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Applying Professional Solutions within the Educational Environments by Means of Cloud Computing: Coaching for Teachers

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Abstract: In a world where the most used sentences is: "I haven't got the time..." Information Technologies (IT) plays an important role in supporting our daily work, including in everyday educational settings. Such technologies can aid a complete educational system to function successfully so to help the whole school educational life. For this to prove, we present the "Coaching for Teacher" system, a personal technological conversational coach; it aims to provide solutions to overcome difficulties that teachers face during their teaching and learning process. In real time, a teacher can appeal and seek advice rapidly by comfortably talking to an agent. In this paper, we present the steps we followed to design and develop this agent-based application, and a case study conducted in an educational centre for proof that the concept works in an authentic educational environment.

Keywords: Education, Educational Environments, Learning/Teaching Process, Cloud Computing, Social Networks, Coaching, Information and Communication Technologies
Categories: D.2.2, D.2.10, D.4.6, D.4.7, H.3.4, H.4.3, H.5.2, K.3.1, K.4.3, L.2.0, L.2.1, L.2.2, L.2.3, L.3.0, L3.6

1 Introduction

Nowadays, we as teachers and educational systems designers, face the challenging task of improving teaching the students in schools to take advantage of the demands and challenges that Information Technologies (IT) offers. Classrooms can be transformed into learning centres providing expert assistance based on thought and practice anchored in reality. Therefore, innovative IT, if used appropriately, offers the potential for the teacher to expand and progress upon the educational environment to the forefront of education in the authentic environment of the classroom. In order to do this, virtual learning networks can be created and implemented by utilising the latest concepts and ideas in formal education from interdisciplinary research such as: distance learning and advanced technology, teachers' relationship with parents, relationships among teachers, and other appropriate modes of connectivity [Robinson, 03].

One on hand, this technological environment has become increasingly important for the learning activities to be activated and occur in; thus to be active in an

educational space that includes new technologies, teachers need to acquire new knowledge, skills and competencies implemented within the educational process [Perraton, 01]. The new IT and Communications (ICT) continue transforming the society, including learning occurring within educational processes in particular. Moreover, digital networks and educational communities are becoming part of this educational change [Haddad, 03]. Such a transformation in communication is important enough to be compared with other great technological revolutions, such as the printing press that have transformed education.

On the other hand, the human right to a better education is related to the continuous progress as IT is evolving rapidly. The emerging digital environment requires the designing of new educational activities to complement existing ones. So, it is no longer enough to teach children how to read, write and perform mathematics as well as introducing basic historical, literary and scientific knowledge. This is basic and necessary, and will keep its natural place in education and traditional social life. However, we can add to this all-possible technological support in order to improve students' educational development and facilitate teachers' educational tasks. Following our research on how to improve the educational process using technology [Fardoun, 11; Paules 09], we have created a platform called "Coaching for Teachers"; this platform helps teachers to improve the teaching quality in their classes in order to empower their students. This is made possible by using the platform to exchange experiences and teaching techniques, as well as to discuss behavioural problems students may face with other teachers in their own or other schools.

This paper consists of seven sections, starting with an introduction to the field followed, in section two, by an examination of the relationship between technology and educational systems and the ways in which the learning process can be enhanced by their use. With regard to the latter, we will discuss the current technological systems and how teachers and students in schools use them. In section three, we present our platform "Coaching for Teachers"; describing it, presenting its functionalities and architecture, and, finally, providing a brief explanation, a tutorial, and some of the ways it can to be used by teachers as well as guidelines for best practice. In the fourth and fifth sections, we present the results from a case study conducted in a regional secondary school where this application was implemented. Finally, in the last two sections, we complete the paper with our conclusions and ideas for future work.

2 Technology Enhanced Learning

Teachers' training, related to the pedagogical use of new technologies, need to be conducted exclusively in terms of helping teachers to take advantage of using computer resources (both hardware and software) to improve the teaching process within their classrooms. Implementing this would expand the existing comprehensive approaches and simplify the teaching cultural complexity of teaching. Those training plans aimed at making teachers mere users of digital machines, as well as training managers of the educational processes occurring within a classroom, demonstrate the need to improve teachers' teaching methods. More importantly, almost all the statistics [e.g. Browen 12; Schmitt, 02] show that the technological use has a positive effect on the teaching and learning processes. Therefore, the facts on introducing

technology into the classroom prove that such technology aids the teaching process and enable the teacher to become more effective so that students are better motivated and can learn more, better and faster.

Today, computers are tools with embedded educational potential, depending on the types of activity and methodological decisions made by teachers. Therefore, what is relevant for the pedagogical innovation of teaching practices are the approaches taken to develop teaching methods and learning processes that encourage teachers and students to use technology appropriately [Hardof-Jaffe & Nachmias, 2011]. However, no expert or teacher can believe naively that the mere use of computers will generate higher quality education. Teacher training must include training programmes designed to provide and improve the pedagogical knowledge, culture and experience to enable teachers to construct educational material and activities using these technologies and to apply them directly in their teaching practice, both in the classroom and across the school. This could form perhaps a small innovative contribution to a particular teaching area but a substantive alteration of the entire pedagogical model and the cultural forms that teachers should be lavish with in their classrooms. There are currently many tools that teachers can utilise in their classrooms. However, the mechanisms for defining the quality parameters and the real pedagogical needs of teachers, existing in the classroom, vary in different contexts. Thus, the tools to support teachers are intended to play an assisting role, like a coach; therefore, specific criteria must be in place to provide a set of indicators for such a framework to respond to questions in well-defined contexts.

Our research focus in technology enhanced learning is on the Personal Learning Environments (PLE) so as to create an educational setting in which scholars working in educational centres, can access specific educational services. This is related to 'personalized learning', a term that has come to mean more than just differentiated learning but also means assisting and enhancing learning with ICT [De Freitas, 07]. Building upon this, and taking a direction towards a more enriched and personalized learning experience, we take 'personal learning environments' to mean accessing and sharing a range of different teaching methodologies and services in support of personalized learning activities and objectives for single learners as well as learners' groups. This study was initially prepared after analysing the best research on the subject [Fardoun, 11; Fardoun 12-a; Paules 09; Tesoriero, 09;]. Thus, we present the principle guidelines extracted for creating a customised tool that reflects the current situation among the schools users (educational department, teachers, students and tutors) in order to enrich the educational process and humanize the technology used by teachers in the classroom. The paper introduces the platform as a permanent part of a new system for contextualized education. To this end, we present the models, methods and data collection processes that allow and aid institutions to launch a system to properly support contextualised student-centred teaching.

2.1 Educational Systems and Teachers Participation

The real star of the educational system is the student. Almost all the trends in current research in education are to create tools and platforms that focus on the core of the education system, the students, with the purposes of making the students happy, comfortable, motivated and participatory in order to increase their performance and reach their potential. So, where is the teacher in all of this? Nowadays, some teachers

in Spanish secondary schools are incorporating social networks as a tool for collaborative work and participation in class. An example of such systems is the Edmodo platform [Edmodo, 2011].

The questions we must ask first are: do teachers want to participate in the creation of the educational system, or do they just want to do the teaching? Do current systems motivate enough and effective participation or have they become obsolete because of the high interactivity outside the educational settings? We all, students even more so, have the human right to be heard but asking teachers one by one would be an arduous task and these oral conversations would be difficult to analyse and could bot be quickly accessed by any system.

So our objective here is to create a system that helps teachers and to consider, in building a student model, how best to improve student behaviour. A human teacher might intervene to enhance student self-confidence, elicit curiosity, challenge students or allow students to feel in control [Lepper, 93]. To achieve this, we must first explain what possibilities there are for student participation in their environment, their college, and during their classes.

3 Coaching for Teachers

In this section, we describe a system called 'Coaching for Teachers', its main features and the user interface developed for the current prototype. Additionally, the system architecture is presented so as to display the way the system has been developed and structured, and we offer guidelines for best practice in using it.

3.1 'Coaching for Teachers' Description

What is the system "Coaching for Teachers" and what is for? To better understand how this system works, we present a typical scene in a secondary school cafeteria where two colleagues are talking, as an example. Usually teachers talk about their classes and how the teaching and learning process is working in the classroom with their students and, occasionally, some problematic issues are discussed in relation to their respective classes. The teachers try to provide recommendations to each other based on previous experiences, information from different sources (e.g. from the student's school history) or known facts. A typical conversation might be: *John 3rd year E.S.O. Maths teacher, asks Pilar 3rd year English teacher: "How does Pepe behaves in your classes? I can't go on with him; I get very nervous because I can't make him stop talking." Pilar answers: "Well, I called his parents and, since then, he appears to behave much better in my classes; you should do the same."*

"Coaching for Teachers" facilitates instructional designers to collect and make use of the kind of information that school teachers typically discuss about their students. "Coaching for Teachers" is an application aimed at helping teachers during their teaching process by taking what is already known or has been experienced by other teachers and sharing it with the teaching community. This is made possible by creating a platform where teachers can view and add general and specific information about their work, methods, tips and everything related to the learning and teaching process and for communication with their students in the classroom. In this way, every teacher can have a personal coach to help him to meet a number of teaching

objectives by applying new methods in the classroom. This process is based on information that has been introduced into the system by other experts (teachers, pedagogical department, etc.). Figure 1 shows the original process by which a teacher can acquire information by utilising the tool in the classroom. In this way, we stress the importance of providing a new channel for knowledge acquisition, through integrating "Coaching for Teachers" with other educational tools.

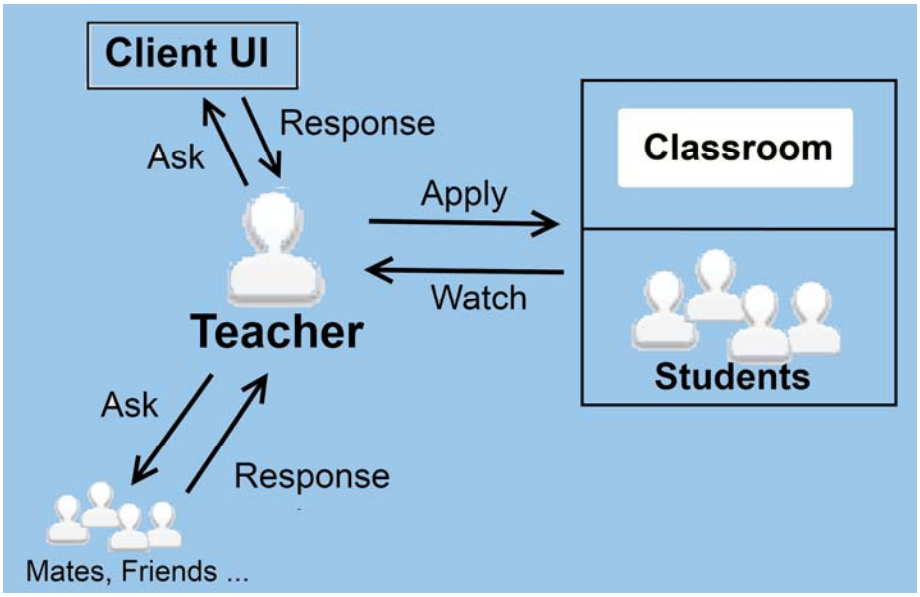

Figure 1: "Coaching for Teachers": Architecture

After four years of research work in this field in the University of Castilla-la Mancha and secondary schools in this region, we obtained a considerable amount of relevant source information, which we used to enrich the system with specific details focusing on re-creating shared experiences between peers. Figure 1 displays a set of resources, informational data and actors that form up the "Coaching for Teachers" architecture. The main platform parts are the methods, techniques, methodologies, tips and tricks, which are presented here as methods and/or techniques. Some of these methods and techniques can then be related to a group or individual techniques, application time, test time, educational level or levels to which they can be applied, based on stages or milestones, and comments. Having described the system, we next present its design, functionalities and architecture.

3.2 "Coaching for Teachers" Design

In order to understanding the 'Coaching for Teachers' system, we needed to discover the kind of capabilities and activities that are needed to support rich and engaging learning. Teachers daily acquire more experience about effective course designs and delivery modes and review examples of current interfaces. So with all the existing

technologies in use, motivate the teachers to desire to create their own teaching methodology and design it keeping the whole system under control. Proposing their students to participate in individual and group activities and to better understand their subjects, suggests that teachers can apply learning theories and understand the models behind effective teaching methodologies and to receive group feedback by reviewing learner-centred design principles for learning until they can create their own teaching systems [Fardoun, 12-b].

While designing the 'Coaching for Teachers' software environment, we noticed that there are three top-level issues that must be addressed; our suggestion is that the system we want to create must permit us to put the teacher at the centre, to display teachers' needs.

Student diversity is the first key issue, due to the existing differences in regard to gender, individual learning styles, background experiences etc., so by taking into consideration the student's growth while designing a teaching method, students may gain some work experience. For example, students, and teachers, should be able to interact easily with each other, to improve their understanding of the educational contents and to focus on acquiring the knowledge, skills and competencies provided in training. Therefore, our main objective was to identify: *how can teachers understand their students, in an easy and smooth way? The design solution for* 'Coaching for Teachers' aims to reduce user frustration and increase usability improving learning/teaching, and satisfaction. We discovered that the concept of the student-teacher experience is so board that it is directly related to usability and satisfaction.

In designing usable teaching methods, we found that it is both interesting and necessary to consider the user (teacher), the content and the educational staff that surrounds the teacher in his/her college as well as our side of this. Considering the "teacher" includes the identification of his/her students and discovering their needs and characteristics. The dimension of the educational content includes the identification of design guidelines, techniques and requirements to be followed and the different aspects relating to the separation of the content and how the content is displayed. The dimension of the teaching environment takes into account the identification of the requirements and characteristics of the teaching environment, task analysis and interaction design. For this, information must be used by the teacher, and furthermore, exchanged between colleagues. Thus, as a conclusion of our study on *how to help teachers in their educational process*, we decided to address the following issues:

- *Understanding is the Goal:* The content material that teachers manage and the reaction of their students must be shared, in a way that other teachers can learn how to interact with them easily and, at the same time, this information needs to be continuously controlled. How can our "Coaching for Teachers" system support the sharing of experiences, and presenting them correctly?
- *Motivation is the Basis:* Teachers are motivated to share; however, this can be achieved when a sense of collaboration exists between them, and also by applying the appropriate techniques and methods. Our system aim to resolves the problem and answers the question of how best to use the teaching techniques and software to support and motivate an unmotivated teacher?

- *Collaborative and Cooperative Help*: teachers are individuals from diverse backgrounds, with a diverse set of levels, skills and abilities, which means that it is not easy to analyse and understand their needs from an instructional design viewpoint. How can our proposed system be "one size fits all"?
- *Interactive, Adaptable and Present Real-time Feedback:* the system must be interactive and adaptable to the user's needs and support the teacher with feedback; also, it must display a user interface adaptable to the environment wherever the platform device is installed. Which approach will be used so that the system can be adapted to the environment used?

Finally, we concluded that, "Coaching for Teachers" can be essential to ensuring successful execution of the educational process, and will provide an essential tool, offering quality education for students by making use of new technologies. For an efficient coaching system to aid teachers, it is important to allow the school educative staff to perform their activities with the efficiency level required by their positions, which consequently, contributes to their self-fulfilment and the achievement of their teaching objectives.

3.3 "Coaching for Teachers" Functionalities

The main features of the system are divided into four groups: voting, information acquisition, coaching and adding new information to the system database. These four groups are essential for the system to function properly and have been implemented in the prototype, which has been applied within the schools presented in this paper. The features were developed based on a set of issues relating to the system's most important features and sections.

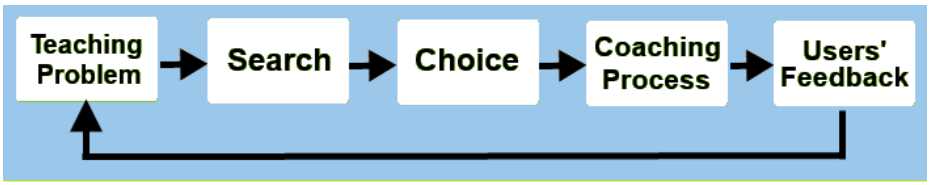

Figure 2: System's main features

Figure 2 presents the basic process used by the platform: "Search" and "Choice" are responsible for the acquisition of information; "Coaching Process" is responsible for presenting the coaching processes intended for the teachers and "Users' Feedback" is responsible for obtaining feedback by voting.

The function of adding information is not considered as a basic user option and was therefore not included in the system features. The main part of the system's Web interface is a search engine, which can be accessed without being registered, as shown in Figure 3, which responds with diverse techniques and methods matched to the problems as expressed in their search.

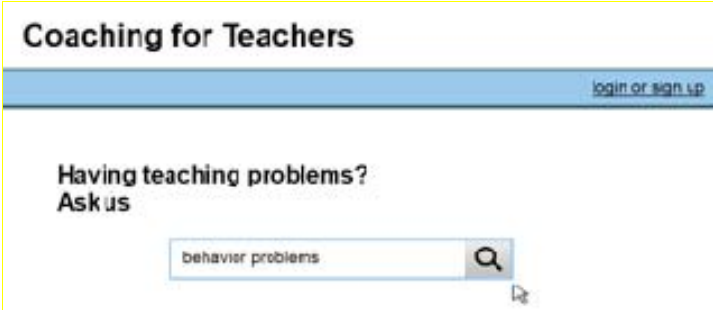

Figure 3: "Coaching for Teachers" main Web interface

The **"Acquisition of Information"** functionalities/questions required by the teachers are:

(1) *What is the problem or difficulty you want to solve?* The teacher can access the main system and seek information about something specific and the system will respond by displaying several options. The teacher enters the keywords to the search engine and the system returns with a number of results based on search requirements. Both registered and unregistered users can do this step; they can both view the information obtained from this search functionality. To access other features, the teacher should be logged in. Once the teacher has logged in, the data entered will be saved as part of the coaching process.

(2) *What is the method that you want to implement in your class?* Once the teacher chooses one of the methods, the system returns with appropriate guidelines for the rest of the coaching process.

(3) *What methods are you currently applying in your classes?* When the teacher enters this information into the system, he can view the methods and techniques that he is currently using in his classes. The teacher has the option to select a specific technique that he wants to stop using. When the teacher takes this decision, the system will ask him if he wants to complete a short questionnaire, evaluating the technique or method, and to store it in the registration database. This allows the system to decide whether or not to display this technique in future searches by the teacher himself and his peers.

(4) *What methods have you applied in your past classes?* The teacher has the option to view a list of best practices on the platform, of all the techniques/methods he has used, including additions and those previously consulted, presented in a list and ordered by date.

The **"Coaching Process"** functionalities/questions are:

(1) *Which guide-lines will the user obtain during the process?* The system will notify the teacher about the important aspects of the technique or method by email, so that he can perform the corresponding action/s. In addition, the teacher will receive information about currently existing activities when he accesses the system.

(2) *Does the system propose methods?* When selecting a method or technique, the system will propose to the teacher a number of methods, which have been used before for specific type of classes or students by other teachers.

Among the features for **"Voting"**, we have the following functionality/question:

(1) *Has this information / method / technique proved useful for your teaching practice?* Once the system has being used by the teacher, he can provide some feedback. This feedback will be entered in the database and will be used for future searches in the knowledge base.

The **"Add information"** functionality/question is the following:

(1) *How is information added and included by teachers and system users?* The system has been developed in such a way that it allows all registered users to collaborate with new information to enrich the system. Only registered users can vote on whether the added content is adequate or not for educational use in the classroom. Voting will be held open for seven days, and all users can view the voting section; if at the end of the week the percentage of positive votes is equal to or greater than 60%, the information will be added to the system. Figure 4 shows the process of validating the information entered by teachers.

Figure 4: "Coaching for Teachers" Validation Process

We also include a **"Real Time validation system"** which allows users of the system to search for and obtain responses to a group of issues, which can be divided into: (1) *Academic issues* and (2) *Technical issues*.

1. **Academic issues** group together the potential problems and concerns that teachers may face during the educational process development of their classes, i.e. in the middle of a classroom session the teacher can receive support from his peers.
2. **Technical issues** provide technical support regarding obstacles that need to be overcome during the session, such as doubt concerning the use of ICTs, which consequently may prevent novice users from starting.

Moreover, the teachers also can have access to all curricula agendas; these agendas are educational topics that are within the given programme curriculum. They

will also find a section of questions for users, in which teachers can make inquiries to other users in the group about the agendas and exercises prepared or developed during the session.

These social functionalities add an enriching element to the system offering the solution of doubts in real-time in question/response format.

3.4 "Coaching for Teachers" Architecture

As with almost all new Internet tools, we have adopted an easy logging-in access to the system; thus, users can enter the system with their "Facebook" account or register as new users [OpenID, 12]. The main activities taking place in the system revolves around information stored there, so the actions that can be implemented are: added information, vote on information, and request information. To date, we have developed three main types of user: teachers, pedagogical department employees, and parents. The main features relating to students are: teaching, applied activities, and behaviours.

The platform does not initially support social interaction between users because we aimed at providing the teachers with the option of a private learning process and, therefore, the information is collected by the system in an anonymous way.

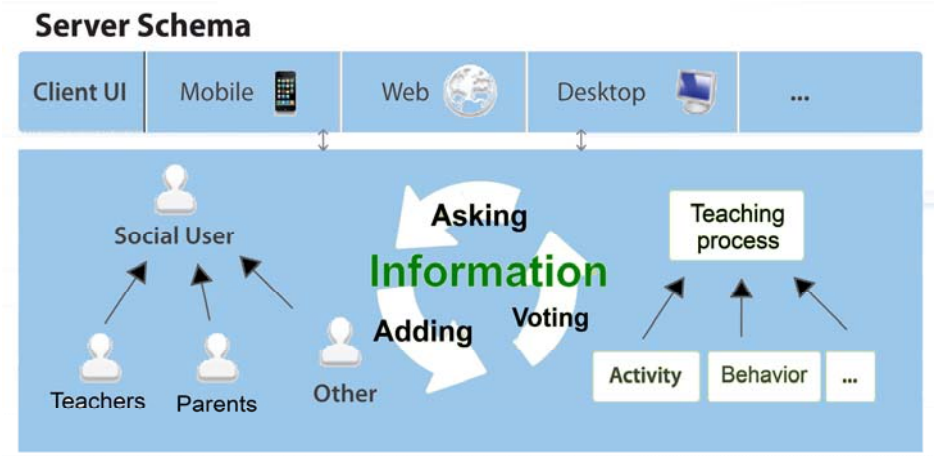

Figure 5: "Coaching for Teachers" Server System

One point to clarify is that our system was developed in an independent way, so that the system interface can support a desktop application, a Web application and mobile device (for Android and iOS). This was possible by applying the Model-Based User Interface Development Environment and by providing real-time service, which allows the communication realization and engagement between members of the educational community, using diverse platforms, which are familiar and user-friendly already.

The cloud systems coupled with the Coaching System, see Figure 6, allow for dynamic, advanced and easy changing for the data used, i.e. for the voting, asking and adding actions in the system, which helps in enhancing and improving the training of

teachers from outside their schools. In this way, we can insure that, for those teachers who have doubts, which has to be settled in real time can access input by other teachers, who are active at that time in the system. Making, or voting on, a proposed solution to the problem that has been raised can do this. We have now added a management system, in the cloud, to collect all questions and answers in order to enrich the current database and to generate reports and statistics for future use in education centres. It also supports conducting online surveys so to evaluate the teachers, according to the teachers' own doubts and proposed solutions.

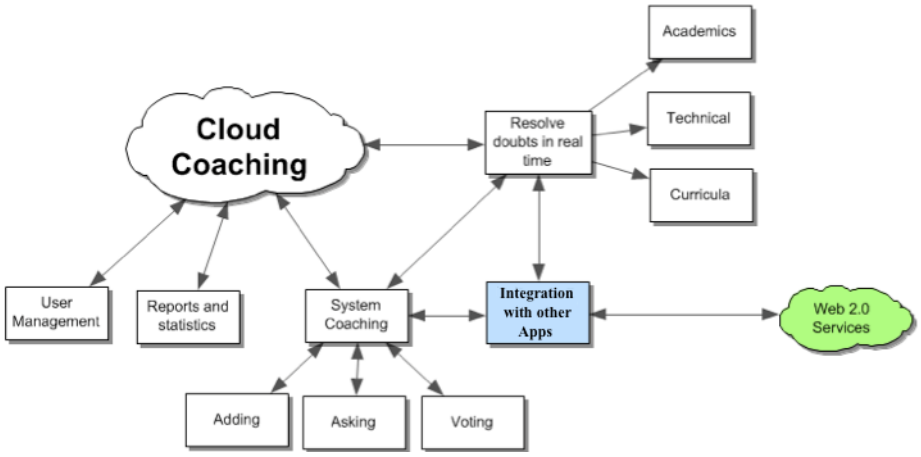

Figure 6: "Coaching for Teachers": Cloud System

Figure 6, shows the features of the "Coaching for Teachers" Cloud architecture: it describes how the system, using appropriate applications, is integrated with other applications in Web 2.0.

3.5 Guidelines for use

After working with schoolteachers and observing their interaction with the system, we concluded that it is necessary to provide two main safeguards: non-mandatory guideline and mandatory rules.

Non-mandatory guidelines explain how to use the system; these are presented as a set of rules implemented in the system to prevent intentional misuse, namely:

(1) Technique evaluation: A technique that has been used only once and the teacher obtained good results by applying it, this technique must be tested several times by the same teacher before considering it as valid and reliable enough to be used by the whole teaching community.

(2) Technique suitability: Whether the technique is suitable or not will occur once it has been applied in a systematic way and for a certain period in the classroom.

(3) Community Management: It is essential to prevent possible legal problems by the use of inappropriate names in the comments uploaded to the system, and more importantly, these inserted by the students themselves in particular.

The system has also **mandatory rules**, some of which are automated and implemented, while others are monitored by for example, the management team and a pedagogical department. These are:

(1) Adding malicious or incorrect data will result in the user's exclusion from the system.

(2) Users will be monitored to ensure they don´t apply more than twenty techniques at the same time and that they have implemented them in their teaching within the classroom. The administration department can also do this monitoring.

(3) It is not permitted to use personal data in the advices or comments added.

(4) Administrators can disable or delete any account if they consider that users are making improper use of the system.

The rules presented in this section can be added to, depending on evolving needs; thus, the current ones only provide the first steps in terms of recommendations and rules.

4 Case Study

A case study was conducted for the first prototype. Validating any new educative tool in authentic educational environment is of great importance and, therefore, the prototype was implemented to obtain real feedback for its initial evaluation and assessment.

4.1 The system in a real and authentic environment

The prototype implemented was deployed on the server of the education department in an education centre of Castilla-La Mancha (a community in Spain), and was accessed by teachers from various regional schools from different educative levels (from high schools to universities). Initially, 32 teachers volunteered to work with the system, however, in the end, the platform was actively used by 22 of these. The test period was approximately three months, from mid-September until mid-December 2011. The prototype was deployed with an initial knowledge base and, during the test period, this knowledge base was expanded with additional information inserted only by the teachers who participated in this case study.

5 The Test Surveys

Once the test period ended, we proceeded to perform a set of surveys [Coleman, 12; McSweeney, 92], to check the teachers' satisfaction levels and their verdict with respect to the system. The first part was conducted by anonymous questionnaires, which the volunteer teachers responded to individually. The level of satisfaction with respect to the system's usability was high as follows:

- Regarding the possibilities the platform offers, more than 80% agreed that it supports the teaching process.
- Half of the teachers (50%) believe that the most important feature of the system is the offered knowledge base offered, which is the actual success factor of the overall platform.

- 36% believe that the greatest difficulty is the large amount of students assigned to each teacher; they prefer to have a common teaching process rather than a personalized one because of the hard work involved.

Additionally, a personal interview was conducted and the results were also positive. Here are two highlights from the teachers' comments:

- "Carlos: "At first instance, I did not know if what I am going to ask the system would be answered consistently, but, finally I realized that I just have to type some keywords, to find what I need."
- "Elena: "Some tips work and others not, as it happens when I ask my peers in the real life."

We can therefore conclude that the teachers received the system positively but that it still has some weaknesses that are going to be addressed in the future versions.

6 Conclusions

The system presented aims to emulate certain processes found within the educational daily life, in order to facilitate and support teachers by making some steps easier and faster. The system was implemented in regional schools in Spain. The results were satisfactory for the first prototype, which leads our research team to continue with our research, in more Spanish schools, acquiring wider comments from other educators so as to enrich its knowledge base with examples of best practices. In this way, we may develop a beta application that can satisfy almost all the identified in relation to coaching in the classroom. This system will be accessible by all teachers in the Castilla-La Mancha region. Such wide acceptance and use that marked the success of the idea is therefore a challenge. This first version is focused on being as a personal support system for the teacher and it functions; so it may be called the automatic "coach". Part of our future work is to create a personalized automatic "coach" for students and also parents.

Currently, the system does not differentiate between courses levels, unless the teacher performs a search using keywords such as "secondary education", and the method or technique suggested is marked for this particular stage It would be very useful for registered teachers to include the educational level, or to include sufficient associated data, so that the system will only return information relevant to a particular educational level according to the official Spanish curriculum. It is also important to improve and enrich certain parts of the system as new teachers may suggest more educational situations that have not yet been covered yet.

Such a system can additionally establish trust relationships among teachers as users, which allows us to say that both, students and teachers can use it for evaluation. Where teachers can evaluate the discussions, students have with each other; this serves to foster relationships between collaborative team members, where more agile students provide support to students lagging behind. Finally, the teacher may well be able to create an environment in which students can work effectively together, and also be able to measure the collaborative work between pupils based on the scores they made together in this peer-to-peer evaluation.

7 Future Work

For the future, we are working on new case studies to further enrich the system's current database. Furthermore, we are also developing a new messaging service to the system to support the faster use of the system, where users can type in messages as they might on the online social networks, "WhatsApp" and "Line". We propose such services, due to the fact that users are more open and familiar to use it s this will give the opportunity for it to be widely applied in a great number of schools, to continue to evaluate and improve.

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