

Affective Model for Teachers in Learning Management Systems

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Resumo – *Inovações na Ciência da Computação têm apresentado uma série de mudanças, incluindo o campo da área de Educação e, especialmente, em e-learning. A Computação Afetiva também surgiu recentemente. Algumas pesquisas estão sendo desenvolvidas nesta área, mas não cobre um papel importante neste processo: o tutor. Esta pesquisa tem por objetivo estudar o tutor, mais especificamente os fatores emocionais que podem ser identificados e como eles podem melhorar o ensino e a influência no processo de aprendizagem. Desenvolvemos um módulo no LMS Moodle, a fim de ajudar o tutor melhorar seus / suas ações e as relações entre os alunos.*

Palavras-chave: *modelo afetivo, tutores, ambientes virtuais de aprendizagem, Moodle.*

Abstract – *Innovations in computer science have presented a lot of changes, including the field of Education area and especially in e-learning. Affective Computing has also emerged recently. Some research is being developed in this area, but it does not cover an important role in this process: the tutor. This research aims to study the tutor, more specifically the emotional factors that can be identified and how they can improve the teaching and influence in the learning process. We developed a module in the Moodle LMS, in order to help the tutor improve his/her actions and the relationship among the students.*

Keywords: *affective model, tutor, virtual learning environments, Moodle.*

Introduction

Nowadays technology enhanced learning is becoming ordinary especially through Learning Management Systems (LMS). By LMS, students can access learning content and resolve activities. Teachers can consult student's performance and promote changes when necessary.

LMS are increasing in last years. They are becoming smart and sensitive to feelings. They are able to adapt for learning needs considering cognitive and affective aspects of students (D'MELLO *et al.*, 2005; KHAN *et al.*, 2010; KORTt *et al.*, 2004). However, there are few efforts to help teachers.

Intelligent Teaching Assistant systems (ITAs) are Intelligent Tutoring Systems (ITS), which aim to assist students and teachers (YACEF, 2002). They offer

assistants to help doing teachers' tasks. However, there are no systems that consider teacher affective model. Emotions are being related as essential in development to any activity. Students learn less if they are anxious, angry or depressive (Burlison; Picard, 2004); but what about teachers? Could they teach better with positive affective states? Sutton and Wheatley (2003) affirm that emotions can influence teacher's cognition and motivation. And, consequently, students are aware of their teachers' feelings.

In teachers' point of view, they affirm that it is important to know how to deal with distance learning and how to teach in this modality. Also, it is relevant to learn how to use technologies to improve their classes (TURCHIELO; WUNSCH, 2013).

Recent studies are worried about the teacher's role in LMS and ITS. It seems that teachers are forgotten (SUTTON; WHEATLEY, 2003), although we can find studies that describe the importance of teacher affective aspects (CUNHA et al., 2008; SUTTON; WHEATLEY, 2003). Cunha et al. (2008) describe an empirical model based on ordinary teacher's behavior to identify affective states.

This paper demonstrates how Cunha's (2008) model can be applied into Moodle LMS. We verified each affective state and how to develop it in Moodle. Finally, we tested the model using controlled and real environment.

Related Work

Our study is based on the bridge among: Learning Management Systems (LMS), emotions and teacher profile. So, we need to comprehend how these components are made and covered. Therefore, we describe LMSs and their evolution stating form adding intelligent and affective components for both students and teachers.

LMS are information systems that offer learning objects, assignments and communication tools. Teachers and students use those resources in courses. When LMS is available through internet, it is possible to offer online courses. Moodle (2014) is an example of LMS, which is free and open source. Therefore, Moodle allows customizing according to developers or school's needs.

Intelligent Tutoring Systems (ITS) are a type of LMS that include intelligent resources. Consequently, they allow expanding the learning possibilities to students. ITS architecture includes student model, domain model and pedagogical model (YACEF, 2002).

After, ITS presented some evolution, including facilities to teachers and affective model to students. Intelligent Teaching Assistant systems (ITAs) consist on ITS that add teacher's model and interface. This model has assistants to help (automating or guiding) teachers' tasks (YACEF, 2002). However, teachers remain in control of activities and pedagogical decisions. When teachers are helped, students are benefited, because the teacher can spend more time doing the mediation (CUNHA et al, 2008).

Recently is noted the need of considering cognitive and affective aspects of students to better provide personalized learning (GOLEMAN, 2006). Affective Tutoring Systems (ATS) are ITS that include an affective student model (ALEXANDER et al, 2003). This model can detect frustration or stress, simulate agents with affective states, monitor social interaction, diagnose motivation, and then to adapt the system for each student (ROBISON et al., 2009). Therefore, ATS adapts as well as a human teacher does (ALEXANDER et al, 2006). And, consequently, the student will feel more pleasant in learning (ALEXANDER et al, 2003).

It's also possible to find ITS that implements both ITA and ATS. Alice is one example. It considers affective aspects of students and provides intelligent assistants that help teachers to verify plagiarism and how correct an answer is (SILVA; RAABE, 2008).

However, despite these studies that describe how important it is to consider emotions in the learning process, there are few about emotion in the teaching process. About teacher, we know how important is to have lower workload, and one way of doing it is by providing automatic tools. But, there are no studies about teachers and their emotions in order to improve teaching. This is also criticized by Tretiakov et al. (2001), who affirm that ITS has failed to recognize the real role of the teacher.

Motivation

According to Carvalho (2007) and Tretiakov et al. (2001), a teacher should be able to guide the learning, to motivate students, to know technological tools, to be aware of student's context, to select and organize the content, to manage the curriculum, to observe the learning progress, and to be open to judgements. However, affective kills influence more than cognitive ones (GOLEMAN, 2006). Yacef (2002) affirm that to help teachers to better teaching is an activity as important as teaching students. When teachers are able to recognize what they are feeling, they can better express themselves in classroom (BRACKETT; KATULAK, 2006). So, a teacher guided affectively (respecting the course content and class scenario) has better condition to develop the curriculum and to get more effective results.

We believe that joining Affective Computing with ITA architecture can improve affective tutor profile. ITA offers a set of functionalities designed for teachers. It allows them to work better and quickly. Consequently, teachers take better care of how student is learning. This mediation needs affective skills to affect student positivity.

Our Proposal

The study goal is to describe how to include an affective model for teachers using Moodle. Although it is just a LMS, not an ITS, we chose it because Moodle allows customizing. Nowadays there are studies towards expanding Moodle as ITS. It allows creating pedagogical rules to provide personalized learning (KHAN et al., 2010). For

the teachers, Moodle offers tools to help them in ordinary tasks, without smart or affective features.

The second definition was about the affective model oriented to teachers. There are many ways to identify emotions, using external clothes or equipment as sensors, or making assumptions through behavioral models (ALEXANDER et al., 2006). We choose the same technology used by LMS that has affective model for students, where assumptions are made by their interactions (KHAN et al., 2010).

We also choose the model proposed by Cunha et al. (2008), by which we can predict six affective states from teachers' interaction. This is an empirical model based on previous studies made by the authors. This is not a surprise for us, as the most of studies are recent, which technologies and proposals are new (WOOLF et al., 2009).

Affective Model

Cunha et al. (2008) model aims to identify affective states of teachers whom use LMS. Authors believe that teachers must present communicability and sociability skills to better talk and give attention to all students. Punctuality and commitment to tasks' deadlines. Meticulousness to be alert to all events, e.g., a new post in forum. And, initiative, to provide new or alternative tasks and contents. They also describe how each affective state can be measured using variables present in most of LMS:

- **Sociability:** it is the teacher's capacity to communicate with all students in the same way (homogenous). It is calculated by the standard deviation of the number of messages sent to students. The higher the value found, the greater the chances of the teacher to be paying more attention to a student or to be paying less attention to a particular student than the other.
- **Communicability:** it is measured by the amount of message size per number of messages. It depends on the tool used. The chat messages are shorter and more direct than forum posts. Messages sent as student's feedback in assignments and quizzes are also evaluated. Authors explain that messages too short or too long might mean bad communicability. We must notice that the quality of the messages is not measured here, because it depends on each context.
- **Punctuality:** from what was agreed with the class, the teacher's cares about students' interactions, whether it be a question via discussion forum, sending a job, a general doubt about the course or feedback to an answer of an exercise. To determine the timeliness, we used the date of delivery of the task, the date of the teacher's response, the date of posting to a forum and the date of the student teacher's response to this forum. The difference of these dates is computed, so that later generate an average response time by the teacher.

- Commitment: it refers to the commitment of the teacher to meet the criteria previously established. The commitment is based on the difference of the final delivery date of the task and the date of assessment and teacher response.
- Meticulousness: it refers to the ability of the teacher to pay attention not only to the interactions of the students in the virtual environment, but also to maintain the perception and solution of the consequences of these interactions. The meticulousness is calculated by the date and time of the last visit of the teacher to the forum. The difference between this date and the current date is the estimated time in which the teacher has not accessed the system.
- Initiative: it refers to the ability of the teacher to support the student in new actions in the virtual environment. We calculated how many weeks have passed since the beginning of the course and how many materials were placed by the teacher from the beginning of the course.

Development

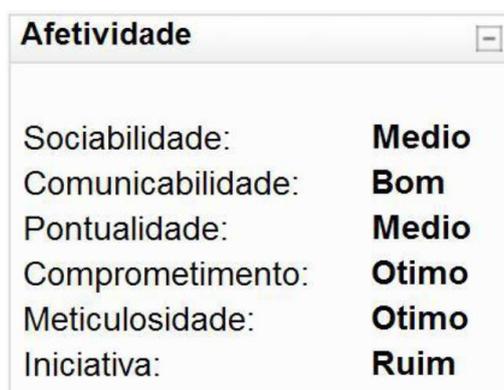
We verified how Moodle organize each information. We match the types of resources and activities that come in Moodle standard installation – version 1.9 with each affective state. Table 1 shows the results.

Tool	Affective States					
	Sociability	Communicability	Punctuality	Commitment	Meticulousness	Initiative
Assignments		X	X	X		X
Chat	X	X				X
Diary						
Directory						X
Forum	X	X	X		X	X
Glossary					X	
Links						X
Page						X
Quis		X	X	X		X
Webpage						X

Table 1 – Relationship between Moodle tools and affective states

After, for each affective state, we built SQL queries to get the values and then calculate. Also, we established values to range: very good, good, regular, bad, very bad. Those values were gotten considering the university where the model was applied.

Moodle offers specific customization points, for example, reports, boxes, resources, questions types, etc. We choose box option, because it can be added as the teacher wants. Also, box is just visible to teachers, students are not able to see. Figure 1 presents the box (only in Portuguese).



Afetividade	
Sociabilidade:	Medio
Comunicabilidade:	Bom
Pontualidade:	Medio
Comprometimento:	Otimo
Meticulosidade:	Otimo
Iniciativa:	Ruim

Figure 1 – Box implemented into Moodle

Nowadays, the box shows each affective state and its value. We know this information is not enough, because the teacher may not comprehend the meaning of each one and how to improve it. So, it is important to give better messages, based on texts that guide teachers in their tasks. Those messages can be determined from affective states and can stimulate teachers' upgrade.

Tests

As a new and empirical model, there are no previous studies proofing its accuracy. We did some tests to check if teachers' actions really change affective states. We also double-checked if students have the same perception about teachers as the model presents.

In the first test, we did some simulations using a controlled environment. We created teachers and did some actions to verify how each affective state oscillates. The results were satisfactory and consistent to the model proposed.

The second test involved real data. We got data from 4 undergraduate courses that use Moodle LMS to support face-to-face and online activities. Students of each course received a survey with sentences like: "I receive activities feedback quickly". For each sentence, students have 5 answer options based on Likert: always, often, sometimes, rarely, never. We received 88 surveys from students.

The results show that the communicability average indicated by students is

lower than indicated by the model. Commitment and initiative have the same values from students and model, either positive or negative. Meticulousness was the affective state with worst accuracy, because the model indicated values much lower than compared to students' opinion. Finally, we could not measure sociability and punctuality because there were not enough information in Moodle LMS.

With these results, we can see a relationship between students' opinions and values presented in the equations. It is understood that full compatibility would not be achieved, since the surveys reflect the views of students, which is susceptible to some variables of the educational process.

Conclusions

Nowadays, with the news technologies, the possibilities of its use in education have been increasing. This situation enabled a revolution and new teaching methods. Several studies involving affectivity in educational processes have been developed in order to analyze the real impact of this aspect during this activity, but few of them work with the tutor itself, seeking to verify their affective aspect. Yacef [6] reinforces the importance that the teacher has on the learning process.

For this study, we chose to use an affective model already defined, requiring only the construction of equations that simulate the oscillations of the values according to the actions of the tutor. These equations were implemented in Moodle through SQL queries and then presented visually in the form of box. To validate the information, a survey was developed in which students informed their perceptions for each of the affective attributes.

The results are promising and open up the possibility for new studies: how can affective states benefit the teacher as well as students? How to guide teachers to better work, without step into their pedagogical decisions? Can those orientations really benefit the educational process? Are there other affective states that should be added to describe teachers?

This study's limitation is concerned in frailty model. Especially if model is applied in a course with more than one teacher. We don't know how it will work.

We hope that this work will contribute to the quality of teaching. We believe that with the inclusion of the box, the teachers can regulate themselves, discovering how to improve in their teaching processes.

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