

# Cataloging Teaching Units: Resources, Evaluation and Collaboration

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**Abstract**—The teaching unit is a way to plan the teaching/learning process about a content item that becomes the focus of a specific educative process, bringing consistency and significance. This way of organizing knowledge and experience should consider the diversity of elements that contextualize the process (level of student development, social background, family and market, Project Curriculum, available resources), to regulate the practice of the contents, to select the basic objectives intended to achieve, the methodological guidelines with which they work and finally the teaching/learning experiences necessary to perfect the process. In this research work we present a system that allow the organization of a set of teaching and learning activities and meets, at its highest level of detail all the elements that compose the curriculum: setting goals and content, design and development of activities and evaluation, organization of space and time, and providing the necessary resources.

## I. INTRODUCTION

The educational environment is constantly changing, there has been an increase in considering the importance of the teaching content in high schools [1], this is leading to an improvement in the educational system and with it new needs have appeared [2], these needs must be solved, so that it can cause a more rapid advancement of the inclusion of cataloging of the subjects resources. In our case, we focus on Information systems (IS) Department.

The professor, usually, use the educational process as a guide and tool for teaching, and this should follow the structure proposed by the country's legal framework. At the same time, this structure can be modified by the teacher, by adding or removing items, but, always within the set limits by the legislation itself.

The teaching-learning process, in the IS, also requires a process of evaluation, monitoring and control. In this process, parents and tutors, are involved, in previous works we detail this architecture, CSchool [3]. In this paper we will present the didactic part within the CSchool system. Thus, the flexibility of the system architecture, in the Cloud, ensures us the sufficient flexibility to include new requirements or modify the existing ones, to complete a complex system such as the IS educational system. This allows us to work now in a collaborative environment by sharing the teaching process between the Universities tutors.

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The teaching-learning process based on ICT for the IS, also needs a follow-up assessment and to adapt itself according to the companies needs [4]. Nowadays, almost all information systems used in education does not have this possibility, because they are more academically oriented: such as the organization of courses, the distribution of activities and resources for teachers and so on.

This paper presents an architecture that supports an information system that improves the development and structuring of curricular schedules. As these schedules are a key element in the educational process, improve the teaching-learning process.

## II. LITERATURE REVIEW

There is a variety of support systems for managing teaching-learning process in the market. These systems are called LMS (Learning Management System). Almost the majority of these, are complexes in their use and configuration and, do not provide students and teachers any other help, like improving students curricula or coordinate subjects content for teachers, to teach the expected needs of the IS career.

The most used tool is: the “exe Learning” [5], used to create educational content using SCORM packages (Sharable Content Object Reference Model) [6]. This system only accelerates the generation of activities and courses, regardless of the curricular program and the creation of teaching units. The program curriculum and lesson plans are based on the educational curricula of the country where it is applied, the cataloging system of educational resources is done through a cataloging education levels and curriculum areas [7] [8] [9].

In our case, the teaching methods are applied by the teacher, according to the taken decisions, based on the subject contents of the IS career, and being developed to achieve the targets set in the teaching-learning process of each didactic unit in this career, to achieve the expected students and career outcomes. The teaching methodology follows the structure presented in Figure 1.

## III. SYSTEM DEFINITION AND NECESSITIES

The teacher's work starts with the creation and preparation of the students' curriculum, subjects and sessions. It is the board administrator, and the pedagogical department of the University who provide the expected structure of the students' curricula, near to the company and market experts



Fig. 1 IS Teaching Units Structure

who set the possible objectives and competencies, the student would face, once he finish his studies. Therefore, this continuous changes occurring in the educational system create the need for a flexible cataloging system. This flexibility ensures that the system support the legislative changes, taking into account the loss of information, this can be avoided by performing a migration, replacement, modernization or improvement of content from the old to the new legislation.

On the other hand, if we consider the structure that a curricular program, in the IS career, must have during an academic year, including meetings, we can base on what mentioned in the Educational Law (Article 6), which defines the curriculum as a set of objectives, competencies, content, teaching methods and evaluation criteria for each of the teachings career [10] [11].

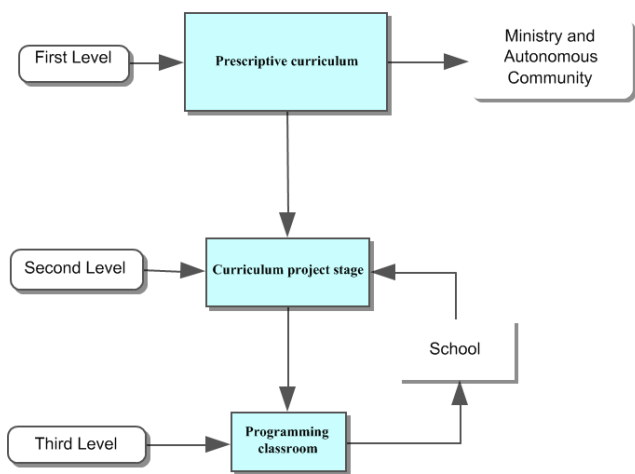


Fig. 2 Curricular Levels

We can extract the specific curricula for each grade from the curriculum structure defined for a specific instructional material of each specific academic year, regardless of their level. Thus, it is impossible to clearly define a generic structure of these teaching curricula, because of the internationalization of education [12], the different international educational laws and the different specific curricula of each university. The structure of the teaching program of high

schools is determined by a ministerial order, if it is a public organization; and by the pedagogical department of this high school if it is a private institution [13]. And both must comply with the established by the Education Act [14], this law establishes the core curriculum for primary education [15] [16], early childhood education [17] [18], compulsory secondary education [19], training [20] and high school [21].

The objective of this research is to establish an information system that facilitates the creation of the subjects curricular and its inclusion in the session, to expedite the process of teaching and learning, communication with companies and preparing sessions for educational standards (see Figure 3). The curriculum structure of any educative program must follow a specificity structure of levels, this specificity levels can be summarized in the following points: objectives, content, basic skills, methodology, evaluation criteria, timing, resources and measures for diversity. This curriculum structure can be changed independently of the teacher, so it could allow flexibility in its creation, but there will always be relationship between the content objectives, core competencies, evaluation criteria and the resources, thus these are represented in the timing and organization of sessions. Our experience in this field, led us to understand, that this structure must be provided with the necessary tools to be flexible to schedule, dynamic, and to be adapted to different teaching methodologies, and to facilitate the use of ICT in the session, as well as communication with companies.

At present the educational curricula, are not included in a comfortable support of an easy accessible reference, in the case of Spanish education: the education departments publish these curricula in the BOA [22]. That is why during the creation of our presented system here, we took into account the creation of a centralized database, of official curricula for the IS career, organized by educational levels, so that by this, we can speed up the creation of subjects curricular of the taught subjects in this career. In addition, our system includes accessibility tools and good interface design, in which users can work in the classroom. And it take into account the hardware which has the centers (Spain and as a future step Saudi Arabia), and finally, the methodological possibilities offered by ICT and its inclusion in the work sessions.

In summary, we have created a system that allows the teacher to structure all the points of the curriculum, within the IS career. The packaging system used is ElearnXML activities [23]. It is closer to the needs of teachers in classroom, for students of all educative levels. For the distribution of this content, we make use of the TabletNET system [24]. Combining both tools we provide the basis for access to CSchool, adding the possibility of SCORM package to the created educational materials, to promote its reuse and distribution.

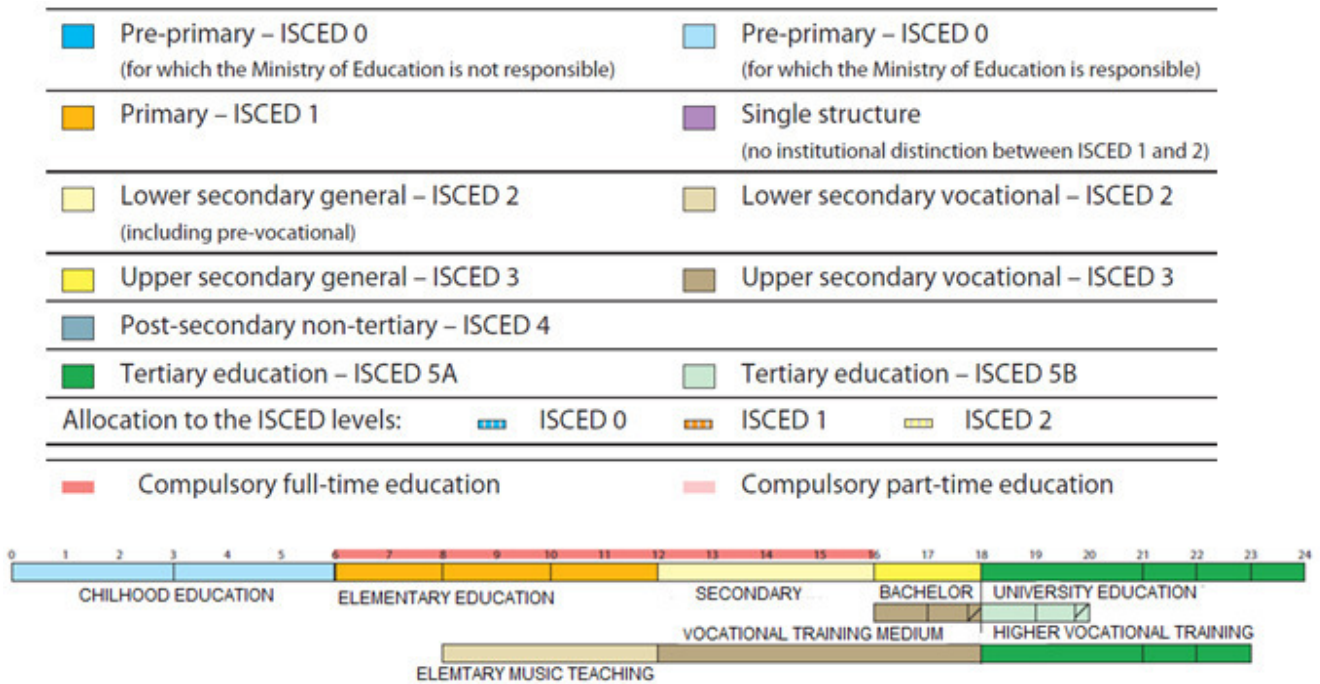


Fig. 3 Educative Level's Structure

I. Users of the System

In the education community different actors interact between each others. These actors and their relationships can be drawn from the Educational Act [14] which also provides the management/administration and evaluation of these as a part of it, Figure 4. For that, we studied these laws to determine the relationships and obligations among members of a specific educational community.

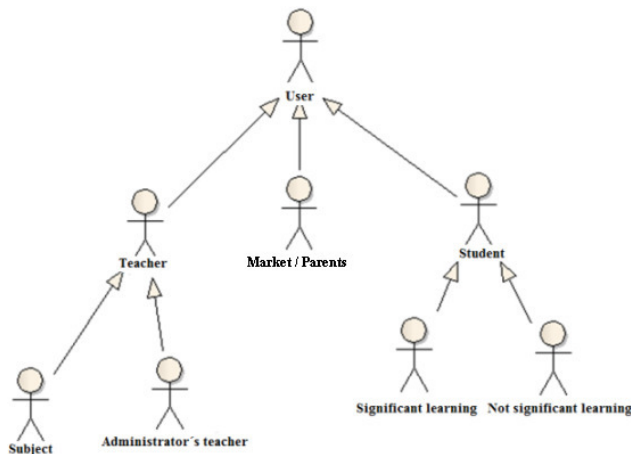


Fig. 4 Educational System Users, (According to the Spanish Educational Law: Law No. 26,206 [h-2])

The actors of the system divide their work in two stages: the first stage will be the scholar environment; and the second can belongs to the market or the familiar surroundings. These scenarios in conjunction with stakeholders, will determine the services the university must provide. The Communication between the different actors is very important, and

it is taken into consideration in the system, thus the flow of information between scholar environment and the market facilitates the strengthening of the taught content [25].

II. System Architecture

When talking about the CSchool architecture [3], we must highlight its most important feature “flexibility”, because of its use of the cloud, and how these provides modularity and interconnection between the various parties through the application of Web Services. The structure is implemented in a similar way as to the public services in the cloud (Google Cloud, Amazon Cloud, Azure Cloud ...), allowing the integration, by means of Web Services [26], of institutions wishing to have these features or services installed within their educational systems.

Figure 5 shows the architecture of the curricular levels these levels are established by law. Even though, the system allow the teacher to shapes and adapts these levels to their needs, creating a teaching schedule as the learning needs of the student group, to which he teacher is teaching. This is done always, under the frame of the above specified law.

This architecture is integrated as new part of the CSchool system architecture [3] [27] [28], the added sub-clouds to the CSchool architecture are:

- Curriculums: This cloud service provides the curricular structure in detail; and following with a consultation structure of the specific educational levels (see Figure 4). It provides the structural basis for the creation of curricula and a support for cataloging educational resources in response to objectives, criteria and competencies.
- CSchool Resources: Provides the system resources, cataloged for different educational levels, and tak-

ing into account the objectives, criteria and competencies.

- Academics CSchool: Provides curricula at different levels. Each teacher will have a space in the cloud where he can create the curriculum for his specific teaching needs.
- CSchool Web 2.0: provides bidirectional communication with companies or tutors, this could be done by using mobile devices.
- Teachers Program: Provides the system with the necessary tools for teachers, to build their teaching schedules in response to the curriculum and resources. Teachers are important to ensure that the activities are related and linked in order to ensure a quality education. From this teaching program students will have access to exercises and workshops that the teacher creates.

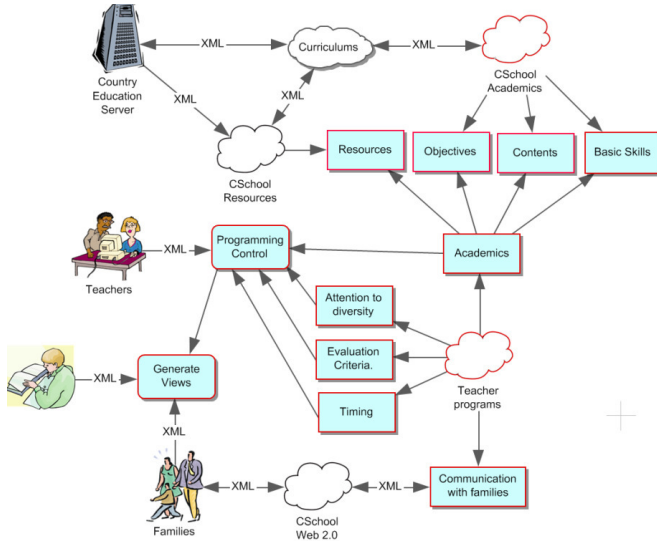


Fig. 5 Cschool System - Cloud Architecture

Applying Web Services promotes security and flexibility. It is necessary to take into consideration the safety of the Web service and its implementation, design and access from mobile devices. Thus, we must provide our educational system the flexibility for its access.

In Figure 6, we can observe the different parts of the architecture, and its function through the use of Web Services. These Web Services are points of input and output of the system, facilitating the communication between different parts of the architecture. What we take value of and emphasize in, are how the communication between the various Web Services can benefit from the "Web Services communication in banking environment" [29], so we can adapt it to our needs in this educational and information system.

Web Services makes possible the communication between the clouds of the system, see Figure 6, so by this it could be possible to manage the educational curricula. The Cloud "StateCurricula" is where Universities can find the official curricula, educational levels. Also by means of Web Services it is possible to access from the business logic of Teachers Program and the CSchool Academics.

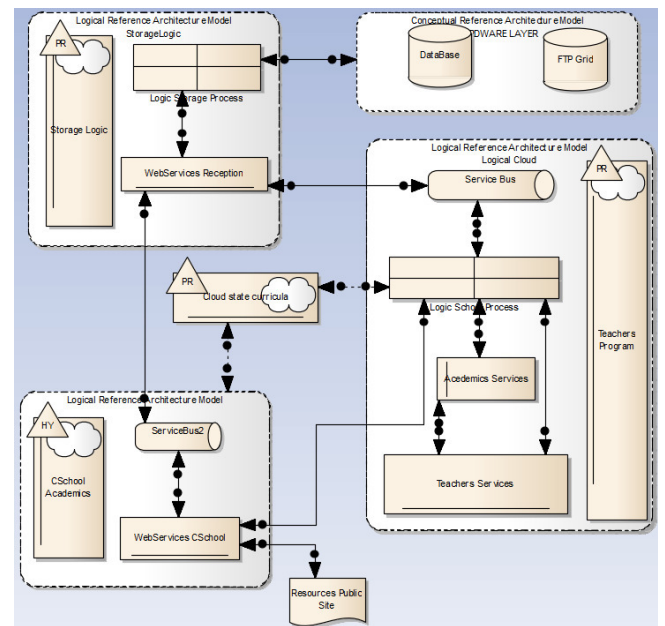


Fig. 6 Cloud Architecture Function by means of Web Services

Curricular elements have a well defined structure in the education system. To represent them electronically, we use a dynamic XML structure, see Figure 7, which facilitates the storage and processing of data in the system database manager, as allowing the extraction of XML documents management system database [30].

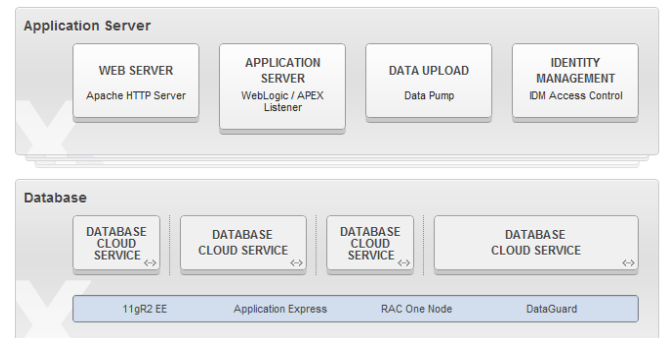


Fig. 7 Cschool System - Cloud Architecture

In addition to this set of Web Services, which allow the teacher to create a comprehensive curricular program, a graphical user interface with which teachers can interact is needed, and which should allow:

- Generate the elements of a specific subject, such as: programming.
- Create views for pupils and tutors enabling communication with them through Web 2.0 CSchool.

The structure of the curricula is stored in a management system for relational databases, from which we can obtain an XML document. This document, meets all the needs of the elements of the curriculum, and can be structured according to two types of elements: enumerative and descriptive. This allows us to work with any curriculum structure.

The class diagram to work with the curriculum structure is that of Figure 8. This structure facilitates the storage of data management, as to query and update it. This is an XML structure that is generated by XML SQL Utility (XSU) [31], which facilitates the storage, query and the Model View Controller (MVC) [32], which separates business logic from user interface.

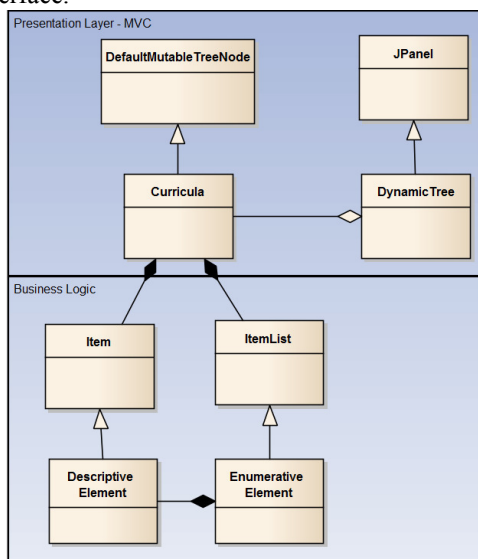


Fig. 8 Classes for Curriculum Design

### III. System User Interface Design

Figure 9 shows the Design of the interface of working with educational curricula curriculum structure. The identified parts in the design, depends of the content, are:

- (A): Contains the menu options.
- (B): Contains the identification of the educational level.
- (D): Contains the general structure of the curriculum following the specificity of the first level.
- (C), (E) and (F): correspond to the detail specification of the curriculum at the specific levels.

These elements of the curriculum can be descriptors or enumerative elements.

### IV. CONCLUSIONS AND FUTURE WORK

ICTs and their inclusion in the educational system is not a simple work to be done directly with satisfactory results, and especially, if its use is to improve and help the teacher's work, to build curricula that can fit the students and market needs. Thereby, this also will improve the educational process through this inclusion and integration in the educational environments.

On the other hand, our system catalog IS educational resources following international standards and as it is indicated in the Spanish Law, see Figure 10, this helps the teacher to search for similar centralized catalogs of resources that other teacher are following in other institutions to share with them their experience.

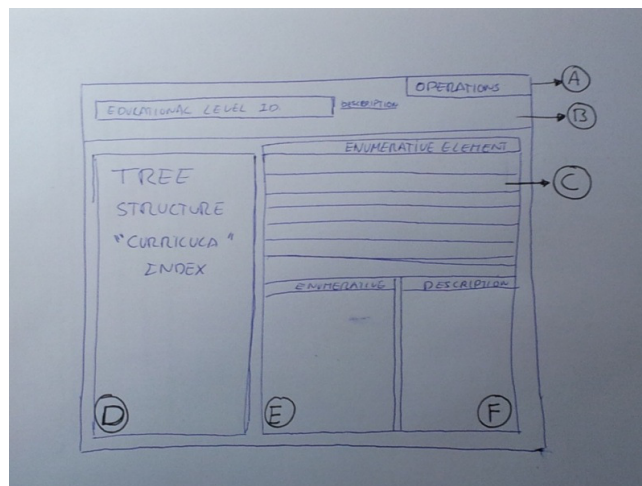


Fig. 9 System User Interface

1. Justification:
2. Context:
  - a) Socio-cultural context.
  - b) School characteristics.
  - c) Students' characteristics.
3. Development.
4. Competences.
5. Objectives.
6. Contents.
7. Assessment:
  - a) Assessment criteria.
  - b) Assessment time.
  - c) Assessment techniques.
8. Self-assessment.
9. Methodology.
10. Use of the space.
11. Materials and Resources.
12. Activities:
  - a) Classification of the activities.
  - b) List of activities.
13. Students with learning difficulties.
14. Didactics Units.

UNIT DIDACTIC TITLE	
Number of sessions:	
Time Line:	April
Justification	
Objectives	
Competences	
Contents	
Materials and Resources.	
Activities	
Qualification	
Students with learning difficulties.	
Methodology	

Fig. 10 Index Didactic Program

By applying Clouds and using of Web Services to access the resources, we are simplifying the cataloging of curriculums. Thus, teachers, from different institutions and countries, can share and work together the curriculum of their students.

As future work, we are sharing with teacher this idea to understand better the real life needs and see how we can include them in the creation of the prototype. For its testing, we are working to support Tablets and Notebooks, to help in the collaboration between teachers.

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