THE PSYCHOLOGY OF SELF-REGULATION

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NOTICE TO THE READER

Chapter 7

How to Enhance Students' Self-Regulation

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Abstract

Critical thinking (CrT) is a fundamental competence, widely recognized as essential for students to learn and become better professionals in the future. Critical thinking, as conceptualized under the Think4Jobs ERASMUS+ project, is a purposeful mental process driven by conscious, dynamic, self-directed, self-monitored, self-corrective thinking, sustained by disciplinary and procedural knowledge as well as metacognition. CrT results from the complex interaction of a set of traits, driven by purpose and self-regulation, allowing the thinker to interpret, analyze, evaluate, infer, and explain different problems or situations arising in personal or professional life. Self-regulation, understood as the ability to self-monitor and self-correct one's thinking or action (implying a regular intentional and adaptive process), is an attitudinal skill highly praised by professionals in the healthcare sector. Based on a personal drive for ongoing professional development and guarantee of service quality, self-regulation is considered a critical requirement for those in health professions. When facing a clinical situation, self-regulation skill drives self-reflection and questions the decision-making pathways into a proposed solution, both contributing to metacognition. However, the development of self-regulation competencies must initiate ahead of the entrance of students and trainees into the labor market. In parallel to the

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opportunity to enhance undergraduates' self-regulation, the growing competence will furthermore foster motivation and engagement with learning, adaptiveness to changing environments, independence, and creativity in approaching complex tasks. Students with well-developed self-regulation competencies will be prone to robust decisions and successful actions. As well as many other traits and habits, the ability to engage in self-regulation is modulated by several psychological or motivational factors that, when not conveniently addressed, may hinder skill development. This chapter intends to discuss the most critical factors affecting the growth of self-regulation in Higher Education students, particularly in Veterinary Medicine, reflect on possible measures to mitigate them, and share possible learning strategies (including assessment methods) supporting the development of self-regulated learning skills in university students.

Keywords: self-regulation, critical thinking skills, competence development, pedagogical strategies, veterinary medicine

1. Introduction

Over the last decades, the development of critical thinking (CrT) has become in focus across all educational levels. CrT is a crucial competence, widely recognized not only as essential for students to learn and become better professionals but also needed to exert citizenship and participate in community decisions conscientiously. Critical thinking, as conceptualized under the Think4Jobs ERASMUS+ project, is a "*purposeful mental process driven by conscious, dynamic, self-directed, self-monitored, self-corrective thinking, sustained by disciplinary and procedural knowledge as well as metacognition*." CrT originates from a complex interaction of qualities, driven by purpose and self-regulation (Giancarlo & Facione, 2001), that allows the thinker to interpret, analyze, evaluate, infer, and explain different problems or situations, find a solution, and act accordingly. Under Facione's framework, self-regulation is one of the CrT skills; it is conceptualized as the ability to identify and correct one's behavior according to the principles of reason, deduction, and logic (Facione, 1990).

A good level of self-regulation has been correlated with efficient study habits. Both were deemed necessary conditions for students' engagement with active learning approaches, critical thinking development, and academic achievement (Payan-Carreira & Cruz, 2019). CrT development also requests

the students to evidence variable amounts of willingness and self-regulation, according to the acquired CrT level, to grow in the ability to maintain a high level of thinking and to transfer it to all aspects of life.

There are different concepts defining self-regulation. For the purpose of this chapter, self-regulation is conceptualized as the ability to self-monitor and self-correct one's thinking or action (implying a regular intentional and adaptive process), thoughts, emotions, and behaviors to achieve personal goals (Sandars & Cleary, 2011; Frazier et al., 2021; Inzlicht et al., 2021). As stated by Inzlicht et al., (2021, pp. 322), self-regulation should be "*conflict-free,* [referring] *to the broader process of steering one's behavior toward a desired end state, and includes setting goals, monitoring goal progress, and acting in accordance with goals.*"

1.1. The Social-Cognitive Model of Self-Regulation

Different theories or models related to self-regulation try to explain how it progresses or acts. Some consider people's actions as resulting from external influences and reinforcements (the behavioral theories); others consider people as driven by internal hidden drives and impulses (psychodynamic theories), while others still claim that people are guided by their own free choice (the humanist theories) (Usher & Schunk, 2018). Contrary to these views, the social-cognitive theory recognized one's ability to intentionally determine the course of events and circumstances in life and to select a reaction or way of acting (Bandura, 2011).

According to the Bandura social-cognitive model of self-regulation, individuals are active participants in their lives or environment, seeking to control important issues by regulating their thoughts and actions to reach personal goals (Sandars & Cleary, 2011). In this concept, reciprocal interactions exist between different dimensions. Self-regulation thus integrates different hierarchical levels, including the cognitive, emotional, behavioral, physiological, and genetic (Blair & Ku, 2022). All these levels are interrelated and determine the success of the self-regulation skill. Consequently, the ability to achieve and practice self-regulation changes among individuals, as well as within a person, according to age, personal context (such as experiences or emotions), and the individual sensitivity to stress. Self-regulatory processes are, hence, dynamic and cyclical in themselves, as is may show continuous changes (Schunk & Greene, 2018) in response to the different weights of their combined dimensions.

When transposed into the academic settings, this conceptualization model supports the idea that any student, if correctly motivated will proactively seek to control their knowledge and behavior, constructing the adequate environment to achieve their goals, leaving behind a passive attitude towards learning (Sandars & Cleary, 2011).

Considering the importance of self-regulation for students through their university paths and as future professionals, the development of self-regulation competencies should start in High Education Institutions (HEI), with students and trainees, before entering the labor market. Students that develop self-regulation towards educational aspects and can retrieve new knowledge by themselves, will be able to follow the explosive growth of scientific and technological knowledge, and modulate (new) skills in their career to cope with new challenges (Nilson, 2013). In parallel to the opportunity to enhance undergraduates' self-regulation, the growing competence will also foster motivation and engagement with learning, adaptiveness to changing environments, independence, and creativity in approaching complex tasks. Students with well-developed self-regulation competencies will be prone to robust decisions and successful actions. The importance of self-regulation has been stretched during the last two years of pandemics, requesting the workforce to adapt and acquire new skills and habits to cope with the restrictions imposed upon business and education, among other sectors.

Self-regulation, along with CrT, creativity, and perseverance, are personal traits considered indispensable to cope with a fast-moving environment, particularly with the technological, in the future (Marschalkó & Szamosközi, 2016). Besides, it is an essential tenet trait in most professions (Collier, 2012); self-regulation has been plainly included in Veterinarians' professional code of conduct, associated with professionalism and professional Identity (NAVMEC, 2011; Matthew et al., 2020).

2. Applying the Social-Cognitive Model of Self-Regulation to Education

Rooted in self-regulation conceptualization, in academic settings self-regulated learning may be defined as the constructive process in which the student controls the learning process (Marschalkó & Szamosközi, 2016). In the past decades, the education paradigm focused on self-guided learning,

contrasting with the traditional methodology centered on the student receiving the teacher/educator knowledge. In addition, access to knowledge has been made easier via the internet, democratizing scientific knowledge. However, one main drawback in the success of the implementation and acceptance of active learning is the student's reluctance to engage in strategies focusing the development of autonomous learning competencies and to cut the umbilical cord to the professor, which often remains viewed as the master/owner of knowledge.

Under the social-cognitive models of self-regulation, several studies analyzed self-regulation in educational settings, mainly focusing on the students' mastering self-control and efficiency in academic learning. Early studies concluded that proactive students usually attain cognitive outcomes faster and can keep a longer learning motivation, primarily due to setting motivational goals, overseeing their learning, selecting adequate learning strategies, and modulating their learning according to the received feedback (Zimmerman, 2013). Moreover, while some studies highlight the importance of students' acceptance of delayed gratification and motivation as a motor to reach academic success, others tackled the modeling of instructional approaches fostering the development of self-regulation skills (Schunk & Greene, 2018).

Self-regulated learning has been defined by Zimmerman (2013, pp. 137) "*as the degree to which students are metacognitively, motivationally, and behaviorally active participants in their own learning processes.*" Self-regulation does not arise by itself; like some other soft skills, it must be nurtured and trained across education. It can be trained through the observation of models, as it happened for long in traditional educational settings, where students play a passive role and absorb the knowledge the teacher diffuses, needing to be reinforced by experiential situations. In this case, the development of self-regulation can be achieved with a greater student effort, and the level reached varies between individuals.

In past decades, active pedagogical strategies demanding the students to reflect on their learning have been proposed as advantageous to the development of self-regulation skills, as students will receive feedback and encouragement from tutors/teachers. Research into the topic exposed various critical points that should be addressed when designing activities targeting student self-regulation development.

2.1. The Characteristics of Self-Regulated Learners

Self-regulation is a very demanding competency, and its development requires a purposeful drive, great energy, and cognitive, motivational, and emotional resources (Berkman, 2016; Usher & Schunk, 2018). Proactive striving is a crucial attitude in either CrT or self-regulation. Thereby, it is often a challenge to engage students in its development. Similarly to CrT, the development of self-regulation skills in academic settings should be considered both a procedure and an outcome. Moreover, it should be developed within domain-specific instruction allowing the students to be aware of its importance and to understand how to transpose this ability to any situation in their personal or professional life.

In academic settings, self-regulation relates to task-specific processes like, albeit not exclusively, setting long-term goals (not immediate ones), managing time, developing work strategies, structuring the learning environment, and seeking help (Barnard-Brak, et al., 2010). An association has also been established between self-regulation, learning deepness, and academic success (Virtanen et al., 2013). Besides, self-regulation is an attitudinal skill highly praised by professionals worldwide, particularly in the healthcare sector (Sandars & Cleary, 2011), as it contributes to minimizing error and malpractice (Lee et al., 2022).

In clinical contexts, self-regulation goes together with self-reflection and question the decision-making pathways for a proposed solution, acting as a motor for metacognition. In this regard, self-regulation encompasses three sub-skills (Usher & Schunk, 2018; Lee et al., 2022):

1. *Self-monitoring* or *self-observation* (of one's behavior and its consequences) – for effectiveness, it must be created a routine for reflecting on and questioning one's behavior and actions and awareness of the control of one's actions or decisions;
2. *Self-judgment* (evaluation of one's behavior or line of action in terms of personal/professional standards or goals) – to be consequential, it requests the student's self-awareness towards a standard or the quality of an achievement (either internal or external), and the belief that reaching the standard will be dully appraised;
3. *Self-correction* or *self-directed change* (modification of previous performances or decision-making, if deemed necessary) – to tune the action or decisions and maintain the focus on the initially defined goals and get the gratification sought at the beginning of the process

(self-satisfaction is an essential element in this phase, as it is providing effective and timely feedback).

These sub-skills or sub-functions represent a cycle (Figure 1), which has different elements according to the conceptualizations of self-regulation learning.

Successful students are more than individuals who learn or know more than others. They also resource to more effective and efficient learning strategies, are better at accessing and using acquired knowledge, can motivate themselves, and monitor and adapt their behavior when learning does not occur (Seli & Dembo, 2019).
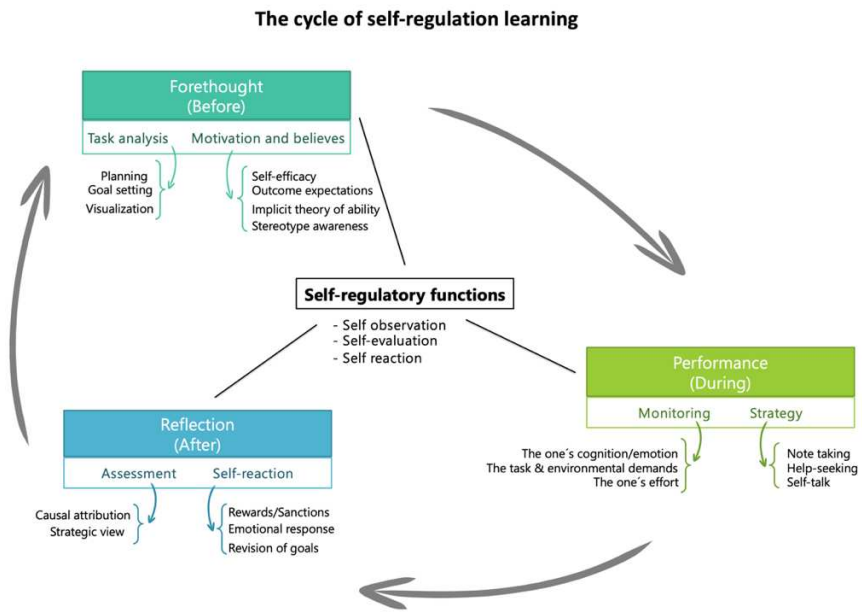
Figure 1. The cyclic nature of the self-regulated learning – phases (solid squares), processes (blank squares) and strategies (brackets) (adapted from Usher & Schunk (2018; p. 22).

In academic settings, self-regulation requests from the student his full attention and concentration, self-awareness, and introspection associated with honest self-assessment, openness to change, willingness to improve, self-discipline, and acceptance of responsibility for his learning (Zimmerman, 2002). Moreover, self-regulated learning is related to a constellation of attitudes, values, beliefs, and personal traits that some categorize under

"*intellectual character*" (Nilson, 2013). Self-regulated learners manage the factors affecting their learning by establishing optimal learning conditions and removing barriers that interfere with learning.

Several traits have been identified in self-regulated learners:

1. goal-directed behavior;
2. following specific strategies to attain their purposes;
3. changing their paths or behavior to optimize their achievements (the learning, in the case of students).

Table 1. Learning strategies supporting students' self-regulation (adapted from Zimmerman, 2013; p. 138)

Categories of Strategies	Definitions
Self-evaluation	Voluntary/autonomous self-evaluation of the quality of one's work to check if it meets the standards/proposed outcomes
Organizing and transforming	Self-initiated overt or covert rearrangement of instructional materials to improve learning (ex. outline a paper/assay/concept map before writing it; summarizing the content of a topic for an easier access to knowledge)
Goal setting and planning	Self-initiated setting of educational goals or subgoals and planning for sequencing, timing, and completing activities related to those goals (e.g., start studying some weeks before an exam; preparing the topics to be tackle in classes in advance)
Seeking information	Self-initiated efforts to secure further task information from nonsocial sources when undertaking an assignment (e.g., going to a library, or performing a search to get as much knowledge as possible before an assignment)
Keeping records and monitoring	Self-initiated efforts to record events or results (e.g., taking notes of the class discussion, or the groups reasoning in a work assignment or to clarify misconceptions)
Environmental structuring	Self-initiated efforts to select or arrange the physical setting to make learning easier (e.g., seek for isolation, or using music to concentrate themselves on what they are doing)
Self-imposed consequences	Student self-imposed/imagined rewards or punishment for success or failure
Rehearsing and memorizing	Student-initiated effort to understand/learn material by overt or covert practice (e.g., read/explain aloud, memorizing formulas, or find a mnemonic to remember some basic knowledge)
Seeking external assistance	Student-initiated appeal for help from peers, teachers, and other persons (e.g., experts, trainers)
Reviewing records/notes	Student-initiated efforts to reread assignments, notes, or textbooks, to prepare for class or further testing
Other	Learning behavior triggered by other persons such as teachers, parents, or mentors

To succeed, they resource to various (sub-)processes (Puustinen & Pulkkinen, 2001) such as setting goals, planning and devising strategies directing them to the proposed achievement, exerting self-control upon themselves and the environment, self-monitoring their behavior/actions, and self-reflecting through the process to correct their paths if necessary to guarantee they succeed.

Methods used by students to exert their self-regulation encompass different strategies, as unveiled in the work of Zimmerman (2013, p. 138), some of which are listed in Table 1. Multiple methods can be combined in strategies selected by a student, and each student may prefer those deemed more effective. Hence, the frequency of the strategies used varies among students (Miyatsu et al., 2018). Also, the effectiveness of the mentioned methods may be diverse. Consequently, the ultimate outcome might also be dictated by the combination of methods used. Miyatsu et al., (2018, p. 400) propose some tips for increasing the effectiveness of the five most frequent self-regulated study strategies that may help guide teachers' counseling.

Therefore, one could say that the learner characteristics (e.g., age, background, expertise, or motivation), the features of the task proposed (i.e., nature of the presentation of the problem/situation), and environmental factors (e.g., physical environment, methods of self-learning, social or cultural composition of the group as well as the climate between group elements) interact to influence the degree to which one's cognitive resources and skills are loaded during self-regulation (Choi et al., 2014).

2.2. Self-Regulation as a Habit of the Mind

As reviewed by Wood (2017), repetition of an activity (e.g., to improve or develop a particular skill) brings the habit for a given behavior, first triggered by context cues, which is highly dependent on motivation and rewards. However, practice repetition later brings an insensitivity towards the context cues, goals, and rewards. Consequently, continuous repetition becomes regardless of the outcome, suggesting the individual has developed habitual responses. This direct activation of habits by context can drive a range of responses that are no longer limited to replicating a particular well-learned response.

This rational support the development of learning strategies designed to foster students' complex skills during (but not limited to) their academic track. Hopefully, once the habit of self-regulation has formed in mind, the students

will be able to transpose this skill to their daily life, less tied to goals and outcomes and more of a standard behavior.

Nonetheless, one should be aware that unwanted habits are easy to develop, often acquired non-intentionally, and frequently bring immediate gratification, in opposition to more demanding habits, such as self-regulation skills enhancement (Wood, 2017). A similar situation can be found in academic settings where students are used to passive teaching methodologies and memorizing the course content for exams when a teacher attempts to use a new active learning approach. The imposed change in the students' habits may explain the poor initial adherence to the changed methodology. The management of unwanted habits (viewed here as the study based on memorization of knowledge to an immediate reward – a high grade in a course) demands implementing strategies designed to change the habit and monitoring behavior acquisition/growth to prevent the reoccurrence of the unwanted habit. This monitoring must be exerted by the teacher and by stimulating a state of vigilant self-control in the students (Wood, 2017).

Consequently, the enhancement of self-regulatory skills requires the student to practice them through new methodological ways of learning and implementing new activities. Also, repetitive practicing so the skills become "intrinsic" is the key to success.

3. Training Self-Regulation

As with any other skill, self-regulation (in the broader sense of the term) may be trained to increase one's ability in this competence. Improvement in self-regulation will demand a conscient effort, guidance, and the repetitive execution of activities or tasks that must allow training transferability of the acquired skills. This training requires time, and it is not depleted in one discipline but must be exercised across a Programme to be effective.

On the other hand, self-regulation training is often indirectly implemented in activities designed to boost students' CrT skills (Payan-Carreira et al., 2022a; Payan-Carreira et al., 2022b) or professional skills (Malone, 2019), meaning that it may be worked along with other soft skills competencies. However, particular attention should be provided to self-regulation, as it may hinder the success of the training focused on other competencies.

Recently, under the Think4Jobs project, the questionnaires used for surveilling the students (n=514) perceived CrT skills and dispositions suggested that self-regulation skills (namely the self-examining and self-

correction sub-skills) were highly correlated with the other CrT skills (r=0.850; p≤0.0001) (unpublished work). The study enrolled participants from different countries (Portugal, Greece, Romania, Lithuania, and Germany) and from different programs in Veterinary Medicine, Teachers Education, Business and Management, Languages, and Informatic Engineering. This positive correlation may be used to indirectly support students' self-regulation development while implementing pedagogic strategies aiming at other soft skills (such as CrT).

3.1. Critical Negative Points That Must Be Considered When Implementing Training for Self-Regulation

Similar to many other traits and habits, the ability to engage in self-regulation is modulated by several other psychological or motivational factors that may hinder skill development. These factors may act synergically to hinder the students' willingness to engage in new forms of learning.

Students' engagement is a critical point in the development of activities designed to enhance self-regulation skills. Engagement may be conceptualized as the co-expression of concentration, interest, and enjoyment in learning (in general) (Shernoff, 2013) or in the proposed learning activities (in particular).

According to Macklem (2015), students' engagement decreases as students transition to higher levels of education, the loss in enjoyment being the most compromised attitude compared to concentration and interest in the class. Furthermore, the same author states that homework is the sole activity students abhorred more than classwork. Homework may become a problem when implementing active learning approaches considering that in some steps of the learning strategies, the teacher expects the student to enroll in self-study tasks that are essential to the success of learning and attain the proposed outcomes. Therefore, when changing the learning paradigm, the teacher should consider the need to overcome the intrinsic poor engagement of students toward a different and more demanding task. Appraising the students' attempts and successes in the proposed activities is vital, as well as creating efficient groups that integrate elements that complement each other in more demanding tasks to balance the effort and reward. In addition, bridging the activity to real work situations may increase students' interest and engagement (Payan-Carreira et al., 2022a; Payan-Carreira, 2022b).

Students' personal experiences may also contribute to intrinsic barriers to their engagement in activities. They do not have enough experience to gauge

the effectiveness and power of the learning strategies (McDaniel & Einstein, 2020). Therefore, when introducing self-regulation-driven activities, it is up to the teacher to drive the students' attention to the process and its benefits in terms of long-lasting cognitive development and integrated professional core knowledge. The instruction should be explicit to improve the understanding of non-cognitive outcomes and foster students' commitment to the activities. Otherwise, these will appear to students as demanding high mental efforts and workload and often perceived as conductive of lower learning gains (Kirk-Johnson et al., 2019).

The study preferences of students are a critical point in implementing active and self-directed learning strategies that intend to enhance self-regulation. A large proportion of students still show learning preferences focused on expositive class along with memorizing knowledge (even if risking not to grasp the concepts underlying said knowledge) to pass exams and get high marks. In expositive lectures, the teacher passes all the relevant information so that the students do not have to screen the information from the primary source, which some students consider a waste of time (Raidal & Volet, 2008). They lack the confidence that they will reach the exact cognitive level the teacher expects, and they fear the responsibility that accompanies self-regulated learning. For these reasons, when introducing self-regulated learning activities, it is vital to support students with close guidance from the teacher or tutor (ex., availability to clarify doubts, effective feedback on the tasks to allow correcting the performance), as it may positively affect students' engagement and motivation (Raidal & Volet, 2008), particularly during complex tasks (Malone, 2019). The teacher should implement orientation or guidance at different stages of the activities according to the difficulty level demanded from students and their experience in the independent self-direct study.

In general, one could say that the more rigid the instructional context (teacher-centered learning), the lower self-regulation will be needed from students. Inversely, the more loosely the teacher defines the instructional context, the greater will be the trigger for students' self-regulation (Stefanou et al., 2013). However, a loose instructional context does not necessarily mean the teacher is absent from the room. It only implies a shift in its role from a position of almost absolute dominance to one of coaching the students' learning.

Time management and planning are also crucial in the success of self-regulation. In general, students who can better use their time, planning how they will approach the tasks and the moments to study (middle- and long-term

planning), detain increased levels of self-regulation. Students often state that they do not have enough time to accomplish the proposed study or tasks during the day. Nonetheless, their problem is not knowing how to manage daily time. They often also have unproductive time during the day, time heedlessly slipping through their fingers (Seli & Dembo, 2019). A heavy workload has been used to explain the annoyance and resentment with self-directed learning tasks, even though it may bring more profound learning outcomes (Raidal and Volet, 2008).

An essential feature of self-regulation is the ability to restructure one's physical and social environments to meet individual needs. Searching for quietness, isolation from distracting cues and pairing with other students when it feels needed, or deciding to study alone, address to teacher or peers for clarification of particularities of a topic or task, are some of the strategies available on this aspect (Zimmerman, 2013; Seli & Dembo, 2019). Before introducing students to a more autonomous and responsible approach to self-studying, it may be important to draw students' attention to this point and ensure that it is not seen as an indicator of a lack of academic or cognitive competencies in developing self-regulatory skills.

Metacognition is determinant for the monitoring step of the self-regulation process (Zimmerman, 2013). Taking a step back or to the side and looking for repeated errors, flaws in performing procedures (for instance, assessing their performance on a video), and screening for differences towards a standard behavior are some aspects of the monitoring routines students' ought to acquire to master self-regulation. Most frequently, students are not practiced in evaluating their behavior, critiquing their own performance, and engaging in the necessary changes to meet the proposed goals at a high level of success (Seli & Dembo, 2019). While students are not proficient in the skills, the activities sought to develop self-regulation should consider a step to guide or scaffold metacognition and provide the necessary amount of time during the activity to allow the conscientious assessment of their performance, whether as an individual or a group. Otherwise, when not motivated, the teacher risks students to complete the activities with poor engagement or with intrinsic inertia, along with a superficial assessment (when they even do it) of their performance. Investing in supporting students' metacognition is, therefore, a decisive aspect of developing their self-regulation skills.

Some problems may arise when implementing active learning strategies focusing on self-regulatory skills. For instance, students often reach higher education levels with good grades doing little or no homework and "studying" or memorizing information to repeat it in their exams, seldom being assessed

for the transposition of the acquired knowledge into the solution of daily (professional) problems or situations. Therefore, they often complain that the proposed tasks take too much of their time and are too loading (Nilson, 2013). So, it is important to appraise their effort by making the effort count for the final grade they will achieve in the course.

3.2. Examples of Instructional Practices Driving to Self-Regulation Skills

Regarding activities that can be used to foster students' self-regulation in a course, Nilson (2013) presents at the beginning of her book a quick reference table for self-regulated learning assignments and activities to be used at the early, mid, and end stages of a course. The table identifies not only the type of assignment or activity but also the grading needs and the time consumed in class or at home. It also discriminates whether it is content-related or generalist, and her own opinion on the task model, rendering it a valuable tool for those interested in the topic. Some of those activities evolve around self-direct learning, whereas others relate to topics covered in the class (Figure 2), even though the listed activities do not exhaust the topic. However, a considerable gap exists between the use of self-regulation driving strategies/activities and the mid- and long-term effectiveness of such training in Higher Education Institutions, supporting the need for more studies addressing this topic in the future.

It is important to understand that to be effectively independent, self-regulated learning demands a range of activities besides reading and listening. In order to allow students to plan their learning, course plans (e.g., the learning goals or the outcomes or the assignment) should be set and published ahead of classes. When designing learning activities or assignments fostering students' self-regulation, one should also consider that they should be gradually integrated into the course curriculum, particularly if students are used to a passive way of teaching/learning. Moreover, the success will be more evident if the focus on self-regulation is integrated across the program, at the course level for context. Thereby, students will learn how to set goals, build standards, assess their progress, review and evaluate their thinking, and discipline themselves for deeper learning and a smoother transition into professional life. Most content-focused activities also contribute to gaining information on students' performance and knowledge and complying with the course syllabus.

Related to self.-learning activities at home	Related to learning activities in class
- Writing answers to questions on reading about learning/thinking; - Reflective writing on assigned readings, videos, or podcasts, and variations on the strategy; - Short questionnaire about the proposed self-learning task [it may be completed a moment in the lecture to clarify identified issues/difficulties (wrong answers) - Complete a reading and answer questions on it - Clicker questions during the lecture - Visual representation of the self-learn task (ex., concept or brain maps) - Pre-exam knowledge survey on exam material - Meta-assignments on papers and projects - Student-created review sheets for exams - Post-quiz/post-task reflection and self-assessment in pairs or groups	- Class discussion on reading about learning/thinking - Knowledge survey - Clicker questions during lecture - Pair and group activities during lecture - Quick-thinks lecture-break activities - Pair activities to close lecture - Minute paper to close lecture - Active listening checks to close lecture - Visual representations of lectures - Think Aloud on problematic situations in pairs - Reasoning practice (after instructor models) in pairs or groups - Weekly journaling on learning - Occasional reflective writing assignments - Writing assignments to overcome procrastination - Knowledge survey

Figure 2. Examples of self-regulated activities or assignments (adapted from Nilson, 2013).

Another point to consider is that it should be made clear that the development of self-regulation skills will be an integral part of the course outcomes (Pintrich, 2002) and, therefore, will be evaluated and contribute to the final grade. That way, the student is made accountable for the outcome and responsible for the quality of his learning (Nilson, 2013). The amount of this contribution can be discussed with students, and some activities may not even be graded (Figure 3). Assuming the intent is to enhance students' skills, the most suitable assessment tool will be rubrics, which can be developed specifically for a course or a type of activity across similar courses. For less important or simpler assignments, a semiquantitative grading may be sufficient: the student gets 0 points if he fails to accomplish or submit the task outcome, or 5 points if he succeeds in completing the task with a minimum of quality. It can also be possible to incorporate an intermediate score of 3 if it is helpful to discriminate between a novice and an expert. For more complex tasks, a 4 or 5-level rubric can be used, scoring different aspects of the task with predefined criteria which describes different levels of the skills standards proposed for the assignment.

As students' motivation is a vital determinant in their engagement in learning, peer learning and positive stimuli to all the students may be

beneficial to maintain their interest across the semester. As an example of the latter, in the Course of Gynecology and Obstetrics in the Veterinary Programme at UÉvora), students are requested to read a book on specific parts of the content before classes where clinical cases will be discussed. Based on their study, students must submit conceptual maps for a symptom or a syndrome proposed by the teacher (5 in total/per semester), which will be graded using a rubric and will account for 20% of the final grade in the course. The rubrics used to grade the activities are made available at the start of the semester to get the students committed to the task. All students start with 20 points (the maximal grade points), which are cut down according to the level of their performance in the proposed tasks (from level A – zero points – to level D – minus 3 points). Scores can be adjusted to the number of tasks proposed for the semester, so students who constantly fail to achieve the threshold mark to pass or do not submit the work will be penalized and end with fewer points.

Activities not for grading	Activities that may be graded with a rubric
- Class discussion or questioning on learning/thinking readings - Class brainstorming on a problem/situation - Self-testing in recall-and-review reading procedures - Pre-lecture active knowledge sharing* - Clicker questions - Pair and group activities during lecture* - Quick-thinks lecture-break activities* - Post-quiz reflection and self-assessment in pairs or groups* - Pair activities within or closing lectures - Think Aloud on (homework) problems in pairs - Reasoning practice (after instructor models) in pairs or groups*	- Meta-assignments on authentic problems (describe thinking process) - Concept or brain maps - Reflective meta-assignments on experiential learning, service-learning, fieldwork, internships, simulations, and role-play activities - Meta-assignments on portfolios (any kind) - Self-assessment on course knowledge and skills (reflective writing on subject matter or content-focused writing, such as letter to pre-class self or value-added essay final) [at the end of course] - Reflective writing on readings, videos, or podcasts

*Hold students accountable by cold-calling on individuals, pairs, or groups, to report out.

Figure 3. Examples of activities according to whether they are gradable or not (adapted from Nilson, 2013).

Other strategies shown to improve students' self-regulation are case-based (Rezaee & Mosalanejad, 2015), problem-based, and project-based learning (Stefanou et al., 2013), usually developed in teams. A solid positive point in these learning strategies is that the proximity and closeness situations arising in the professional daily work will catch the interest of most students while also allowing them to understand how the knowledge they acquired in the

course will translate into practice. However, the difficulty level and the requested cognitive load must be adjusted to the student's level. It may be excessively demanding for inexperienced and novice students, which may require a higher level of scaffolding to avoid hindering the development of self-regulatory skills and discouraging students.

With e-learning platforms, such as Moodle or Google Classroom (among others), the teacher can also provide the student with shorter tasks, such as reading a paper or chapter to be discussed in class, or analyzing a video. During or at the end of the task, the teacher can provide a short questionnaire focusing on aspects relevant to grasping the knowledge content or request the student to provide a list of meaningful questions about the analyzed text (Nilson, 2013).

Portfolios, particularly learning portfolios on paper or online, are considered valuable tools for fostering self-regulation skills and their assessment (Mak & Wong, 2017; Al-Hawamleh et al., 2022). Portfolios allow students to record their work, reflect on their learning, make their struggles and efforts visible, clarify their learning strategies, present their learning development, and ultimately depict their progress across a given period (either a project or an academic term). It can be used to make proof of competence in a given field or task, even though it may not present as a core objective in determining the student proficiency level in a topic. To be effective, portfolios should include mandatory fields that scaffold the students across the critical analysis and reflections on the learning process and guide them towards the learning outcomes proposed. Self-assessment grids may also be incorporated into portfolios. Regular teacher feedback is crucial for the portfolio's learning support effectiveness, as it happens with any other active learning strategy.

Activities fostering self-regulation skills may also encompass the training of procedures, where students will develop simultaneous technical skills, autonomy, and self-regulation. The following is an example of the task that can be proposed to students during a traineeship in veterinary clinical rotations where the student needs to perform a procedure (i.e., perform a physical exam or any other type of clinical exam; perform and analyze a blood smear) to demonstrate his ability and autonomy. The procedure may be repeated as often as needed, so the student feels confident. For building the standard, students may be recommended to address a video showing a professional or an expert acting. When finding they reach standard competency in the procedure, the student must record his performance, analyze it, and decide on the need to repeat any segment so the final record to be submitted for assessment will reach the expected level.

Conclusion

Self-regulation is a highly praised skill in most professions and everyday life. Students in higher education still struggle to achieve the necessary levels of self-regulation that guarantee the empowerment of deep learning and translational application of the theory into practice. Nonetheless, professional training programs should aim at fostering self-regulatory capacities because, as widely shown in different studies, it correlates strongly with academic, professional, and personal success. Moreover, self-regulated learning endorses long-lasting knowledge, resilience to unexpected changes, and the ever-growing complexity of environmental dimensions.

The problem in dealing with soft skills is that they are soft. Their boundaries are fuzzy and defining them requires complex circular causality chains. This also applies to self-regulation ability that, as mentioned, implies hierarchical levels, including the cognitive, emotional, behavioral, and genetical ones. The frame of the Think4Jobs project tries to establish a link between CrT development and self-regulation capacity, knowing that the last one uses the former as an instrument. However, it is conditioned by many other determinants, personal histories included. As mentioned, it has been suggested that self-regulation training can be indirectly improved in activities designed to promote students' CrT.

Self-regulation can be trained, but several concerns must be addressed regarding the student's engagement and motivation to avoid disappointments and reduced effectiveness of instructional strategies. Factors that may modulate the response to implementing instructional strategies designed to enhance students' self-regulation (alone or in combination with other soft skills, like CrT) have been discussed in this chapter. Some of the more critical points that affect self-regulation development have been discussed to highlight factors that need to be addressed when designing active learning strategies focusing on skills development. Finally, some examples of more complex activities were presented.

There is still much to do before being able to recommend the best pedagogical approaches to develop self-regulation in higher education. Since self-regulation presents a strong positive correlation with other CrT skills, one can try to use this synergy to improve students' performance in this skill. Most of the topics covered herein also apply in the case of different non-cognitive skills.

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