's learning (assessment for learning) and the summative assessment of a student's knowledge, skill and competencies (assessment of learning).

These developments in particular appear important:

- **More advanced automated assessment** – item generation, assessment design and marking. We already have highly efficient and effective basic test item generation and marking systems for multiple choice and short form essay items, such as those just described. We are getting closer to long form essay marking systems.
- **Providing meaningful tutoring at any time.** Artificial Intelligence (AI) systems can appear very human and very well informed, which is why online AI academic advising systems are seen to be effective. AI tutoring systems are already emerging – mainly in the areas of mathematics, [writing](#) and basic science. The range and quality of these services is quickly expanding, especially since tutoring is a fast growing business.
- **Predicting student behaviour and outcomes.** Can we predict when a student will drop out, fail or find a particular section of a course difficult? Using behavioural analytics, analysis of past student behaviour in an online course and in other courses, systems exist, which can provide predictive analysis and encourage active intervention to prevent dropout, failure and enable a higher level of student success.
- **Adaptive learning systems.** If you login to an Amazon account, its AI engines suggest books or items you may be interested in, based on past patterns of searching and buying. Google adjusts search results by location and past search behaviour. As these systems become more sophisticated, they are being integrated into adaptive learning engines, which change the content of a course based on student behaviour and performance. As the student completes self-assessments, the system changes the next set of materials they see to reinforce areas of strength and significantly enhance activities and resources linked to areas of weakness. More recently, such systems also adapt to the learning styles of the user, based on observed patterns of behaviour.
- **Enabling trial and error / prototype learning.** Trades education involves trying to do something (a weld, a dovetail joint, an electrical installation, plumbing in a bathroom) under supervision and then improving performance the next time the task is completed. Using simulations and immersive environments (virtually reality), students can practice these skills with an AI tutor

who can provide feedback in a neutral environment. Students can repeat these activities at any time and not feel they are taking too much lab or class time or their performance is having an impact on how their real-life tutor views them. Such systems exist in other fields as well, such as counselling, nursing, and environmental sciences, and are being enhanced all of the time.

Several of the developments outlined here provide the focus for a great deal of private capital investment in education and represent a significant focus for the major technology players including Google, Apple, Facebook, Pearson, and McGraw Hill. Some colleges and universities are partnering with these organizations and others are leveraging their own resources to move in these directions. The costs of adoption are coming down and the opportunity to improve student retention, completion and depth of learning outcomes appears real.

7. Governments are Rethinking Quality and Accountability.

A recent publication from CHEA – *CIQG International Quality Principles – Towards a Shared Understanding of Quality*³ – documents developments in our understanding of quality. In particular, important chapters on the shifting understanding of quality by governments and the growing emphasis on the student experience clearly show our notions of quality are changing.

People go to college or university for different reasons. Some want to fast track through and get their credential. Others want to think, engage and learn through discourse, dialogue and challenge. Technology can help with all kinds of aspects of learning, but in the end, the key is relationships:

- Relationship between the student and the knowledge base
- Relationship between the student and her or his faculty member
- Relationships between the student and other students
- Relationship between the student and others in the same area of study beyond the class or institution
- Relationship between the knowledge and skills being developed by the student and the real world uses or applications of that knowledge
- Relationships between the student, the discipline of study and the competencies and knowledge required to be an effective practitioner of that discipline
- Relationship between the students learning and their ability to contribute to their community as a citizen
- Relationship between the faculty member and the knowledge base
- Relationship between the faculty members and her or his peers in that discipline

³ Available at http://www.chea.org/userfiles/CIQG/Principles_Papers_Complete_web.pdf

- Relationship between today's knowledge and the creation of tomorrow's wisdom
- Relationship between the faculty member and those who can support the work of teaching and learning for that discipline

A quality assurance system for post-secondary education could focus on documenting and analyzing these relationships and their value as predictors of learning outcomes and student performance. Technology developments would enable this to occur.

8. Equity Remains a Challenge, Despite Massification.

Yet, despite the massification of higher education, equity remains a challenge. MOOCs provide free and ready access to learning but rarely to qualifications and completion rates remain low. Inequality in developed nations, including Canada, is rising and the gap between rich and poor grows. Before exploring the opportunity for higher education to make a difference to inequality, especially in developing nations, it is important to ask a basic question: who succeeds in higher education and what is the relationship between success in higher education and inequality?

A 2015 Pell Institute and the Alliance for Higher Education and Democracy (AHEAD) study of US students makes the issue of access to, and success, in higher education crystal clear. Dependent students from families in the highest income quartile are now eight times more likely than dependent students from families in the lowest income quartile to earn a bachelor's degree by age 24. Since 1970, the share of dependent students from high-income families earning a bachelor's degree has nearly doubled (rising from 40 percent to 77 percent), while the share of dependent students from low-income families earning a bachelor's degree has remained virtually unchanged (moving from just 6 percent to 9 percent)⁴.

Similar findings were reported in other developed nations. Chile dramatically increased its national enrolment in higher education in a very short period of time, but the enrolment rates by income quintiles show concerning gaps, considering only 19.5 percent of college-age Chileans, with the lowest income corresponding to the first quintile, are enrolled in higher education in comparison with 67.5 percent of the ones from the richest quintile. Similar findings were reported for Mexico and France⁵.

In a substantial overview of developments in higher education in the developing world by the International Bank for Reconstruction and

4 Indicators of Higher Education Equity in the United States. Available at http://www.pellinstitute.org/downloads/publications-Indicators_of_Higher_Education_Equity_in_the_US_45_Year_Trend_Report.pdf

5 See Marmolejo, F. (2010) Access, Retention, and Success in Higher Education Around the World. Chronicle of Higher Education, November at <http://chronicle.com/blogs/worldwise/access-retention-and-success-in-higher-education-around-the-world-are-we-widening-or-narrowing-the-gaps/27599>

Development / The World Bank (2000)⁶, the authors note there was such a massive expansion of higher education in developing nations that the system has moved from a system geared to elites to a system focused much more on access for suitably qualified candidates, no matter what their background.

9. e-Portfolios Are Emerging as Critical Resources for Students.

Learner mobility is a major tenet of public policy and is fast emerging as a key issue for the future of higher education. With a growing number of transnational qualification agreements (e.g. The European Qualifications Framework, South African Development Community Qualifications Framework, Transnational Qualifications Framework of the Small States of the Commonwealth, Caribbean Qualifications Framework, Association of South Asian Nations Framework Agreement)⁷, many of which are now reciprocal, learners have greater mobility now than ever before. Further, national and regional systems of credit transfer, work-based learning accreditation and prior learning assessment and recognition (PLAR) are all making the life of registrars more difficult. Securing transcripts, interpreting transcripts, assessing equivalencies, and valuing credit and credentials now comprise a complex task.

The idea of the e-portfolio is not new; the first examples began to emerge in the mid-1990s. What is new is the more extensive use of e-portfolios.

In November 2015, for example, Cal State rolled out a major initiative to make e-portfolios available to more than 3 million students and alumni. Also in the US, 80 of the country's most selective institutions — including the Ivy League schools, Stanford, University of Chicago, Amherst, Swarthmore and Williams —are implementing a plan to offer free e-portfolios to high school students so they can begin tracking their skills, achievements and work and engage in reflective learning in their college or university education. Stella and Charles Guttman Community College, formerly the New Community College, is the first community college to open in the City University of New York in over forty years. It is modelled around the idea of building e-portfolios. It is estimated that, worldwide, over 30 million students now maintain e-portfolios.

e-Portfolio accounts are available for individuals anywhere, with providers hosting the functionality and data on their servers. Many e-portfolio providers also offer simple ways of using a smart phone or tablet to capture evidence and to upload the evidence. Being able to collect and reflect on their own work, whether in class assignments, community-based projects, or individual initiatives, allows

6 International Bank for Reconstruction and Development / The World Bank (2000) Higher Education in Developing Countries – Peril and Promise. Washington, DC: World Bank. Available at <http://documents.worldbank.org/curated/en/345111467989458740/pdf/multi-page.pdf>

7 For a review and analysis, see [http://www.etf.europa.eu/webatt.nsf/0/720E67F5F1CC3E1D-C125791A0038E688/\\$file/Transnational%20Qualifications%20frameworks.pdf](http://www.etf.europa.eu/webatt.nsf/0/720E67F5F1CC3E1D-C125791A0038E688/$file/Transnational%20Qualifications%20frameworks.pdf)

students to see changes over time, in itself an important learning experience. It also enables them to express and articulate their own learning successes.

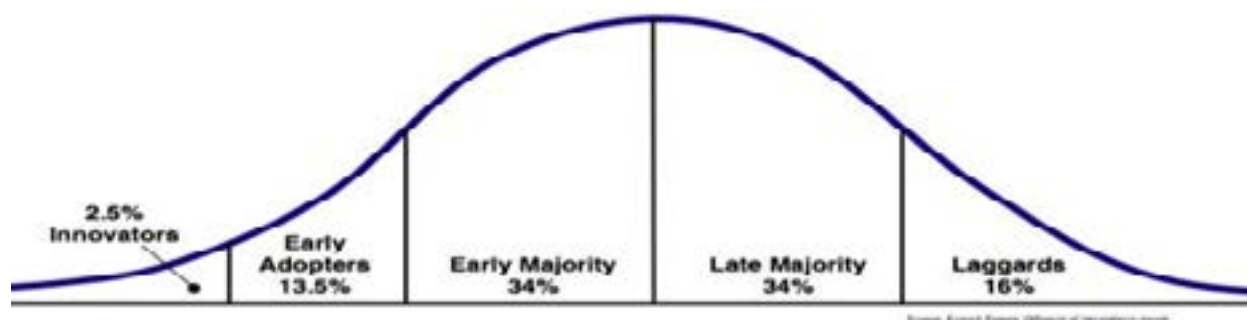
Employers can look beyond the certificate, diploma or degree to spot patterns across student work, assess its relevance to workplace demands and use predictive algorithms to parse competencies and match candidates to job descriptions. Data from e-portfolios also allows employers to identify future talent, develop a candidate pipeline and begin meaningful engagement through internships to evaluate student work firsthand.

We are starting to see e-portfolio and MOOC integration in some of the more recent MOOC offerings⁸ (there is even a MOOC on how to develop and use e-portfolios⁹). Learners themselves are making this happen, using simple and effective low-cost tools¹⁰, something institutional leaders need to notice.

10. The Roles of Faculty and Instructors Are Changing

When we put these developments together, the nature of the offer colleges and universities make to their students and the value proposition they make to governments are slowly changing. This inevitably involves changes to the roles of faculty and instructors.

But the Rogers adoption curve is still in play. Shown below, this curve is used to explore the speed at which technologically- driven change is adopted by members of an organization. Rates of adoption vary, but in North America the evidence suggests¹¹ there is still a long way to go to persuade faculty and instructors that blended, online and flexible approaches to learning represent quality, meaningful and valuable approaches for learners in their subject.



Given all of the developments we have outlined – and there are many more – what is it that faculty and instructors now need to do?

8 Bonk, C.J. et al (2015) *MOOCs and Open Education Around the World*. London: Routledge/Taylor & Francis.

9 See <https://www.openeducationeuropa.eu/en/news/europortfolio-and-uoc-announce-launch-eportfolio-self-development-study-mooc-emma-platform>

10 A catalogue of these tools is available at <http://epac.pbworks.com/w/page/12559686/Evolving%20List%20of%20ePortfolio-related%20Tools>

11 See <http://www.thechangingfaculty.org/>

The knowledge, skills, understanding and social networks, which faculty and instructors have, can be more fully leveraged in the interest of learners and learning. This work includes, but is not limited to:

- In partnership with employers and other faculty members and instructors, determine what the needed knowledge, skills and competencies are for a particular set of learning outcomes.
- Design and develop a range of rigorous, multifaceted assessments for the knowledge, skills and competencies, making best use of all available technologies for assessment.
- Design, in partnership with other faculty members, instructional designers and librarians, the learning pathway and resource recommendations for learners making best use of open educational resources, third party multimedia and more traditional resources, and community resources.
- Create, either on their own or with others, new open educational resources, which fill gaps they observed in the available resource base.
- Design, in partnership with instructional designers and others, alternative routes for learners who are most able and those who are least able, given the learning outcomes and competencies they are expected to master.
- Be available to mentor, coach and guide learners on an as-needed basis, following the college or universities design for this support.
- Participate in professional development activities aimed at improving assessment, outcome-based learning, the development of OER material and learning pathways.
- Use social networks to connect to others engaged in teaching, research and development in their field and find new ways of connecting their learners to these networks.
- Translate research findings in their disciplines into action and development, including research on the effectiveness and efficiency of technologies for learning.
- Explore new approaches to quality assurance, which give emphasis to student engagement, learning outcomes and effective supports for varied routes to success for learners.

This work fully leverages both the content and professional instructional expertise of faculty and instructors, but also places them in a different relationship to learners than is currently the case. They are co-creating and navigating a learning journey rather than instructing. All of this work can be aided by technology, especially collaborative technologies.

RETHINK WHAT WE ARE DOING AND HOW WE ARE DOING IT.

This has been a rapid exploration of the future of technology-enabled learning. It provides an opportunity to rethink what we are doing, how we do what needs to be done and who we are able to serve. The future is, as we can see, different and challenging. It is an exciting time.