The DEDEPRO™ Model of Regulated Teaching and Learning: recent advances

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Abstract

Research on *self-regulated learning* has evolved from classic models focused exclusively on the student and the learning process, to models which take into consideration the context or the teaching process, as an element which can stimulate self-regulation in students. The DEDEPRO™ model is offered as a model of the latter type, focusing on self-regulated learning from an interactive, interdependent conception of the teaching-learning process.

Elements essential to this theoretical conception are reported here, as well as advances gained from assessment instruments taking this conception as their basis, and intervention strategies for improving the teaching-learning process, in particular using ICT. Finally, we conclude with representative empirical evidence gathered to date, prospects for the future and potential for its use as a utility model in the field of Psychology and Education.

Introduction

The historical evolution of conceptions and research on teaching and learning proc-esses has often involved conceptual renewal, adjustment and substitution of models which address this field of evaluation and intervention. Within the cognitive paradigm, different models of this phenomenon coexist. Some have addressed the learning process with great precision (Cano & Justicia, 1994; Marton & Säljö, 1979; Pintrich, 2000, 2004; Vermunt, 1998). Others, however, are more focused on the teaching prcess (Ramsden, 2003; Vermunt, 2003). Furthermore, there are models which take into account both the learning and the teach-ing process, in an attempt to better explain the construction of knowledge and academic per-formance, as a function of both (Biggs, 2001; Housell, Entwistle, et al., 2001; Entwistle & Tait, 1990; Vermunt, 2003; Weinstein & Mayer, 1986).

These models, despite their considerable theoretical and empirical strength, have not exhausted their object of study. Development of the competencies *learning how to learn* (in the pupil) and *teaching how to learn* (in the teacher) continue to be a priority in any educa-tional system. Thus, understanding the *teaching-learning process* as a sequential, interactive, interdependent event can help towards a redefinition and better execution of tasks by each of the agents involved, teachers and pupils.

The objective of this report, far from pretending to establish an exhaustive compara-tive review among existing models, is to provide up-to-date understanding of the essential assumptions and practical applicability of the model being proposed for evaluation and im-provement of the teaching-learning process.

The DEDEPRO™ model as a conceptual support for teaching and learning

The DEDEPRO Model, whose name is an acronym of the terms Design, Development and Product, was proposed by De la Fuente, Justicia and collaborators (De la Fuente, 2001; De la Fuente & Justicia, 2001, 2004; De la Fuente, Justicia & Berbén, 2005; De la Fuente & Martínez, 2004; García, De la Fuente, Justicia & colls., 2002; Justicia, De la Fuente & Ber-bén, 2007). It seeks to integrate conceptual contributions of regulation, both from the point of view of the learning process and the teaching process. In essence, the model assumes that self-regulated learning should inevitably be connected to regulated teaching, and any inter-

vention should be designed taking into account this mutual relationship. The following sections will separately address the concept of self-regulation from the standpoint of learning and from the standpoint of teaching, in order to provide an integrated view of the components of each of these processes, and to thus justify the need for an integrated conception of self-regulation in the teaching-learning process.

A comparative view of regulation as a psychological variable

Regulation from the point of view of the learning process

Self-regulation, as a psychological variable and personal competency, has been studied from different perspectives. All of them defend its importance in daily life, and affirm the need to develop self-regulated subjects (Bandura, 2005; Boekaert, 2003; De la Fuente, 1998; De la Fuente & Martínez, 2001; De la Fuente, Berbén & Martínez, 2006). Self-regulation has been defined as the process by which a person generates thoughts, feelings and actions, and systematically orients them toward the attainment of proposed goals (Bembenutty & Karabenick, 2004; Schunk & Zimmerman, 1994; Zimmerman, 2002).

Notwithstanding, self-regulation depends on the nature of the component being regulated. Self-regulation of information processing has been studied essentially as a process where the student focuses on how to execute learning processes around specific given tasks. Within the educational paradigm and from a psychological perspective, self-regulated learning can be defined as an *active process by which the person establishes objectives which direct his or her learning, seeking to observe, regulate and control cognitions, motivations and behaviors, for the purpose of meeting proposed objectives* (De la Fuente & Martínez, 2004; Valle, Cabanach, Rodríguez, Núñez & González-Pienda, 2006). Recent research advocates for this type of learning when it gives evidence that learning and academic achievement increase to the extent that more and better learning strategies and self-regulated behaviors are put into practice (Torrano & González-Torres, 2004; Nota, Soresi & Zimmerman, 2005; Schunk, 2005; Zimmerman, 2000, 2002; Zimmerman & Bandura, 2002).

Research on self-regulated learning, therefore, integrates concepts referring to *metacognition*, *learning objectives, student motivation,* etc. (Boekaerts, 1997, 2003; Núñez, Solano, González-Pienda & Rosario, 2006). Self-regulation in learning is a complex act, includ-

ing diverse sub-processes such as: a) Strategic knowledge, key to the learner's success, if the learner possesses a high amount of self-knowledge and knowledge about his or her mastery of the task (before, during and after executing it); b) Having a repertory of cognitive strategies that enable acquisition, codification, elaboration, personalization, memorization, recovery and transferral of knowledge, and c) Processes of a motivational nature, such as learning and performance goals, self-efficacy beliefs, attributions.

Torrano and González-Torres (2003) have listed characteristics which differentiate students who regulate their own learning from those who do not:

1) They know how to plan, control and direct their mental processes toward achievement of personal goals (metacognition).

2) They are familiar with and know how to use a series of cognitive strategies (repetition, elaboration and organization), which help them to apply their attention to, transform, organize, elaborate and recover information.

3) They show a set of well-adjusted motivational beliefs and emotions, such as a high sense of academic self-efficacy, the adoption of learning goals, development of positive emotions toward tasks (e.g. joy, satisfaction, enthusiasm), as well as the ability to control and modify these, adjusting them to task requirements and to requirements of the concrete learning situation.

4) They plan and control the time and effort which they are going to spend on their tasks, and they know how to create and structure favorable learning environments, such as finding a suitable place to study and seeking help from teachers and classmates when they have difficulties.

5) To the extent that the context allows, they show greater effort to participate in the control and regulation of academic tasks, and of the class climate and structure (e.g., how they will be evaluated, task requirements, the design of class assignments, organization of work groups).

6) They are able to put into play a series of volitional strategies, oriented toward avoiding external and internal distractions, in order to maintain their concentration, their effort and their motivation during performance of academic tasks.

These characteristics are acquired by students through their experiences as learners. Thus, self-regulated learning is an acquired process and can be improved through the influence of third parties. However, it is evident that other personal characteristics, of a motiva-

tional and affective nature, such as *action-emotion style*, also play a part in forming self-regulated learners (De la Fuente, in press).

Regulation from the point of view of the teaching process

The instructional conception of self-regulated learning has focused on the teaching process. In this case, the competency "*teaching how to learn*" requires both planning and executing a series of activities in the design and development of instructional work (Jorba & Cassellas, 1997; Jorba & Sanmartí, 1996; Luo, 2000; Sanmartí, 2001, 2006).

The essential characteristic of this *instructional disposition* lies in focusing attention on teaching variables which address learning. In other words, great importance is given to representating and appropriating objectives, anticipating and planning one's action and representing evaluation criteria (Sanmartí, 2001, 2006). Jorbas and Casellas (1997) have established factors which are instrumental in acquisition of self-regulated learning. These include, most notably: 1) An evaluation model which is formative, continuous and which regulates the process facilitates self-regulation in students; 2) For students to put into practice self-regulated learning, anticipated and planned action is involved; therefore, the student must make the proposed objectives and evaluation criteria his own, and finally, 3) A structuring of learning which takes into account the different times at which there will be student-student interaction or teacher-student information in order to optimally construct meanings and concepts of the process being developed. This process of structuring learning involves the following phases: a) an exploration phase or making content explicit; b) a phase for introducing concepts or procedures, modeling and confronting knowledge; c) a knowledge structuring phase; d) a phase for making knowledge explicit.

However, while this perspective is quite useful, it does not sufficiently address the cognitive and strategic processes offered by the cognitive psychological model. Models and contributions from educational psychology have also shown the relevance of the teaching process and its effect on the learning process (Biggs, 2001, Ramsdem, 2003). All these contributions, in short, support a reassessment of the importance of teaching as a causal variable of effects in the learning process.

Regulation as an interactive phenomenon in teaching and learning

To conceive self-regulation as an interdependent, interactive phenomenon in both the teaching and the learning process—as the DEDEPRO™ model clearly defends—has meant a step forward in our understanding, as recent research has shown (Alonso-Tapia & Pardo, 2006; Bigss, 2001; De la Fuente, 1999; Justicia, De la Fuente & Berbén, 2007; Entwistle & Tait, 1990; Monereo, 2006; Monereo & Pozo, 2003; Pintrich, 2000; Randi, 2004; Van Eekelen, Boshuizen & Vermunt, 2005; Vermunt, 2003; Weinstein & Mayer, 1986). De la Fuente and Martínez (2004) explain the advantages of this approach:

In *students*: 1) It enables them to know the teachers' previous ideas; 2) It anticipates difficulties which will arise, especially in design; 3) It elaborates strategic, conditional knowledge, difficult to grasp for many students, since there is dialogue and confrontation of ideas about strategic learning decisions: the *why*, *what for, what, when, how* and *who of learning* and *evaluating learning,* not just an exclusive focus on what must be learned. In general, use of these competencies allows students to become more autonomous in learning significantly and constructively over their lifetime, as expressed in the legislation drawn from the Bologna Declaration and other European documents.

In the *teacher*: 1) It facilitates a reflection process and raises metacognitive awareness of the cognitive requirements of the teaching-learning process, by properly responding to strategic teaching decisions: the *why, what for, when, and who of teaching* and *evaluating teaching*; 2) It promotes anticipation of difficulties which may along the way and forces a sequencing of teaching; 3) It helps teachers to modify possibly erroneous or limited conceptions about the teaching process as an independent process, not interacting with the learning process; 4) It promotes the design of a regulated teaching process, since it encourages different strategies that promote self-regulation in students: initial evaluation and process evaluation, making teaching objectives explicit, and planning self-regulated educational action; 5) It develops self-regulation in the teacher in the design and development of the teaching process, since, on one hand, it contributes to the design of a sequence of teaching activities as a process, and on the other hand, it helps regulate their development, readjusting them towards their initial purpose, and 6) It helps fill classroom methodology options for teaching-learning with cognitive content, avoiding the risk of a merely activity-driven approach.

Regulating teaching and learning online: Internet and web applications

There is a recent line of work which seeks to improve teaching and learning processes through use of information technology – Internet and web applications. Generally speaking, there are numerous initiatives at all educational levels which seek to optimize teaching and learning by application of ICT systems (Aleven, Stahl, Schworm, Fisher & Wallance, 2003; Hmelo-Silver & Bromme, 2007). Nonetheless, beyond a mere interest in introducing new technology and its effects on learning, it is still necessary to establish the comparative effectiveness of computer-supported strategic or self-regulated learning systems in comparison to other systems commonly in use. Considerable progress has been made in this direction (Azevedo, 2007; Azevedo & Cromley, 2003; Vovides, Sánchez-Alonso, Mitropoulu & Nickmans, 2007; Zhang, Zhao, Zhou & Numamaker, 2004)

The DEDEPRO™ *Model: Multi-level, interactive regulation of the teaching-learning process*

The DEDEPRO model is offered as a more in-depth adaptation of the Biggs (2001) and Zimmerman (2000, 2002) models. It begins with the *presage-process-product* variables (De la Fuente, Justicia & Berbén, 2005; De la Fuente, Justicia, Cano, Martínez, Pichardo & Berbén, 2005), and the times *before-during-after* (De la Fuente & Martínez, 2001, 2004)*,* respectively, in its proposed relationships and hypotheses.

Levels of regulated learning (Dimension 1)

The DEDEPRO model establishes, as a *first hypothesis,* that self-regulation in the learning process has two *regulation levels: micro-regulation* and *macro-regulation* (De la Fuente, Justicia & Berbén, 2005). *Micro-regulation of learning* is the process of learning involved in executing specific learning tasks (e.g. solving a problem, composing an essay, memorizing a list of rivers, etc.). This *type* and *level* of regulation is what has generated the most research to date. *Macro-regulation of learning* can be considered self-regulation of the learning process, in a broad sense, over the duration of this learning (e.g. degree program, multi-year, single year, semester, trimester, month, day). This level of self-regulation, though it is essential, has yet to be defined and studied in any precise fashion.

Levels of regulated teaching (Dimension 2)

The *second hypothesis of the DEDEPRO model* establishes that regulation of the teaching process has two *levels: micro-regulation* and *macro-regulation* of teaching (De la Fuente, Justicia & Berbén, 2005). In *micro-regulation of teaching* one can consider those variables in the instruction process carried out by the person teaching, focusing on execution of specific teaching tasks (e.g. teaching how to solve a problem, teaching how to write an essay, teaching the names of a river's tributaries, etc.). This *type* and *level* of regulation has generated a greater degree of research interest, although with different conceptions and names for the variables, focusing on teaching strategies, methodologies or activities, almost exclusively. *Macro-regulation of teaching* is considered the regulation of this process, in a broad sense, over the duration of the process (plan of studies, multi-year, single year, semester, trimester, month, day). Even though it is very relevant, this level likewise has had little attention, not having been defined or studied with precision. Nonetheless, more recent research has presented this relationship as an emerging topic of study in self-regulation, since regulated teaching substantially facilitates self-regulation in students (De la Fuente & Justicia, 2001, 2004; De la Fuente, Justicia & Berbén, 2005).

Levels of interdependent, interactive regulation of teaching and learning (Dimension 3)

Taking the next step forward, the third explanatory hypothesis of the model arises from an empirical determination that there is little interactive conception of the teaching-learning process. The *third hypothesis* of the DEDEPRO model establishes in complementary fashion that *each of the two processes, teaching and learning, is produced interdependently and interactively with the other*.

The *interdependence relationship* arises from ascertaining a mutual conditioning and effect of a causal relationship which each process produces in itself and in the other. Thus, a teacher who plans, reflects on the design, is methodical, systematic and strategic in teaching, will most likely produce a self-regulated learning process, although mediated by the student's own learning process, and vice versa. For their part, students who plan, reflect on the design, are methodical, systematic and strategic in learning, will most likely produce and give high value to a teaching process which is congruent with their own characteristics of self-regulated

learning, and vice versa. The interdependence may also produce cross interactive effects, that is, unbalanced or even contrary levels of regulation in teachers and students. This would mean that learning and potential performance would result from the multiplicative effect between the level of regulation in the learning process and in the teaching process. Different levels of regulation in learning (theoretical range: 1-3), in interaction (x) with different levels of regulated teaching (theoretical range: 1-3), would be associated with a different product of potential levels of learning and performance (theoretical range: 1-9). As follows intuitively, the model addresses the theoretical multiplicative combinations between the different levels of regulation of teachers and students. See Table 1.

Table 1. Potential regulation levels in the teaching and learning process

Processes	Regulation Levels		
	High	Medium	Low
1. Learning Process	3	2	1
2. Teaching Process	3	2	1
3. Performance Level	9	6-4	3-1

In no case should *regulated teaching* be identified with the mere physical presence of the teacher in the process, or the student's dependence on the teacher; on the contrary, it refers to an adequate delimitation of the teaching process and the learning that is to be pursued, in terms of concept, timing, materials and procedures. Likewise, adequate *self-regulated learning* should not be considered simply attending class, but rather, an active, constructive participation in the process, by means of multiple learning channels and actions.

The *interaction relationship,* however, refers to the subjects, teacher and student, actively seeking and valuing a regulation system congruent with their own. Thus, each party involved—the one executing each process—should be aware that the process is two-way and interactive. This means that each of the parties influences the other with their behavior (see Figure 1):
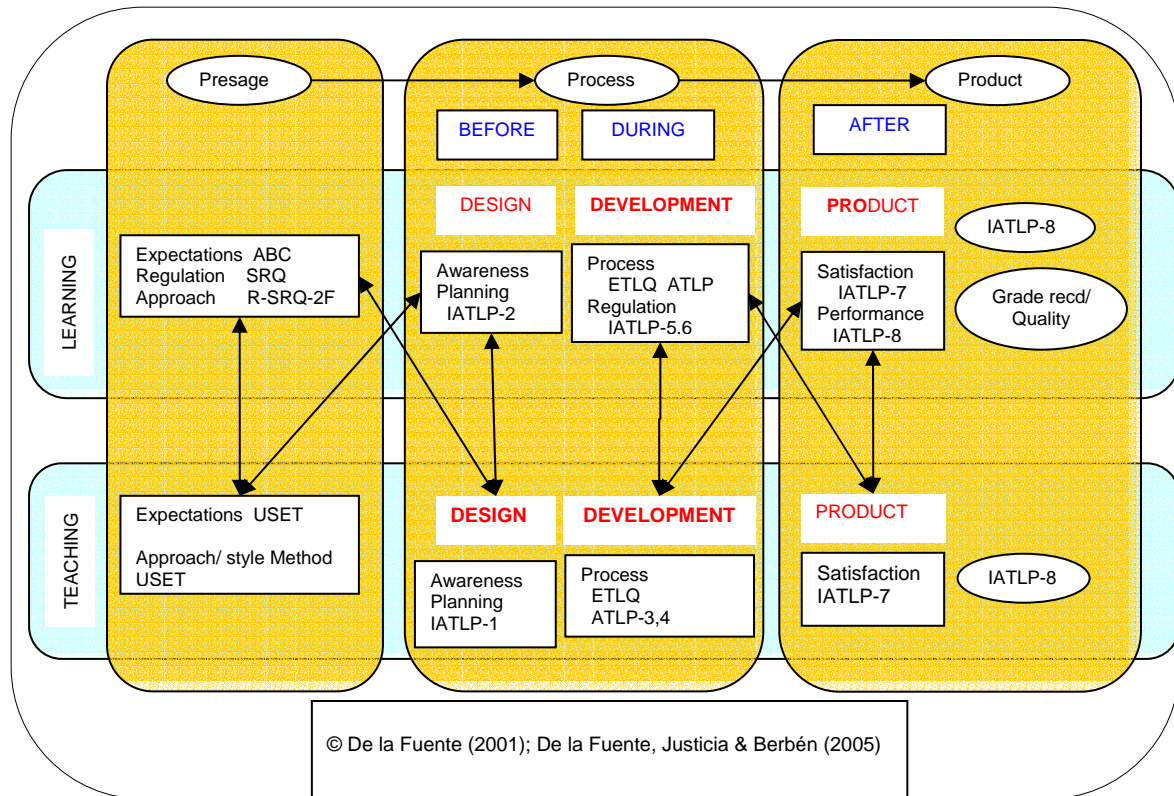
Figure. 1. DEDEPRO Interactive Model of Teaching – Learning. (Adapted from Biggs, 2001).

The DEDEPRO Model gives strength to the *interdependence* and *interactivity* relationships between the two processes, at the three levels of the variables *Presage, Process* and *Product*. Development of the teaching-learning process requires special attention. In the DEDEPRO Model it is assumed that adequate development of both processes involves adequate definition (in the design) and execution of strategic decisions referring to the *why, what for, what, how, when, where, who* of *learning/teaching* and *evaluating learning/teaching*. This fact gives the model with a marked curriculum orientation, unlike other models:

1) In the teaching process, the teacher should produce *regulatory teaching,* that is, he or she should know how to *regulate the learning process through another* –something which requires a high component of self-regulation during teaching (Randi, 2004)— *in order to contribute toward the student's own self-regulation of the learning process.* This regulation is also produced at two levels in teaching: it is an equally valid principle for concrete learning (micro-regulation) as for broader learning (macro-regulation). Thus, the teacher tries to teach

and to make students learn in a determined manner, but this action is not uni-directional, since it is mediated by (is interactive with) the way that students want or are able to learn.

2) In the learning process, the student must know how to *self-regulate the learning process,* and at the same time know how to *actively intervene in regulating the teacher's teaching process.* As in the above case, this process is produced at the two levels of micro-regulation and macro-regulation of learning. The students seeks to learn and to make the teacher teach in a certain manner, but this action is mediated by (is interactive with) the way the teacher wishes to teach the students.

Points of time in interactive regulation: DE-DE-PRO (Dimension 4)

This dimension, based on Zimmerman's self-regulation model (Zimmerman, Greenberg & Weinstein, 1994; Zimmemen & Kintasas, 1997; Zimmerman, 2000, 2002), establishes as a *fourth hypothesis* that there are three significant, meaningful points of time in regulation, both for the *teaching process* (teacher) and the *learning process* (student): 1. *Design* (at the beginning of and before execution), 2. *Development* (during execution). 3. *Product* (at the conclusion of and after execution). It is assumed that performance of regulation in one phase of this process, especially in the earlier ones, affects regulation in subsequent phases. Specific regulation behaviors and sub-processes typical to each phase are described in Table 2.

Table 2. Model of Regulated Teaching and Self-regulated Learning: DEDEPRO (De la Fuente, 2001)

1. Initial regulation of the T-L process: teachers' and students' design.	2. Regulation of the T-L process: development of the process.	3. Effects which should be produced by regulated T-L: product of the process.
1.1. Input to students' design of the T-L process (teachers). 1.1.1. Conceptions: ■ Teachers' conceptions, expectations and beliefs about "teaching" and "learning" ■ Teachers' conceptions about regulation and self-regulated learning. 1.1.2. Planning the teaching process and the students' learning process: ■ Planning didactic units: Approach, objectives, content, methodology (principles, methods, strategies, organization and resources). Planning evaluation (teaching process	**2.1. Regulating learning from the teaching process (teachers):** 2.1.1. Initial diagnostic evaluation (construction of the why and what for of teaching/learning): ■ Awareness of *why* and *for what* there is teaching and the students must learn. ■ Awareness of oneself, of the task and of the strategies required in teaching ■ Planning the students' teaching-learning process. 2.1.2. Presenting objectives and content to the students (construction of how to teach/to learn). ■ Presentation of objectives ■ Presentation of content: facts and concepts; procedures and attitudes, values, norms 2.1.3. The structure of the teaching and learning process (construction of how/when to teach / to learn):	**3.1. End results in teachers:** ■ Greater satisfaction with the teaching and learning process. ■ Improvement in teaching repertoires and the way learning is promoted. ■ Better teaching style ■ Fewer difficulties in teaching

and learning process). ▪ Classroom teaching strategies: type of activities and learning strategies to be promoted.	▪ General T/L behaviors to be promoted in the students ▪ Metacognitive, cognitive and support strategies to be promoted in the studens ▪ Strategies promoted for self-regulated learning: awareness of and planning for an activity; regulating and controlling action and self-evaluation of the action. ▪ Learning techniques promoted. 2.1.4. Formative evaluation (construction of what, how, when and who to evaluate the teaching-learning process): ▪ Evaluation of the students' learning processes and development. ▪ Self-evaluation and evaluation of the teaching process on the part of the students.	
1.2. Designing the T-L process (students). 1.2.1. Conceptions: ▪ Students' conceptions, expectations and beliefs about "teaching" and "learning" ▪ Students' conceptions about regulation and self-regulated learning. 1.2.2. Planning the learning process. ▪ Planning the learning process: methodology (principles, methods, strategies, organization and resources). Planning evaluation (teaching process and learning process).	**2.2 Self-regulated learning (students)** 2.2.1. Initial diagnostic evaluation (construction of the why and what for of teaching/learning): ▪ Awareness of *why* and *for what* there is teaching and the students must learn. ▪ Awareness of oneself, of the task and of the strategies required in learning ▪ Planning the learning process 2.2.2. Representation of objectives and content (construction of how to teach / to learn). ▪ Representation and appropriation of teaching and learning objectives ▪ Representation and appropriation of the types of content of teaching and learning 2.2.3. Representation and appropriation of the process of learning (construction of how/when to teach / to learn): ▪ General learning behavior ▪ Metacognitive, cognitive and support strategies ▪ Shared, participative learning strategies for evaluation ▪ Self-regulated learning strategies (awareness of and planning of an activity, regulating and controlling action and self-evaluation of action) ▪ Learning techniques 2.2.4. Formative evaluation (construction of what, how, when and who to evaluate the teaching-learning process): ▪ evaluation of the teaching process ▪ self-evaluation of the learning process	**3.2. End results in students** ▪ Greater satisfaction with the teaching and learning process ▪ Improvement in learning repertories and in the way one learns. ▪ Better learning style ▪ Fewer difficulties in the learning process. ▪ Better academic performance.

The DEDEPRO® model as a support for regulated, interactive evaluation of the teaching-learning process

The DEDEPRO model assumes the approach and conceptions of an Integrated Learning Evaluation System (Birenbaum et al., 2006), since it encourages an evaluation *for* learning (process) and not only *of* learning (product), with a clearly multidimensional, formative, intracurricular, authentic, contextualized and flexible orientation. Moreover, it applies this conception to both processes, teaching and learning, interactively.

In line with the conceptual assumptions taken on to empirically evaluate the model at the times of Design, Development and Product, the authors of the model developed several

assessment instruments and have made use of others, to be discussed below. These tools are well-suited for a reflective, constructive evaluation system, that is, an *authentic evaluation* that allows for joint reflection on the teaching-learning process, both from the teacher's and the students' point of view. Furthermore, this evaluation provides elements for reflection that make it possible to improve at each of the stages in the process, both for the teacher and the student, around strategic decisions typical to teaching and learning.

One of the advantages of this model is its versatility for using different assessment instruments already in existence and well-established, in addition to instruments drawn from the model itself (see Figure 1), which we explain below.

Assessment of presage variables of learning and teaching

The presage variables of the Biggs (2001) model have been taken into consideration and related to the variables which make up the DEDEPRO model. As for evaluating *presage variables of the learning process*, there are different assessment instruments which are consistent and used in research with this model. The *Revised Study Process Questionnaire, R-SPQ-2F* (Biggs, Kernber & Leurng, 2001) and its Spanish version (De la Fuente & Martínez, 2003a) is being validated with Spanish samples (Justicia, Pichardo, Cano, Berbén & De la Fuente, in press). The *ABC Self-efficacy Expectations Questionnaire* (Sander & Sanders, 2003), in its Spanish version (De la Fuente, 2003a), has proved useful for assessing presage variables of the learning process, in relation to the DEDEPRO model. The questionnaire *University Students' Expectations of Teaching, USET* (Sander, Stevenson, King & Coates, 2000), in its Spanish version (De la Fuente, 2003b) has made it possible to learn the type of teaching that university students expect and desire.

Assessment of process and product variables: self-regulation during learning

The type of evaluation drawn from the DEDEPRO model encourages and strengthens self-regulation also when the process is under way (during development) as well as self-regulation of the product (at the end). Moreover, it promotes an evaluation model focused on all the executive decisions in the learning process, as discussed above. The *ATLP Scales* (De la Fuente & Justicia, 2001, 2007) and the *IATLP Scales* (De la Fuente & Martínez, 2004) make it possible to evaluate the learning process, from a conception of interactive regulation.

The former is a quick assessment instrument and allows for a reliable general assessment of a short teaching-learning process (an activity, a session) or a longer one (a trimester, an academic year, a degree program), whether during the process or at the end of it. Thus they are suitable for producing a quick, approximate report on the process, with empirical data.

The latter allow for greater depth in assessing regulated teaching strategies (teacher) and learning strategies (students), and can be used at any phase in the process. These make it possible, *before* starting, to become aware of and assess how the action is planned (Scale IATLP-2, for students); *during* the process, they allow an assessment of whether there is control and whether learning and evaluation strategies are being used (Scale IATLP-4 , for students, for teaching; IATLP-6, for students, for learning); and, upon *finishing,* they assess the product, the degree of satisfaction and elements to be improved (Scale IATLP-8 for students). Both are currently available in Spanish (De la Fuente & Martínez, 2003) and English (De la Fuente & Martínez, 2007a), with the English version also available online (De la Fuente & Martínez, 2007b).

Nonetheless, the model also lends itself to use of other instruments, as reflected in Figure 1. One instrument which was used in research (De la Fuente et al., 2003-2006), and which is pertinent to the conception of the DEDEPRO model is the *Experiences of Teaching and Learning Questionnaire, ETLQ* (Hounsell, Entwistle & colls., 2001-2003), in its Spanish version, and also the *Cuestionario de Experiencias de Enseñanza y Aprendizaje, CEEA* (De la Fuente & Martínez, 2003b), since it collects relevant information about both learning and teaching experiences.

Assessment of process and product variables: regulated teaching

The *ATLP Scales* (De la Fuente & Justicia, 2001, 2007a, 2007b) and the *IATLP Scales* (De la Fuente & Martínez, 2004) offer an assessment of the teaching process, from the conception of regulation. As in the case of the learning process, the former are a screening instrument and allow for quick, reliable assessment of a short teaching-learning process (an activity, a session) or a longer one (a trimester, an academic year, a degree program)—at the end of the entire process, whether it is a short or a long one. They are therefore suitable for producing a quick, approximate report of the process, with empirical data. The latter allow for

deeper evaluation of regulated teaching strategies (teacher) and of learning strategies (students), and can be used at any phase of the process. They make it possible, *before* beginning, to become aware of and to evaluate how action is planned (Scale IATLP-1, for the teacher); *during* the process it evaluates whether control is in place and whether learning and evaluation strategies are being used (IATLP-3, for teachers, on teaching; EIPEA-5, for teachers, on learning); and, upon *finishing,* it allows assessment of the product, the degree of satisfaction and elements to be improved (IATLP-7, for teachers). Both are currently available in Spanish (De la Fuente & Martínez, 2004) and English, the English version also available online (De la Fuente & Martínez, 2007a, 2007b).

Regulated, interactive assessment of the teaching-learning process

One of the essential contributions of the DEDEPRO model and its derived instruments is interactive evaluation. This involves reflection and collecting information from both processes, learning and teaching, from both points of view: teacher and student. In fact, most assessment instruments in use do not have a format which allows interactive ("cross") completion, in order to contrast the points of view of teachers and students, including the ETLQ itself (op. cit). This fact means that, from the regulation approach of the DEDEPRO Model, there is a great loss of relevant information for regulation (in the teacher) and self-regulation (in students).

Research carried out with the ATLP and IATLP Scales (op. cit), has demonstrated their usefulness and sensitivity in assessing regulated teaching and self-regulated learning (De la Fuente & Justicia, 2001; De la Fuente, Justicia & colls., 2003-2006). Furthermore, these Scales have proved very useful for joint, constructive reflection with teachers and students, as reported in other studies (Sánchez, De la Fuente & Peralta, 2007; De la Fuente, Cano, Justicia, Pichardo, Martínez, Berbén & Sander, in press).

The DEDEPRO® Model as an intervention strategy and support for using ICT during the teaching-learning process

The era of information and communication technology (ICT) has given rise to changes in education, offering more opportunities, both for distance education, as well as assessment tools and support for face-to-face education. This new medium for teaching-learning requires

students to possess certain concrete characteristics that allow them to meet their academic goals. Self-regulation is considered one of the important characteristics of virtual learners (McMahon & Ron, 2001).

Regulated teaching and self-regulated learning through online devices

Online assessment of teaching-learning

Current progress in ICT has produced rapid advances in evaluation models and tools. The online assessment instruments, e-ATLP, in Spanish and English (De la Fuente & Justicia, 2007a, 2007b) and e-IATLP, in Spanish and English (De la Fuente & Martínez, 2007a, 2007b) have meant a significant advance in an integrated system which makes assessment more versatile, rapid and valid, granting it clear added value to the evaluation model drawn from the DEDEPRO model.

Online regulation of the teaching-learning process: DIMEPEA-PLEYADE

Research which addresses the study of *regulated learning on-line* is still limited. However, it does show that such regulation is a necessary, important characteristic for students being instructed through virtual utilities (McMahon & Ron, 2001). One important characteristic which influences this learning are the subject's strategies, since these are closely related to self-regulated learning in an online environment (Lee, 2002; McMahon & Ron, 2001). Lyman (1998, quoted in Lee, 2002) indicates six typical learning strategies of online learning: knowing when information is necessary, and knowing how to identify it, locate it, evaluate it, organize it and use it effectively.

Interventions aimed at improving regulation of the teaching-learning process through ICT opportunities are a real need. ChanLin, Huang and Chan (2003) used virtual teaching as a complement to face-to-face teaching on nutrition, obtaining satisfactory results. The study by Rogers and Swan (2004) shows that self-regulated learning can be effectively applied to Internet information-search behaviors, indicating some of the strategies used.

In our country, online interventions for improving regulation of the teaching-learning process are still undeveloped. The lack of research in this field has prompted a group of re-

searchers on learning strategies to develop a virtual intervention in the framework of an R&D&I Project (De la Fuente & colls. 2003-2006), with three universities participating, University of Almería, of Granada, and University of Wales Institute, Cardiff. From this intervention a virtual utility was created as a support to self-regulated learning in a face-to-face teaching situation. Applicability of the DEDEPRO model is currently being evaluated through an online platform which integrates two tools, one specific to strategic regulation of the teaching-learning process, TLPA (De la Fuente & Trujillo, 2004) and the other, Pléyade, designed to encourage virtual communication of information and learning strategies among members of the class group (De la Fuente & Martínez, 2002). Strategies for their use and the promising effects of this innovation experience are also reported in this monograph (De la Fuente, Cano et. al, 2007)

Regulation of teaching and learning at pre-university levels

The DEDEPRO model has also been implemented as a comprehensive heuristic at pre-university levels, with conceptual and empirical success (Martínez & De la Fuente, 2004; Sánchez, De la Fuente & Peralta, 2007a; Sánchez, De la Fuente, & Peralta, 2007b). At the conceptual level, it has produced a better conceptual representation of the teaching-learning process, especially in teachers. At the empirical level, it has meant being able to evaluate and intervene, with precision and interactively, in teachers' teaching strategies and students' strategies for learning. In summary, the model has become a strategy protocol for formative, participative intervention for teachers and students. This makes it a practical implementation of *learning-centered teaching* or, if you prefer, of *student-centered teaching* (Chocarro, González-Torres y Sobrino, 2007; Weimer, 2002).

Regulated teaching and self-regulated learning in the European Space for Higher Education

In the setting of the European Union, convergence of educational systems by the year 2010 has given rise to the current situation of change and readjustment in the concept of teaching and learning, in addition to changes occurring through definition of competencies, producing a great transformation in the European Space for Higher Education.

The DEDEPRO model has provided the basis for an evaluation and intervention protocol in the teaching-learning process in pilot experiences within the framework of the ECTS

(European Credit Transfer System), both in written and electronic formats (De la Fuente, 2007a, 2007b), as well as intervention and training experiences with university teachers for the development of new Teaching Guides. In the university setting, this involved elaboration of an integrated proposal for *Evaluation and Improvement of the Teaching-Learning Process in the European Space for Higher Education* (De la Fuente, Justicia & Sander, in process).

Conclusion and future prospects

Conclusions

Although this rational model is still in a phase of global, empirical consolidation, at university and pre-university levels, available results obtained on partial relationships among variables, and other results still under analysis, have shown consistent relationships. Furthermore, they suggest that the model gives adequate weight to the teaching-learning process as an interactive psycho-educational construct, made up of variables from both sub-processes: the learning process and the teaching process (Rivas, 1997).

As for the *learning process,* certain variables with *presage* value in self-regulated learning have been determined. The role and diversity of university students' approaches to learning have been determined (Berbén, De la Fuente, Justicia & Pichardo, 2005; De la Fuente, Berbén & Pichardo, 2006). Furthermore the predictive value of learning style with respect to self-regulated learning has been established as a *process* variable, especially with regard to the role of previous planning, control during the process, and final satisfaction with learning (De la Fuente, Justicia & Berbén, 2006). A consistent relationship of significant association was also found between different self-regulation times: before, during and after. Moreover, analyses to date have shown consistent correlations and similar statistical effects after the psycho-educational intervention, evaluated both with instruments originally in Spanish (IATLP) as well in English (ETLQ) (De la Fuente, Cano, Justicia, Pichardo, Martínez, Berbén & Sander, 2007). Nonetheless, relationships have not been as clear when establishing relationships between *presage* and *process* variables (self-regulation during learning) and *product* variables (academic performance), results yet to be reported.

As for the *teaching process,* certain variables with *presage* value have also been the object of study, such as student expectations and preference for teaching methods (Pichardo,

Justicia & Berbén, 2006; Pichardo, Berbén, De la Fuente & Justicia, 2007), as well as *process* variables*,* such as perception of the development of the teaching process, its strong points and points for improvement, comparing Spanish university students with students in the U.K. (De la Fuente, Justicia, Sander, Cano, Martínez & Pichardo, 2004).

Interactive and interdependence relationships, that is, mutual conditioning relationships between the learning and teaching process –core elements proposed by the DEDEPRO model—are currently being analyzed and are the object of future research reports.

Future prospects

Changes under way in our educational system and the importance of curriculum based on acquiring competencies has meant shifting our attention from the process of teaching-learning to the attainment of its final product (De la Fuente, Justicia, Trianes & Casanova, 2005; Eurydice, 2002). In line with this challenge, the DEDEPRO model has put forward the interesting idea that more self-regulated, strategic learners and learning processes, together with more regulated teachers and teaching processes, will result in more and better construction of academic-professional competencies in students (De la Fuente, Justicia, Sander, Pichardo, Martínez & Berbén, 2007-2010; Monereo & Pozo, 2003).

The DEDEPRO model has therefore become a utility model (De la Fuente, 2007e), for identifying interactive, interdependent phases and subprocesses, particularly in macro- and micro- processes as complex as those of teaching and learning. This advance has led to its use as a *research + development + innovation model* (R&D&I) in the area of evaluating and improving teaching-learning processes, whether through a school Guidance Department (De la Fuente et al., 2007; De la Fuente, Peralta & Sánchez, 2007) or in the R&D Department of any organization that wishes to improve its educational processes and products (Education & Psychology, 2007).

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estrategias de enseñanza reguladoras on-line. Proyecto I+D+i [Improving self-regulated learning in university students, through online regulated teaching strategies. R&D&I Project.] ref. BSO2003- 6493/PSCE. Madrid, Spain: Ministerio de Ciencia y Tecnología.

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