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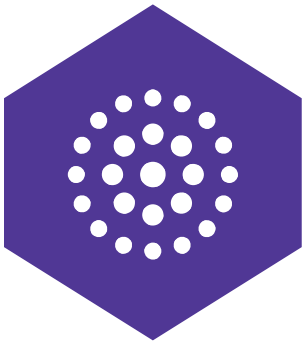

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## Educational Model for Scenarios of Ubiquitous Learning

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# Educational Model for Scenarios of Ubiquitous Learning

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*Abstract: The present paper presents a proposal of an educational model for Higher Education Institutions, based on the principles of ubiquitous learning and its main advantages in order to strengthen the teaching and learning processes. The model proposes a systemic structure in which, the elements are interconnected on a network scheme without the intervention of hierarchies or pre-established orders, enabling new elements or connections to be incorporated into the system at any moment and influence it according to their level of communication with one another. Therefore it is intended to place the learning process as the core that articulates the different available technology mediations with the follow-up strategies that incorporate skills-based education and progressive assessment mechanisms for the student, allowing them to validate their concepts and their argumentative and knowledge apprehension competencies, leveraging team work as a means for approaching problems, developing projects and collaborative product creation, favoring communication and discussion between professors and students.*

*Keywords: U-learning, TAG, Ubiquity, Educational Model, Technology, Learning, Teaching, Higher Education Institutions*

## Introduction

With the evolution of technology, new ways to communicate and access knowledge begin to emerge, facilitating its democratization process regardless of time or location of people. Those people not only search for information, but they also create and share that information immediately via their devices. This scenario offers new possibilities for learning, such as removing the barriers of time and space, or at least part of them, aiding mobility and at the same time enabling the identification of interests, learning styles and needs of the user according to their context, in order to provide the best experience possible to the student.

From Spivakovsky et al. (2012) it can be emphasized that Information Technology (IT) is an important tool to optimize the performance of a university because this infrastructure becomes the backbone for decision-making processes in strategic and operational management. In this way, organizations such as IMS Global Learning Consortium (http://www.imsglobal.org) have concentrated their efforts to generate standards and best practices to advance the affordability of technology in order to expand and improve student participation and student performance.

It can be stated that context awareness, invisibility of technology and mobility are important elements in the learning process, but in order to take advantage of them it is necessary to adjust the pedagogical models and practices as well as the culture of users and institutions including management models.

This conceptualization corresponds to the essential characteristics of ubiquitous learning, which has been listed by several authors as a new educational paradigm made possible, in part, by the possibilities offered by digital media (Yahya et al. 2010, Zhang 2008, Yamamoto et al. 2010). Additionally these authors state that currently a development of m-learning have increased and the first stages of u-learning. Furthermore, they predict that in the near future learning will be integrated into everyday life through services and applications such as nanotechnology, Web OS and artificial intelligence.

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## Higher Education and Ubiquitous Technologies

### *Trends and Changes in Higher Education*

Several authors have laid their views on the future of higher education in the world. Through Inayatullah and Gidley (2003) and other publications several approaches and beliefs can be identified.

For example, Dator (2003) establishes three aspects that the XXI century universities need to learn, if they seek to form better citizenship skills in the XXI century. These aspects are: the change into culturally diverse curriculum, the development of the multi-disciplinary environments and the contribution from invention and creativity to manage new paradigms in political economy and learning communities

From Inayatullah and Gidley (2003), four factors that motivate transformation in higher education systems can be identified:

- Globalization, seen as the release of capital and the domestication of labor.
- Multiculturalism, from the perspective of different views as individuals that know the world, even when reality is socially constructed and the community should genuinely reflect that reality.
- Internet, particularly because of the ability to create virtual universities and the decentralization of higher education.
- Politicization, referring to the increasing attempts to use the university to take repressive actions, and to make it a place of dissent, while in North America, university is related as part of the economic rationalization of society.

Finally, it should be noted that in addition to the challenges facing the XXI Century University, it should also be prepared for Scott (2006):

- Constant search of knowledge in all ways. The university should have a double front in the pursuit of knowledge: develop higher creative thinking and contribute to the solution of specific needs of their country and the world.
- The expression of capabilities of the human condition: thought and creativity.
- Learning languages and symbolic representations of knowledge, and its many inter-relationships.
- Learning skills, values and attitudes that allow the use and permanent enlargement of knowledge, the way to share it and apply it ethically.
- Active participation in the emerging changes and transformations of social, cultural, scientific and technical environments.
- Learning to understand, maintain and respect the environment.
- Intercultural, transnational and interdependent life, a university for elimination of all forms of discrimination.
- Formation of democratic citizens oriented towards tolerance, scientific and humanistic thinking, critical thinking, esthetic thinking, problem solving and the ability to undertake.

### *Ubiquitous Technologies in Educational Contexts*

To review use of ubiquitous technologies in educational contexts it is important to address the future vision developed in the Horizon Report 2013—Higher Education Edition (New Media Consortium 2013), which emphasize the importance that some tools start to gain in the academic

sector such as: Learning Analytics (Big Data); Internet of things and Virtual and Remote Laboratories.

Then, several international initiatives that demonstrate the presence of ubiquitous technologies and their penetration in different contexts are mentioned.

Reviewing the Asian continent it is possible to highlight the great commitment from its countries to generate policies around the use of technology for education in the form of White Papers, which have been published by the Center of the International Cooperation for Computerization (CICC) in 2006, about Study "E-Learning in Asia". Similarly, "The UNESCO ICT in Education Programme" (UNESCO 2007) shows an overview of the adoption of ICT initiatives in education supported by the organization in that region.

Both reports show a clear trend in designing and building policies and projects that favor the adoption of technology in the educational process in Asia.

The European vision focuses more on the development of citizens towards creativity and innovation through ICTs (Revista Colombiana de Telecomunicaciones (RCT) 2009). i2010 is a strategy launched in 2005 by the European Community, which seeks to establish a single European information space, including affordable and secure broadband communications, diverse and rich digital content and digital services, and strengthen the investment for research, innovation and social inclusion under a regulatory framework for ICTs.

In addition, (WORLD SUMMIT ON THE INFORMATION SOCIETY 2003), conducted in 2003 and 2005 in Geneva and Tunisia respectively, shared the vision of an "information society centered in the person, inclusive, development-oriented, in which everyone can create, access, utilize and share information and knowledge... [1]". It also raises as a challenge to promote the objectives of the Millennium Declaration, among which are: universal primary education and promoting gender equality, etc. All these elements are treated from regulatory fronts, technology infrastructure, training, entrepreneurship, international cooperation and generation of digital content and services.

### *Ubiquitous Learning Experiences in Higher Education*

According to Roschelle (2003), Ogata et al. (2008), and Ogata and Yano (2004), based on the characteristics of systems using ubiquitous technologies developed for university contexts, they can be classified as:

- Classroom Response Systems: Systems that allow the teacher to perform short questions to the group in order to obtain a previous diagnosis.
- Collaborative Data Gathering: Systems that allow the collection, transmission and analysis in real time, in order to focus students on the interpretation of the phenomenon.
- Participatory simulations: Students can do internships and simulations along with peers collaboratively through mobile devices.
- Other applications: Applications that support the student at the time of revision of topics, among others.

However, other authors reduce the categorization into two groups: 1) The applications that directly support the teaching-learning process both inside and outside the classroom, keeping track of all academic activities, facilitating access and content creation, the delivery of reports, communication among peers and experts, collaborative work, evaluation and monitoring and the development of "ubiquitous teacher", 2) developments that focus more on the ubiquity of the

1 WORLD SUMMIT ON THE INFORMATION SOCIETY. Declaration of Principles: Building the Information Society: a global challenge in the new Millennium, (Geneva: http://www.itu.int/wsis/docs/geneva/official/dop.html, 2003), 1.

campus, to learn about different events and activities occurring on campus or strengthen social networks among the members of a university community, recommendation systems and to place "virtual graffiti". Generally, functions to support the learning process at all times and places.

Both perspectives agree on the key factors to determine the existence of the so-called Ubiquitous Learning. These elements are formed by social networks, the recording of learning activities, the active location and the geo-location of those involved in the teaching-learning process. Therefore, it is important to add that new concepts like collective intelligence (Grubber 2007, Tovey 2008) and analysis of digital ecosystems[2] and their applications in the world of higher education become additional tools to detect the presence of ubiquitous learning principles in academia.

## Educational Model Proposal for Scenarios of Ubiquitous Learning

Once addressed both future trends in the university context, as the potential of U-Learning and some of its many opportunities in this context we proceed to propose a new educational model, which is definitive for the development of the curriculum of a university program since it defines the scope, roles and methodologies to ensure successful learning under the precepts of ubiquitous learning (Kalantzis and Cope 2009).

The proposed model is a systemic structure, which means that the component parts have relationships with one another and interact in a network scheme, without the intervention of hierarchies or pre-established order. This provides the ability to incorporate new elements or categories into the system at any time, and affect it in conformance with its adaptation levels and its communication with the other proposed nodes.

Basic principles on which it is based are equilibrium, sensitivity and connectivity.

Table 1: Basic Principles for Educational Model for Scenarios of Ubiquitous Learning

| *PRINCIPLES* | *PERSPECTIVES* |
|---|---|
| Equilibrium | Assumed as the ability to harmonize the appropriation of multiple technologies to support the learning process as well as the incorporation of different types of learning and the attenuation of the barriers between teachers and students. |
| Sensitivity | From the capability to receive signals from the context (geographical and socio-cultural) of the learning styles of the students and their level of use and preference for available mediations. |
| Connectivity | Capability to do the connections between the different components of the model to promote cooperation and sharing of content, experiences, methodologies, criteria, among others. |

The purpose is to create a synergy of three clearly defined entities that come together in a fourth: learning, as core and at the same time as a natural consequence of the actions, attitudes, skills and competencies that learners develop in any educational process. These entities are:

- Learning, understood as final receiver of the actions developed in the rest of the system, but also as a determiner of the dynamics of the model, in accordance with

2 http://www.digital-ecosystems.org

the type of learning to use in the different activities that are designed and the role of the teachers and students in them.

- Mediations, which can or not use ICT as an enhancer.
- Monitoring strategies that incorporate skills training as a central focus of curricula and micro Curricula and the progressive assessment mechanisms for students, allowing to validate their concepts, their argumentation abilities and knowledge apprehension.
- Communication and Involvement Strategies as tools that articulate teamwork and knowledge building for the development of projects and joint creation of products that have ongoing support and advice of teachers.

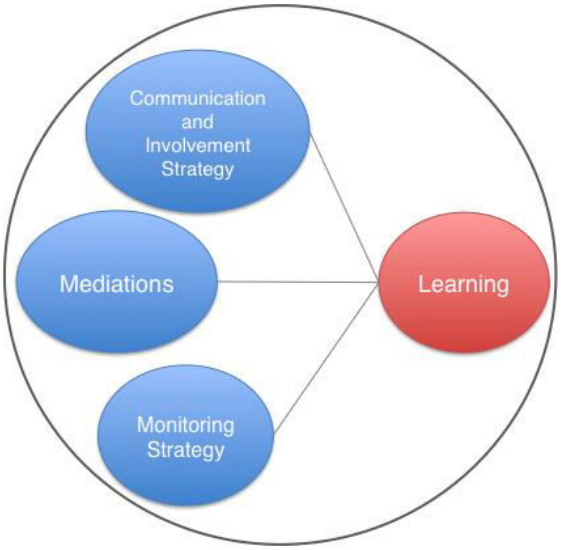


Figure 1: Educational Model for scenarios of U-Learning

Increasing the focus of observation in each of the general elements of the educational model found the following characterization for each.

- Learning: As sub-nodes of the learning component it is possible to find the "Types of Learning", "Activities" and the "Learning Subjects". The first dealt with from the perspective of Ausubel et al. (1990) when they state that "no theoretical interest is more essential and urgent in the present state of our knowledge than the need to distinguish clearly the main types of learning..."

Research in Education cannot ignore that classification and the influence of the way of learning in how meaningful the learning process can be and in the characteristics the new environments and resources must have. In this sense the types of learning that the model privileges are: observational or modeling (Bandura 1997), by discovery (Bruner 1988), meaningful (Ausubel 1973, 2002), conectivism (Siemens 2004) and the ubiquitous learning (Kalantzis and Cope 2009).

On the other hand, subjects were defined as those actors directly involved in the learning process: students and teachers. Some of the most important roles that each subject should be developed under the proposed model are:

Table 2: Faculty and Students Role

| FACULTY ROLE | STUDENTS ROLE |
|---|---|
| • Present, guide, plan, stimulate, rethink content and guide the learning process.<br>• Create their Personal Learning Environment (PLE) and motivate students to build their own, and interconnect them.<br>• Put the knowledge built in contexts of application.<br>• Promote awareness about ethical use of ICT and respect to copyrights.<br>• Innovate teaching the use of collaborative tools and ICT (essentially transmissive, active and interactive) (Galvis 2004).<br>• Promote the use of networks for knowledge distribution in a systematized and organized way.<br>• Reflect on the opportunity of having knowledge distributed in networks, organizations and devices, and not just in people.<br>• Answer questions about pedagogical, epistemological and disciplinary approaches of the contents shared by them and their students.<br>• Link the educational research and the use of learning analytics.<br>• Build learning activities optimizing the mediations.<br>• Train students so that upon completion of the course, they keep their learning networks active and in continuous growth. | • Reflect on the problems they are working on.<br>• To appropriate, research, extend and confront the information they are provided with.<br>• Continue the discussion with their partners using the different mediations at hand.<br>• Become aware of the ethical use of ICT and its importance to achieve a correct digital citizenship.<br>• Take responsibility for their learning process and its control.<br>• Become aware of their duties and obligations and the times that they need.<br>• Acquire autonomy and discipline of work.<br>• Receive and discuss the work plan with their teacher, to solve questions or to structure the relevant support. |

And finally, the activities, which are the place where the teacher's actions that favor the students learning process become concrete, because it is not about proposing certain contents but also it is about designing the types of interaction that the student will have with these contents, from the perspective of appropriation and construction of knowledge as well as from its assessment and evaluation.

That is the reason why, in order to design activities, it is imperative to cite (Garrison 2011), who identifies three fundamental entities in the design of the learning processes: a) the teacher entity, developed from the actions of designing, enabling and orienting the cognitive and social process with the purpose of achieving meaningful educative results; b) the cognitive entity, in relation with the design of the interactions that happen between the student and the specific learning contents, starting from the design of resources and available mediations and c) the social entity, defined as the student capability to blend in in work areas with the rest of participants (teachers and peers).

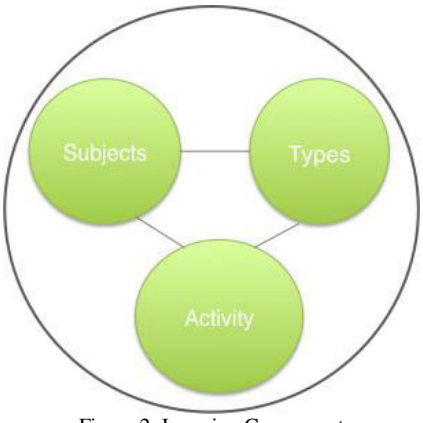


Figure 2: Learning Component

- Mediations: It refers to all those computational or non-computational tools that allow students to have a new learning experience. In this sense, those mediations that eliminate time-space barriers, making learning subjects can continue functioning synchronously or asynchronously and across multiple (fixed or mobile) devices, showing postulated as (Weiser 1993) said "you focus on the task, not the tool" and ensuring that their learning experience is sensitive to both the context of the individual, such as your preferences and tastes to choose one or several mediations. Some of these are shown in the graph below:

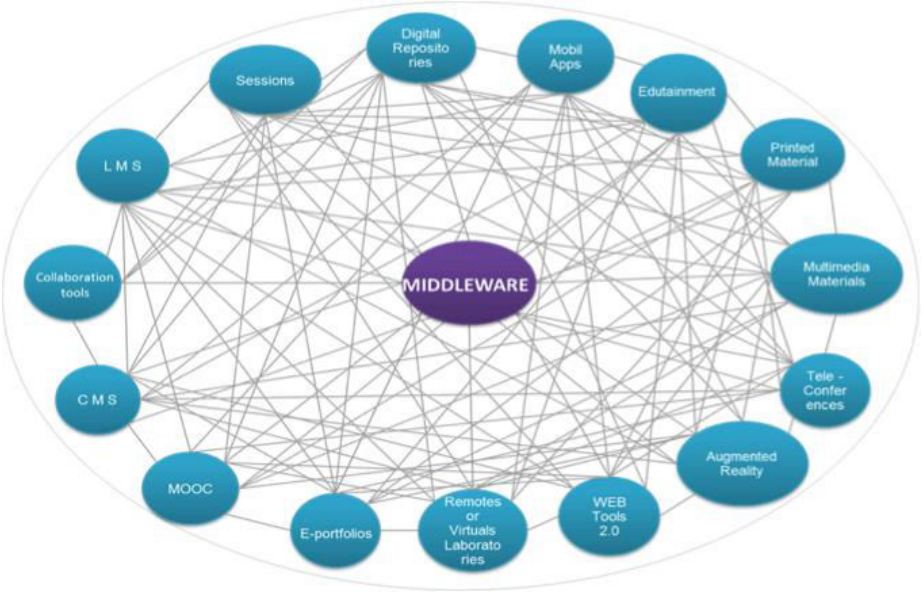


Figure 3: Mediations

It should be highlighted that all these mediations facilitate learning inside and outside the classroom, and they should converge on a single computerized core (middleware) able to perceive the environmental conditions of the subjects and their tool usability preferences when facing learning dynamics, and also be able to process and adapt these inputs and transmit to each sub-node the proper way to display the different contents and activities, generating a

personalized experience for students and teachers. In a similar way, the middleware should be able to self-manage and self-learn according to the versatility of the subjects over the use of tools.

For that reason it is necessary that user experiences (online or offline) are registered appropriately. An interesting standard to represent experiences is Tin Can API[3] and its Experience API, because ubiquitous learning also assumes the Invisible Learning (Cobo Romaní and Moravec 2011) premise in regards to the possibility of knowledge and competencies acquisition at any moment, place or by any means. In that sense, Tin Can API will allow creating, recording and registering activities, whenever and wherever the learning process happens, with the help of a LRS (Learning Record Store[4]).

- Monitoring Strategy: Involves the mechanisms to ensure that learning is productive, i.e., allowing the trained professionals not only to have a compendium of technical knowledge and expertise in their discipline (acquired through the study of their curricula and rated under a scheme of formative assessment[5]), but with a high degree of apprehension of the so-called "soft skills".

The triad made of: competencies, assessment and appropriately designed curricula and micro-curricula, must tend to encourage in institutions and their educators the idea that learners should enhance their theoretical and abstract thinking abilities, strategic thinking, to respond creatively to new situations, comprehensive understanding of the global technological process, with solid logical-mathematical and computer science formation; with autonomy in the decision-making process, and finally, aware of quality and performance criteria (Filmus et al. 2003).

The evaluation will be developed along the academic periods, allowing to observe and assess the changes that occur, facilitating the adaptation of activities and methodologies. The contributions of the students, the level of argument, and the language used, built relationships and categories will be considered high value judgments in the evaluative stage. The tests will be a complementary part.

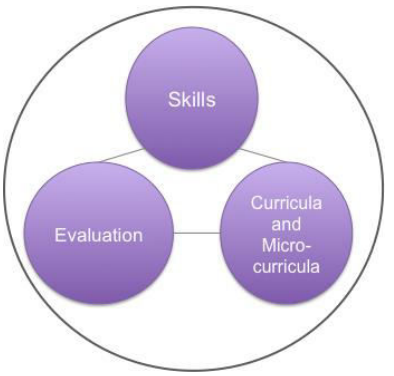


Figure 3: Monitoring Strategy

3 www.tincanapi.com

4 An LRS allows to identify what, how, and who has performed an activity, specifying a "Subject," "Verb or action," "Learning Object," example: I sent an e-mail. These LRS are independent from an LMS, because these activities could happen inside or outside an e-learning platform

5 Developed along the academic periods, allowing observing and evaluating the changes that occur, facilitating constant adapting activities and methodologies. The contributions of the students, the level of argument, the language used, built relationships and category judgments are considered as extremely valuable in evaluation stage. Periodic tests will be a complementary part.

- Communication and Involvement Strategy: Through this strategy, self-learning and abilities to interact with peers, teachers and the environment are promoted. Seeking a mix among personal experience, group research process and management of knowledge with the support of mediations arranged by the educational model, creating favorable environments so that in the interaction with follow-up (monitoring) strategies, spaces for self-assessment and peer assessment can be found.

Particularly in this component it is even more necessary that the teacher fulfills his/her role of guide and leader, made explicit in the roles proposed in the model, because he/she must stimulate the construction of knowledge, the collaborative work and the team work interaction towards the acquisition of the objectives established in the activities.

The fundamental purpose of the accompaniment is materialized in the possibility to consolidate the coordination of mediations and the design of the most appropriate collaboration mechanisms in order to achieve the learning objectives in each specific case, favoring maximum personalization.

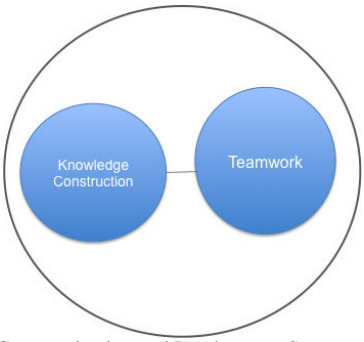


Figure 4: Communication and Involvement Strategy

Concretely the model intends that the student takes full advantage of his/her learning style guided by an exhaustive design of didactic activities proposed by the teacher, under an environment where available mediations are used as a means towards the achievement of objectives and where the knowledge construction processes as well as the ICT appropriation, competencies acquisition and evaluation are adaptable according to context conditions and the learning subjects.

The design for the development of skills required in the model responds to the following process model, where the mission, strategies, services and users are outlined.

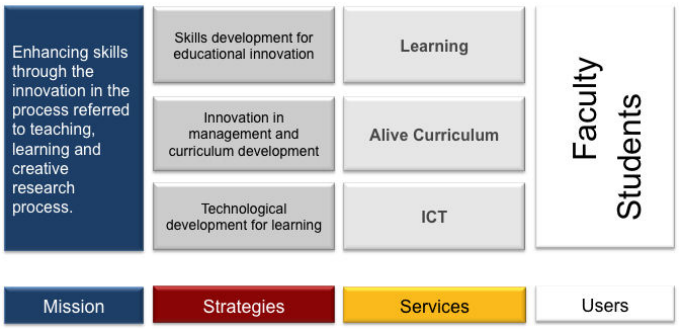


Figure 4: Process Model for skills development

*Source: Proyecto 50 – Universidad EAFIT (2013)*

## Conclusions and Future Work

After the analysis of trends referenced in this article, concerning the prospective of the mission of universities in the twenty-first century and the impending arrival of emerging technologies in the education sector, it could be concluded that the proposed educational model for learning ubiquitously, that has been presented allows the incorporation of these trends and retains the versatility to be adapted in the academic programs of higher education institutions with fully virtual vocation or those that intend keeping your face design incorporating ICT in their teaching and learning.

This model pretends to be a foundational base for vocational and context particularities of Higher Education Institutions, making it clear that the three components are equally important. Additionally, it favors seven U-Learning principles, proposed by (Kalantzis and Cope 2009), which were proposed as changes to be implemented in the current education environment.

- Blur institutional, spatial and temporal boundaries of traditional education
- Reordering the balance between teachers and students
- Learning to recognize student differences and use them as a productive resource
- Expand the range and combination of modes of representation
- Developing the skills of conceptualization.
- Connect your own thinking with distributed cognition
- Cultures build collaborative knowledge

Also, the model allows the incorporation of such tendencies and keeps the versatility to be adapted in academic programs in Higher Education Institutions with completely virtual vocation or those that while maintaining their on-campus-classroom-based conception intend to incorporate ICT in its teaching and learning processes.

Similarly it serve to strengthen the Learning dimension in TAG Model (Zea et al. 2012), which is being consolidated to become a tool to asses the level of ubiquitous learning a Higher Education Institution.

The next step with this theoretical model will be the exposure to academic criticism and the adaptation and implementation in a cohort of one higher education program, with the purpose of performing the necessary adjustments and transcend to its complete implementation in the selected Institution. Both experiences will be monitored with the goal of performing an impact assessment on the process and the resulting outcomes.

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***Ubiquitous Learning: An International Journal*** sets out to define an emerging field. Ubiquitous learning is a new educational paradigm made possible in part by the affordances of digital media.

Ubiquitous Learning is a counterpart to the concept "ubiquitous computing", but one which seeks to put the needs and dynamics of learning ahead of the technologies that may support learning. The arrival of new technologies does not mean that learning has to change. Learning should only change for learning's sake. The key perspective of the conference and journal is that our changing learning needs can be served by ubiquitous computing. In this spirit, the journal investigates the affordances for learning in the digital media, in school and throughout everyday life.

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