Creation of Meaningful-Learning and Continuous Evaluation Education System

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Abstract. This paper is based on the principal bases defined in the theory of communication of McLuhan and the principles of David Ausubel. We want to propose a system that allows teachers to perform a methodology based on meaningful learning and a continuous evaluation system. We take McLuhan's theory of communication as a process of creating curricular programs and turn the theory of knowledge into one based on meaningful learning. Therefore we perform a methodology to be explored by students, and teachers could develop their work through exploration within the teaching-learning process.

Keywords: Educative systems · Cloud computing · Web Services · Systems architecture · Students curriculum · Educative curricula

1 Introduction

In this paper we describe an adaptation of McLuhan [2]. So we proceed from the need of teachers for a process of evaluation and for qualification in new methods, and through the exploration of student work within a system of continuous evaluation. The following sentence is the reason we decided to start this research: *"I do not explain anything. I explore"*.

The work and ideas of Herbert Marshall McLuhan (1911–1980) obtain more force and effect in science communication and social behavior within the framework of the mass media with each passing day. His most notable works are *The Gutenberg Galaxy* (1962), *The Global Village* (1989) and essays such as "Joyce, Mallarmé and the Press" or "Laws of the Media", all included in the McLuhan anthology. *Essential Writings* (1998), and *The Gutenberg Galaxy* popularized his ideas about the media, and for McLuhan, the culture that is just based on the book has been completed.

A premise of education is that it must adapt it to its society; we hear from the media companies' terminologies such as Society 2.0 and Society 3.0, based on the definition of information systems. In this research we aim to use these societies by following McLuhan and communication technologies adapted to the educational world. Thus we have developed a specific and concrete methodology based on technological influences

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and the transmission of content. That is, the classroom becomes a transfer of content, and use McLuhan teaching-learning sentences:

- "The medium is the message".
- "Restructuring of the contents".
- "In a pre-alphabetic world, words are not signs."
- "We return to the acoustic space".

Also, we must consider student assessment and personalized follow-up. The teaching methodology uses these premises to improve the student's work in the classroom. Thus through the acquisition of knowledge, it can be argued that by receiving meaningful learning as taught by David Ausubel [2], meaningful learning becomes focused. For this reason we use a translation of McLuhan as the basis of self-sufficient reception learning. Thus, we will use the full potential of students and information technology.

2 State of the Art

We have to consider the creation of this platform from two points of view: (1) from the viewpoint of the teachers' work in preparing classroom activities; and (2) from the students' evaluation process of exploring the objectives achieved in the contents developed by the student through meaningful learning. According to McLuhan, the influence of communication technologies on the content they transmit is a wholly generic synthesis of thought. McLuhan's theory is based on the laws of communication [1] and patterns of communication [3]:

- The medium is the message: McLuhan adopts the concept elaborated by anthropology, according to which instruments and tools are considered to have been created as extensions of the human body. Now everything is immediate, reproducible, and combinable; there is no longer a place for everything and a time for every event. The time and space make the means for us, but also we ourselves are able to manipulate them.
- Restructuring of the Contents: Our perceptions have shaped the way we understand and think. These effects are so important that they cause distinct stages in culture. From here, McLuhan, in a historical perspective, describes three eras of humanity, which are: oral communication, written communication, and the electronic or global village.
- In a pre-alphabetic world words are not signs. This refers to the first stage of humanity, an era in which the only means for the transmission of messages is the spoken word. There are no procedures for the storage of information beyond human memory. Humans of the pre-alphabetic era had a world-view that placed great importance on the sense of hearing. The ear prevailed over vision, which created a conception of an inclusive world. With alphabetic writing came a move from a culture based on oral, direct communication, favoring an emotional type relationship, to another in which abstract rationality prevails. It is a visual activity, not only hypertrophying the sense of sight, but also distorting the harmony of the proportions

of the five senses. The written culture has unstructured relationships that kept the senses different. McLuhan wants to highlight that texts favor abstract rationality, seeing things and the world as a process, the ability to discern and classify those complex units, used first, within the group.

- We return to the acoustic space: time and space merge into the current physical on a space-time continuum, which brings us to the notion that humans cultures had in past, and still maintain communities not influenced by Western culture. Audiovisual media require the presence of transmitters and receivers in two spaces, but not in a time unit. Written communication does not require either temporary ownership or space, and fosters an enabling environment of abstraction. Broadly speaking, the main feature is that it relies on involvement, simultaneity, discontinuity, and space-time, and tends to develop at work by defragmentation and political participation by television. It should also be noted that it imposes a new electronic interdependence and a new concrete and immediate relationship, which not only detribalize, but also recreate the world in the image of a global village.
- I do not seek, I find: it is precisely the ability to see reality as multisensory that McLuhan proposed as a mechanism. The tetrad, taken as a whole, is the manifestation of how the human mind operates. This is similar to the semantic mechanism that makes the trope known as metaphor. This provides the shifting of a hidden background to the foreground of perception. The scientist, immersed in the visual world (sequential, linear, logical) asks questions concerned with reality and acts consistently. Conversely, the browser enters an area of complexity, not knowing what to find. It cannot have a logical plan of discovery. It must be delivered into the complexity with all senses alert.

Once we have described the usefulness of the media, we must first think of a teacher as a communicator. In addition, we must apply this methodology to other developing methodologies of teaching in the classroom. In this case we turn to the didactic methodology of David Ausubel, meaningful learning. In meaningful learning, ideas are substantially related to what students already know, and new knowledge is closely linked to the previous ways it is used to be performed by:

- The learning content is potentially significant, i.e. it must be able to be learned significantly.
- The student must already have the concepts used in a preformed cognitive structure. Thus, in this way the new knowledge can be linked to the previous one. Otherwise, the assimilation fails.
- The student must demonstrate a positive attitude toward meaningful learning. They must demonstrate a willingness to relate the learning material to cognitive structures that they already have.

Meaningful learning requires finding out what the students and teachers know already, which determines the working of the methodological strategy, but not the purpose, content or sequence of the curriculum.

3 Application and Adaptation of the Methodology

At this point we will try to give an overview of what type of methodology would be necessary to use McLuhan's theories for meaningful learning. On the one hand we establish the basis for a theory of knowledge and meaningful learning. The process of learning is based on information technologies. Therefore we adapt the phases and the teaching-learning process of McLuhan, as we have an amply demonstrated starting point, discussed and dealt with in the world of communications. McLuhan's phases must follow some specific steps within the child's process of learning, and must be adapted first to the educational environment and analyzed within the whole educational world. In this case, moving the steps or phases that McLuhan sets within the educational system will allow for meaningful learning. The steps we have to take into account are:

- **The medium is the message:** we need to create a system that is an extension of the classical teacher's notebook, which picks up his notes and the classroom activities, centralizes his administration, and also enables a communication channel for the teacher with parents, students, other teachers, and other members of the educational community.
- **Restructuring of Content:** The work of teachers and students towards meaningful learning leads to the creation of content. Therefore the work on the content must be allowed to modify through a system that allows the creation of content from content made before, which is a time-saver for teachers.
- **In a pre-alphabetic world, words are not signs:** At the present time and in the present educational world, educational content focused on the internet is a given; society has advanced in some points of view from the book. For years the only educational content at the disposal of both teachers and students was textbooks and teachers' notes, but now we all know this has changed.
- **We return to the acoustic space:** The transmission of the content in this case is done from three points: on one hand the teacher transmits the content, and the student learns from that content; this entails a relationship with the outside world which is implemented by the ICT and communication with other students; thus we have to emphasize improving collaborative work in the classroom and facilitate this type of work in the classroom.
- **I do not seek, I find:** In this section we understand that teachers and students develop their work to meet their needs on the internet. This is done through an initial search and easy navigation through the material. On the other hand the teacher performs an evaluation process by scanning the contents.

Adaptations or creations of methodological aspects need to be moved to ICT. That is, ICT methodologies for educational environments are necessary for the teaching-learning process, and also to present curriculum content, students' work, and integration. A methodological adaptation requires a process of previous research. As seen in the above description, we need a system that allows us to develop different parts of the required methodology, and also allows an operation in ICT environments.

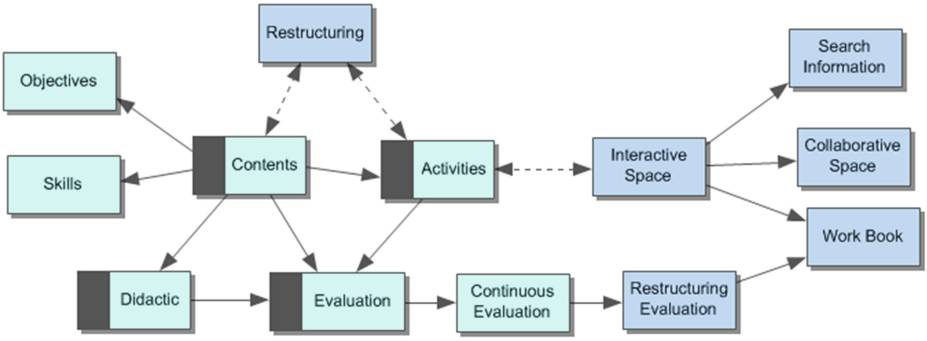

Fig. 1. Teaching-learning process diagram

In Fig. 1, the green color shows the different parts of the teaching-learning process; these parts have been worked on in previous research [5, 7, 8]. The educational contents are structured and cataloged to order achieve aims and educational skills. From these contents, work activities are performed, correcting these teaching contents. Evaluations of activities within a continuous evaluation process are necessary elements for the teaching-learning process. That is, we need documentation of educational content and organization of the work, as done by the teacher [4]. In this way, teachers have a system that allows them to manage educational content based on the teaching-learning process.

As we can see, the process of evaluation in the teaching-learning process is performed continuously throughout the process. This requires restructuring of the evaluation process. We need to modify the teachers' workbook according to the students' work in their notebooks, and in turn restructure the students' activities in terms of their progress in achieving the objectives and the basic skills. These are evaluated in the activities of the students, and, as we have developed in other research, this is achieved by treating the educational curriculum as part of the curriculum or history of student learning [5, 6]. The curriculum and the educational curriculums of the students are fully linked, as students develop their curriculums to arising from curriculum education laws. This also involves the modification of both the activities prepared by the teacher and of the exercises and the work done by students.

4 Design Patterns

We have described the adaptation or creation of teaching methodology, justified by prestigious authors and including the use of ICT, where the method and methodology in developing a formula that allows the inclusion of ICT in the classroom-to-classroom education curriculum is implemented [7].

In this section we discuss design patterns. This is done from the point of view of the structure of these design patterns as developed in the thesis [8], where patterns are developed. In this first application of the method, we develop patterns generically, by indicating a first group and then from discussion and debate in scientific forums

developing the contents thereof. This can be done because of our research background in the application of ICTs to the classroom. In this methodology we have isolated the following patterns:

- **Curricular Patterns:** These patterns are responsible for establishing the relationship between the different elements of the teaching-learning process. These are focused with the aim of establishing the evaluation of the student in the process. This pattern also includes necessary elements that are defined by the contents, activities and evaluative elements, including objectives and competencies. These elements have a relationship with each other in defining the evaluation, making it an evaluation rather than a memo. It will be well-defined according to the score of each of the parties, evaluating the students through the level of achievement of each of the objectives of each of the core competencies. These are not patterns; they are statements of curricular pattern corresponding to the evaluation. In this way we can modify the states over time, taking into account the parameters defined above for the group of students in the teacher's programming. Setting the minimum and maximum for the students to perform allows for paying attention to diversity in the case of students who do not meet the minimum or are above the maximum, thus serving students who are above or below the level of achievement of objectives.
- **Restructuring Pattern:** This pattern makes a break in the process of teaching and learning. Thus the teacher can make a modification of the process. It is a pattern that performs a state change in the curriculum pattern, and thus achieves a curriculum adaptation or modification to enhance the strengths and weaknesses of students. In addition, it allows the achievement of the objectives.
- **Interaction Pattern:** These patterns are intended for the creation and modification of activities for teachers. Additionally, this should facilitate collaborative work in the classroom and internet search information by students. As a result, this facilitates the consultation of information that teachers leave prepared for the performance of their activities. These interaction patterns are also used to edit the objects with which students and teachers work together in the classroom with patterns to share information, to add specific objects to other objects' modification, and to provide educational objects and patterns designed to share information among members of the class and the teacher.

Educational patterns are focused on areas that teachers need to do their work in the classroom. In this way we combine and integrate these patterns into an architecture that supports these features.

5 System Architecture

Cloud systems allow the integration of services and functionality in a single workspace. The users can develop their work and the system allows flexibility and growth according to the appearance of new features. These aspects make cloud systems ideal for inclusion in application platforms and educational environments, as these require a multitude of services that allow their proper functioning, and the system can develop according to new situations and the requirements of teachers.

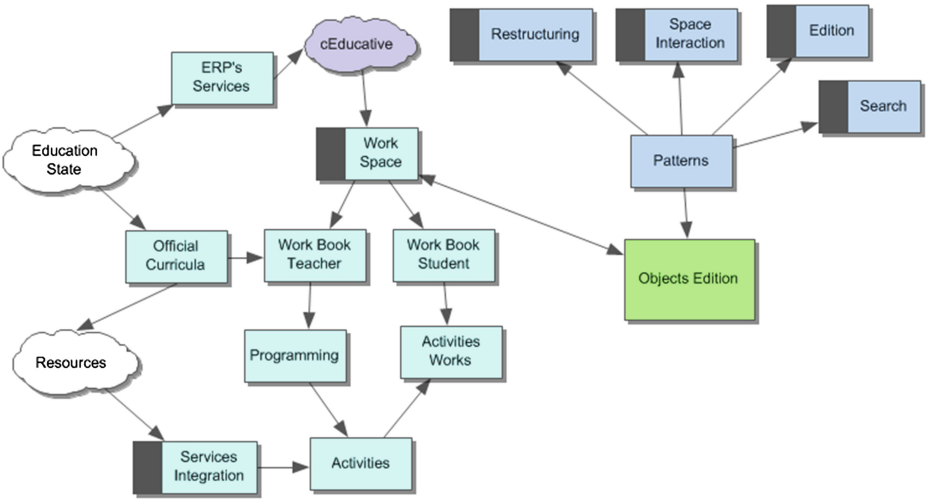

Fig. 2. System architecture

Curriculum systems in the cloud are a reality. Where some research give the integration of various systems in the cloud [8], it is possible to integrate environments defining these new services and educational methods within the systems themselves.

Figure 2 shows how the system allows integration with other systems, in this case by integration of services, which allows access to the systems that provide the resources, linked and indexed with the official curricula. From the organizational point of view, integration is important for creating users with educational ERPs within public administrations. The Web Services can perform this integration of different systems, which is by specifying a standard allowing the integration of these systems. The cloud "cEducative" is the core of this research; this cloud defines a workspace for users of the system, in this case teachers and students. Teachers conduct their activities from the workbook that includes programming, which consists of activities and curriculum elements as defined above. These activities comprise the student workbook, in which students solve problems and work with activities by editing patterns. An important aspect is the user interaction in classroom-to-classroom education. We define a space of interaction for users, in which, from patterns and editing of objects, students can perform collaborative work in the classroom, and editing these objects leads to the successful completion of the relevant activities [9, 10].

We are therefore faced with the same system, where the interaction takes place between the devices themselves that make up the micro cloud. Figure 3. Shows the different parts that make up this architecture. Figure 3 shows the different parts that compose that architecture.

We conducted a hybrid cloud on the device that consists of the following parts. On one side, there is all the logic storage, where, through a database SQL Linte for mobile devices, this database performs database operations. On the other side we have a storage repository for objects, which can store either objects in XML format or the serialized object itself, and a file system for the application where the necessary files

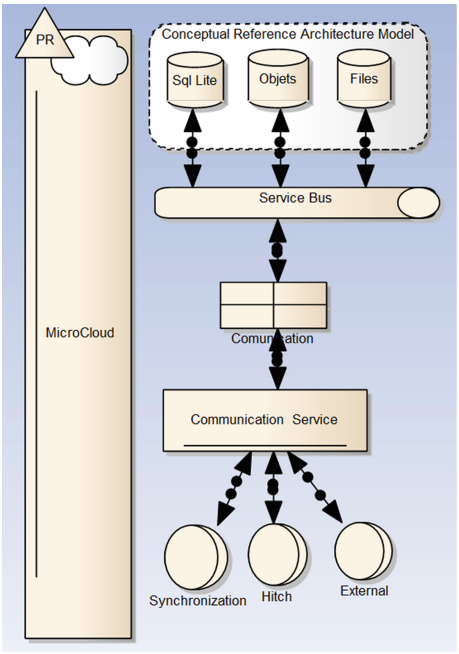

Fig. 3. System architecture in the micro-cloud

would be stored. The communication service comprises a programming package. This receives data from the device itself and tails synchronization and external engagement. These queues allow processing of information in the device asynchronously or synchronously, depending on the type of information being processed. The sternal queue receives data from other devices that make up the cloud micro, and should have a higher priority to allow interaction between devices in the micro cloud and the passing of information to each other.

These services facilitate communication device interaction in the cloud and allow its use in classroom education. The need to treat these devices independently facilitates the creation of activities by students and staff working in the classroom. It also simplifies the maintenance process and the integration with other devices, such as tablets, computers, or smart TV, which pupils and teachers may have at their fingertips.

6 Conclusions and Future Work

In this article we have adapted a method using ICT, as we have seen the necessity of adapting a method not using ICT to take ICT into account. This will allow us to further integrate these systems and also enable them to be used by members of the educational community more intuitively and to apply them more closely to the reality of their work, because sometimes teachers do not have the applications that allow certain methodologies, or that allow them to suit their own methodology.

Future work will be the creation of a distributed system interface that allows this architecture to make these patterns in the cloud, and allows the flow of information between the various objects that make up the activity regardless of which user is working on the object.

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