MÉMOIRE

PRÉSENTÉ
À L'OFFICE DE CONSULTATION PUBLIQUE DE MONTRÉAL
(OCPM)

PAR

ALBERT AUBRY

**DANS LE CADRE DU PROJET D'IMPLANTATION
D'UN CAMPUS DE L'UNIVERSITÉ DE MONTRÉAL
SUR LE SITE DE LA GARE DE TRIAGE D'OUTREMONT
ARRONDISSEMENT OUTRETREMONT**

MARS 2007

I. INTRODUCTION

Titre du projet

Projet d'implantation d'un campus de l'Université de Montréal sur le site de la gare de triage d'Outremont, arrondissement Outremont.

Présentation de la personne qui présente le mémoire

Mon nom est Albert Aubry, propriétaire et résidant d'Outremont. J'ai participé aux séances d'information de l'OCPM, ainsi qu'à trois des quatre ateliers thématiques entre les 14 et 20 mars 2007.

II. BRÈVE EXPLICATION DE L'INTÉRÊT PORTÉ AU PROJET:

Mon intérêt est en tant que :

- Contribuable, donc éventuel financier du projet;
- Citoyen préoccupé par les décisions stratégiques de certaines institutions du Québec, incluant l'Université de Montréal.

III. OPINION SUR L'ENSEMBLE DU PROJET

Je ne suis pas contre la présence d'un campus de l'Université de Montréal sur le site de la gare de triage. Je préfère un campus universitaire à tout autre projet à vocation commerciale, tels que magasins à grandes surfaces, stationnements publics ou encore un terrain vague contaminé. Cependant, je crois qu'un tel projet mérite plus de temps de réflexions et moins de précipitations.

IV. PRÉOCCUPATIONS LIÉES AU PROJET

1. Que l'Université de Montréal et ses partenaires (incluant les contribuables) choisissent une stratégie d'expansion coûteuse et inadaptée aux nouvelles réalités et tendances d'enseignement à distance, basées sur les technologies de communication Internet, comme l'apprentissage en ligne (*e-learning*);

2. Que le modèle de campus « carte postale » ne soit plus une marque de commerce importante des universités. (Marque de commerce qui peut influencer le choix ou la préférence d'un étudiant(e) envers un campus par rapport à un autre);

3. Que le modèle d'enseignement classique « gros campus – un professeur – une classe – un cours à une heure précise » soit révolu. Le modèle universitaire se transforme rapidement en campus virtuel – un professeur – un cours à n'importe quelle heure ou journée et où il y a un accès Internet;

4. Que la notoriété passée d'une université n'est plus garante de son futur. Les étudiants étrangers ou de Montréal seront attirés par la profondeur et le dynamisme d'une l'université dans ses aptitudes de réseautage (*networking*) et d'alliances avec d'autres universités, ONG, centres de recherches, gouvernements et entreprises au niveau régional, national et international;

5. Que de mettre tous les œufs dans le même panier (brique et mortier) risque sérieusement de restreindre l'Université de Montréal dans la compétition face aux alliances universitaires internationales ou contre les universités qui ont sagement décidé de leur niche stratégique afin de clairement se distinguer;

6. Que le système d'éducation est perpétuellement sous financé (gouvernement, philanthropie et privé). Conséquemment, il est périlleux de mobiliser tant d'argent dans des infrastructures immobilières de briques et mortiers alors qu'il est probable que l'achalandage des étudiants ne sera pas au rendez-vous pour des raisons d'une part démographiques et d'autres parts, un exode de nos étudiants vers des universités internationales grâce aux nouvelles technologies d'enseignement à distance;

7. Mes préoccupations se sont amplifiées lorsque les représentants de l'Université de Montréal ont affirmé que la dimension et le nombre de bâtiments proposés ne peuvent être réduits, puisque qu'ils représentent la masse critique pour être rentable. Ce ne serait pas l'avis de l'Indiana College Network qui a rapporté une augmentation de 68,232 inscriptions à des cours à distance par l'apprentissage en ligne (*e-learning*) post secondaire en 2003, soit une augmentation 42% pour une seule année et une augmentation de 438% pour une période de 5 ans. Les revenus associés à ces inscriptions sont approximativement de 20,5 millions de dollars. (voir Annexe A).

8. Mes préoccupations se sont amplifiées lorsque les représentants de l'Université de Montréal ont affirmé que l'apprentissage en ligne (*e-learning*) n'est pas adapté à l'enseignement scientifique, telle que la médecine. Ce n'est pas de l'avis de l'Université de Miami et de Strasbourg (Voir Annexe B et C) ou de l'alliance de l'Université de Berlin (polytechnique), l'Université de Barcelone, l'Université de Technologie de Lappeenranta (Finlande), l'Université d'Oxford, l'École Nationale Supérieure des Mines de Saint-Étienne (France) et l'Université Polytechnique de Bucarest (Roumanie). Ce groupe de six universités a décidé de mettre leurs ressources en commun pour l'enseignement à distance de l'ingénierie chimique (*Process and Chemical Engineering*). (Voir Annexe D);

9. Que l'Université de Montréal devra faire face à de telles alliances internationales avec comme as dans son jeu « un campus vert »;

10. Que l'Université de Montréal se retrouve isolée devant la nouvelle réalité de l'enseignement supérieur, soit par manque de ressources (englouties dans de la brique) ou par un protectionnisme de ses connaissances qui malheureusement sont universelles. L'Université de Montréal risque par ses choix précipités d'investissements, de se transformer en université de campagne ou au mieux une institution à vocation éducative incertaine pour un groupuscule quelconque déconnecté avec les réalités d'un futur très proche.

11. Qu'une fois de plus, la facture d'un investissement spéculatif soit payée par les contribuables.

12. Et autres préoccupations…

V. CONCLUSION

Suggestions et commentaires dans le but d'améliorer le projet

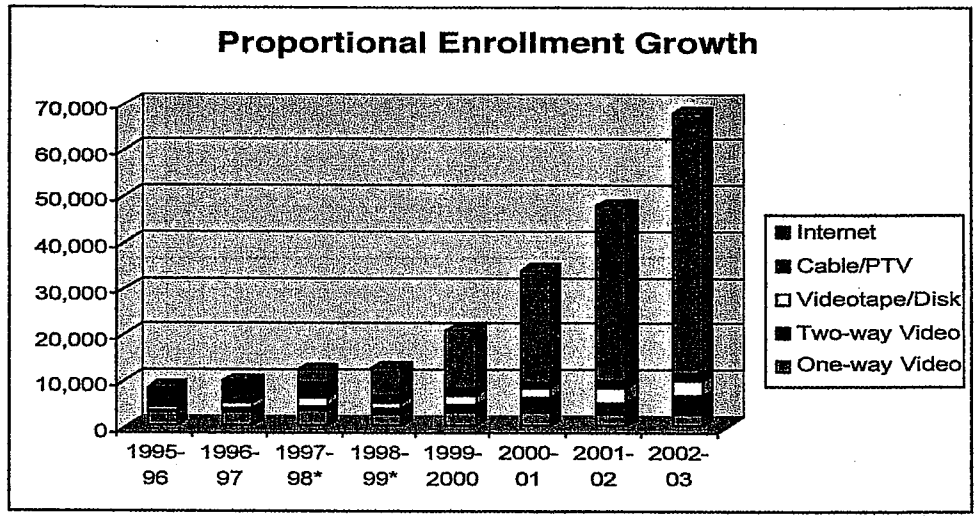
Je suggère de prendre du recul face à ce projet. Un recul qui mérite une attention particulière à la dimension technologique des communications, qui actuellement révolutionnent le monde de l'enseignement supérieur. L'enjeu est, à mon avis, la survie de l'Université de Montréal.

ANNEXE A

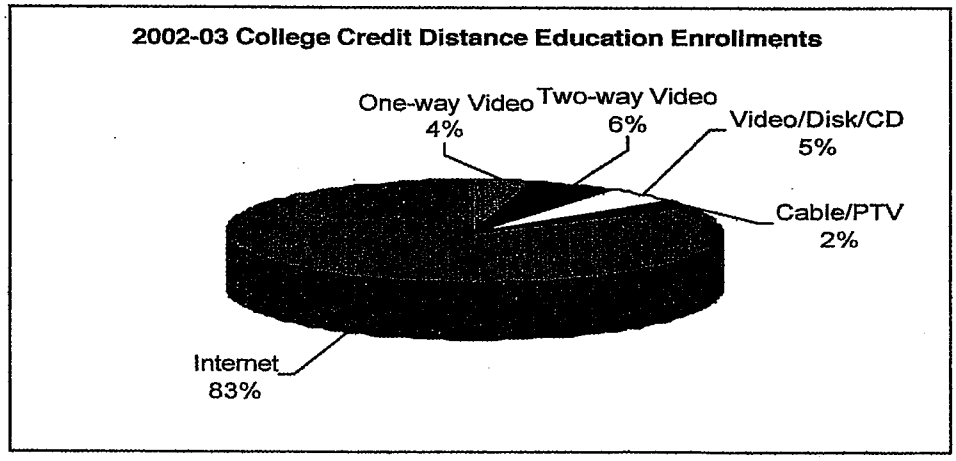
E-Learning Continues Upward Path in Indiana for 2002-03

Susan B. Scott, Director of E-Learning
Indiana Higher Education Telecommunication System

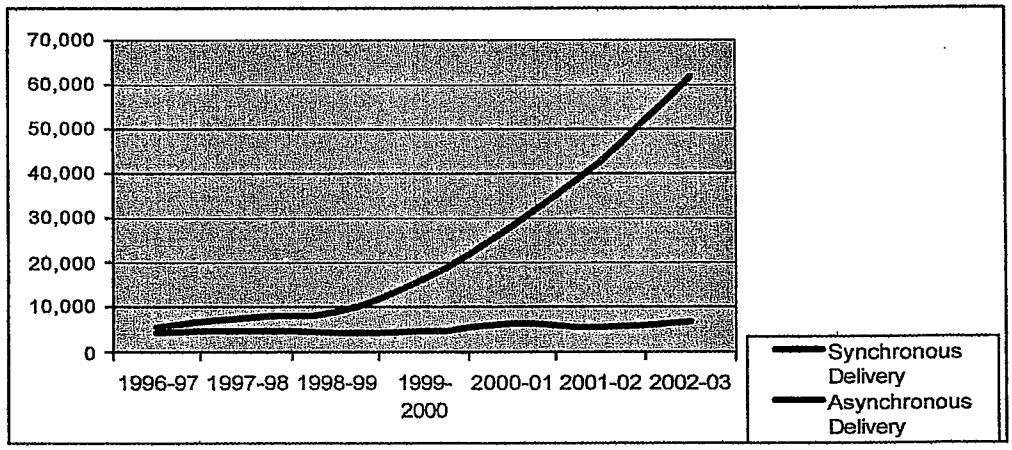
Indiana learners continued to respond in large numbers last year to educational opportunities made accessible through technology. In its annual report on college e-learning trends for 2002-03, the Indiana College Network reported 68,232 course enrollments at public postsecondary institutions—an increase of 42% over the previous year, and a five-year increase of 438%.



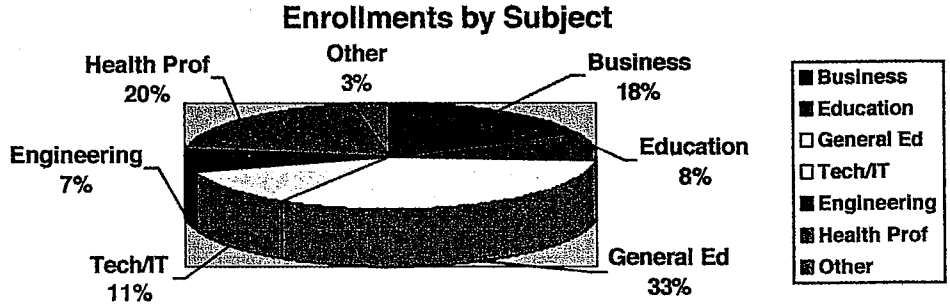
Continuing growth trends from the past few years, online learning now accounts for 83% of those enrollments. Videoconferencing enrollments also grew by 38%, videotape and cable classes increased by 20%, and satellite numbers remained steady, but the 48% increase in Internet course enrollments drove growth overall.



Though a stable core of students continues to prefer synchronous classes with "live" real-time interaction, adults' needs for flexibility in class schedules favor "asynchronous" interaction modes such as Internet, videotape, DVD, and cable or public TV.



Indiana's colleges and universities now offer 70 degree programs—roughly one-third each at associate, baccalaureate, and master's degree levels—plus another 63 certificate and endorsement programs for completion at a distance via technology (many of the latter on a non-credit basis and therefore not included in this report). Approximately 80% of credit-course enrollments are at the undergraduate level. The remaining 20% are graduate students pursuing degrees such as MBA, engineering, nursing, and various teacher-education master's and licensure programs. The proportions of enrollments by subject area have changed little over the past three years, though the numbers keep climbing in each area.



Approximately 1,600 technology-delivered credit classes are offered each semester, with enrollment increases handled occasionally by increasing class size but more often by opening new sections to help assure adequate instructor attention. Much of the growth in ICN catalog listings during the past two years has come from new high-school classes and from a variety of new non-credit self-study opportunities. (See the ICN online catalog at www.icn.org for more information.)

All of the public institutions shared in the e-learning growth, particularly those with new programs climbing an adoption curve.[1] Ivy Tech State College and Vincennes University, the Community College of Indiana partners, combine to account for 46% of total e-learning enrollments. Several recent program launches gave IUPUI the largest increase of any single campus, at approximately 83%, but even the well-established programs at Ball State University and Purdue University West Lafayette saw healthy increases. For comparison, total enrollment increases last year at public institutions averaged approximately 3%.

2002-03 Enrollment Growth by Institution

Institution	E-Learning Enrollment	Increase over 2001-02
Ball State University	2,819	11%
Indiana State University	6,635	33%
Indiana University System	18,132	74%
IUPUI	15,287	83%
Ivy Tech State College	28,368	36%
Purdue University West Lafayette*	2,429	60%
University of Southern Indiana	4,968	42%
Vincennes University	2,941	293%

**data unavailable for Purdue regional campuses*

Although the number of students engaged in e-learning is still only an estimated 6% of total postsecondary enrollments, their impact continues to grow. The nearly 203,000 credit hours of tuition and fees accounted for an estimated $20.5 million in revenue, and the 6,732 annualized full-time-equivalent (FTE) student count is larger than most regional campuses.

Because Indiana's universities have been engaged for over thirty years in offering distance education to students in remote areas, they have made sure that students can actually complete a full degree program via technology with few if any trips to campus. As a result, unusual among state virtual university consortia, few Indiana e-learners are traditional on-campus students. Instead, most are working adults with job and family responsibilities that prevent their regular attendance at a campus or learning center, even if the campus is near their home or workplace. Most are women, most have children still at home, and the average age is in the early thirties.

As with trends more common in other states, Indiana is beginning to see some campus-based students use online learning to pick up a closed or cancelled class they need in order to stay on track to complete their degree in a timely manner. Often, they may be Ivy Tech students who work full time and care for children, take one class at the local Ivy Tech campus, and take another class—from Ivy Tech or another institution—via technology so they can complete their associate degree in four years or less on a part-time basis. Repeatedly, they praise the flexibility of distance learning. Actual geographic distance is seldom the issue, except for the extent to which greater distance means more time traveling to and from work, home, and campus. Their choice is typically not between on-campus and distance learning but rather between distance learning and nothing. Students report that had it not been for distance learning, they would not have been able to fulfill their educational goals.

[1]Several independent universities now participate in ICN, and their e-learning enrollments will be included in future reports.

The Indiana College Network is a service of the Indiana Higher Education Telecommunication System.

The Impact of E-Learning in Medical Education

ANNEXE B

Jorge G. Ruiz, MD, Michael J. Mintzer, MD, and Rosanne M. Leipzig, MD, PhD

Abstract

The authors provide an introduction to e-learning and its role in medical education by outlining key terms, the components of e-learning, the evidence for its effectiveness, faculty development needs for implementation, evaluation strategies for e-learning and its technology, and how e-learning might be considered evidence of academic scholarship.

E-learning is the use of Internet technologies to enhance knowledge and performance. E-learning technologies offer learners control over content, learning sequence, pace of learning, time, and often media, allowing them to tailor their experiences to meet their personal learning objectives. In diverse medical education contexts, e-learning appears to be at least as effective as traditional instructor-led methods such as lectures. Students do not see e-learning as replacing traditional instructor-led training but as a complement to it, forming part of a blended-learning strategy. A developing infrastructure to support e-learning within medical education includes repositories, or digital libraries, to manage access to e-learning materials, consensus on technical standardization, and methods for peer review of these resources. E-learning presents numerous research opportunities for faculty, along with continuing challenges for documenting scholarship. Innovations in e-learning technologies point toward a revolution in education, allowing learning to be individualized (adaptive learning), enhancing learners' interactions with others (collaborative learning), and transforming the role of the teacher. The integration of e-learning into medical education can catalyze the shift toward applying adult learning theory, where educators will no longer serve mainly as the distributors of content, but will become more involved as facilitators of learning and assessors of competency.

Acad Med. 2006; 81:207–212.

Today's medical educators are facing different challenges than their predecessors in teaching tomorrow's physicians. In the past few decades, changes in health care delivery and advances in medicine have increased demands on academic faculty, resulting in less time for teaching than has previously been the case.[1] Changes in sites of health care delivery, from acute care institutions to community-based settings for chronic care, have required adaptations in educational venues.[2] Finding time to teach "new" fields such as genomics, palliative care, geriatrics, and complementary medicine is difficult when medical school curricula are already challenged to cover conventional materials.[1] Traditional instructor-centered teaching is yielding to a learner-centered model that puts learners in control of their own learning. A recent shift toward competency-based curricula emphasizes the learning outcome, not the process, of education.[3]

E-learning refers to the use of Internet technologies to deliver a broad array of solutions that enhance knowledge and performance.[4,5] E-learning can be used by medical educators to improve the efficiency and effectiveness of educational interventions in the face of the social, scientific, and pedagogical challenges noted above. It has gained popularity in the past decade; however, its use is highly variable among medical schools and appears to be more common in basic science courses than in clinical clerkships.[6,7]

In this article, we review the current state of e-learning in medical education by outlining the following: key terms, the components of e-learning, the evidence for its effectiveness, faculty development needs for implementing e-learning, evaluation strategies for e-learning and its technology, and the potential for e-learning to be considered evidence of academic scholarship.

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Dr. Leipzig is professor, Department of Geriatrics and Adult Development; and vice chair for education, Brookdale Department of Geriatrics and Adult Development, Mount Sinai School of Medicine, New York, New York.

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Definitions

E-learning is also called Web-based learning, online learning, distributed learning, computer-assisted instruction, or Internet-based learning. Historically, there have been two common e-learning modes: distance learning and computer-assisted instruction. Distance learning uses information technologies to deliver instruction to learners who are at remote locations from a central site. Computer-assisted instruction (also called computer-based learning and computer-based training) uses computers to aid in the delivery of stand-alone multimedia packages for learning and teaching.[7] These two modes are subsumed under e-learning as the Internet becomes the integrating technology.

A concept closely related to e-learning but preceding the birth of the Internet is

multimedia learning. Multimedia uses two or more media, such as text, graphics, animation, audio, or video, to produce engaging content that learners access via computer. Blended learning, a fairly new term in education but a concept familiar to most educators, is an approach that combines e-learning technology with traditional instructor-led training, where, for example, a lecture or demonstration is supplemented by an online tutorial.[8]

Faculty, administrators, and learners find that multimedia e-learning enhances both teaching and learning. These advantages can be categorized as targeting either learning delivery or learning enhancement.

Learning delivery is the most often cited advantage of e-learning and includes increased accessibility to information, ease in updating content, personalized instruction, ease of distribution, standardization of content, and accountability.[4,5] Accessibility refers to the user's ability to find what is needed, when it is needed. Improved access to educational materials is crucial, as learning is often an unplanned experience.[5,7] Updating electronic content is easier than updating printed material[9]: e-learning technologies allow educators to revise their content simply and quickly. Learners have control over the content, learning sequence, pace of learning, time, and, often, media, which allows them to tailor their experience to meet personal learning objectives.[10] Internet technologies permit the widespread distribution of digital content to many users simultaneously anytime and anywhere.

An additional strength of e-learning is that it standardizes course content and delivery; unlike, for instance, a lecture given to separate sections of the same course. Automated tracking and reporting of learners' activities lessen faculty administrative burden. Moreover, e-learning can be designed to include outcomes assessment to determine whether learning has occurred.[11]

Advantages in learning enhancement are a less well recognized but potentially more revolutionary aspect of e-learning than are those related to learning delivery. E-learning technologies offer educators a new paradigm based on adult learning theory, which states that adults learn by relating new learning to past experiences, by linking learning to specific needs, and by practically applying learning, resulting in more effective and efficient learning experiences.[11] Learning enhancement permits greater learner interactivity and promotes learners' efficiency, motivation, cognitive effectiveness, and flexibility of learning style. Learning is a deeply personal experience: we learn because we want to learn. By enabling learners to be more active participants, a well-designed e-learning experience can motivate them to become more engaged with the content.[12] Interactive learning shifts the focus from a passive, teacher-centered model to one that is active and learner-centered, offering a stronger learning stimulus. Interactivity helps to maintain the learner's interest and provides a means for individual practice and reinforcement. Evidence suggests that e-learning is more efficient because learners gain knowledge, skills, and attitudes faster than through traditional instructor-led methods. This efficiency is likely to translate into improved motivation and performance.[12] E-learners have demonstrated increased retention rates and better utilization of content, resulting in better achievement of knowledge, skills, and attitudes.[12] Multimedia e-learning offers learners the flexibility to select from a large menu of media options to accommodate their diverse learning styles.[12]

Components of E-Learning

Creating e-learning material involves several components: once content is developed, it must be managed, delivered, and standardized.

Content comprises all instructional material, which can range in complexity from discrete items to larger instructional modules. A digital learning object is defined as any grouping of digital materials structured in a meaningful way and tied to an educational objective.[13] Learning objects represent discrete, self-contained units of instructional material assembled and reassembled around specific learning objectives, which are used to build larger educational materials such as lessons, modules, or complete courses to meet the requirements of a specified curriculum.[14] Examples include tutorials, case-based learning, hypermedia, simulations, and game-based learning modules. Content creators use instructional design and pedagogical principles to produce learning objects and instructional materials.

Content management includes all the administrative functions (e.g., storing, indexing, cataloging) needed to make e-learning content available to learners. Examples include portals, repositories, digital libraries, learning-management systems, search engines, and ePortfolios. A learning-management system, for example, is Internet-based software that facilitates the delivery and tracking of e-learning across an institution.[15,16] A learning-management system can serve several functions beyond delivering e-learning content. It can simplify and automate administrative and supervisory tasks, track learners' achievement of competencies, and operate as a repository for instructional resources twenty-four hours a day.[15,16] Learning-management systems familiar to medical educators are WebCT® or Blackboard®, but there are more than 200 commercially available systems, a number that is growing rapidly.

Content delivery may be either synchronous or asynchronous.[5] Synchronous delivery refers to real-time, instructor-led e-learning, where all learners receive information simultaneously and communicate directly with other learners. Examples include teleconferencing (audio, video, or both), Internet chat forums, and instant messaging. With asynchronous delivery, the transmission and receipt of information do not occur simultaneously. The learners are responsible for pacing their own self-instruction and learning. The instructor and learners communicate using e-mail or feedback technologies, but not in real time. A variety of methods can be used for asynchronous delivery, including e-mail, online bulletin boards, listservs, newsgroups, and Weblogs.

In addition to establishing, managing, and delivering content, a fourth component is part of the e-learning equation. It is becoming increasingly clear that standards are needed for the creation of new e-learning material.[17] Such standards promote compatibility and usability of products across many computer systems, facilitating the widespread use of e-learning materials.

Several organizations have been engaged in creating broad e-learning standards.[17] Although not specifically designed for medical education, these standards offer medical educators important advantages. The most well-known set of standards is the Advanced Distributed Learning: Sharable Content Object Reference Model (SCORM). SCORM is a group of specifications developed through a collaborative effort of e-learning organizations funded by the United States Department of Defense.[17] SCORM specifications prescribe the manner in which a learning-management system handles e-learning products.[17] E-learning material built to SCORM specifications will interact with a conformant learning-management system, allowing for the prescription of the learning experience and tracking of learner performance. In medical education, MedBiquitous, a consortium of academic, government, and health care industry organizations, is working to develop SCORM-compliant specifications and standards for medical education.[18]

The Evidence for Effective and Efficient E-Learning

The effectiveness of e-learning has been demonstrated primarily by studies of higher education, government, corporate, and military environments.[11,19] However, these studies have limitations, especially because of the variability in their scientific design.[19,20] Often they have failed to define the content quality, technological characteristics, and type of specific e-learning intervention being analyzed. In addition, most have included several different instructional and delivery methodologies, which complicates the analysis.[21] Most of these studies compared e-learning with traditional instructor-led approaches.[15,19]

Yet three aspects of e-learning have been consistently explored: product utility, cost-effectiveness, and learner satisfaction. Utility refers to the usefulness of the method of e-learning. Several studies outside of health care have revealed that most often e-learning is at least as good as, if not better than, traditional instructor-led methods such as lectures in contributing to demonstrated learning.[5,11] Gibbons and Fairweather[11] cite several studies from the pre-Internet era, including two meta-analyses that compared the utility of computer-based instruction to traditional teaching methods. The studies used a variety of designs in both training and academic environments, with inconsistent results for many outcomes. Yet learners' knowledge, measured by pre-post test scores, was shown to improve. Moreover, learners using computer-based instruction learned more efficiently and demonstrated better retention.

Recent reviews of the e-learning (specifically Web-based learning) literature in diverse medical education contexts reveal similar findings.[22] Chumley-Jones and colleagues[22] reviewed 76 studies from the medical, nursing, and dental literature on the utility of Web-based learning. About one-third of the studies evaluated knowledge gains, most using multiple-choice written tests, although standardized patients were used in one study. In terms of learners' achievements in knowledge, Web-based learning was equivalent to traditional methods. Of the two studies evaluating learning efficiency, only one demonstrated evidence for more efficient learning via Web-based instruction.[22]

A substantial body of evidence in the nonmedical literature has shown, on the basis of sophisticated cost analysis, that e-learning can result in significant cost-savings, sometimes as much as 50%, compared with traditional instructor-led learning.[11] Savings are related to reduced instructor training time, travel costs, and labor costs, reduced institutional infrastructure, and the possibility of expanding programs with new educational technologies.[11] Only one study in the medical literature evaluated the cost-effectiveness of e-learning as compared with text-based learning. The authors found the printing and distribution of educational materials to be less costly than creating and disseminating e-learning content.[22]

Studies in both the medical and nonmedical literature have consistently demonstrated that students are very satisfied with e-learning.[11,22] Learners' satisfaction rates increase with e-learning compared to traditional learning, along with perceived ease of use and access, navigation, interactivity, and user-friendly interface design.[11,22] Interestingly, students do not see e-learning as replacing traditional instructor-led training but as a complement to it, forming part of a blended-learning strategy.[11,22]

Availability of E-Learning Resources

Thanks to the growth of educational technologies and the Internet, the number of e-learning resources available to educators has dramatically increased. Within medical education, repositories or digital libraries have been established to manage access to e-learning materials. Although few at this time, such repositories offer a vision of expanded access to a large number of high-quality, peer-reviewed, sharable e-learning materials (see Table 1). Examples include the Association of American Medical Colleges' (AAMC's) MedEdPortal, a repository for curriculum and assessment materials organized around core competencies in medical education and populated with up-to-date, peer-reviewed teaching and assessment materials.[23] The End of Life/Palliative Education Resource Center is a free-access repository of digital content for health profession educators involved in palliative care education.[24] The Health Education Assets Library (HEAL) provides high-quality digital materials for health sciences educators[25] and promotes the preservation and exchange of useful educational assets such as individual graphic, video, or audio elements, while respecting ownership and privacy. HEAL has begun a peer-review process for all e-learning materials submitted to the library.[25] The Multimedia Educational Resource for Learning and Online Teaching (MERLOT) is designed primarily for faculty and students of higher education.[26] The service collects links to online learning materials, along with annotations such as users' reviews and assignments. MERLOT contains a growing science and technology section that includes health care education e-learning materials.[26] The International Virtual Medical School (IVIMEDS) is an international organization whose mission is to set new standards for e-learning in medical education through a partnership of medical schools and institutions, using a blended-learning approach. IVIMEDS hosts a repository for use by its member medical schools.[27] Most of the materials in this repository are free to use, although some materials have clearly defined conditions for use. In the future, these

Table 1
Medical Education Organizations Supporting E-Learning

Organization	Characteristics
MedEdPortal, Association of American Medical Colleges (AAMC) (http://www.aamc.org/meded/mededportal/)	Repository All digital content types Material linked to educational competencies Peer reviewed "Virtual patients" bank
End of Life/Palliative Education Resource Center (EPERC) (http://www.eperc.mcw.edu/)	Repository Digital content in end-of-life issues Peer reviewed Links to other online resources
The Health Education Assets Library (HEAL) (http://www.healcentral.org)	Repository Large number of learning assets Growing number of learning objects Peer reviewed
Multimedia Educational Resource for Learning and Online Teaching (MERLOT) (http://www.merlot.org)	Repository for higher education Links to other online resources with peer-review comments Growing science and technology section
International Virtual Medical School (IVIMEDS) (http://www.ivimeds.org/)	A consortium of medical schools Setting standards in medical education Repository for member schools Partnerships Blended learning

and other repositories may require a membership or other fees to cover the ongoing expenses of Web-site maintenance.

Evaluating E-Learning Processes and Outcomes

Adopting e-learning and its technology requires large investments in faculty, time, money, and space that need to be justified to administrators and leadership. As with other educational materials, there are two major approaches to the evaluation of e-learning: process and outcomes.

Process evaluation examines an e-learning program's strengths and weaknesses and how its results are produced, often providing information that will allow others to replicate it. Peer review is one type of process evaluation. Traditional peer review for journal articles verifies the quality of content. E-learning requires the consideration of additional dimensions. For example, is it easy to "navigate" through the online material? Is the appearance conducive to education? Are multimedia elements used effectively? Is the interactivity appropriate for the level of the learner? Are special computer skills, hardware, or software required? These and other questions place new demands on peer reviewers engaged in process evaluation of e-learning. In fact, the AAMC, at the request of the Council of Deans, has begun a peer-review process of e-learning that recognizes these materials as evidence of scholarly activity for faculty promotion and recognition.[28]

Outcome evaluation of changes in learners' knowledge, skills, or attitudes allows e-learning developers to gauge program effectiveness. The evaluation framework outlined by Kirkpatrick[29] in the 1950s and later adapted to health care education[30] can be used to evaluate e-learning interventions.[31] The Kirkpatrick model defines four levels of evaluation based on outcome: satisfaction, learning, change in learner behavior, and organizational change/patient outcome.

Satisfaction measures learners' reactions to the material: was it easy to use, hard to use, fun, boring, and so forth. But satisfaction measures alone do not measure learning. For example, excellent content that learners find difficult to use may be rated as poor. Likewise, a module that is highly entertaining in its use of multimedia but superficial in its content may be rated as excellent.

Tracking and monitoring learners' knowledge, attitudes, and skills via a learning-management system can greatly simplify the process of evaluating the gains made through e-learning. An approach that combines assessment of skills and attitudes using e-learning technology with facilitator-mediated observation would allow a more in-depth evaluation of skills and behavior. By contrast, evaluating the direct result of an education program by measuring changes in learners' behaviors, institutional changes, and better patient care is often complex, time-consuming, and costly. E-learning assessments can be one valuable component in such overall evaluation of medical school curricula.

E-Learning as Academic Scholarship

The literature regarding faculty development or promotion of e-learning as evidence of scholarly pursuit is almost nonexistent to our knowledge; however, as noted above, e-learning requires faculty competencies that go beyond traditional instructional activities. Furthermore, by its nature, e-learning offers learners and instructors the possibility of widespread use, access, and sharing unmatched by other types of instruction. Evaluation data from peer review as well as learning-management system tracking and monitoring of e-learning use can provide evidence of its quality and effectiveness. How are faculty members recognized and rewarded for their dedication to this effort? The following activities could be considered evidence of scholarship for faculty promotion:

- Publication of e-learning materials in a national online peer-reviewed repository.
- Faculty and learner evaluations of one's e-learning material.
- Peer-reviewed publications describing the process, impact, and scientific contributions of e-learning to medical education.
- Successful grant awards in e-learning.
- Participation in national (and international) societies concerned with

the development, application, and use of e-learning in medical education.

Numerous research opportunities exist in the relatively new field of e-learning. Faculty, administrators, and the public will demand that educators evaluate the impact of e-learning on the quality and efficiency of medical education. Extrapolating methods from other clinical and educational research, including comparative studies, is insufficient because such studies often ignore the complexity of the learning process and the methods of delivery characteristic of e-learning. Potential areas for research include assessing contexts for effective use of e-learning in medical education, the differential use of e-learning in preclinical versus clinical years, the adaptation of e-learning to a wide variety of medical specialties and clinical settings, an exploration of methods for simplifying the e-learning creation process to gain wider acceptance and use, the incorporation of e-learning as part of a blended-learning strategy, and the use of a multimedia instructional design process by medical educators.

Integrating E-Learning into Medical Education

The integration of e-learning into existing medical curricula should be the result of a well-devised plan that begins with a needs assessment and concludes with the decision to use e-learning.[32] Although some institutions have tried to use e-learning as a stand-alone solution to updating or expanding their curricula, we believe it is best to begin with an integrated strategy that considers the benefits and burdens of blended learning before revising the curriculum. In undergraduate medical education, e-learning offers learners materials for self-instruction and collaborative learning. In graduate medical education, the Accreditation Council for Graduate Medical Education has established six core competencies toward which e-learning can be applied. E-learning materials suited for each of these competencies can be integrated into the education of residents and fellows, replacing lectures and other synchronous methods of instruction. Asynchronous e-learning can be effectively used during demanding clinical care rotations, especially when duty hours are limited yet curriculum requirements remain high. In continuing medical education, physicians with daily clinical obligations can attend medical "e-conferences" using e-learning.

The complexity and breadth of medical education content, together with the scarcity of experts and resources in e-learning, make the creation of centers of excellence in e-learning a reasonable proposition. The Federal Interagency Working Group on Information Technology Research and Development has recommended the establishment of centers to explore "new delivery modes for educating medical practitioners and providing continuing medical education"[33]; e-learning clearly fits that description. Such centers could offer a wide range of services, including system deployment and administration, training of faculty and administrators, assistance in content development, the design of learning pathways and programs, marketing and support, supervision, maintenance, research, and consultation.

The Internet2 is a U.S.-based, collaborative, university-led project started in 1996 to develop additional infrastructure for the Internet backbone capable of superhigh bandwidth.[34] The Internet2's vision of extremely fast speed, complex real-time multimedia capabilities, and quality of service would provide educators enormous potential to enhance the learning experience.[34] Larger bandwidth offers the promise of sophisticated immersive simulations and the use of full-motion video in real time, in both asynchronous and synchronous modes of instruction, delivered to any desktop computer.[35] Many medical schools and health care organizations are already producing high-fidelity e-learning materials, such as virtual patient simulations, that could soon be within the reach of any educator and learner.[35–37]

Directions for the Future

Developments in e-learning and technologies are creating the groundwork for a revolution in education, allowing learning to be individualized (adaptive learning), enhancing learners' interactions with each other (collaborative learning), and transforming the role of the teacher (from disseminator to facilitator).

Adaptive learning uses technology to assess learners' knowledge, skills, and attitudes at the beginning of online training in order to deliver educational materials at the level most appropriate for each learner.[11] In the online environment of e-learning, adaptive learning is possible through identification of the learner, personalization of content, and individualization of tracking, monitoring, support, and assessment.[11,21] Adaptive learning is the ultimate learner-centered experience because it individualizes a unique learning path for each learner that is likely to target his or her specific learning needs and aptitudes.

The potential for collaborative learning to break the isolation of learners is realized in e-learning technologies. Advances in synchronous distance education and collaborative technologies like Weblogs, message boards, chats, e-mail, and teleconferencing are making such collaborative learning more readily available. Quantitative and qualitative studies of collaborative learning in medicine have shown higher levels of learner satisfaction, improvements in knowledge, self-awareness, understanding of concepts, achievement of course objectives, and changes in practice.[38,39]

An evolving emphasis within medical education on lifelong learning and competency-based education has forced educators to reevaluate their traditional roles.[10] In this changing paradigm, educators no longer serve as the sole distributors of content, but are becoming facilitators of learning and assessors of competency. E-learning offers the opportunity for educators to evolve into this new role by providing them with a set of online resources to facilitate the learning process.[10]

Summary

E-learning refers to the use of Internet technologies to deliver a broad array of learning modes that enhance learners' knowledge and performance. There is evidence for the effectiveness and acceptance of e-learning within the medical education community, especially when combined with traditional teacher-led activities in a blended-learning educational experience. Several digital repositories of e-learning materials exist, some with peer review, where instructors or developers can submit materials for widespread use or retrieve them for

creating new materials. The evaluation of e-learning should include a peer-review process and an assessment of outcomes such as learner satisfaction, content usability, and demonstration of learning. Faculty skills in creating e-learning may differ from those needed for traditional teaching; faculty rewards for scholarly activity must recognize this difference and should be commensurate with effort. With technological advancement, the future offers the promise of high-fidelity, high-speed simulations and personalized instruction using both adaptive and collaborative learning. Centers of excellence in e-learning can provide national support for the design, development, implementation, evaluation, collaboration, and sharing of digital e-learning materials. The integration of e-learning into undergraduate, graduate, and continuing medical education will promote a shift toward adult learning in medical education, wherein educators no longer serve solely as distributors of content, but become facilitators of learning and assessors of competency.

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ANNEXE C

2ème Cycle de Médecine à Strasbourg

Liste des cours proposés par module	Descriptif et programme du cours
Apprentissage de l'exercice médical	1
De la conception à la naissance	2
Module intégré et stage de pédiatrie et chirurgie infantile	3A
Maturation et vulnérabilité	3B
Module intégré de psychiatrie et pédopsychiatrie	3C
Handicap - incapacité - dépendance	4
Vieillissement	5
Douleur - Soins palliatifs - Mort - Accompagnement - Anesthésie	6
Maladies transmissibles	7A
Santé et environnement - Nutrition	7B
Immunopathologie - Réaction inflammatoire	8
Athérosclérose - Hypertension- Thrombose	9
Cancérologie - Onco-hématologie	10
Synthèse Clinique et Thérapeutique - Préparation à l'examen classant	11A
Urgences et détresses vitales	11B
Neurologie et neurochirurgie	12A
Appareil locomoteur	12B
Pathologie pulmonaire et thoracique	13

Pathologie digestive médico-chirurgicale	14
Pathologie de l'appareil urinaire	15
Dermatologie	16 A
Ophtalmologie	16 B
O.R.L.	16 C
Maladies du Sang et transfusion	17
Pathologie endocrinienne	18
Pharmacologie générale et médicaments du système autonome DCEM1	
Pharmacologie clinique - DCEM3	E04
E06 : Médecine sociale: Epidémiologie et Santé Publique	E06A
E06 : Médecine sociale : Médecine légale	E06B
E06 : Médecine sociale : Médecine et santé du travail	E06C
Enseignement Complémentaire : EC08 - Formation à la méthodologie de la recherche clinique	EC08
Enseignement linéaire de sciences biocliniques DCEM1	
Modules à option (D.C.E.M.2, D.C.E.M. 3 et D.C.E.M. 4)	
Réponses aux Cas cliniques DCEM1, DECM2 et DCEM3	

ANNEXE D

E-Learning in Process and Chemical Engineering – Trends and Challenges

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Abstract

In the poster, the European Network for E-learning in Process and Chemical Engineering (EuPaCE.net) is introduced. EuPaCE.net is a special interest group that has been set up by seven European Universities to exploit synergies in the field of e-learning for Process and Chemical Engineering (PaCE) education. The poster includes the results of an international survey about trends and challenges of e-learning in academic PaCE education, which was conducted with students and faculty members at the EuPaCE.net partners. Results show that the use of information and communication technologies in PaCE education is still evolving.

1. The EuPaCE.net community

In the European Union, there is a great number and variety of e-learning activities in the domain of process and chemical engineering education. Efforts range from single personal initiatives ("lone rangers", Bates, 2000) to cooperative projects on regional, national or international level. After a time of pioneering and expansion, the lack of coordination between the various initiatives is an outstanding problem, which leads to isolated applications and an insufficient transfer of know-how. Harmonisation, shared standards and communication about best practices and promising approaches is urgently needed to achieve synergies at an international level. Therefore, the following seven European universities have joined together in a special interest group (SIG) to establish of the European Network for E-learning in Process and Chemical Engineering (EuPaCE.net): Technische Universität Berlin (Germany, coordinators), University of Barcelona (Spain), Lappeenranta University of Technology (Finland), UMIST Manchester (UK), University of Oxford (UK), Ecole Nationale Supérieure des Mines de Saint-Etienne (France), University Politehnica of Bucharest (Romania). EuPaCE.net has the following objectives:

- Develop guidelines and identify best practices for e-learning in PaCE education,
- Provide a platform for dialogue to exchange experiences and ideas,
- Set up a network for sharing resources,
- Promote national and international cooperation between higher education institutions, industry, professional organisations, and schools.

The consortium operates the internet portal www.eupace.net, that provides a platform for building an international online community. The portal is based on the *socialware* approach and the technology of useworld.net (Leuchter et al., 2003).

2. E-learning survey

As a basis for the work of the consortium, a survey about trends and challenges of e-learning was carried out at the EuPaCE.net members' faculties in April 2004. The survey comprised the two different groups of faculty members and students. Participants were 16 faculty members and 179 students at six academic departments in five European countries (Finland, France, Germany, Spain, UK).

2.1. Faculty members survey

The faculty members survey was conducted in two rounds. In the first round, a questionnaire was applied, containing 13 questions about computer usage, attitudes towards computer based learning, experiences and opinions about e-learning. About half of the questions were ratings, the other half of the questions had open answers with free text (e.g., "What are the

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major advantages of e-learning in your opinion?"). In the second round, the results of the questionnaires were subject to a group discussion during a meeting of the EuPaCE.net consortium. In average, the participating faculty members were 41 years old and had a teaching experience of 13 years. The most important results of the faculty members survey are summarised in the following. The general observation of "continuity and diversity" for the introduction of e-learning into academic education (Leppori et al., 2003) also applies to the PaCE education sample. Instead of provoking revolutionary changes, the integration of e-learning applications into the curricula is a slow, incremental process. At the moment, only one of the EuPaCE.net partners offers complete online study courses, the others are still traditional campus universities. The most widely used ICT application is offering learning materials for download, and communication via e-mail. Web-based interactive learning modules and virtual courses are still rare. Accordingly, the rationale behind the introduction of e-learning is in most cases the enrichment of face-to-face learning scenarios to improve the quality of learning. The survey revealed a considerable diversity in the use of e-learning within and between different faculties of PaCE. For a staff member's engagement in e-learning, individual preferences are more important than organisational (not to mention national) culture.

2.2. Students survey

The student questionnaire comprised 54 items, divided into four sections: (1) personal data, (2) computer experience, (3) attitudes towards computer based learning, and (4) motivation for studying. In average, the surveyed students (34% of which were women) were 24 years old and had been studying PaCE for 2.5 years. At their homes, 97% had access to a computer, 90% had access to the internet. They used a computer for 29 hours per week in average, about half of the computer time (15 hours) was used for studying, 6 hours of computer study time were online. The differences in computer use time were stronger between different faculties than between women and men. While men still spend considerably more time with computers in total (31.3 vs. 24.5 hours/week), gender differences of computer time for studying are much smaller (men: 15.9 vs. women: 15.0 hours/week). At least for learning PaCE, students' gender does not seem to affect the use of ICT. Currently, the most widely used ICT application for studying is the download of materials (used by 82% of the students), followed by communication by e-mail (54%), web-based learning modules (35%) and virtual courses (10%).

2.3. Synopsis and conclusion

Faculty members and students were both queried about their attitudes towards computer based learning. Measured with 3 items on a scale from 0=very negative to 3=very positive, average staff members' attitude was more positive than students' attitude (2.0 vs. 1.6). Regarding the judgment of different applications, both groups rated download of materials as most important (staff: 2.4 vs. students: 2.3). While staff members gave higher ratings than students for the importance of web based learning modules (staff: 2.1 vs. students: 1.6), students gave slightly higher ratings for communication with ICT (staff: 1.8 vs. students: 2.0).

Summing up, results of the survey show that the use of ICT in PaCE education is still evolving. Virtually all students are already using computers in their daily life and for their studies. Students' attitudes towards e-learning are slightly positive, but there seems to be no urgent demand for new applications from their part. So, the driving force for innovations will be the faculty members. The great challenge for EuPaCE.net consists in building a community that bundles the efforts and makes sure that the "lone rangers" do not get annihilated in the academic wilderness.

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