Coaching for Teachers: Applying Professional Solutions within the Educational Environments

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Abstract. In a world in which one of the most used sentences is: "I have no time to do ..." Information Technologies play an important role in supporting our daily work including everyday educational settings. These technologies are responsible for making a complete educational system to function successfully. For this to prove, we present the "Coaching for Teacher" system. This system aims to provide solutions for difficulties that teachers face during the teaching/learning process via a personal technological conversational coach. The teacher can appeal and seek advice quickly using our tool, in real time, by comfortably taking 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 of concept in a real and authentic educational environment.

1 Introduction

Today we must face the challenging task of improving teaching in schools taking advantage the demands and challenges information technologies offer. The classrooms can be transformed into learning centres providing expert assistance based on practice, thought and reality. So, innovative information technologies, if used properly, can offer the potential for the educational environments to expand and progress to the forefront of education in the classroom. To do this, virtual learning networking must be created and implemented by utilising the latest concepts and ideas in formal education, distance learning, advanced technology, teachers' relationship with parents, relationships among teachers, and appropriate modes of connectivity, to name a few [1].

This technological environment becomes increasingly important for the learning activities to occur; thus to be active in the new educational space that includes new technologies, new knowledge and skills must be learned within the educational process [2]. The new information technology and communications are transforming society, and the educational process in particular. Moreover, digital networks and educational communities are becoming part of the educational change [3]. Such communication transformation is important enough as it is compared with great tech-

nological revolutions such as the writing and printing press that transformed education.

On the other hand, the right for better education is related to continuous progress as the information technologies are evolving fast. This emerging digital environment requires designing new educational activities complementary to existing ones. So, it is not enough to teach how to read, write and perform mathematics algorithms as well as introducing basic historical, literature and scientific knowledge. This is necessary and will remain in the natural and urban spaces in which traditionally education has been developed in the social life. However, we must insert all possible technological support to improve students' educational development and facilitate teachers' educational tasks. Following our research to improve the educational process using technology [4], [5], we have created a platform called "Coach for Teacher"; this platform helps teachers to improve the teaching quality in their classes to empower their students. This is possible by using the platform to exchange experiences and teaching techniques as well as behavioural problems students may face with other teachers in the particular school or other schools.

This paper consists of 5 sections: it starts with the introduction of the field followed by the second section on the relation between technology and educational systems and the ways the learning process can be enhanced by their use. Related to the latter, we discuss the current technological systems and the ways they are used by teachers and students in schools. Thirdly, we present our platform "Coach for Teacher"; we start by describing it, we present its functionalities, architecture, and in the end, we provide a brief explanation, a tutorial, and ways to be used by teacher as well as rules during its use as best practices. Fifth, we present results from a case study conducted in a regional secondary school where this application was implemented. Finally, we end the paper with conclusions and future work.

2 Technology enhanced Learning

Teachers' training related to the pedagogical use of new technologies must be conducted exclusively in terms of helping teachers to take advantage of using computer resources (both hardware and software) to improve the teaching process in their classroom. By doing so, it would expand existing comprehensive approaches and simplify teaching cultural complexity. Those training plans aimed at making teachers mere users of digital machines as well as training managers of the educational process in the classroom so to improve teachers' teaching methods. Thus, almost all statistics [6] [7] show that the use of technology has positive effects on teaching and learning processes. Therefore, facts on introducing technology into the classroom prove that such technologies aid the teaching process of the expert or teacher to become more effective for the students so they can learn more, better, faster and be well motivated.

Today, computers are objects or tools that embed educational potential depending on the type of activities and methodological decisions made by the teachers. Therefore, what are relevant for the pedagogical innovation of the teaching practice are the approaches, the developed teaching methods and the learning processes that encourage teachers and students to use appropriate technologies [8]. But yes, no expert or

teacher must believe naively that the mere use of computers will generate a higher quality education. Therefore, teacher training must include training areas designed to provide and improve pedagogical knowledge, culture and experience to construct educational material and activities using these technologies, applied directly in the teaching practice in both the classroom and the entire school. This could form perhaps a small innovative contribution to a particular teaching area, a substantive alteration of the entire pedagogical model, and the cultural forms that a teacher should be lavish in their classroom. There are currently many tools the teachers utilise in their classrooms. However, the mechanisms for defining the quality parameters and teachers' real pedagogical needs existing in the classroom vary for different contexts. Thus, the tools supporting the teachers are intended to have assisting roles such as a coach; therefore, specific criteria must be in place as sets of indicators that provide such tool 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 to create educational settings in which scholars who work in educational centres can access specific educational services. This is related to 'personalized learning', a term that has come to mean more than differentiated learning, but also assisting and enhancing learning with ICT [9]. 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 and groups of learners. This study was initially prepared after analyzing the state of the art on the subject [4], [5], [10], [11]. Thus, we present the main extracted guidelines for creating a custom tool that reflects the current relation among the schools users (educational department, teachers, students and tutors) in order to enrich the educational process and humanize the technology used by the 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 process that allows institutions to launch a process to properly support contextualised student-centred teaching.

3 Coaching for Teachers

In this section, we describe a system called 'Coaching for Teachers' followed by its main features and the user interface developed for the current prototype. Also, the system architecture is presented so to display the way the system has been developed and structured, and also provide ways to correctly use it as best practices.

3.1 'Coaching for Teachers' Description

What is, and what is for, the system "Coaching for Teachers"? To better understand how the system works, we present a use case as a typical scene in the secondary school cafeteria where two colleagues have a talk. Usually teachers' talks about their own classes and how the teaching/learning process is elapsing in the classroom with

their students. And occasionally, some problematic issues are discussed corresponding to their respective classes. The teachers also try to provide recommendations to each other based on previous experiences, information from different sources (e.g. from the school students' history) or known facts. A typical scene can be: *John 3rd E.S.O. math teacher, asks Pilar 3rd English teacher: "How 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's answer is: "Well, I called his parents and since then he appears to behave much better in my classes; you should do the same."*

"Coaching for Teacher" facilitates us to collect and make use of such information schools teachers discuss about their students. "Coaching for Teachers" is an application aiming at helping teachers during their teaching process by facilitating what is already worked or experienced by other teachers, and share it with the teaching community. This is possible by creating a platform where teachers can view and add general and specific information about their work, methods, tricks, and all what is related to the learning/teaching process and communication with their students in the classroom. In this way, every teacher can have a personal coach to help him meeting a number of teaching objectives by applying new methods in the classroom. This process is always based on information that has been introduced into the system by other experts (teachers, pedagogical department). Fig. 1 shows the original process of acquiring information by a teacher by utilising the tool in the classroom. In this way, we stress the importance of providing a new channel for knowledge acquisition from integrating "Coaching for Teachers" among other educational tools.
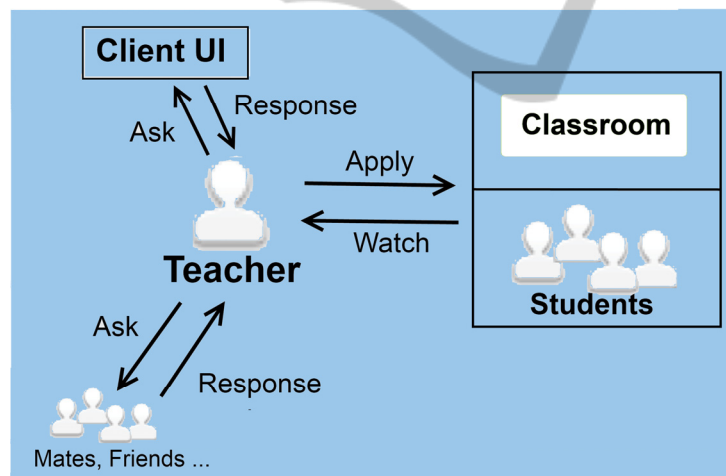

Fig. 1. "Coaching for Teachers" Architecture.

After 4 years of research work in this field between the University of Castilla-la Mancha and Secondary schools of this region, we obtained source considerable amount of relevant information used to enrich the system with specific details focusing on re-creating shared experiences among peers. Fig. 1 displays a set of resources, information data, and actors that form up the "Coaching for teachers" architecture. The main platform parts are: methods, techniques, methodologies, tips and tricks,

presented here as methods and/or techniques. Some of their main methods and techniques are related to: a group or individual techniques, the application time, test time, educational level or levels that can be applied, based on stages or milestones and comments. After discussing the system architecture the functionalities are presented next.

3.2 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; the latter was developed and applied within the schools presented in this paper. The features were studied and developed based on a set of issues related to the system's most important features and sections.
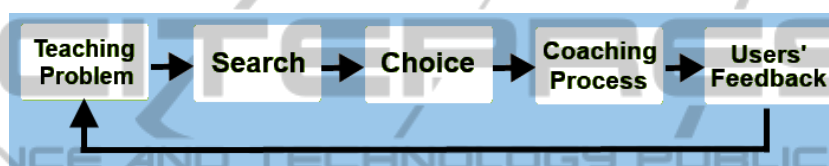

Fig. 2. System's main features.

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

The part of adding information is not considered as a basic user option, and for this it is 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, see Fig. 3, and returns with any techniques or methods matched to the problems as expressed in their search.

Fig. 3. "Coaching for Teachers" main Web interface.

The functionalities/questions of the "**Acquisition of Information**" 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 related to what the system will respond 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. This step can be done by both registered and unregistered users; they can both view the information derived by the search functionality. To access the other features, the teacher should be logged in. Once the teacher has logged in the entered data will be saved for 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 are you currently applying in your classes?* When the teacher re-enters this information in the system, he can view the methods and / or techniques which are currently being used by him in his classes. The teacher has the option to select whether he wants to stop using a specific technique. When the teacher takes this decision, the system will ask him if he wants to complete a short questionnaire, evaluating the technique or method, so to store it in the registration database. This allows the system to bid or not bid this technique in future reference to the teacher himself and other peers. (4) *What have you applied in your past classes?* The teacher has the option to view rich, dated best practices on the platform of all used techniques/methods, additives and consulted, presented in a list and ordered by date.

"**Coaching Process**" functionalities/questions are the following: (1) *Which guidelines will the user obtain, during the process?* The system will notify the teacher about the important parts of the technique or method by email, so 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 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 been 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.

"**Add information**" functionality/question is the following: (1) *How added information is included by teachers and system users?* The system is developed in a way that 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. The vote will be held for seven days, and the voting section can be viewed by all users; 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; Fig. 4 shows the process of validating the information entered by the teachers.

3.3 Architecture

As almost all new Internet tools, we have adopted an easy logging access to the system; thus, users can enter the system with their "Facebook" account or register as new
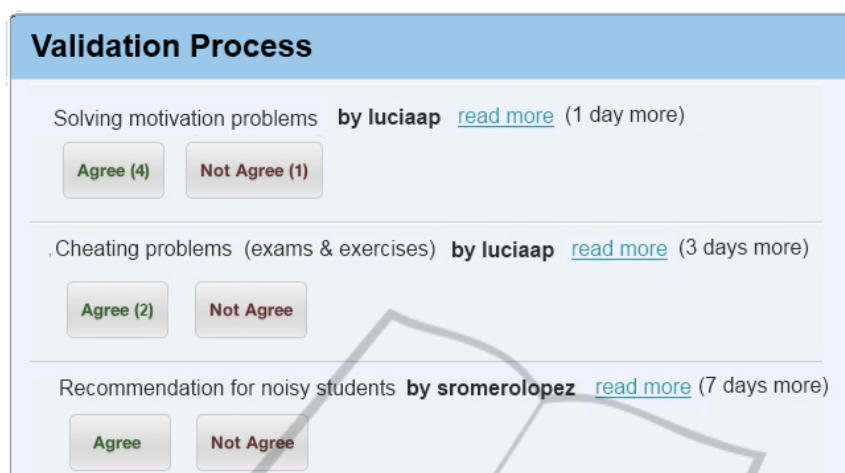
Fig. 4. "Coaching for Teacher" validation process.

users [12]. The main activities taken into account in the system, revolve around the stored information; so the implemented actions are: *added information, voting infor-mation,* and *request information*. To date, we have developed three main user roles: teachers, pedagogical department employees, and parents. For the students the main features are: *teaching, applied activities,* and *behaviours*.

The platform does not initially support social interaction between users; this is be-cause we aimed to provide the teachers with the option of a private learning process, and the information collected by the system to be conducted in an anonymous way.
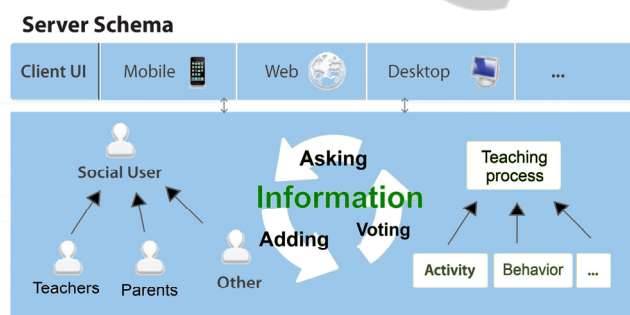

Fig. 5. "Coaching for Teacher" Server System.

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, presented in our next research work.

3.4 How to Use it?

After working with the school teachers and observing their interaction with the system, we concluded that it is necessary to provide two main facilities, a non-mandatory guideline and mandatory rules.

A non-mandatory guideline explains how to use the system; this guideline is presented as a set of rules implemented in the system to prevent intentional misuse; these are: (1) 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 teaching community. (2) Whether the technique is suitable or not will be voted when it has been applied in a systematic way and for a certain period in the classroom. (3) Avoiding inappropriate names in the comments uploaded to the system and these inserted by the students in particular, is essential to prevent possible legal problems.

The system has also mandatory rules, some of them are automated and implemented, while others are monitored by a management team and a pedagogical department; these are: (1) Adding malicious or incorrect data will result in the user exclusion from the system. (2) Users will be monitored so not to apply more than twenty techniques at the same time and to implement them in their teaching and educational process within the classroom. This monitoring can also be done by the administration department. (3) It is not permitted to use personal data in the added advices or comments. (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 increased 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 a real system is of great importance, and therefore, the prototype was implemented to obtain real feedback for initial evaluation and assessment.

4.1 The System in a Real and Authentic Environment

The implemented prototype was deployed on the server of the educative department in an educative centre of Castilla-La Mancha (community of Spain), and 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 them. 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 added information inserted *only* by the teachers who participated in this case study.

4.2 The Test Surveys

Once the test period ended, we proceeded to perform a set of surveys [13] [14], to check the teachers' satisfaction levels and their verdict with respect to the system. The first part was anonymous questionnaires, where a set of volunteer teachers responded individually. The level of satisfaction with respect to usability factor was high as follows:

- Regarding the possibilities the platform offers, more than 80% agreed that it facilitates the teaching process.
- Half of the teachers (50%) believe that the most important feature of the system is the offered knowledge base, which is the actual success factor of the overall platform.
- And finally, 36% believe that the greatest difficulty is the large amount of students assigned for 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 applied and the results were positive; here two highlights from the teachers' comments are presented:

- "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 system was received positively by the teachers; it still has some weaknesses that are going to be addressed in the future versions

5 Conclusions & Future Work

The presented system aims to emulate certain processes found in the educational daily life in order to facilitate and support teachers 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 our research with more Spanish schools, acquiring wider comments from other educators so to enrich its knowledge base with best practices. In this way, we may start with a beta application that can satisfy almost all identified teachers' needs for coaching in the classroom. Thus, 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 the teacher as a personal support system; so it may be called the automatic "coach". Part of our future work is to create a personalized automatic "coach" for students and parents.

Currently, the system does not differentiate the courses levels as it works only if the teacher performs a search using keywords such as "secondary education", and the method or technique introduced and marked for this particular stage. It would be very useful for registered teachers to configure the educational level or to include associated data in, so the system will only return information on this particular educational

level. It is also important to improve and enrich certain parts of the system as new teachers may suggest more educational situations that have not been covered yet.

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