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Dossier de veille de l'IFÉ

You are reading a literature review compiled by members of Veille & Analyses , a department of the French Institute of Education within the higher education institution ENS Lyon. We analyse research literature and activities throughout scientific and institutional productions in education in order to map out key research trends on current topics and produce states of the art in the educational research field.

DIGITAL TECHNOLOGIES IN HIGHER EDUCATION: CHALLENGES AND OPPORTUNITIES

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Beyond the conflict between technophilia and technophobia, the real impact of technologies on the quality of teaching and learning has attracted increasing interest since the 1980s. The findings of the first meta-analyses conducted by Kulik in the United States showed that there was no evidence that technology improves learner performance. In line with Russell's claim that technology use makes "*no significant difference*" (2001), many criticisms have been leveled (and continue to be leveled) at studies in this area, the assumption being that research has so far failed to provide "hard evidence" of the impact of technologies on learning.

Nearly thirty years after the publication of Kulik's work, there is still no satisfactory answer to this question. Is it simply that we do not know how to assess the "impact" of technology use on learning and teaching? If so, what is the point of reconsidering these questions? One hypothesis would be to suggest that it is because the issue is no longer relevant if posed in such terms. After all, technologies are part of our daily lives and they shape our relationship to the world, whether we are a digital "immigrant" or "native", to use the controversial distinction made by Prensky (2001). Therefore, the issue now is not whether it is relevant to use technologies in a formal education or training setting (and therefore whether we need them or not), but rather to determine the optimal conditions for successful integration. The assumption is that technologies must be integrated and that their integration needs to be based on approaches that go beyond the pioneering practices of a few 'self-convinced' teachers.

Universities are changing, and may even be said to owe their continued survival not to the fact that they have not changed, but to the fact that they have been able to adapt and respond to changing social demands. Higher education institutions have developed strategies to gain more autonomy and to carve out a space for themselves in a globalized world. Digital technologies are increasingly at the heart of these strategies, serving as a lever for university-wide projects rather than representing a mere add-on consigned to IT departments and services (Albero & Charignon, 2008; Caisse des Dépôts et Consignations, 2009).

Teaching is also changing, with more creative and more collaborative practices playing an increasingly important role in education (Ro-

mainville & Rege Colet, 2006). Our understanding of the links between technology and pedagogy is improving, and a consensus on a number of points has emerged from recent studies in the field. For example, we no longer believe that ICTs can be applied *en masse* to all students (i.e. that "one size fits all"), that ICTs are a given for all "digitally native" students, or that the transfer between personal and professional uses and practices occurs naturally. We also no longer believe that flexibility (i.e. the "anywhere, anytime" principle) is invariably beneficial or that, in order to promote their use, technologies simply need to be made available. However, there are still many unanswered questions surrounding the impact of technologies on social life, and very few longitudinal studies have been conducted to assess recent changes in higher education.

To assess the current state of research, we begin by examining the contribution of technology to instructional reform and institutional modernization based on an assessment of public policies implemented over the last ten years, primarily in France. Section two examines recent changes in digital practices among students and teachers and their potential impact on educational expectations, based on research conducted mostly in Europe and North America. Section three examines the benefits of technologies in teaching and learning and the research methodologies used to assess them.

THE PROMISES OF TECHNOLOGY

THE CASE OF FRANCE: EMPHASIS ON INFRASTRUCTURES, EQUIPMENT AND RESOURCES

Public policies and large-scale investments

In France, the earliest efforts to promote the use of digital technologies in higher education were founded on a policy of contract agreements between the state and universities implemented in 1989. In addition to support for intra-university projects, financial support was also provided to inter-university projects, initially as part of the *Plan d'Action Gouvernemental pour la Société de l'Information* (PAGSI) in 1997, and subsequently as part of more specific programs such as *Campus Numériques* (2000, 2001 and 2002), *Environnements Numériques de Travail* (ENT, 2001), *Universités Numériques en R*égion (UNR, 2003), and *Universités Numériques Thématiques* (UNT, 2004).

As well as relatively short-term projects such as *Campus Numériques*, longer-term programs were also initiated, indicating that the French government has been relatively consistent in its position on digital technology issues (ENT program since 2001 and UNT program since 2004). However, the initiatives taken in this area suggest a **tension between support for pedagogical *experiments* and support for pedagogical *resources*.** For example, the aim of the first *Campus Numériques* operation in the early 2000s was to focus on developing comprehensive training systems, while the aim of the UNT program was to focus on digital content production (Petit in Jacquinot & Fichez, 2008).

Alongside the emphasis on content, an infrastructure policy was also developed through the UNR program, aimed, among other things, at generalizing the ENT program. The UNT and UNR programs were accompanied by a policy to provide equipment and resources to students and campuses, implemented through MIPE operations (*Micro-Ordinateur Portable Étudiant* and *Mesures Incitatives pour les Établissements*), in addition to a policy of user support in the form of the *Certificat Informatique et Internet* (C2I) program (Isaac, 2007). However, insofar as the broader aim was to promote the active involvement of universities, some policy decisions may have seemed somewhat misguided. One example was the implementation of the C2I program by the central authorities at a time when universities were in the process of redefining the structure and content of their courses as part of the transition to the LMD system. Another example was the legal framework of the

UNT program, which tended to bypass senior management (i.e. the 'local' decision making authorities) in universities (Thibault, 2012).

Overall, there is a consensus that the measures implemented to promote and improve infrastructures, equipment and resources have been uncoordinated and have not been integrated in a global strategy (Isaac, 2007). Broadly speaking, **there is an assumption that the state has tended to set the ICT question apart rather than seeking to incorporate technologies across the board**, as shown by the fact that ICTs have a dedicated budget (like libraries) and are not included in the overall budget allocated to universities. ICTs remain the responsibility of dedicated experts who, since the introduction of the contract-based agreement system between the state and universities, have supported higher education institutions in implementing their ICT policy, and also involve a dedicated mission in the organization chart of the ministry, the *Mission Numérique pour l'Enseignement Supérieur* (Thibault, 2012).

Since 2008, a *Stratégie Nationale de Recherche et d'Innovation* (SNRI) has been developed and new projects have emerged (*Opération Campus*, *Programme Investissements d'Avenir*) in order to promote excellence in teaching and research in French universities. Although these measures are indicative of an attempt to develop a comprehensive approach, the use of digital technology remains marginal. The *Schéma Stratégique des Systèmes et Technologies de l'Information et de la communication* (S3IT 2013) for higher education was developed to define the various challenges and objectives of digital technology use in higher education, focusing on the development and promotion of ICT use among all users (students, teachers, researchers and administrative staff).

To what extent have the public policies aimed at developing and promoting the concept of "digital university" resulted in a change in teaching practices? Have users seized the opportunities offered by recent projects and proposals?

Superficial instructional changes and enduring innovations

The initial policy decision to focus on promoting and supporting hardware, (free) software and (free) content industries was clearly **to the detriment of a focus on redesigning the provision of training and support**. However, little attempt has been made to assess the translation of these measures into practice. Therefore, it is difficult to assess both their scope and their deficiencies (Thibault, 2012).

Since the Isaac report submitted in late 2007 to the French Ministry of Higher Education and Research, there has been no public report on recent advances and developments in current policy-making, and no summative evidence has been given to assess the penetration and use of ICTs in French higher education, whether at an administrative or pedagogical level. To gain an overall view of the current situation, we need to re-examine the studies conducted as part of the E-pathie program in the first half of the 2000s.

The calls for projects and proposals made during this period were designed to promote a wide range of initiatives, based notably on the *Campus Numériques* programs and, subsequently, the UNT program, although the level of involvement varied considerably from one university to another. The most visible efforts focused on infrastructures, equipment and technical training courses as part of an attempt to promote specific tools. By contrast, the level of investment in staff remained low, despite **the increasing number of ICT services and departments and the recruitment of contractors** (Chirichilli, 2006).

Attempts to reform and modernize higher education teaching have also been superficial and have mainly involved providing and promoting access to online resources. Innovative systems and approaches have tended to focus on modernizing methods of teacher-stu-

dent communication. However, they **have had little impact on lesson content and instructional methods** and have had a limited effect outside the LMD system. Innovations in this area have generally been driven by individuals and small structures, with institutions taking the initiative in only a third of cases (Chirichilli, 2006).

Although the aim of the *Campus Numériques* operation was not simply to reform teaching methods and practices, its impact on organization has been limited. Whatever the chosen strategy, the concept of the 'digital campus' has yet to become a reality at the heart of French higher education. The resources allocated to digital technology in universities have largely failed to promote a dynamic between teachers and between universities, and the *Campus Numériques* operation has often been perceived as undermining the professional and cultural identity of teachers and the autonomy of universities (Miladi, 2010).

Traditional distance education services, brought together as part of the FIED (*Fédération Inter-Universitaire d'Enseignement à Distance*), have also failed to act as a driving force in the deployment of ICTs in education, unlike, for example, the Open University in the United Kingdom. By 2003-2004, member institutions of the federation had invested very little in ICTs, with 85% of lesson resources still only available in paper format and traditional mail remaining the most widely used method of communication (Thibault, 2006).
The current state of affairs is difficult to assess. Interventions in both annual events (*Colloque International de l'Université à l'Ère du Numérique* – CIUEN) and seasonal events (*Universités Vivaldi*) organized by the French Ministry of Higher Education and Research have provided further evidence of the broad trends highlighted in E-pathie research and the Isaac report – i.e. that **digital technology has to become a strategic priority, that there is a lack of coordinating bodies and monitoring tools, and that current initiatives are not sufficiently rooted in local practices**, regardless of their quality.

> The demand for new equipment and software and for maintenance appears to have absorbed most of the allocated budgets, thereby diverting attention away from the lack of investment in staff recruitment and training (Albero, 2011).

Amid some pessimism, many researchers agree that a number of experiments have provided valuable insights into the innovation process, highlighting the importance of external, internal and cultural factors in the obstacles encountered in practice (Albero & Charignon, 2008). We will cite three examples: the RUCA and RANACLÈS networks and the Campus FORSE program.

First, despite their longevity, the projects implemented as part of the RUCA network (*Réseau Universitaire des Centres d'Autoformation*), supported from 1987 by the Ministry of Higher Education and Research and further extended until 2003 as part of the interuniversity PCSM/UEL/C@mpus Sciences program, can be seen as a failed attempt to introduce ICTs at undergraduate level in the hard sciences. ●

Several reasons have been given for this failure, including the increasingly exclusive focus on the production and standardization of resources, with, as a corollary, a low level of collaboration in terms of learning design, a paradoxical environment promoting student autonomy while closely regulating the pedagogical uses of resources, and a tutoring system that has failed to define its role in relation to teaching, itself increasingly challenged by the dynamic of autonomy and empowerment which the system aims to encourage (Jacquinot & Fichez, 2008).

● The task of making scientific resources available is currently the responsibility of the UNT Unisciel (in subjects such as physics, chemistry, mathematics, life sciences, earth sciences and IT).

The training developed by the RANACLES network (*Rassemblement National des Centres de Langues de l'Enseignement Supérieur*) since 1992 (Albero & Poteaux, 2010) and as part of the Campus FORSE program (training and resources in education research) since 2002 (Wallett, 2007) are notable exceptions. However, their continued existence and success remain in doubt. Both of these initiatives may be considered to have been successful, despite the obvious mismatch between the initial objectives and expectations and the actual uses to which they were put, and in spite of the fact that the proposed measures have tended to accentuate rather than attenuate the divide between autonomous and less autonomous students. While the two programs were designed to meet specific needs, both the RANACLES network and the Campus FORSE program face specific cognitive, cultural and institutional difficulties. As such, the potential for reproducibility seems limited. While both represent enduring innovations, their existence as innovations may be compromised by the simple fact that the institutional conditions required for their integration in daily learning have yet to be met. In other words, **while both are now widely accepted as particular forms or methods of training, they have failed to conquer the higher education community** (Develay & Godinet in Wallett, 2007) in discussing the Campus FORSE program. Both measures continue to be associated with niche services in higher education institutions that continue to operate on the basis of traditional teaching and assessment methods, while ignoring the challenges related to lifelong learning.

However, senior managers and teachers in higher education have expressed their needs and expectations, and a consensus has emerged that higher education teaching needs to integrate digital technologies and that provision of support to teachers is vital (Albero & Charignon, 2008; Heutte et al., 2010).

• programs supplemented by web tools and resources (i.e. broad outlines of courses and classes and lesson notes available online, use of emails, links to external online resources).
• web-dependent programs: students are required to use the Internet for the main "active" elements of the program – such as online discussions, assessments, online collaborative projects and assignments – but there is no significant reduction in the amount of time spent in class.
• hybrid programs: students are required to participate in online activities – such as online discussions, assessments, online collaborative projects and assignments – that replace part of the face-to-face component; however, students continue to work on campus.
• exclusively online programs. (CERI, 2005)

BEYOND FRANCE: UNEQUAL PROGRESS, BUT STILL NO REVOLUTION

ICTs as a supplement to face-to-face teaching

In the early 2000s, one assumption was that the rise of ICTs in higher education required the development of distance education provision distinct from the existing provision of face-to-face education, thus providing access to new markets. While various scenarios were envisaged, **the perceived benefits of ICTs in political and economic circles clearly involved an emphasis on distance education**, the assumption being that it would gradually replace face-to-face instruction. The OECD has identified four instructional configurations involving different degrees of independence (CERI, 2005).

Distance education provision has not developed at the same rate in different countries. In some countries (such as Finland and France), significant levels of public funding, combined in some cases with private investments, have often been granted to universities to develop provision. By contrast, in other countries (such as Italy), the decision to allocate public funds to the development of ICTs has often been left to the discretion of universities (Chirichilli, 2006). The countries that have made the most significant advances in the development and implementation of distance education (notably Scandinavian countries, the United Kingdom and Germany) are also those where the diffusion of other uses of the information society has been fastest (Aceto et al., 2006).

There are also significant disparities between universities. For example, one third of the 200 universities involved in the Ramboll Management survey conducted for the European Commission (2004) focused on partnerships, while another third defined themselves as self-sufficient in their integration of ICTs. However, technol-

ogies have not radically changed traditional education. Research suggests that ICTs have had a greater impact on administrative services (admissions, enrolment and registration, invoicing, etc.). Against the grain of political forecasts, **senior managers in universities have often resisted the idea that education might be transformed** or that new modes of access to lesson content might provide access to new markets. Teachers have been even harder to win over. The studies published in the mid 2000s all provide support for this view.

In the early to mid 2000s, **ICTs were seen as an adjuvant or additive and were merely used to support the delivery of lessons or modules**. The aim was to improve the quality of the student experience, but not to challenge or redesign the curriculum or the content of study programs. During the same period, schools were beginning to adopt e-learning platforms, although their use remained limited. The general tendency was to turn away from commercial platforms and to develop adapted tools and/or free software. The need to implement support structures and to recruit technical staff to support university teachers also became more pressing (Ramboll Management, 2004 ; CERI, 2005).

As a result, the introduction of technologies in universities did not result in a significant or unprecedented rise in distance education provision during this period. In France, the proportion of distance students identified by the FIED remained constant between 1987 and 2004 at around 2% of the student population (an extremely low percentage compared to neighboring countries), despite the increased provision of distance courses and classes (Thibault, 2006). More generally, the investments and support provided to promote distance education have essentially been directed toward technical matters, with some exceptions, such as the Finnish Virtual University, which provides both technical and pedagogical support (Chirichilli, 2006).

Do hybrid programs remain a niche market?

To what extent have digital technologies been a catalyst for more profound changes? 2004 was a major turning-point. After an initial period in which the focus was on the needs of administration, universities began to invest more heavily in the development of ICTs after 2004. However, it is important to note that very few studies have examined the penetration and use of technologies in higher education or provided conclusive data for assessing changes in distance education provision. In Europe, the most recent study was conducted in 2008 (European Commission, 2008). An OECD study was also published in French in 2006 (CERI, 2005).

In France, like in other countries, there have been significant advances in the use of ICT in higher education, including initiatives to equip universities, to promote and support the production of digital resources and, to a lesser extent, to train teachers. However, the various measures taken to promote ICT use have not resulted in a radical modernization or upheaval of education and training systems. Opportunities for redesigning programs and lessons have often been ignored, and the full range of temporal and spatial configurations made available by ICTs (i.e. the “anywhere, anytime” principle) has not been sufficiently exploited (European Commission, 2008).

Ultimately, the evidence suggests that **the impact of ICTs at an institutional level remains limited**, at least in French-speaking European countries, as shown by the initial findings of the Hy-Sup project. The development of hybrid configurations has been confined to isolated individual (and occasionally collective) initiatives, but there is still no overall direction at an organizational level. The activities of specific services (such as university pedagogical services in France) continue to remain marginal, limited and remote from the decision making authorities, and have suffered considerably from the lack of a clear and visible institutional policy and from a lack of concerted action at a management level. While various financial and administrative support

According to the ICT Development Index (IDI) developed by the International Telecommunication Union, the most advanced countries are South Korea and Northern European countries. While the level of development increased everywhere between 2002 and 2007, the digital divide remains and the disparities between countries have not improved (2009).

measures have been taken, these have generally been designed to support the conception phase of new systems and approaches, but not to guarantee their long-term use (Deschryver & Charlier, 2012). These assessments require further research since very few studies have provided an overall view of the current situation based on empirical evidence, and even fewer studies have used a longitudinal approach.

Volume 3 of *"Higher Education to 2030"* (CERI-OECD) will be devoted to technologies.

However, some studies have shown that there has been an increase in provision. One example is a recent study conducted by the Canadian Council on Learning (CCL, 2009). However, the data provided by the CCL are incomplete and are largely based on information provided by Athabasca University, the Canadian Virtual University and TELUQ, all three of which are largely or even exclusively devoted to distance education.

Another example is the Sloan Survey in the United States, an exception in the field. The ninth edition of the survey showed that there has been a constant increase in the number of online classes and the number of students enrolled on online courses since 2002. In 2010, 31% of students were enrolled on at least one online class. This increase has gone hand in hand with a greater awareness of the strategic nature of distance education among senior managers in the 2,500 participating institutions. By contrast, teachers' perceptions of the benefits and legitimacy of ICTs have remained largely unchanged, although the proportion of teachers in favor of ICTs varies widely in different institutions. In other words, in cases where distance education provision is well developed, teachers tend to have a more positive view of ICTs (Allen & Seaman, 2011).

At Université Laval, 75 % of courses are based on hybrid instruction. In other words, the conflict between distance education and face-to-face teaching no longer applies. The combination of the two approaches has resulted in new forms of interactivity and is designed to promote the transition from mass education to tailored education (Caisse des Dépôts et Consignations, 2010).

However, the causes of this resistance are not to be sought in the inertia or inability of actors, but lie at the very heart of the university tradition. Unlike other sectors, where the fit between structures, methods and production is greater, **the massification of higher education and the integration of technologies tend to be perceived negatively in the academic sector, the assumption being that they undermine established conceptions of education and its ends**. The established models of thought and practice, rooted in the history, structures and habitus of the university institution, are also considered to be at risk (Albero, 2011).

Many experts, recently solicited by the American think tank Pew Internet, believe that there will be radical changes in higher education in the next eight years, largely because of the economic context. Combined with face-to-face instruction, online teaching is expected to develop at an unprecedented rate, and there is a very real risk that campuses will become deserted (*The Future of Higher Education*, 2012).

Some have argued that the problematic nature of the relationship between pedagogy and technology, which can be seen in the discrepancy between discourse and the reality of practice, may explain why universities have been slow to integrate ICTs, both in France and in other countries (European Commission, 2008).

ICTS AND THE MODERNIZATION OF UNIVERSITIES: THE QUESTION OF LEVERS

However, universities have changed in recent years and are becoming increasingly aware of the unprecedented opportunities offered by digital technologies for redesigning their structure and organization.

Seizing the right opportunities to avoid jumping on the bandwagon

The question of the bandwagon effect arises with the introduction of every new technology in formal education and training settings. It involves a recurring pattern in which equipment is prioritized at the expense of users, thereby tending to "*maintain an equally recurrent alternation of hope and disappointment*" (Albero, 2011): "*A new technical tool emerges in the social landscape; its introduction in education is designed to promote the ability of educational institutions to adapt to new conditions and to modernize their practices; it is also supported in political circles, notably through agreements with industry; a range of pedagogical experiments are conducted by 'innovators' over a number of years, encouraged by incentive measures and public regional, national and/or European funding; studies and surveys are conducted on 'new' practices, funded in part by the same bodies; after an increasingly short lapse of time, another tool invariably emerges that serves to relegate the previous tool before any generalization or cumulative analysis of observed prac-*

tices, and without any evaluation or prospective assessment of the benefits and drawbacks associated with these practices, and, ultimately, without any significant effect on the structures or functioning of the institution." (Albero, 2011).

For example, interactive whiteboards have been largely superseded by digital tablets, while interactive keypads are also becoming increasingly common in lecture theatres. After their success in North America, MOOCs (Massive Open Online Courses) are also beginning to take over e-learning platforms in Europe. There has also been much speculation (both humanist and economic) on OERs (Open Educational Ressources) in international organizations such as UNESCO, the OECD, the ICDE (International Council for Open and Distance Education), the CoL (Commonwealth of Learning) and EFQUEL (European Foundation for Quality in eLearning). ●

While it may seem premature to question the benefits of open education, prestigious educational institutions appear to have been the main precursors in the use of digital technologies in higher education. In recent years, a number of institutions have been investing in digital technology on an unprecedented scale. Examples include MIT in the United States, the Open University in Britain, Aalto University in Finland and the École Polytechnique Fédérale de Lausanne in Switzerland. Recent trends suggest that **the onus tends to be on universities rather than national governments, with the role of governments tending to be limited to providing local support to enable "digital universities" to "invent" themselves**. Various case studies conducted on "exemplary" universities by the IPTS in Europe and the Caisse des Dépôts et Consignations in France have shown that there is no single model but rather local configurations, although a systemic approach to change appears to have been universally adopted (Bocconi et al., 2012; Caisse des Dépôts et Consignations, 2010).

There is also an assumption that it is the sum of configurations chosen by institutions that will determine the extent to which higher education will be influenced by digital technologies. Studies by the OECD (see prospective studies by OECD) suggest that the more liberal the set-up, the lower the tendency to use digital technologies to reap the specific benefits of digital technology use. The most "open" set-up involves an explicit reliance on ICTs, viewed as the cornerstone of change, the aim being to encourage more spontaneous international and inter-university partnerships with a view to harmonizing higher education systems and promoting network-based systems. In this view, courses and pathways are differentiated based on a modular system, and standardized courses and lessons are offered online, especially at undergraduate level. In this view, time is also organized differently, with more seminars and interactive discussions, while students' personal study projects also play a key part.

Toward an integrated approach to ICTs at a 'whole university' level

As part of a forecasting exercise designed to support the work carried out by the OECD, EDUCAUSE recently identified the various short-term technological issues at the heart of the concerns of American higher education institutions. The most significant finding was the emergence of an integrated approach to ICTs involving a radical departure from the traditional organization chart. For example, there is a growing consensus that we need to stop thinking of the needs of governance and research in isolation. There is also evidence to suggest that technologies can help to make education more effective, to transform it altogether or to provide indicators to improve student performance. In this sense, **the integration of ICT in decision circuits concerns the full range of activities of universities**. The point is to consider "internal" needs in relation to "external" configurations, which may involve taking account of individual practices and the mobile devices used by students (based on the "bring your own device" principle) or promoting cloud computing, both key items of the "Top 10" future developments. The top-ranked development is

● On OERs and MOOCs, see L. Endrizzi, "Les promesses de l'open education", *Éduveille*, October 2012.

the importance of relying more heavily on staff skills and developing and implementing new models for the diffusion of practices. The human dimension is thus at the heart of change (Grajek & Pirani, 2012).

The challenges of the integrated approach to ICTs are thus both internal and external, and **the proposals for a new integrated approach need to be based first and foremost on the needs of actors**. The renewed focus on actors is a central feature of recent research conducted in France by the Caisse des Dépôts et Consignations and the CPU. A guide published in 2009 identified the areas that are most likely to benefit from technologies. For example, from a student perspective, evidence suggests that ICTs provide vital support at the beginning of the educational career and may also help students to enter the job market at the end of their studies. Evidence also suggests that ICTs can improve the student experience in terms of knowledge and skill acquisition by promoting individual pathways and mobile work (Caisse des Dépôts et Consignations, 2009).

The multidimensional approach at the service of students was also at the heart of a study by Lefever and Currant (2010) that provided a detailed inventory of the various technology-based systems available to facilitate the transition from secondary to higher education, based on examples drawn mostly from British universities.

In the Unites States, "learning analytics" is currently attracting significant interest as part of this refocus on the human dimension of ICT in education. The idea is to generate real-time data that provide indications of student activities to best predict student performance and to identify the difficulties that students are likely to face. Here, the focus is on the exploratory and predictive power of statistical models as part of an attempt to support managers and teachers in making decisions and, ultimately, to promote equal opportunities and student success. Several chapters of the book entitled *Game Changers: Education and Information Technologies* published by EDUCAUSE are devoted to learning analytics (Oblinger, 2012).

An infography published in July 2012 identified 19 studies (complete or in progress), involving 124 institutions (including 8 PRES and 34 universities) and 2 regional councils.

The conditions for a successful digital strategy

While the experiments cited above (RUCA, RANACLÈS and Campus FORSE) indicate that the ICT culture has yet to conquer French universities, it would appear that the French government has become increasingly committed since 2008 to promoting ICT in higher education, focusing on two complementary objectives that have so far been lacking: **support for an increase in the provision of digital resources and services**, provided by MINES (*Mission Numérique pour l'Enseignement Supérieur*), and **support for digital technology management** in universities, provided by the Caisse des Dépôts et des Consignations in partnership with the Conférence des Présidents d'Université. Both policies are designed to challenge the prevailing techno-centered vision that has dominated educational policy-making over the last decade with a view to using technology to improve the quality of teaching and research (Heutte et al., 2010; Caisse des Dépôts et Consignations, 2009).

As part of its ELAN 2010 action plan, the Caisse des Dépôts et Consignations is committed to developing decision making tools and reference indicators to support universities in defining and implementing their own digital strategies and, more broadly, to support higher education institutions in the process of modernization.

These studies have resulted in a number of publications that provide a useful basis for exploring the conditions for a successful digital strategy. The evidence suggests that a successful strategy requires supporting governance, teaching and research, promoting digital resources and library services, supporting student services aimed at local or international partners, supporting information systems and infrastructures, and promoting the development of intelligent buildings (Caisse des Dépôts et Consignations, 2010).

At a methodological level, there is a consensus that digital strategy needs to be at the heart of a university's vision rather than simply a secondary component or a mere add-on. The assumption is that a digital strategy needs to be supported by senior management and to reflect the broader objectives of the university in terms of research, teaching and professional integration. An effective digital strategy also needs to focus on the needs of users and to provide support in the use of ICTs. It also needs to be coherent, to incorporate pedagogy, information services, administrative services and senior management, and to result in organizational change.

As shown by research conducted by Albero and Charignon on behalf of the Agence de Mutualisation des Universités (2008), any prescriptive framework, however complex, is not a sufficient condition for transforming professional work and work methods. The key condition for ensuring that change is viewed as being institutionally and socially legitimate (and therefore desirable) is to develop converging initiatives based on common objectives (such as student success).

In the emerging dynamics, other transversal actors have recently become more visible. Examples include university libraries, which are increasingly seizing the opportunities for evolving toward (or transforming into) learning centers (Jouguelet, 2009) and instructional design services, which are increasingly coming together to better manage their activities (see, for example the PENSERA network in the Rhône-Alpes region of France). The UNRs are also becoming increasingly committed to promoting convergence at a regional level.

HAVE TECHNOLOGIES CHANGED PRACTICES AND REPRESENTATIONS?

THE IMPACT OF TECHNOLOGIES ON COGNITION, SOCIAL VALUES AND LIFESTYLES

Social values influence how ICTs are used on a daily basis

Although it has developed considerably in recent years, the screen culture has not fundamentally changed the general structure of cultural practices. However, technology use has increasingly significantly across all age groups, whether for communication or leisure purposes (Donnat, 2009). The common assumption that teachers are technologically less competent than their students needs to be challenged. While young people use technologies more intensively, their actual uses of ICT are often rooted in routine practices that leave little room for creativity, and are also often driven by a largely normative goal, since the point is often not to stand out but to become a member of a group and, therefore, to adopt the practices of other group members (Endrizzi, 2012; Pedró, 2012).

Two types of practices are common among young people: friendship-driven practices and interest-oriented practices. While these practices tend to promote the development of social and technical skills conducive to social participation, the level of acculturation varies widely in different social groups (Ito et al., 2009).

Some studies have shown that the increasing use of social media among young girls may increase their sense of isolation, while boys often use online multiplayer games as an opportunity to expand their social network. In other words, **the uses of ICT tend to accentuate inequalities**. **It is not that technologies impact on values and attitudes, but rather that values and attitudes influence how technologies are used** (Endrizzi, 2012; Pedró, 2012).

Insofar as it is based on an unsubtle deterministic approach, research on digital practices from a generational perspective remains controversial. The generational approach is also considered to be ill-adapted, implying as it does that practices are homogeneous. However, nothing could be further from the truth, since discriminating factors include age, sex, the values of peers and parents and the social context. There is also the personal factor, and in particular the perception of technologies, which also involves little subtlety or nuance, with users tending either toward technophilia or technophobia (Endrizzi, 2012; Pedró, 2012).

New opportunities, but relative knowledge

Some studies have highlighted the widening gap between traditional forms of education and current student practices, focusing on the one hand on the uses of social media and plagiarism practices and on the other on criticisms of virtual learning environments, which are often considered to be poorly used or ill-adapted. The question that arises is: to what extent does Web 2.0 discredit or undermine formal education?

According to Ito et al., (2009), digital experiences with new media promote self-learning and remove the traditional boundaries related to status and authority. There is also evidence to suggest that digital technologies promote an autonomous exploratory approach to learning largely unrelated to formal learning methods and settings. However, according to Bouchard (2011), the nature of knowledge has not changed as a result of the advent of social media. What is new is our perception of the many varieties of knowledge that have emerged from the new paradigm. Research suggests that we are currently witnessing **the emergence of a new form of relativism, sustained by the contemporary emphasis on uncertainty and fluidity** and the relative decline of authority. Research suggests that the Internet has a significant influence on sites of knowledge outside educational institutions, but that it also provides access to a new form of expertise (in the form of networks of individuals) and promotes the co-construction of knowledge (Endrizzi, 2008). Social media are an integral part of the advent of a participatory culture in which creation and shared online content are the norm and in which *bricolage* (in Levi-Strauss's sense of the term) is increasingly commonplace (Attwell, 2010).

The rise of digital technologies has widened the range of **learning opportunities**, promoting the development of informal personal strategies, processes and approaches (Ito et al., 2009; Redecker et al., 2010). The control that learners have over what they learn, but also over when, how, at what cost and with whom they learn, fundamentally differentiates formal education from informal learning. But is the notion of learner autonomy and control a reality or a fantasy? Whatever the context or environment, it is important to note that there is no such thing as *complete* learner autonomy. Seizing opportunities for autonomous learning implies both using a wide range of meta-skills and developing them in the course of the learning experience. There is evidence to suggest that individual inequalities often produce a hierarchy of "leaders" and "followers" (Bouchard, 2011).

Yet to what extent does this new relation to knowledge serve to impoverish the learning experience in formal settings? A recent study by CERI provided no definitive answer to this question. Studies in this area have often produced biased results affected by varying degrees of evangelicalism, doom-mongering and skepticism. Their findings remain inconclusive since they fail to demonstrate that the alleged discrepancy between personal practices and formal teaching methods is detrimental to learning. In the absence of evidence, it seems prudent to conclude (for now) that **the level of use of (or reliance on) digital technologies has only a marginal impact on learning experiences in formal education** (Pedró, 2012). However, this does not exclude the possibility of interrogating the accreditation of prior learning and the methods used to assess prior learning and knowledge acquired outside formal education (Bouchard, 2011).

See also issue 62 of *Philosophie Magazine*, entitled "Pourquoi nous n'apprendrons plus comme avant", and issue 467 of *La Recherche*, entitled "Comment Internet modèle notre cerveau" (2012)

No definitive evidence that cognitive processes are changing

Some empirical studies have shown that the affordances of technologies predetermine the development of new learning styles, thus prefiguring their use (Dieterle et al., 2007). These new learning styles are assumed to involve new skills, including the ability to use several media, the ability to research, filter and synthesize information from several sources, and the ability to organize one's personal environment. In this sense, in addition to the various dimensions that traditionally characterize learning styles (related to personality, skills and sensory preferences), the technological dimension itself also needs to be taken into account.

To go beyond pure speculation, we need to delve more deeply into (the increasing number of) studies on the learning process conducted in cognitive neuroscience – and in particular research on the gap between our knowledge of brain structure and our understanding of psychological processes. While it may be tempting to conclude that technologies have an impact on cognitive processes, very few empirical studies have provided support for this view. Studies in this area have also produced conflicting results. In other words, there is no evidence that the cognitive processes of "digital natives" differ from those of previous generations (Ellis & Goodyear, 2010; Pedró, 2012).

Although it is probably too early to draw definitive conclusions, some studies have found evidence of **a decline in verbal intelligence in favor of more "visual/spatial" forms of intelligence**. However, the impact of ICT and digital technologies on reasoning, reading, creativity and metacognition more generally remains unknown and/or poorly documented. The fact that memory tends to be increasingly external to the individual and, therefore, that attention tends more and more to focus on where to find information rather than information itself does not appear to result in a decline in working memory performance. Similarly, there is no definitive answer to the question of knowing whether multitasking helps to learn better or less well compared to more linear and deeper work habits (Ellis & Goodyear, 2010; Pedró, 2012).

The evidence in this area is not conclusive, probably because ICTs are very recent inventions and their effects too complex. Most of the studies conducted in this area have been qualitative, focusing on how technologies promote reasoning (for example) rather than examining the cognitive process itself, or have sought to assess the impact of a specific intervention without considering the impact of everyday uses of technologies (Pedró, 2012).

THE IMPACT ON STUDY PRACTICES AND ACTORS' EXPECTATIONS

Practices and expectations driven by the search for efficiency

Few large-scale studies have been conducted to assess how representations and uses have changed in recent years. However, there are two notable exceptions in the United States, in the form of two longitudinal surveys: the ECAR Study of Undergraduate Students and Information Technology, conducted by EDUCAUSE since 2004, and the MISO Survey (Measuring Information Service Outcomes) begun in 2005. In Quebec, a survey conducted for CREPUQ (*Conférence des Recteurs et des Principaux des Universités du Québec*) in 2011 also provided an insight into student and teacher practices based on their activities (Léger Marketing, 2011a and b). In addition to two British studies (Ipsos MORI, 2007 and 2008), these surveys provide a useful basis for examining students' study practices and expectations.

In the United States, hybrid instruction is becoming increasingly common and the use of e-learning platforms is now considered standard practice. Between 2008 and 2012, the proportion of students who took a class entirely online doubled, increasing from 15% to 31%. 75% of students now feel that digital technologies help them in their studies (Dahlstrom, 2012). Evidence also suggests that an increasing number

of students own a laptop and use it at university. Very few students now use free-access computer rooms in higher education. Like teachers, students also have increasingly high expectations in terms of infrastructures (WiFi access, spam management, etc.), technical and information support services (use of digital work environments), and communication tools (Consiglio et al., 2011).

While most students feel that they are active in their learning and use effective learning strategies, fewer students use lesson content to consolidate and deepen their learning. Study outside class tends to focus on the essentials (revision and exercises). For written work and oral presentations, the evidence suggests that online research has become the dominant practice. Key tools include emails, presentation software and word processing. In class, students are also keen to have access to downloadable support material as a basis for organizing lesson content as and when required (Léger Marketing, 2011b).

Uses of the Internet are essentially focused on reception: conducting research, watching videos or listening to audio files. Uses of the Internet for online productions (forums, blogs, wiki), including minor productions, are very rare. Utilitarian applications, such as bookmark sharing or planning tools, are also rarely used, suggesting a disjuncture between uses in a university context and personal uses, which tend to be largely focused on social networking and multimedia file sharing (Léger Marketing, 2011b).

Research suggests that students are not particularly keen to use social networking sites to communicate with their university, preferring to keep their private relationships separate from more formal communication practices in their academic work. The evidence suggests that students prefer to use emails and the communication tools available on e-learning platforms rather than social networking sites. Nevertheless, students are keen to have access to more information (for example, exam results) and more pedagogical content (programs, lessons) on their mobile devices. More generally, uses and practices are changing. For example, research indicates that in 2011 there was a significant growth in the use of e-portfolios, eBooks and bibliographic management software among a still limited number of students, suggesting that further support may be needed to promote their use among both teachers and students (Dahlstrom, 2012).
Research also suggests that teachers' digital practices are not fundamentally different from students' practices. The main digital tools used by teachers are geared toward communication (email) and writing (presentation software and word processing), in addition to e-learning platforms. While teachers tend to have a better understanding of utilitarian practices, their uses of ICT applications remain limited, since very few teachers use more specialized applications (e.g. sharing bookmarks, logs, simulators and other tools for generating and sharing material and resources) (Léger Marketing, 2011a).

There is also evidence suggesting that students are **increasingly keen to have independent access to resources** to help them in their work and that they are increasingly turning away (whether rightly or wrongly) from more traditional library and research services, where provision is often more established (for example, in the form of access to databases and reference services). In other words, rather than personalized results in response to a specific information search, students are increasingly keen to have access to tools and resources that enable them to be more efficient in their information searches at the time and place of their choice (Consiglio et al., 2011).

Efficiency is also vital for teachers. Teachers increasingly use technologies first and foremost to make documents accessible to students and to limit the need for face-to-face contact (Deschryver & Charlier, 2012). Teachers who use e-learning platforms do so because platforms are easy to use and help to simplify the structure and delivery of lessons and to improve the learning experience (Lebrun, 2011).

This brief overview gives a skewed vision of recent developments in the use of ICTs and digital technologies in higher education. While all students may know how to post a photo on Facebook, their ability to evaluate information found on the Internet and to use e-learning platform tools varies widely. The same applies to teachers (Ellis & Goodyear, 2010).

> Research also indicates that students who have a superficial approach to learning will not develop a deeper perspective simply as a result of using a technological device or as a result of the engaging nature of the activity (Ellis & Goodyear, 2010).

Nevertheless, this overview of recent research highlights broad trends and suggests significant points of convergence between students' and teachers' perceptions in terms of convenience and, above all, efficiency. There is an assumption that digital technologies need to provide solutions that are adapted to the goals and needs of students and teachers (and not only to learning objectives). In short, what matters is the potential of technologies for flexibility and personalization. There is also a consensus that digital technologies must enable students and teachers to increase their efficiency and improve their performance, i.e. to become more efficient based on the same level of investment in the task (Pedró, 2012).

For students, the added value of digital technologies is not innovation...

The use of e-learning platforms does not automatically result in a radical change in study methods or practices, nor does it radically alter student attitudes. Evidence suggests that students are generally more reluctant to use ICTs in education than might be suggested by their level of exposure to new media. Students may not feel comfortable with pedagogical innovations perceived as too experimental and are usually reluctant to adopt new tools or to change their practices if there is no obvious benefit in doing so. This reluctance is explained by the fact that innovations are by their very nature uncertain, unsettling and discomforting (Pedró, 2012).

There is an assumption that **ICTs must be used first and foremost to improve education as it currently stands rather than being used to change it radically**. Research suggests that while they recognize the benefits of easy-to-use tools and technologies that enable them to be more efficient in their work, students do not want to see an end to the face-to-face teaching model. In short, students are not geeks at any cost, the assumption being that **the quality of education matters more** than the technological environment (Dahlstrom, 2012).

There is also evidence to suggest that students do not want technologies to replace teachers. In other words, students tend to prefer well-organized face-to-face classes that provide technologies for peer exchange over exclusively online methods, which are generally perceived as being better suited to personal study (Léger Marketing, 2011b). While they rarely question the principle of authority, students often feel that too many teachers have yet to recognize the complexity generated by technologies. By contrast, students tend to be critical when teachers fail to use the basic functionalities of e-learning platforms and when lesson content is "poor". They also consider that inappropriate use is worse than no use at all (Dahlstrom, 2012).

The preference for a "reasoned" use of technologies, which tends to be more pronounced among new students than among older or more experienced students, thus goes hand in hand with a marked preference for "hybrid" instruction. Students' educational expectations tend to be more influenced by their previous educational experience than by their personal prac-

tices (Littlejohn et al., 2010). The fact that they may be skilled users of ICTs does not mean that students are capable of using ICT tools to optimize their learning experiences. In this sense, their strategies remain highly dependent on teacher instructions (Kennedy et al., 2008). From a student perspective, technologies are not designed to perform the same role in educational and personal settings. In other words, **recreational practices are not considered to provide general transferable skills applicable to study practices** (Pedró, 2012).

This gap has been highlighted in a number of studies, including in France. For example, research by the RANACLÈS network has shown that there is a tendency to overestimate the rationality of the approaches that competent students are expected to take and that the strategies developed by students are generally "*affective, impulsive and pragmatic rather than rational, methodical and reflective*" (Albero & Poteaux, 2010). Research on student behavior conducted as part of the Campus FORSE program has confirmed this preference for "traditional" and legitimate methods of transmission **consistent with existing summative assessment methods** based on printed material and structured knowledge. There is also evidence that we tend to underestimate the skills required of students beyond strictly procedural skills, since while an e-learning platform may require good methodological, interpersonal and discursive meta-skills, it also requires good writing skills (paradoxically) in order to be able to read (understand, interpret) and write (explain, formulate) in a distance education context (Godinet in Wallett, 2007).

Different perceptions among teachers

Research suggests that the preference for a reasoned use of ICTs among students is not entirely shared by teachers, who face a range of constraints (both external and internal). Teachers who prefer to focus on the transmission of knowledge, who pay little attention to student understanding and who take a narrow view of the use of technologies tend to make a superficial use ICTs and focus very little on learning design. By contrast, **teachers who have a more student-centered approach to learning and a greater understanding of the potential of technologies are better able to integrate ICTs in their teaching** and to reflect critically on how to strike a balance between face-to-face and distance learning and between the real (physical) environment and the virtual (online) environment (Ellis & Goodyear, 2010).

Beyond their conceptions of teaching, the main factor governing the willingness of teachers to use e-learning platforms is their professional and collective perception of their **professional identity**. Studies have identified various obstacles that teachers may or may not be able to overcome, including the fear of being dispossessed of the very foundations of their competence and expertise (i.e. the content of their lessons), their reluctance to transmit knowledge in ways that prevent feedback, further explanations and reformulations (i.e. in writing), and the fear of being judged by colleagues (Develay & Godinet in Wallett, 2007).

While there has been a slow increase in transmission-based practices over the last decade (in the form of access to documents and information related to the content of lessons and pedagogical organization) toward more interactive or more engaging uses (Lebrun, 2011), **teachers who use e-learning platforms tend not to have a "global" or "comprehensive" ecological view of the learning environment**, unlike students, who have a more articulated vision and who consider that it is precisely this articulation that provides added value (Ellis & Goodyear, 2010).

Inevitably, these differences generate different perceptions. Teachers tend to be more enthusiastic than students about ICT use in education, notably for the purposes of collaboration and communication. These discrepancies are well-known, with the various parties involved tending to overestimate their involvement. For example, senior managers in universities often

claim to be more involved in digital governance than teachers commonly assume, while teachers often feel that they are more open to technology than students commonly assume (Deschryver & Charlier, 2012; Heutte et al., 2010; Lebrun, 2011; Léger Marketing, 2011a).

While teachers tend to underestimate the appeal of more interactive forms of learning and the ability of students to perform several activities simultaneously, **they also have a tendency to overestimate students' expectations of technology**, particularly in the areas of practice-based learning (or "learning by doing") and learning through audiovisual media (Lam & Ritzen, 2008).

Teachers' representations of teaching and learning (and of educational technologies) vary widely. Broadly speaking, a university teacher's perception of instruction tends to be heavily influenced by the broader disciplinary environment and institutional context in which they operate and by their professional culture. Despite the increased pressure on quality in teaching, the professionalization of teaching skills and competencies at university remains in its infancy, and the fact that teaching is largely irrelevant to status and career progression has prevented any real engagement in pedagogical reflection and the adoption of new methods (Albero & Charignon, 2008; Endrizzi, 2011).

A large-scale survey conducted as part of the European TEC-MEUS project ("ICTs in education and higher education professions") has confirmed the key role of disciplines in shaping the practices of university teachers and "*the unreflective practice of teaching in higher education*". **The limited use of ICTs** in teaching, primarily explained by the underlying tension between the two identities of academics as researchers and teachers, **is also explained by the limited ability of higher education teachers to take on a support role to accompany students in their learning** (Barbot & Massou, 2011). However, it is important to note that support is not solely dependent on teachers. The development and implementation of distance education implies that the design of a lesson or course needs to be based on a framework that incorporates interactivity and self-assessment and that involves a support or supervisory team with complementary skills. The development of pedagogical scenarios would benefit from being based on scripts specifying the roles and tasks of lesson designers, tutors and IT engineers in the various predefined phases (Godinet in Wallett, 2007). More generally, the professionalization of teaching requires professionalizing the various design roles and functions that have so far remained the "*weak link of training systems based on computer-mediated communication*" (Jacquinot & Fichez, 2008), and in particular the different tutoring roles required to ensure the success of distance education (Depover et al., 2011).

TOWARD LESS TECHNO-CENTERED INSTRUCTIONAL APPROACHES

While the term "pédagogie universitaire" has only recently appeared in France, the idea that universities might be concerned about instruction and pedagogy has come a long way in other countries (Endrizzi, 2011). The introduction of more active instructional methods now seems inevitable (Romainville & Rege Colet, 2006).

A paradigm shift?

Many observers have argued that education systems will gradually move toward learner-centered models, with social learning and lifewide learning playing an increasingly important role. According to researchers at the IPTS, **personalization, collaboration and informalization** will come to play an increasingly significant role in the learning methods promoted by digital technologies in the medium term, the assumption being that students will have a range of tools at their disposal to assess their progress and reflect on their work. The idea is that students will be better able to participate in virtual exchange programs and will increasingly resort to virtual environments involving interactions between learners. Study programs will also provide opportunities for combining content and teaching methods to respond better to users' needs (Redecker et al., 2011).

See also the literature review by Jones and Shao, "*The Net Generation and Digital Natives: Implications for Higher Education*", conducted for the Higher Education Academy (HEA) in 2011.

"*Expert opinion underlines and confirms that in 15 years' time learning strategies will be personalised, tailor-made and targeted; collaborative and networked; and informal and flexible. For initial Education and Training (E&T) this will signify a move towards learner-centred and social learning strategies that are integrated in their daily lives and into society*" (Redecker et al., 2011)

These forecasts have fostered the view that digital technologies will gradually lead to a paradigm shift in learning. Every year since 2001, the Questions de Pédagogies dans l'Enseignement Supérieur (QPES) conferences have provided an opportunity for assessing recent advances in active instruction and pedagogy through presentations of projects that would otherwise remain invisible.

The dominant model in formal education remains the transmission and reproduction of "academic" knowledge. In other words, knowing and memorizing continue to be more valued than the construction and co-construction of knowledge. However, the development of e-learning platforms, the availability of a wide range of tools for expression and communication and the development of online information sources are gradually redefining the perception of the educational and academic environment and of pedagogical possibilities. The current paradigm shift faces two major obstacles: the lack of dialogue and consultation in teaching and the sense of technological incompetence. ●

See also the book by Charlier and Henri entitled *Apprendre avec les technologies*, PUF, 2010.

The issue of overall coherence in the broader context of a reform of university pedagogy has been a central focus in Quebec for a number of years. The "approche-programme" is widely seen as a major catalyst for change, and technologies are considered to be a key part of its implementation. The aim is to reconfigure the provision of education by taking as a unit the program of study (rather than the class) and by focusing on the skills that students need to develop (rather than learning objectives) (Prégent et al., 2009). This approach, which is widely thought to be capable of bringing pedagogical teams together, highlights two key points: first, that **the shift toward active learning methods requires critical reflection on learning outcomes**, as shown by recent research conducted by the OECD as part of the AHELO Feasibility Study and by research-in-progress in France on standards for bachelor's degree programs.

On the relationship between pedagogical methods and learning objectives, see issue 68 of the journal *Recherche et Formation* (n°68 de *Recherche et formation*), edited by Stéphane Simonian and published in 2011.

Second, the integration of technologies in higher education requires a better understanding of the meta-skills that are needed for their use and which develop through practice – in other words, what is needed is "*a deeper understanding of the simultaneously circular and systemic relationship they generate between tools, uses and teaching methods*" (Lebrun, 2011). What is also required is a greater focus on "digital literacy", which is predicted to become a cornerstone of education and training systems in the twenty-first century. The inclusion of digital literacy as a core skill should help to develop and implement frames and systems of reference that go beyond mere technical or procedural skills – suggesting that we may need to speak of digital literacies in the plural (Ferrari, 2012).

The "dispositif" as lever

The concept of *dispositif*, introduced by Linard in 1999, is indicative of the shift from a techno-centered perspective to a more anthropocentric approach. This move lies at the heart of the definition of the hybrid approach to instruction provided by Charlier et al. (2006): in this view, actors and their intentions are taken into account, in the same way as the specific dynamics of the approach, with all of these factors facilitating the emergence of complex forms of mediatization or computer-mediated communication (design) and cognitive mediation. ●

Whether hybrid or not, a *dispositif* is seen as a lever for a more innovative pedagogy and is designed to transform the existing system by redefining what, how, where and when we learn. Teachers and learners play a key role in the implementation of a *dispositif* since their values and practices shape the emergence of a new learning culture (Kampylis et al., 2012). To illustrate this focus on the concept of *dispositif*, we will examine some of the tools used to assess its various components.

The notion of creative classroom, the central concept of the SCALE CCR European project (Up-Scaling Creative Classrooms in Europe), integrates digital technologies as part of a systemic approach promoting changes at several levels: from study programs to infrastructures, through teaching,

learning and assessment practices. The frame of reference proposed by researchers at the IPTS (8 dimensions, 28 parameters) provides a general framework for analyzing innovations and assessing implementation strategies (Bocconi et al., 2012).

Other tools are also available. For example, a white paper published recently by EFQUEL (Ehlers et al., 2011) outlined an assessment approach based on software designed to generate questionnaires on the basis of predetermined criteria, which can be used prior to the design and conception of the *dispositif*, in the course of its deployment, or after its implementation. The SEVAQ+ tool, based on research by Kirkpatrick, can also be used to assess the quality of distance education tools in educational and professional training contexts and in higher education.

In Québec, the analytical framework proposed by Barrette (2009), now part of the toolbox of all the advisers of the REPTIC network, can be used to conduct prospective and retrospective assessments of pedagogical scenarios, based on their fit with study programs, the skills and resources involved, and the broader institutional context.

In a similar way, the typology of hybrid *dispositifs* developed as part of the HySup European project identifies six types of *dispositifs*, including three based on a teacher-centered approach and three involving a more learner-centered perspective. The distinction between the two types of *dispositif* is based on a "*conscious attempt to apply learning design to distance education activities*": in the first case, teachers essentially use the functions designed to enable access to resources and to manage information, while in the latter case they combine the various elements composing the techno-pedagogical environment in a range of different ways (Deschryver & Charlier, 2012).

DO TECHNOLOGIES HELP STUDENTS TO LEARN BETTER?

As we noted above, boundaries are shifting, both politically and institutionally. Students and teachers are also changing, although it is important to note that their personal practices are changing more rapidly than their expectations of formal education. Measuring the impact of technologies on learning is a vital part of research in this area. In a sense, it amounts to rejecting commonly held assumptions about the fossilization of practices and defending the idea that the pedagogical uses of technologies will and must extend beyond the mere reproduction of transmissive practices (Docq et al., 2010).

Since the first meta-analyses by Kulik in the 1980s, how has research addressed this issue? What evidence is there of the impact of digital technologies on teaching and learning? Do we know whether digital technologies help us to learn better, if not differently?

THE POTENTIAL OF ICTS

There is an assumption that ICTs have many virtues: on the one hand, they are assumed to facilitate personalized learning, to enable tailored learning on a large scale and to promote informal practices; on the other hand, they are thought to promote collaboration, to enable educational communities to network, and to promote the emergence of collective intelligence (Redecker et al., 2011).

According to Charlier (2011), personalization is a key factor for a successful integration of ICTs in higher education. The point is to provide students with space to reflect on their practices and to provide resources to support them in designing their personal learning environment. A PLE is designed to ensure that students take control of their learning by helping them to define their own objectives, to manage content, to select resources and to define methods. A PLE involves combining

With its wide range of initiatives in this area, MIT is a good example of the multidimensional approach to innovation. For example, the Media Lab is resolutely multidisciplinary and aims to promote the scientific and artistic potential of students (i.e. to promote polymathy). The Fab Lab supports teachers throughout the world to develop pedagogical projects that promote cross-disciplinary skills. In terms of learning, the move toward free educational resources, with the creation of OpenCourseWare in 2001, has been further extended with the creation of Online Laboratories (environments conducive to experimentation and critical thinking) and the edX project, which brings together a number of universities with the aim of providing free certifying courses to a critical mass of students, based on the principle of MOOCs (Bocconi et al., 2012).

different information, whether derived or not from social media, and also helps to communicate or share information and resources with other learners.

The concept of PLE is based on an approach aimed at promoting learner autonomy and control based on theories of self-regulated learning (Attwell, 2010). There is evidence to suggest that the PLE approach helps to attenuate the effects of the various non-academic factors (such as personal, situational and contextual factors) that can potentially threaten autonomous learning (Albero & Poteaux, 2010). Studies conducted as part of the RUCA project have shown that autonomy is not a prerequisite but a skill that needs to be developed and that the development of resources needs to be viewed from this perspective (Jacquinot & Fichez, 2008).

According to Ellis and Goodyear (2010), the learning potential of technologies is twofold: technologies are an effective tool for connecting people, whether synchronously or asynchronously, and for finding resources and processing information. There are two types of approaches: learning through discussion and learning through inquiry. The second approach involves defining a specific objective – for example, the aim may be to solve a problem, to carry out a project, to conduct a case study, or to produce knowledge collaboratively.

For others, the potential of ICTs is to be found in the new learning opportunities they provide. According to Eurostat, 31% of Europeans have used the Internet to search for information with a view to learning, while just 5% have completed a class or course online. Building on the taste for online study and research is a major challenge for educational institutions and universities (Redecker et al., 2010). The development of OpenCourseWare and MOOCs is also designed to harness the potential of informal digital practices.

According to Romero (2012), the question of temporal flexibility also needs to be addressed. On e-learning platforms, students required to work regularly are generally more successful than students operating on a more independent basis. This flexibility is also relative since many 'temporal frameworks' compete on distance training courses (based on hybrid instruction or distance instruction): the amount of time allocated to learning activities (length, deadline) in the context of academic temporal frameworks (cohort system or flexibility), individual temporal frameworks of engagement in the task and temporal frameworks of co-presence (according to the level of interdependence in the completion of a collective task) are all major constraints that suggest the need to develop regulations.

According to Jézégou (2010), these questions are indicative of the issues and challenges of online interactions, notably the development of a community of inquiry and the individual and collective construction of knowledge. The point is to promote collaboration based on social interactions involving confrontation, exchange, knowledge sharing and negotiation in order to encourage questioning and stimulate engagement in collective activities. In this view, the idea of "presence at a distance" needs to be thought of in terms of three structuring dimensions: socio-cognitive presence, socio-affective presence and pedagogical presence.

Further analysis of the conditions required to fulfill this potential requires a more extensive study beyond the scope of this review. These avenues suggest that the complexity of the relationships between pedagogy and technology is now better understood and that researchers are gradually developing tools to improve and refine our understanding in this area.

TYPES OF RESEARCH AND THE ASSOCIATED RESULTS

The significant amount of studies that have attempted to provide evidence of the impact of technologies on learning (whether directly or indirectly) is explained by the fact that evidence for the relationship

is not easy to obtain. Charlier (2011) identified four types of studies that provide a basis for examining the relationships between pedagogy and technology:

- basic meta-analyses aimed at confirming that we learn better or worse by using (or not using) a given technology;
- studies examining practices with a view to understanding the impact on learning ; research has shown, for example, that technologies generate new ways of learning; studies in this area have also focused on "learning styles" and addressed the widening gap traditional teaching methods and student practices;
- studies aimed at achieving a deeper understanding of the changes associated with uses of technology and the conditions of these changes with a view to promoting their development; research in this area focuses not only on changes at an individual level, but also examines changes in the *dispositif* and in institutions;
- studies in which the researcher designs and experiments with innovative *dispositifs*: here, the impact is limited to the duration of the study, except when design-based research methods are used.

Today, these different levels of analysis co-exist and reflect very different rationales. For example, meta-analyses can be used to argue against or in favor of a specific form of technology; research on practices can influence the activities of designer/authors of lessons or tutors, while studies relating to changes in *dispositifs* or within institutions contribute to reflection on the quality and durability of tools (Charlier, 2011).

When technology takes precedence over pedagogy: "no significant difference"

While French research, which has been largely unaffected by educational science, has tended to remain fragmented and dispersed (Albero, 2011), research in the United States has been involved since the 1990s in an epistemological conflict opposing pedagogy and technology (Tamim et al., 2009).

Some have argued that pedagogy takes precedence over technology and that the value of the learning experience depends on the design of the *dispositif*. Others consider that technology (and its affordances) plays a key role in learning by prefiguring the activity. This debate has been fuelled by hundreds of studies, which still seek to show that use is better than non-use, regardless of the level of education. However, none of these studies have provided evidence of the impact of technology on learner performance (Tamim et al., 2009).

In the late 1990s, research by Russell served to popularize the "*No Significant Difference Phenomenon*", showing that the mere presence of ICTs in a *dispositif* of any kind was not enough to ensure a positive impact on learner outcomes (2001). In a sense, the meta-analyses conducted by Kulik in the 1980s had already said everything there was to say: when focusing exclusively on the presence or absence of technologies, contextual variance, i.e. organizational, pedagogical and material characteristics, is not sufficiently taken into account, thus preventing the production of conclusive evidence.

The results of these meta-analyses are undermined by three factors: first, **the adoption of a technology is not sufficient to change pedagogy**; second, **the "technology or no technology" comparison is irrelevant** since it prevents consideration of the different uses associated with the adoption of a technology; and lastly, **the impact on skills or well-being cannot be measured based on summative assessments** (Lebrun, 2011).

On this point, many studies have shown that "success" remains a fundamentally multifactorial concept and that it does not depend exclusively on how education is conceived, since the educational trajectory, the socio-economic background, the cultural environment and the attitude toward learning also play a role in determining success (Endrizzi, 2010).

This was also one of the conclusions of an overview by Tamim et al. (2009) of 40 years of meta-analyses. The findings suggest that the effectiveness of a *dispositif* depends on how it can help teachers and

learners to achieve their objectives, but that it is also determined by other factors, both internal and external, whose combined impact with ICTs remains poorly understood. These factors include the characteristics of learners and teachers, the institutional context, and the disciplinary environment. The point is to revise and improve current methodologies to take this complexity into account.

When pedagogies take precedence over technologies

While the pitfalls and limitations of meta-analyses have often been highlighted, more complex methodological frameworks have only recently begun to emerge – as if both technologies and uses needed to reach a certain level of maturity and our understanding of cognitive processes needed to improve.

According to Barrette (2009), the effective integration of ICTs must be subordinated to critical reflection on pedagogical objectives and strategies. Since 2003, research conducted by the Association pour la Recherche au Collégial (ARC) in Quebec has focused on the benefits associated with different *dispositifs*. A distinction is made between different approaches: the "reactive" approach, broadly inspired by behaviorism, which aims to encourage reasoning by induction and memorization; the "proactive" approach, inspired by cognitivism, which aims to promote metacognition and the development of individual skills; and the "interactive" approach, which aims to promote the co-construction and development of collective skills.

Recent research at Louvain-la-Neuve (Docq et al., 2008; Lebrun et al., 2009) has shown that the positive impact of technologies can vary from 20 to 60% according to the degree to which the *dispositif* is described as transmissive or active and interactive. According to Tamim et al. (2009), ICTs have a slightly greater impact when used alongside traditional face-to-face methods compared to distance education alone, suggesting that ICTs are more effective as a learning support tool than as a resource used to provide access to content. According to Morgan (2003), the added value of e-learning platforms is not their potential as a tool for providing access to content since using platforms does not radically alter practices, suggesting that teachers who use them to "restructure" their lessons may be said to practice accidental pedagogy.

In these studies, **the pedagogical objective or intention is paramount and discriminating**. Awareness and assessment of change among actors, teachers, tutors, techno-pedagogical counselors and students is thus emphasized: the point is to focus on their perceptions and to move from an objective model toward subjective measures capable of shedding light on their level of engagement.

Docq et al. (2010) distinguished three categories of indicators, relating the added value of digital technology to effective uses of technologies when:

- they encourage pedagogical approaches **to focus more on learning**;
- they exploit the potential for **flexibility** to better respond to the specific needs of students;
- they encourage teacher **professional development** (Docq et al., 2010).

In short, the aim is no longer to determine whether students perform better in their final exams. Research conducted since 2009 as part of the European Hy-Sup project has put the three categories of indicators to the test of practice (Deschryver & Charlier, 2012).

THE BENEFITS OF DIGITAL TECHNOLOGIES DEPEND ON THE RICHNESS AND COMPLEXITY OF THE DISPOSITIF

Not all pedagogies are of equal value

Though incomplete, the findings of the Hy-Sup project are promising. They have confirmed (while also extending) what other studies, including those conducted by Clark in the United States and by Tardif in Canada, had already demonstrated in the 1980s – namely that the benefits of tech-

nologies depend primarily on how technologies are used by teachers and, more generally, on the richness and complexity of the overall *dispositif* (Deschryver & Charlier, 2012).

One of the first large-scale studies to address this question in a large population was the SITES 2006 survey conducted by the IEA (Law et al., 2008). The survey found that when technologies are used as part of a learner-centered approach and provide opportunities for group work and inquiry-based projects, they tend to promote the acquisition of new skills. Broadly speaking, activities based on interactivity invariably promote **deeper learning and richer experiences from a reflective and participatory point of view**.

However, the benefits perceived by students need to be qualified (Karsenti, 2007). Students recognize that the use of an e-learning platform primarily enables access to information and facilitates and improves learning. Technological and e-learning tools appear to encourage communication with the teacher and among students provided participation in forums is not compulsory. Students also tend to feel that technologies increase their interest in lessons, promote deep learning, encourage them to devote more time to their work, and support the assessment process, both formative and summative. However, they tend to be more critical if they feel that the frequency of use of communication tools by teachers, the quality of the support provided by digital technologies and the type of activity they aim to promote are inadequate (Raby et al., 2011).

For students, what matters most is not quantity, since research has shown that students who are highly exposed to technologies in class tend to be less successful than those who are less exposed. In addition, not all technologies are of equal value: those which stimulate cognitive activity appear to have a greater positive impact compared to those used to provide or enable access to content. Research by Concordia University has shown that while interactions with the teacher and among students can have a positive impact on learning, the most important factors are **the methods and conditions governing the mediation of content** (Schmid et al., 2009).

A study conducted between 2005 and 2007 at Carnegie Mellon University showed that students on a hybrid pathway absorbed the learning of a standard semester twice as fast and achieved similar or better results than students on face-to-face courses. Conceived originally to be used solely in distance education, the course was carefully planned and designed: the workload that had to be undertaken in order not to withdraw was taken into account and the students were given regular feedback, which helped to increase their engagement (Lovett et al., 2008). Other more recent studies based on the e-learning platform used at Carnegie Mellon University have confirmed that using platforms and virtual environments results in **faster learning**, though in lower proportions, and have emphasized the opportunities for investing more in the development of online courses at undergraduate level (Bowen et al., 2012).

While overall the perceived benefits of the ICampus platform remain limited among both teachers and students (38 % of respondents have a positive perception), research conducted at the University of Louvain-la-Neuve has shown that the added value of e-learning platforms depends "*on the richness and complexity of the pedagogical environment (i.e. the variety and complementarity of tools, approaches and uses) developed by the teacher and on a range of motivational and interactive factors*" (Lebrun, 2011). ●

Research conducted as part of the HySup project has reached similar conclusions (Deschryver & Charlier, 2012). The evidence suggests that the greater the possibilities and affordances of the *dispositif*, the greater the predicted impact on learning from a teacher perspective and, to a lesser extent, the greater the perceived impact on learning from a student perspective. In other words, **teacher-centered approaches consistently have a smaller impact** than more learner-centered approaches. For students, factors

> *"In our view, the development and improvement of the system is achieved by focusing specifically on the learner (i.e. by moving beyond the transmission model of education, whether with or without ICTs) and also by activating learning factors such as activity (incitement to activity) and interactivity (the provision of opportunities for co-construction)"* (Lebrun, 2011).

accounting for significant variance include "information" and "interactions", indicating that face-to-face instruction needs to be redefined by combining it with distance teaching methods.

Dispositifs characterized by relatively high indicators of openness, support and active student participation also appear to have a greater impact on teacher professional development. In such cases, teachers tend to feel that they are more actively involved in defining learning objectives and methods. Teachers also report higher levels of motivation, associated with an emphasis on personal development, improved student learning and collaboration with colleagues. Their level of involvement and engagement also appears to be higher, with teachers becoming more involved in the life of the institution, and even in extramural activities (Deschryver & Charlier, 2012).

These results highlight at least one constant – namely that technologies have the **potential to increase student and teacher engagement**. Motivation is not simply a matter of demonstrating or promoting an interest in "new" technologies, since other indicators are also involved, as shown by the pioneering work of Ryan & Powelson (1991). These include personal autonomy (i.e. the ability to decide to act and the capacity for self-determination), perceived personal competence in challenging conditions, and the sense of participation and relatedness, which foster well-being and self-cohesion. The perceived value of the activity also plays a key role, as shown by Viau (2009).

Despite significant disparities, the increasingly widespread use of e-learning platforms has tended to promote engagement and involvement. A number of studies have shown that students are willing to spend more time studying and to invest more time in their studies when e-learning platforms are used. There is also evidence to suggest that students are more likely to focus on the quality of their work and that their work will have meaning to them beyond its purely instrumental value (Pedró, 2012)

The first SCALE-UP experiments in the French-speaking world were deployed in the Quebec collegial network under the name "salle de classe du 21ème siècle"; in France, ESSCA was the first to go down this road.

The specific constraints of the *dispositif* increase the demands placed on students, teachers and tutors (Pedró, 2012).

Another point of convergence is implicit in the various studies conducted in this area – namely, the emphasis on the need to rethink the complementarity of distance education and face-to-face instruction.

When distance re-emphasizes the value of face-to-face instruction...

The American SCALE-UP project (Student-Centered Active Learning Environment for Undergraduate Programs) proposes an "upside-down" or "flipped" approach to teaching. To date, the "upside-down" approach has been adopted by over 50 higher education institutions across the United States. Broadly, the aim is to encourage students to work together in small groups, in specially designed classrooms (based on the model of restaurant dining rooms) in an environment fostering collaboration and interactivity. ●

Based on a combination of distance instruction and face-to-face tutorials, the "upside-down" approach was popularized in 2011 by two chemistry teachers at Woodland Park High School in Colorado, under the name "flipped classroom", based on the motto "Class is for conversation, not dissemination". In the "flipped classroom" model, the content of lessons can be accessed online – generally in the form of video clips that students are able to access at the time and place of their choice. Class time is devoted exclusively to team projects and more in-depth study through exchanges with the teacher and among peers, practical exercises and other collaborative activities (Bergmann & Sams, 2012).

A survey among 16,000 students showed that those involved in the SCALE-UP project were significantly less likely to fail compared to those receiving traditional in-

struction. This is particularly true among students from minority backgrounds and female students. The evidence suggests that their problem-solving skills improve, as does their theoretical understanding (Beichner et al., 2007).

The experiments conducted at the École Polytechnique Fédérale de Lausanne provide conclusive evidence that students are keen to have access to theoretical material before lessons and prefer to focus in class on solving exercises in small groups with tutors. Students also tend to feel that the "upside down" approach is more effective than the traditional lecture format since it helps to create a dynamic learning environment conducive to engagement and involvement (Ricci & Ramseyer, 2011).

However, the "flipped classroom" approach is not simply a matter of turning teaching upside down, since it also involves a renewed focus on the classroom as a physical space and on teachers as orchestrators of learning opportunities. It also gives a new meaning to face-to-face instruction, which many see as being threatened by the rise of online teaching, and prevents the risk of seeing campuses being deserted, which has also often been identified as a potential threat. The "upside down" approach inverts the notion of "presence at a distance" popularized by Weissberg and Jacquinot in the early 2000s (Jézégou, 2010). The assumption is that distance education provides the basis for a reinvention of face-to-face instruction.

This new perspective is also at the heart of the work conducted by researchers involved in the BOLD network (Blended Online Learning Design). In some sense, the model they propose also promotes "presence at a distance", since the aim is to develop systems and approaches in which technologies are used in the service of face-to-face learning strategies to promote ICT use among teachers who have yet to take the leap (Power, 2010).

While the physical presence of the teacher or tutor is in the process of regaining legitimacy, the physical spaces designed for students are also attracting increasing interest. For example, the notion of "learning center", "*based on a triptych combining a wider integrated provision of services, a physical place (often symbolic) and effective and reactive organization*", represents a kind of "third place", a symbol of the renewed focus of universities on their audience (Caisse des Dépôts et Consignations, 2011; Jouguelet, 2009).

While these paradoxical combinations may seem promising, they are also a cause for concern. Will we see the emergence of distance courses taken over by prestigious professors with an international reputation, alongside face-to-face instruction provided by ordinary teachers and/or tutors? In any event, recent developments clearly provide support for combining (rather than opposing) **face-to-face and distance instruction**, a major difference from the forecasts made just over a decade ago.

SOME CONCLUDING REMARKS

Research on the impact of technologies on learning is both complex and insufficient. It is complex because the relationships between technology and pedagogy are difficult to determine, as shown by studies conducted over the past 30 years. It is also insufficient since once the conditions required for an effective use of technologies have been identified, there also needs to be a focus on raising awareness among teachers and encouraging them to improve the learning opportunities they provide to students – something that is often lacking.

While digital technologies may be a catalyst for developing pedagogy in higher education, the shift from purely experimental trials to a deeper change in teaching and learning practices requires addressing a range of other issues and challenges. By way of concluding this review of the literature, let us consider just three of these: first, the challenge of digital literacy, which concerns students, teachers and administrative staff; second, the challenge of ensuring that instructional design professionals are able to provide appropriate support; and third, the challenge of recognizing and promoting the teaching role of academics.

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