



Self-Regulated Learning

Theories and potential applications in didactics

Annarita Bramucci, University of Macerata

03/04/2013



Summary

Introduction.....	3
1 Theoretical approaches	5
1.1 Motivation	7
1.2 Self-awareness.....	9
1.3 Key processes	11
1.4 Physical and social environment	13
1.5 Acquiring capacity	15
2 Self-regulated learning and pedagogy	17
2.1 Pedagogic devices for self-regulation.....	17
2.2 Regulation and cooperation in process activating environments.....	18
2.3 Reflections and self-evaluation in the activational tools for the key self-regulation processes.....	19
Conclusions.....	21
Bibliography.....	22

Introduction

Self-regulated learning is both a theory and a field of research on self-regulated school learning which emerged in the mid-1980s. Focusing on the principle that learning is an active and constructive process, research has enquired into the ways in which learners can take control of their own learning processes.

Self-regulation is a key element within this theoretical framework. Zimmerman (1990) considers it important to clarify that self-regulation is not a mental ability and neither is it a skill linked to specific academic performance but rather it is a self-directed process by means of which learners transform their mental abilities into skills linked to activity practised in a specific context. Such an approach sees learning as an activity which students do for themselves in a proactive way.

Research and observations on self-regulated learners in different times and using a range of methods (Zimmermann, 2001) have demonstrated that they approach school activities diligently, confidently and in an entrepreneurial way. Furthermore, they show awareness both of when they know a given fact or possess a specific ability and when they do not. In contrast with their 'passive' classmates, proactive self-regulated students search out information and adopt whatever measures are necessary to take control of it. When they encounter adverse situations such as bad study conditions, confusing teachers or text books which are difficult to understand they find ways to succeed in any case. Self-regulated learners see knowledge acquisition as a systematic and controllable process and feel greater responsibility in the achievement of their results. They show that they:

- possess an awareness of the strategic relations which exist between regulatory processes or responses and learning results;
- can make use of the strategies they are aware of to achieve pre-established objectives.

Self-regulated learning, must thus be split into:

1. processes of self-regulation such as perceptions of self-efficacy which we will look at further on and
2. adoption of strategies aimed at optimising such processes such as, for example, setting intermediate objectives or the intrinsic task itself.

Identifying a highly exhaustive theoretical and experimental framework must be accompanied by teaching practice which is particularly attentive and aimed at promoting self-regulated learning. This has profound implications in planning, choice of teaching strategy, teaching practice, interaction with students and the way in which the school should be organised in order to promote activities aimed at acquiring and developing skills and self-regulatory abilities within teaching. Furthermore this vision radically changes the focus of educational analysis: from the ability to learn and environments considered fixed bodies, the focus of educational analysis shifts to processes activated autonomously by students and the responses received from them with the aim of improving their skills and the environment in which they learn.

This analysis is made up of two parts: the first deals with setting out the main theoretical perspectives relating to research into the processes involved in self-regulated learning and the second part briefly analyses what it means for didactics and focuses, in particular, on the



importance of planning perspectives which place students at the centre of the process as active, autonomous and aware of their learning processes in accordance with the main educational aims.

1 Theoretical perspectives

There are many ways to interpret self-regulated learning and they are influenced by the various theoretical orientations of the researchers concerned. However within and between the various perspectives it is possible to identify a field of research whose elements show a shared conceptualisation which presents a range of interpretative variants and brings out features of self-regulated learning (Zimmermann, 2001).

The first key element which appears in all theoretical perspectives is that *students are self-regulating to the extent that they take an active part in their own learning processes* not only in *cognitive and metacognitive terms* but also in *motivational and behavioural terms*. Aside from the already recognised cognitive and metacognitive dimension then, the importance of the emotions which guide these processes in tacit form also emerge. Zimmermann (1990) argues that the three dimensions of self-regulated learning can be summed up as processes which are always open and active in response to the 'self' and the context in which they work:

- The *metacognitive processes* concerned relate to mastery of one's own acquisition processes during which self-regulated learners plan their own learning trajectory, set out their objectives, organise the steps to be taken, adopt solution strategies, draw up mental images, monitor themselves, evaluate themselves from various points of view and establish reference standards to measure themselves against. These are processes which help them to be aware of, competent in and confident of their learning processes.
- The *motivational processes* are linked to the tacit and emotive sphere which is the inevitable precursor and guide to action. Self-regulated learners are not discouraged by failure but develop strategies to overcome it and keep control of their emotions. This prompts them to show a high degree of self-efficacy, i.e. an awareness that they can effectively take on their difficulties and feel capable.

They also show a significant ability to self-define in terms of role and a particular interest in the task itself which is not explicitly required but autonomously established and carried out because it is seen as functional to their activities. Self-regulated students thus do not simply react to their learning results but rather they search proactively for opportunities to learn, setting in motion autonomous activities to promote self-observation, self-evaluation and self-improvement.

- To observers, *behavioural processes* are proof that self-regulated learners take an active part in their own learning processes. They select, structure and create environments (physical and social contexts) to optimise their learning with incredible effort and persistence. They seek advice, information and venues in which they will have a greater chance of learning, they self-teach during the acquisition process and they reinforce this while performing tasks. In other words, they actively guide and monitor their own learning processes instead of submitting passively to them.

A second key element which the various definitions of self-regulated learning have in common is a recognition that in it students create self-oriented feedback loops. These involve cyclical processes which enable students to monitor the efficacy of the methods and learning strategies they have adopted and thus react to such feedback in a variety of ways ranging from tacit alterations closely linked to their self-perception to clear behavioural changes and learning strategy differentiation.

A third shared element is the attempt to give precise and detailed indications on how and why students choose to use one specific strategy or response rather than another. The *motivational sphere*, in fact, is recognised in all perspectives as the determinant element in self-regulation processes. We will see later on how this is attributed to different factors according to the type of approach to learning processes involved.

If self-regulated learning is to involve a range of specific strategies or responses at the same time, students' efforts to initiate and regulate these in a proactive way requires time, preparation and care. Motivation is therefore the core of pro-active processes and strongly connected to them. There is nothing random about the fact that learning and motivation are treated as interdependent processes which, consequently, cannot be understood fully if disconnected from one another.

Motivation is evident in students' ongoing tendency to work to higher learning objectives every time they achieve their previous objectives, a quality which Bandura (cited in Zimmermann 1990, p.6) has defined as self-motivation. Thus self-regulated learning involves more than a straightforward ability to carry out learning responses autonomously (such as self-control) or adapting responses to new circumstances or changing conditions in response to negative feedback. *Self-motivation* consists of full-blown proactive attempts to discover and benefit from learning activities. At this level, students are not only self-directed on a metacognitive level but also capable of self-motivation.

Zimmermann (2001) analysed the main theoretical perspectives on self-regulated learning and found shared research elements in them which are analysed differently according to theoretical approach. Each theory is capable of bringing out specific characteristics of self-regulation processes and each has made its own specific contribution to the definition of self-regulated learning.

In explaining what becoming a self-regulated learner means not only on the cognitive and meta-cognitive levels but also in motivational and behavioural terms, research in the various theoretical perspectives has focused substantially on five basic issues:

- 1) *What motivates* students to self-regulate during learning?
- 2) *What procedures* do students *use* to become self-responsive or aware?
- 3) What are the *key processes* or responses which self-regulated students perform in order to achieve their academic objectives?
- 4) How do the *social and physical environments* influence students' self-regulated learning?
- 5) How can students *acquire self-regulatory abilities* during learning?

A need for a range of observation methods and types of analysis emerged from these fundamental issues and thus a number of research approaches can be identified which place different emphases on the specific strategies and functions capable of making learning into a pro-active process aimed not simply at formulating responses (and thus purely re-active) but also at influencing choices, behaviours, motivations and environments on the basis of personal experiences in relation to determinate objectives.

I will set out here the theoretical framework of the various approaches as proposed by Zimmermann (2001).

TABLE 1.1
A Comparison of Theoretical Views Regarding Common Issues in Self-Regulation of Learning

<i>Common Issues in Self-Regulation of Learning</i>					
<i>Theories</i>	<i>Motivation</i>	<i>Self-Awareness</i>	<i>Key Processes</i>	<i>Social and Physical Environment</i>	<i>Acquiring Capacity</i>
Operant	Reinforcing stimuli are emphasized	Not recognized except for self-reactivity	Self-monitoring, Self-instruction, and Self-evaluation	Modeling and Reinforcement	Shaping behavior and fading adjunctive stimuli
Phenomenological	Self-actualization is emphasized	Emphasize role of self-concept	Self-worth and self-identity	Emphasize subjective perceptions of it	Development of the Self-System
Information Processing	Motivation is not emphasized historically	Cognitive self-monitoring	Storage and transformation of information	Not emphasized except when transformed to information	Increases in capacity of system to transform information
Social Cognitive	Self-efficacy, outcome expectations, and goals are emphasized	Self-observation and self-recording	Self-observation, self-judgment and self-reactions	Modeling and enactive mastery experiences	Increases through social learning at four successive levels
Volitional	It is a precondition to volition based on one's expectancy/values	Action controlled rather than state controlled	Strategies to control cognition, motivation, and emotions	Volitional strategies to control distracting environments	An acquired ability to use volitional control strategies
Vygotskian	Not emphasized historically except for social context effects	Consciousness of learning in the ZPD	Egocentric and inner speech	Adult dialogue mediates internalization of children's speech	Children acquire inner use of speech in a series of developmental levels
Constructivist	Resolution of cognitive conflict or a curiosity drive is emphasized	Metacognitive monitoring	Constructing schemas, strategies, or personal theories	Historically social conflict or discovery learning are stressed	Development constrains children's acquisition of self-regulatory processes

1.1 Motivation

The central focus of debate not only between the various theories but also amongst researchers within the same theoretical perspective is the issue of where motivation comes from during self-regulation processes. *What motivates* students to self-regulate? Certain experiments and studies have made an understanding of the elements and events which generate motivation necessary. The motivational issue is implicit in the self-regulation process and as such it is the most difficult to identify.

In accordance with the idea that motivation is a hidden dimension in action processes, researchers who have analysed learning processes from the point of view of volition (Zimmermann 2001, p. 23) have identified the strongly implicit nature of motivation which is at the centre of the multi-layered structural complexity of the learning process. In learning understood as a volitional process - one, that is, which is made possible by the individual's will - self-regulatory motivation is held to be a precondition of volition and is determined by the learners' values and his or her expectations in terms of achieving specific objectives. This approach argues that motivational processes are distinct from volitional processes and precede the latter. In fact, if motivational processes influence and promote decision making, volitional processes influence such decisions coming to fruition and safeguard them. Once learners have the motivation required to carry out a specific task, volitional processes work to sustain its functions. Whilst the intention to act derives from motivational factors, volition certainly intensifies the intention to learn and directs its actuation.

It would seem that motivation comes before volition and is an essential component in any action process.

Researchers in the information processing (IP) field (Zimmermann, 2001, p. 16) who have always focused their attention on the state of knowledge or reasoning and communication methods in order potentially to reproduce these in electronic computing machines have also had to include motivational components in their models. In elaborating cognitive models, this has led to differentiation between cold (based on cognitive processes) and hot (relating to the motivational sphere) forms of information and the identification of specific combinations of these aimed at achieving specific levels of self-regulation. For example, self-efficacy beliefs were added to the

cognitive control circuits enabling students to cope with self-doubt or anxiety about their ability to act. Winne (cited in Zimmermann, 2001, p. 153) extended the list of personal beliefs with the inclusion of four motivational variables: outcome expectations, efficacy judgements, roles and incentives or values.

The experiments conducted by Skinner et al. (*Ibidem*, p.10) have been an excellent starting point since the 1960s for research on self-regulation in terms of the formulation of specific and well-prepared external stimuli. The theorists of instrumental conditioning argue that the responses of a self-regulating individual must necessarily be tied to **external** reinforcing **stimuli** applied methodically. In this sense self-regulation responses are seen as control links between responses which build up to create an external bulwark in their turn.

It has, moreover, been found that students who self-regulate sometimes decide to postpone short-term gains in favour of better, long-term alternatives. The decision to self-regulate is thus based on the subjective measurement of short or long-term gains and the intervals of time between these. Certain behaviourists argue that this degree of autonomy reveals the discriminatory nature of self-produced stimuli in that, rather than acting as stimuli in themselves which serve only in the performance of immediate action, they are capable of guiding individuals to further and different responses.

According to the phenomenologists the primary source of self-regulatory motivation during learning is to be found in the intensification and **self-actualisation of the self-concept**. The fundamental role of the self in learning is to generate a motivation to attempt and persist in learning activities. This can occur by means of a personal evaluation of the meaning and significance of learning activities on the basis of the perception of individual goals and abilities. McCombs (see Zimmermann, 2001, p.13) subdivided the structure of the system of self into global forms and specific domains.

- The global form of the sense of self relates to the images that students have of themselves as self-learning subjects and are based on their awareness of the knowledge, skills and abilities required to carry out a given task.
- The specific dominion of the sense of self is defined as individuals' perceptions of their own ability to manage and control their motivation and understanding, feelings and behaviours in a specific learning context. It is assumed that these self-perceptions determine the way in which students self-regulate when they learn in that context. The McCombs model argues that emotional responses play a determinant role in motivation. If the individual's sense of self is not positive negative effects such as anxiety and reduction in motivation will result. This emotional state will express itself in impotence, avoidance or withdrawal from learning activities and the learning environment. If the individual's sense of self is positive, on the other hand, he or she will not only demonstrate self-confidence during learning but also intrinsically high motivation. This applies to students who continue learning even when the external context does not require it.

Social cognitive theory places motivation in two types of expectations which are considered fundamental: (1) the expectations that students have of their goals and results and (2) expectations relating to their own self-efficacy (Schunk, 1990).

- 1) As far as the former type of expectation is concerned, social cognitive theory moves away both from a behaviourist vision which sees benefits purely in terms of external and environmental events and a phenomenologist approach which sees the motivational impulse as coming exclusively from the subject. Social cognitive theory demonstrates that learners regulate their behaviour not on the basis of pre-established goals and the effective results of their performance but rather on the basis of the expected outcome of these goals and results. Motivation is thus seen as coming from the benefits that learners expect to receive personally rather than direct

external benefits (according to behaviourists) or perception of self alone (according to phenomenologists).

- 2) Whilst motivation is based on expected rather than actual results, however, it has been found that many students show a certain reluctance to attempt tasks on a model which would bring them guaranteed success in any case. To explain this, Bandura (cited in Zimmermann, 2001) has suggested that a second framework of expectations exists in which motivation derives from the expectations that learners have of their own self-efficacy. The results of a given model might be personally recognised and considered favourably by learners but not sought after if students consider this model too advanced for them and risk not feeling up to the task. The sense of self-efficacy consists in the perception of one's own ability to implement the action required to achieve the required performance standards. The measure of a student's self-efficacy is closely tied to elements such as choice of task, commitment, effort made and skills acquired. Expectations of self-efficacy combined with results expectations supply learners with representations or models of future outcomes which help them to establish their goals. Whilst not the basis of motivations, personal goals serve, in turn, as reference standards on the basis of which learners assess their future performance. If learners are sacrificing personal satisfaction to the achievement of their objectives, they will tend to persist until their performance reaches pre-established standards. According to Schunk (cited in Zimmermann 1990, p. 6), moreover, perceptions of self-efficacy are both a motive for learning and, at the same time, a result of efforts to learn in a cyclical and recursive model.

Vygotsky's very different stance gives a small and formal definition of the motivational processes themselves in that, in arguing for the principle of co-determination between external environment and mental processes, he refutes the idea that a clear distinction exists between the two historic categories of effects and motivations. He recognises, however, that whilst the value of knowledge is acquired from social interaction in natural contexts in a self-evident way, mastery of the environment must be an individual and collective goal which can be achieved in a **self-directed dialogue**. Vygotsky holds that there are two types of **inner speech** in motivational processes, one which is task involved and one which is self-involved. By task involved inner speech Vygotsky is referring to strategic problem solving states aimed at increasing control over the performance of the task. By self-involved inner speech he means an emotional and motivational state used to improve self control. In this approach both states can influence motivation.

The constructivist approach assumes that motivation consists in an innate need to construct meaning from experience and, thus, that an intrinsic motivation to search for information and increase knowledge exists. From this principle, motivation comes either from the urge to satisfy curiosity or the desire to resolve a 'cognitive conflict'. An undesirable state forces learners to carry out a structural re-organisation of knowledge in order to re-establish their own cognitive equilibrium.

1.2 Self-awareness

Despite the fact that self-awareness, in the same way as motivation, is an implicit component which cannot be directly observed, it is generally accepted by researchers that it can be observed on a phenomenological level and encourages self-tracking in students in order to derive from it processes *by means of which* they can become self-reactive and aware. What is self-awareness? How can it be identified and what processes can prompt it?

The theorists of instrumental conditioning have identified awareness in expressions of a behavioural type and recognise it specifically in self-reactivity, i.e., the ability to respond to self-produced stimuli. They underline the importance of carrying out self-monitoring or self-recording activities (keeping track of oneself) in order to become self-regulated learners. They place primary emphasis on the importance of stimulating awareness during school activities with the use of strategies such as story telling, frequent calculations, measurement of the length of performance, temporal sampling procedures and behavioural evaluation. For self-reactivity stimulation, they recommend a behavioural and environmental method involving studying observable events produced by registering action which constitutes an external stimulus and a physical trace in itself aimed at stimulating re-action processes.

Social-cognitive theorists argue that self-awareness involves one or more perceptive states such as self-efficacy which emerge from specific self-observation and self-tracking responses. Self-observation is the process which guarantees the information required in directing subsequent self-regulation efforts and is more useful when it is focused on specific conditions in which learning takes place such as time, space and duration. Self-observation can be supported by **self-recording** activities using diaries, work sheets on the state of progress and behavioural graphs. Research has demonstrated that regular and immediate self-recording is of determinant importance in ensuring immediate responses to self-observation.

In reinforcing such proposals in self-regulation, for the theorists of information processing too, cognitive self-monitoring plays a complex but crucial role. Self-monitoring metaphorically implies a window of awareness of one's own functions. Aimed at supporting adaptation processes, self-awareness occupies an important part in mental capacity and thus it is necessary to reduce it to some extent in order to achieve optimal performance for self-monitoring. This requires a simplification of tasks by means of performance automation. In this way learners are not obliged to exercise direct awareness on a motor level and thus employ their self-regulation energies at a higher hierarchical level of the goals and feedback cycle. Studies have shown that when motor sub-objectives are linked automatically to a higher cognitive goal, better results can be obtained.

Vygotsky's stance on task automation is quite different (*Ibidem*, p.27). He suggests that once a specific skill has become automatic, self-awareness is no longer substantially called for and this can be damaging for the purposes of facilitating the integration of further tasks. He considers awareness to be a sub-category of the conscience which he sees as the highest level of mental functioning and argues that the conscience's base unit is closely linked to the use of language in the sense that words can tap into the conscience when their meaning is internalised. Awareness thus takes place when control over performance no longer derives from the words of others but is transferred to the level of inner speech. This type of **transition** can reinforce individuals in carrying out activities if it is facilitated by the use of open speech centred on oneself or self-directed. At a certain point in activities each individual must take account of a combination of hetero-regulation, self-regulation and automatised processes and thus awareness must be selectively focused on all the elements which enable us to exercise a skill which emerges in the proximal development zone.

Vygotsky's phenomenological perspective is also different from that of the behaviourists and cognitivists as he sees awareness as an omnipresent condition of mental functioning. Self-awareness is something that we all have naturally, our sense of self, that is, and thus individuals have no need to share with others to be aware or self-reactive.

McCombs' studies (cited in Zimmermann 2001, p. 14), however, have found that a high level of self-awareness is linked to the desire to know oneself while low self-awareness is linked to self-defence. A defensive attitude can become a key self-awareness inhibiting or distorting factor and thus students who doubt their ability to learn will become anxious and may even avoid learning situations. Educators must, then, intervene to modulate self-awareness processes and contribute to

diminishing or even possibly eliminating defensive reactions. Self-monitoring and self-evaluation have been shown to be effective strategies in promoting self-awareness. In line with this vision teachers must teach students to track what they think and hear during learning in order to increase subjective awareness of their own potential.

The approach to self-awareness of the researchers who have emphasised the volitional aspects of learning is interesting (*Ibidem*, p.24). They argue that, whilst self-awareness is an essential element in volitional processes it is not always capable of leading to volitional control. The cause is to be found in two classifiable dominant cognitive processes which determine or obstruct self-awareness. If action-oriented cognitions prompt learners to exclude tendencies to competitive action and remain focused on current intention, state-oriented cognitions are characterised by emotional states and feelings of doubt which can interfere with control over action. The state-oriented cognitions identified are as follows:

1. brooding and the inability to exclude thoughts on prior failure;
2. extrinsic attention is excessive worrying about the future rather than immediate goals;
3. indecision leads to hesitation and comes from a lack of confidence when deciding the course of action to take.

Such thoughts can get in the way of an intention moving on to its expression in behavioural terms. Teachers thus need to make use of cognitive monitoring techniques aimed at combating state oriented cognitive processes and reinforce specific control and attention strategies which can shift learners' focus from self-states to task action.

The cognitive-constructivist approach attributes the degree of awareness to the child's development and emphasises that this plays a central role in the formation of mental frameworks at a meta-cognitive level of self awareness (*Ibidem*, p.30). Children's thoughts never begin in a fully logical, or operational, way until children integrate their perceptions of themselves and their world into that of others. The highest level of awareness linked to self-regulation does not occur until children enter the last of Piaget's stages of development. When this occurs children are aware of their thoughts and capable of treating them as hypotheses requiring validation. This level of functioning takes on the prefix meta in order to underline that cognitive functioning begins to be monitored and controlled at a high level of awareness. At a certain point in their growth students are capable not simply of adopting self-regulating practices but also of building representations and models of experience and control in specific knowledge domains. Teachers must thus take account of the learners' stages of development in constructing measures to promote self-awareness.

1.3 Key processes

What are the *key processes* or responses which self-regulated students set in motion in order to achieve their academic objectives?

For information processing researchers the key processes in self-regulation are to be found mainly in memory management (Zimmermann 2001, p.17) by means of conserving and transforming information. Three types of memory are used during self-regulation. In (1) the sensory memory information has a brief life of a second or two and takes the form belonging to one specific sense (visual or auditory). Sensory information which is subjected to focal attention shifts to a (2) short term or work memory which is limited to 20 seconds. If the information is codified or organised in the (3) long-term memory it is stored there for an indefinite period of time. The long-term memory is represented as a network of nodes, portions or frameworks which are connected up by links. Students can modulate their memories of a fact or event by taking part in it and organising it into a form which is easy to recover. They can also manage memory passages and increase what

they remember by assimilating pieces of information subdivided into greater units thus freeing their short-term memories for other phases of work such as self-monitoring. Self-regulated learning encompasses a recursive control cycle and monitoring processes which need to be used during the progressive four phases of (*Ibidem*, p.165): 1) task definition, 2) goal and planning definition, 3) study strategy actuation and 4) strategy adaptation. Self-monitoring involves goal evaluation in terms of personal standards. This cognitive evaluation between current personal objectives and objective standards prompts students to learn.

Theorists of instrumental behaviour (*Ibidem*, p.43) consider four processes to be fundamental which consist of activities aimed at prompting external stimuli in themselves which I will briefly summarise here:

1. Self-monitoring. As has been considered in depth self-monitoring stimulates self-reactivity prompting motivation.
2. Self-instruction. The self-instruction state consists of written or oral stimuli which learners are capable of activating themselves and which guide them to respond in situations in which external 'reinforcer' stimuli are weak or absent. From this perspective self-directed speech takes on the terms of stimulus-response and the self-instruction state explicitly indicates appropriate responses and the resulting consequences.
3. Self-evaluation. Self-evaluation requires measuring one's behaviour against a reference standard which takes the form of precise actions (the number of steps carried out correctly) and performance improvement in terms of speed, quantity and duration. The types of self-evaluation described influence self-corrective responses and modify reactions or even reference standards if these are revealed to be insufficient or unnecessary.
4. Self-reinforcement. Self-evaluation is in turn the basis for self-managing rewards or prizes, a process which instrumental theorists call self-reinforcement.

For phenomenologists (Zimmermann 2001, p. 86) self-worth and self-identity - which are respectively perceiving one's own value and one's own identity - are structures in the self-system and in turn influence and determine an extended network of specific processes of self-regulation such as self-evaluation, planning, defining objectives, monitoring, elaborating, codifying, recovery and strategies. Special emphasis is given to the role of self-evaluation. Self-evaluation is carried out by comparing the structures of the self-system on the basis of the necessary requisites by means of an ongoing interaction between tasks, personal needs, one's own abilities and control capacity.

Bandura's approach is more complex and this is the basis of Schunk's (Schunk 1990; Zimmermann, 2001) approach which identifies three key phases in self-regulation:

- self-observation informs and motivates. Behaviours can be evaluated on the basis of elements such as quality, speed, quantity and the originality of one's actions. The information thus obtained is used to evaluate progress in relation to goals. Self-observation is also capable of motivating behavioural changes. Motivation is in turn reinforced when students believe in and feel able to change their current habits (high self-efficacy) because if they change their behaviour they will get better results and enhance those results. Ongoing monitoring activities can enable self-observation to take place in that, if they are observed immediately and on an ongoing basis rather than intermittently, behaviours can become motivational forces for change.
- self-judgement consists of measuring present performance against one's goals. Self-judgement is influenced by the types of standard used, by goal characteristics, the importance of achieving goals and the characteristics of performance.
- self-reaction motivates behaviour in relation to the next goal. Believing that one's progress is acceptable, together with advance satisfaction with the achievement of a goal, improves self-

efficacy and motivation: negative evaluations do not reduce motivation if the individuals concerned believe that they are capable of improvement. On the other hand motivation does not improve if students do not believe that they are capable of succeeding.

For the constructivists, self-regulated learning is a multifaceted process (Zimmermann 2001, p.261). It is hypothesised that students will even draw up personalised explanations to regulate the four components of their learning (self-competence, possibility of action and control, school and academic tasks, strategies).

1. Students' explanations of self-competence are similar to the definition of self-efficacy and it is held that they involve perceptions of personal academic abilities and respond to the question - "Am I capable of self-regulating?"
2. Explanations of agency and control focus on interpretations of success and failure as well as of students' intentions and actions and answers the questions: "Why do I need to self-regulate?" or "How much effort do I need to make for this task?"
3. Lastly, the explanation that students give in relation to school tasks which encompasses their opinions on the key properties of the tasks (such as variety, diversity, challenge, control, meaning) and their influence on goal tendencies prompts them to adopt mastery goals (relating to control and skill management) or performance (relating to carrying out actions) and ego (relating to the construction of one's own identity) goals. It also responds to the question: "What is necessary to learn this activity?"
4. Strategies involve deliberating on the action required to reach specific objectives such as information, time, motivation and emotion management. The students' strategy explanations encompass knowledge relating to the choice of strategy (declarative knowledge), how they should be used (procedural knowledge) and when and how they should be used (conditional knowledge). The two latter forms of knowledge are often defined as meta-cognitive by other researchers.

Volition theorists (*Ibidem*, p.24) have identified the key processes in self-regulation as volitional strategies aimed at self-control and classified them into six general macro categories. Three of these categories, which can be grouped under the name of 'cognition control' (attention control, codification control, information elaboration control), can be combined with the categories of motivation control, emotional control and environmental control. This analysis reveals the highly meta-cognitive dimension which these processes involve. The category of environmental control (environmental in nature and thus not part of meta-cognition) is also considered valid for the purposes of self-regulation if it is controlled and validated by meta-processes.

1.4 Physical and social environment

How does the *social and physical environment* influence students' self-regulated learning?

According to Zimmermann (2001) the instrumental conditioning theorists are the most explicit on the subject of the links between self-functions and the immediate environment. Internal processes are defined in terms of their appearance in open behaviour and the functional relationship between environment and behaviour is the focus of this approach. The link with the environment is advantageous for the effective development of educational intervention procedures. In this sense the environment is capable of exerting modelling and reinforcing processes on learners.

By contrast the phenomenological approach refutes the objective nature of the physical and social environment in that it makes it the subjective perception of learners. This requires the construction of pathways centred on learners in the sense that teachers must evaluate the results of

their activities taking account of their perceptions and not on the basis of external criteria. For this reason teachers must promote students' self-confidence in their ability to learn.

The social cognitivists focus their research programme on the relationship between specific social processes such as modelling or verbal persuasion and the various self-regulation processes (Zimmermann 2001, p. 128). Environmental factors such as the nature of the task and the framework used to create it have also been systematically studied. Modelling and enactive mastery experiences have been shown to influence students' perceptions in achieving self-efficacy in a particularly significant way. Successful adaptation models can strengthen observers' sense of efficacy to the extent that they may succeed in experiencing them for themselves.

Information processing researchers argue that the physical and social environment is a relatively unimportant factor in determining self-regulation unless it is transformed into information that can be processed. If the influences of an environment are converted into specific information they can be self-regulated by means of control cycles in the same way as other sources of information. On the basis of such assumptions, certain theorists have argued for the need for a social environment as a necessary condition for the task in that it is evident that the presence of others influences students' needs to self-regulate their learning.

In the same way, volition theorists see the environment as secondary to cognitive factors whilst recognising its impact on emotions and motivation. Control over the environment can increase only if control over action mediation is first improved. The students will to learn can be increased by means of the tasks themselves and in the way they are set out. Volition strategies are also encouraged to maintain control in 'distracting' environments. Kuhl (cited in Zimmermann 2001, p.25), for example, hypothesised that an unexpected failure, which is the key to the environmental event, triggers off a range of volitional control processes. Failure interrupts the automatic mechanism and stimulates a critical condition in self-awareness which is necessary to volition processes.

According to the principle of co-determination, Vygotsky emphasises the role of physical and social environments in child development. Individuals develop within an influential historical social context and speech plays an essential role in adaptation and control processes in this context. Once speech initially derived from social encounters especially in dialogue with adults is internalised it becomes inner speech and takes on its own dynamics. Inner speech is seen as an instrument which enables students to act on the physical and social context of the immediate environment in order to trigger off new levels of mental, physical and social functioning. Inner speech is thus shown to be a self-regulatory tool to be used in solving difficult tasks, overcoming impulsiveness, planning solutions to issues which require resolution and mastering one's own behaviour.

The constructivists trace the concept of learning environment to those of social conflict or discovery. They research pedagogic procedures which increase cognitive conflict via the use of tasks which favour learning by discovery or learning groups involving social conflict. Learning by discovery procedures bring unexpected results for students. Social conflict, just as in encouraging face offs between students of different cognitive levels or points of view, has been shown to be useful in producing the cognitive conflict which is needed to build growth. Within constructivism other researchers have adopted a situated cognition approach and suggest that concepts of self and the use of self-regulating methods should be adapted to their social context and include local community tools, values and habits. In the second wave of constructivism, learning by discovery and cognitive conflict shifted from exclusively personal causes of cognition to generally accepted mediating constructs in the collaborative learning of personal theories, identities and action adaptation.

1.5 Acquiring capacity

How can students *acquire self-regulatory capacity* during learning?

The behaviourists have devoted only marginal attention to the development of instances of self-regulation but they have emphasised the role of external factors which can favour self-regulated learning. They identify the key factor in success as the existence of effective models and external events which can trigger self-regulating responses. The key methods that they have used in forming these are modelling, oral (front-of-class) lessons and reinforcing. The reinforcing method involves setting out the stimuli foreseen in the planning phase and setting them out according to a specific order functional to the achievement of pre-established goals. Initially external signals and unexpected events are set up so that self-regulation can be gradually controlled and modelled on the basis of specific indicators. Subsequently the external signals are reduced and the reinforcements correspondingly gradually loosened.

Phenomenological research, on the other hand, sees self-regulated learning as strongly dependent on the various development phases of the basic self-system which is strongly linked to age. From the beginning of their school experience students gradually acquire perceptions of their abilities which are increasingly differentiated. An overall sense of self-respect and of our own value emerges at around eight years of age. Prior to this age individuals confuse and cannot distinguish between emotions and interests and find formulating independent judgements on their own abilities difficult. The phenomenologists adopt an active role in encouraging self-regulated learning sustaining direct intervention on self-perception as the key to supporting open performance.

The cognitivists argue that learning involves a permanent growth in the abilities of an individual to process information and respond in a self-regulating way. Over the years and with experience students increasingly develop complex systems governed by specific rules for processing information and each system in turn acts as the base or structure with which to self-regulate learning.

On the basis of the approach that construct system processes are functional to self-regulation processes, it is possible to build digital systems capable of supporting self-regulating processes. Winne and Stockley (1998), for example, proposed the use of a computer assisted learning system called STUDY to help students increase levels of self-regulation during study. Specific menus are set out in STUDY which supply signals, feedback and supplementary information as soon as students embark on new educational content. This will provide forms of support to students in accordance with their stage of self-regulated learning.

The social-cognitivists have had to recognise that a considerable number of changes occur in individuals as a result of their personal development. It has been shown that these changes influence self-regulation in terms of sub-processes of learning. Age differences, for example, determine individuals' abilities to understand language and acquire specific knowledge bases and influence their ability to make distinctions and attributions in social contexts. Educators must take account of these limitations when they adopt self-regulated learning strategies. The social cognitivists focus in particular on the development of self-regulating competences in four progressive levels:

1. At an observation level students learn to distinguish between the main characteristics of a model skill or strategy.
2. At an emulative level learners are capable of approximating in a general way to a model skill or strategy by means of an enactive performance.
3. At a self-control level students can carry out a skill or strategy based on representations of a model performance.
4. At a self-regulation level learners can adapt their skills and strategies in a systematic way to changes in personal and context conditions.

Acquiring and developing skills or strategies, therefore, originates in sources of a social nature and subsequently shifts to self-resources.

Volition theorists maintain that it is possible to acquire the ability to self-regulate and, that is, the ability to exercise control over one's actions and state. This implies the ability to commit oneself to tend to an action which is not predominant and to be able to control the performance of this tendency however great the pressure from a dominant need. This skill can be improved by using strategies aimed at the control of the categories described above all in open and group activities such as cooperative learning.

Vygotsky describes the self-regulation development process in terms of internalisation. Social interaction supplies the contents to be internalised above all at a young age. Self-regulation starts as an interpersonal level by means of contact with adults and is gradually internalised throughout infancy. By mediating inner speech children can exercise self-control at an intra-personal level.

Constructivists also emphasise that changes during the stages of cognitive development are essential to the growth of self-regulated learning abilities and therefore that there are various forms of self-perception of one's own abilities in relation to age and educational level. Moreover, hierarchical organisation of the overall sense of self-competence begins as soon as individuals increasingly differentiate between competence characteristics in relation to tasks such as didactic, social and physical skills. As Zimmermann as shown (*Ibidem*, 33), Paris et al. have hypothesised that self-regulation changes occur on the basis of growth and development on:

- an understanding of the role one's own skills and effort play in performance;
- expectations of the control threshold that they can exercise;
- an understanding of the nature of the task;
- the quality of the strategies that they construct and adopt.

In view of all these proposals it is important to take account of the changes that occur on these levels both in terms of formulating theories on the self and adopting specific methods of self-regulation.

2 Self-regulated learning and didactics

Pedagogical approaches take account of the complexity of the situation which the individual lives and acts in today's society and recognises the importance of contributing to the development of autonomy and self 'government'. The need for lifelong learning in a complex, multifaceted scenario is an effective metaphor of passage, openness, metamorphosis and transience as fluid reality, dynamic structures of mobile and vibrant networks and interpretation paradigms oriented towards open and autopoietic systems. It is linked also to individuals' needs to possess abilities and skills which support them in an ongoing identity, knowledge and relationship building process in view of achieving a higher level of meta-competence and, that is, of awareness and mastery of their reflection and action management processes.

As I mentioned in the introduction to this essay, understanding the processes of self-regulated learning enables teaching to identify appropriate development methods both from the point of view of planning and subsequently in implementation of the process. Appropriate devices need to be built and strategies chosen in order to promote the exercise of key processes and procedures aimed at stimulating self-motivation and self-awareness.

2.1 Didactic devices for self-regulation

It has been shown to be essential in didactics to encourage self-regulated learning (Laurillard, 2012) from the starting point of the device planning and building phases as micro and primary elements in the teaching process. In didactic terms, devices are space and time intentionally set aside to support individual and collective change in view of pre-established purposes and goals. They are made up of tools and activities put together in a specific way in order to be capable of encouraging free exercise (such as self-planning and identity definition) and enacted to prompt changes in self-perception in relation to the learning task and environment concerned. The change of state must, in turn, take the form of an aware and strongly motivated process in order to make learners active within the didactic system and their own self-systems. Self-awareness enables individuals to activate proactive regulation of events which occur during their learning experience and anticipate events before they occur and in this sense to be able to find their own way in the experience. Self-motivation processes prompt them to change and adapt on an ongoing basis within the system for the purposes of achieving pre-established goals.

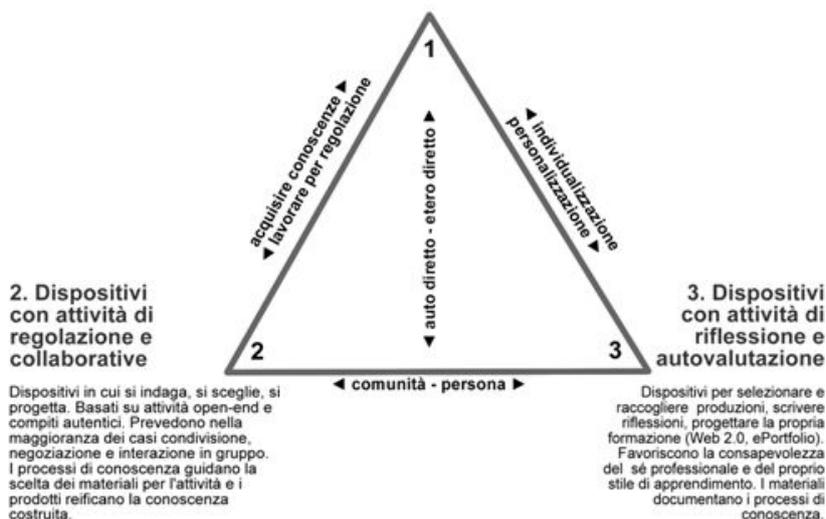
Rossi and Toppano's model (2009) of the types of device identified in didactics which have shown their ability to respond positively to the key processes which determine self-regulated learning is important in this framework.

This triangular model shows how these types are oriented towards encouraging not only the acquisition of knowledge and procedures transmitted by educational devices but also cooperative activities. These allow for the exercise of regulation and self-regulation by means of appropriate regulation devices and reflection and self-evaluation activities oriented towards the exercise of awareness of one's identity and learning style via devices which support reflective and self-evaluating processes.

DISPOSITIVI

1. Dispositivi con attività istruzionali

Dispositivi per l'acquisizione di conoscenze e procedure (es. lezione frontali, percorsi strutturati a scoperta guidata, learning object, studio individuale di testi e manuali).
I materiali "guidano" i processi di conoscenza.



2.2 Regulation and cooperation in process activating environments

If educational devices are based on erogative models and use front-of-class lessons, guided and structured processes with material and objective tests, the apex of regulation is made up of devices which contain open, authentic problems, group negotiations and project work, all the activities, that is, which enable students not only to research information but also to develop hypotheses, model problematic situations, elaborate strategies to resolve them and exercise choice. The apex of regulation confirms the importance of the social and physical environment's influence on self-regulatory practice as the key element in self-regulated learning. If regulation allows for a sort of mediation between the self and others, between our own thoughts and those of the group we belong to and the context learners find themselves in, then it has been shown necessary to stimulate self-directed processes too by means of which we can transform our mental abilities into skills linked to activities and practised in a specific context which generates events.

An environment which has been specifically set up for exercises and action in freedom enables students to develop awareness and recognise their self-efficacy via direct experience in a relationship of co-determination between individuals and their context. Not only does the use of cooperative activities allow for modelling as potential stimulus to experiment models of action on oneself but, the constructivists would argue, it also triggers elaborations of personal theories on their learning in an active way by students stimulating specific reinforcing processes. In practice, in interaction, exchange and group work learners can activate *meta-cognitive* processes which can lead to the creation of personal interpretative processes on one's own role in knowledge and relationship building. The regulation which occurs takes the form of a meta-competence which enables individuals to gain awareness of their learning processes and the ability to activate questions and provide the answers to them on self-perception, motivational and emotional states and their own management and control as well as tasks and strategies.

2.3 Reflections and self-evaluation in the activational tools for the key self-regulation processes

Clearly the relationship between the operational context and the management of the relationship part must be accompanied on an ongoing basis and in a parallel way by specific tools and activities which encourage motivation and stimulate awareness. Tracking activities are determinant in all the theoretical approaches analysed. Self-monitoring is the activity which is recommended to the greatest extent by self-regulated learning researchers because it is held to be the most significant trigger to motivational processes.

We have seen that the desire to tell one's own story is determinant for the purposes of the perception of one's identity and self-esteem. Writing allows one to move away from self-interpretation, from one's thoughts and this facilitates processes of reflection on one's work and identity in terms of enquiry into the conditions (one's emotional states, beliefs, past experiences, preconceptions and theories) which have determined action. Writing provides an opportunity, then, for self-observation and to externalise inner speech, the fruit of interaction and social practice, activating an overall reconstruction of the self in terms of professionalism and identity.

The third type of device features writing tools such as those promoted by Web 2.0 for example Blog and e-Portfolio to a greater extent. Different tools allow different types of activities. Whilst blog practices take the form of expressions of individual thought in relation to a range of themes and possible encounters with other bloggers, writing in the e-Portfolio reinforces the ordered building over time of ongoing diaries, collections of notes and reflections on one's actions and oneself for the purposes of an education CV with the potential to make the Vygotsky task-involved and self-involved inner speech real in relation not only to a specific activity or pathway but in a wider sense also from the perspective of lifelong learning. The e-Portfolio takes the form of:

- a repository of materials researched and produced by students;
- a personal, intimate space in which students can practice reflecting about themselves and their learning process through writing;
- a public and relationship space in which students must build their own identity from the point of view of socialisation, sharing and exchange.

The multidimensional and multi-perspective aspect to e-Portfolio supports self-monitoring, reflection and self-building processes from various perspectives as it is possible to:

- select and link up material and link it with reflective writing in both personal and collective spaces via publication;
- reflect privately in a sort of personal diary in which students write about themselves, their educational process, the activities carried out and performed and build their own personal profiles by means of projection processes consisting in self and co-evaluation of knowledge and competences acquired for the purposes of educational goals;
- practice writing processes oriented towards the community in which students build a personal public profile in relation to others and prepare to encounter the social context in which they will be working.

This sort of parallelism between the public and private spheres in a space managed by students themselves encourages self-motivation in terms of:

- actualisation of the self-concept in that writing allows this to become real by placing students in conditions which encourage analysis and conceptual realisation of their identities in relation to others and involve them fully in the building of the self;
- self-reactivity, in that in a sort of referral it obliges students to formulate responses to self-produced stimuli from the private to the public sphere and vice versa. Self-building in the

private space is a stimulus to self-projection activities in the public sphere and collective exchange in turn prompts the need to give an account of oneself in the private sphere and reflect on one's own action in context;

- clarification of the values which learners possess and the expectations that they have of themselves. Explaining oneself places the attention of those writing on the values behind their actions and allows their actions or even values in relation to themselves or others to be revisited and adapted.

Self-evaluation is a process of determinant importance for the purposes of orientation to action and self-motivation in that it is a fundamental step in identifying the abilities, competences and baggage of situations which an external performance evaluation would not be able to grasp in terms of precise and prompt processes (Magnoler in Rossi 2009). Returning to the behaviourists' definition - and in line with the other theories - highlights the necessarily methodical character of self-evaluation. It requires students to measure their own behaviour against a reference standard which takes the form of precise actions (number of steps carried out correctly) and performance progress in terms of speed, quantity and duration. The types of self-evaluation described influence self-corrective responses modifying reactions or even reference standards.

Rubrics have shown themselves to be effective tools for competence evaluation via evaluation of one's production and performance. They are made up of several sections aimed at facilitating evaluation processes: size (space given to planning competence), indicators (specific measures, concrete performance examples), levels (the complexity of performance descriptions) and anchors (examples of production linked to levels). Rubrics are also effective tools when they are linked to e-Portfolios, shared with other rubrics and made up of a mash up of tools such as forums, wiki and maps to collect production in carefully chosen combinations acting as anchors to describe the levels achieved, a tracking process which enables students to visualise the activities carried out and evaluations received or self-assigned on the basis of shared rubrics (Magnoler in Rossi 2009, p.234).

Given the transversal, meta disciplinary and cross disciplinary nature of the devices for cooperation, reflection and self-evaluation, it is to be hoped that they will be used in as many teaching activities as possible as they can support specific processes of self-regulation not only in relation to the individual disciplines but also in a time framework and from the perspective of students' individual educational processes. Moreover, these devices support activities and considerably strengthen self-regulation processes and open up the lived environments such as physical and social spaces for aware and motivated learning in which students are key players in their competence and meta-competence development.

Conclusions

In the light of the research and theories considered, learning does not occur randomly but is prompted by learners. Learners, then, take an active part in their own learning processes to the extent that they are capable of managing and directing them. This in turn involves recognition of the self-awareness and motivation which learners are able to garner to manage not simply their activities but also their internal processes. It requires an approach to learning relative to visible (what is learnt) and hidden levels (how learning occurs, which processes are personally activated to direct and orientate their own learning).

In view of pedagogic aims, didactics must take account of learners' meta dimensions suggesting mediation process building not simply between learners and knowledge but also between learners, their context and their 'selves' in order to develop competences and meta-competences as an autonomous, self-reflective and pro-active process.

Bibliography

- Laurillard D. (2012), *Teaching as a Design Science. Building Pedagogical Patterns for Learning and Technology*. Routledge, New York and London. E-book.
- Schunk, D. H. (1990). Goal setting and self-efficacy during self-regulated learning. *Educational Psychologist*, 25, 71-86. http://libres.uncg.edu/ir/uncg/f/D_Schunk_Goal_1990.pdf
- Zimmermann Barry J., Schunk Dale H. (2001) *Self-Regulated Learning and Academic Achievement. Theoretical Perspective*. Routledge Taylor & Francis Group.
- Zimmermann Barry J. (1990) Self Regulated Learning and Academic Achievement: An Overview. *EDUCATIONAL PSYCHOLOGIST*, 25, (1), 3-17. Copyright Lawrence Erlbaum Associates, Inc. http://www.unco.edu/cebs/psychology/kevinpugh/motivation_project/resources/zimmerman90.pdf
- Rossi, PG (2009). *TECNOLOGIA E COSTRUZIONE DI MONDI. Post-costruttivismo, linguaggi, e ambienti di apprendimento*. Armando Editore, Rome.
- Rossi, PG Toppano, E. (2009) *Progettare nella società della conoscenza*. Carocci Editore, Rome.