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Models of Self-Regulated Learning in the Context of New Higher Education Standards Implementation

Liliya M. Sirazieva[*]
Kazan Federal University, Kremliovskaya str, 18, 420008, Kazan, Russia

Radif R. Zamaletdinov
Kazan Federal University, Kremliovskaya str, 18, 420008, Kazan, Russia

Rezida A. Fahrutdinova
Kazan Federal University, Kremliovskaya str, 18, 420008, Kazan, Russia

Rifat R. Fahrutdinov
Kazan Federal University, Kremliovskaya str, 18, 420008, Kazan, Russia

Abstract
Self-regulated learning (SRL) is viewed as an important aspect of student academic performance and achievement. Over the past decades, the concept of SRL has been heavily researched, with many educational psychologists proposing theoretical models and setting up studies to test the theories and provide pragmatic information about SRL. The aim of this review was to analyze different models of SRL. To achieve this goal, three models of SRL developed by Zimmerman, Pintrich and Efklides were presented. All of the models had empirical evidence supporting the validity of some of their main aspects. As developing their models, both Pintrich and Zimmerman, and partly Efklides; drew on the same background theory and their models reflected Bandura's 1986 Social Cognitive Theory, underlining social foundations of thinking and behavior. The terminology also varied from one model to another, but all the authors assumed SRL to proceed from a preparatory or preliminary phase, through actual performance or task completion phase, to an appraisal or adaptation one.

Keywords: Self-regulated learning; Assessment methods; Higher education standards; Learning strategies; SRL model.

1. Introduction
At the beginning of the 21st century, Russia adopted European competence- oriented concept of education which caused massive changes in the methods of teaching and learning throughout the national educational system (Pimenova *et al.*, 2017).

Traditionally, the system was focused on acquisition of literacy and numeracy knowledge and skills. In the context of competence orientation, the stress was also made on key competences that were to be trained to students on different levels of schooling (Yarmakeev and Abdrafikova, 2016).

New educational standards were further developed and gradually implemented in all levels of schooling including higher and post-graduate education. Federal State Educational Standard of Higher Professional Education of the third generation (FSES HPE-3++) was the state mandatory instruction that regulated the process and the content of higher education in Russia. FSES HPE also implied that every student should be capable of becoming autonomous in not only basic competences, but also in coping with one's life and new present challenges (Rimma and Akhmadullina, 2017).

According to FSES HPE, up to 60% of all educational time was to be spent on student's self-study. In this prospective, the role of self-regulated learning (SRL) became significant and its promotion tended to be important in the process of teaching and learning.

The concept of SRL refers to "the process for learners taking the initiative to adjust cognition, emotion, and behavior in order to enhance learning effects and achieve learning goals" (Zimmerman, 1989).

Central to this concept are the autonomy and responsibility of students to take charge of their own learning. Self-regulated students personally initiate and direct their own efforts to acquire knowledge and skills rather than relying on others; such as teachers, parents, or other agents of instruction (Kozhabergenova *et al.*, 2018).

SRL is viewed as an important aspect of student academic performance and achievement in classroom settings. Students who naturally self-regulate know about themselves as learners and also have knowledge about learning tasks and environments. They have an understanding about various learning strategies, and also know how, when, and why to use such strategies in a specific context (Sadriev and Andrianova, 2017). They effectively monitor their own thinking, problem-solving, allocating their time, and assessing their progress. Likewise, they actively find a way to succeed and are motivated to learn. They continually reflect, make changes in order to complete tasks, and succeed (Zimmerman, 1989).

*Corresponding Author

These characteristics together describe a learner; teachers are continually striving to develop. Student who are motivated to learn and know themselves as learners can utilize strategies and skills to reflect on their learning, and most importantly, are learners who assume responsibility for their own learning (Bird, 2009).

SRL includes cognitive, metacognitive, behavioral, motivational, and emotional/affective aspects of learning. It is, therefore, an extraordinary umbrella under which a considerable number of variables influencing learning (e.g., self-efficacy, volition, and cognitive strategies) are studied within a comprehensive and holistic approach. For that reason, SRL has become one of the most important areas of research within educational psychology (Panadero, 2017).

Over the past 30 years, the concept of SRL has been embraced and heavily researched, with many educational psychologists proposing theoretical models and setting up studies to test the theories and to provide pragmatic information about SRL (Antúnez, 2016).

In this paper, three models of SRL were analyzed; that is, Zimmerman; Pintrich, and Efklides.

2. Methodology

The model by Zimmerman was chosen for study as it is widely used, and Zimmerman was one of the first SRL authors who made an attempt in 1989 to explain the interactions influencing SRL.

The model by Pintrich (2000) was chosen as the questionnaire based on it, the Motivated Strategies for Learning Questionnaire (MSLQ) is widely used, and, recently, two reviews had found that the MSLQ was the most used instrument in SRL measurement (Pintrich *et al.*, 1993; Roth *et al.*, 2016).

As the previous models were developed relatively long ago, a decision to consider a new model was made. For that purpose, the model by Efklides (2011) was chosen for this study. First, it is one of the latest models developed; and, second, the SRL-measurement instrument based on it is appropriate for our further research.

3. Results & Discussion
3.1. Zimmerman's Model of SRL

Zimmerman developed three different SRL models; the first one was published in 1989. The model under study was the last one and represented the Cyclical Phases of SRL; which explained, at the individual level, the interrelationships of metacognitive and motivational processes. This model was presented in a chapter in the 2000 handbook, and it became usually known as Zimmerman's model (Zimmerman, 1989;2000).

Zimmerman (2000) SRL model is organized in three phases: forethought, performance, and self-reflection (see Figure 1). In *the forethought phase*, students analyze a task, set goals, and plan how to reach them and a number of motivational beliefs energizing the process and influencing the activation of learning strategies. The forethought phase is what a learner brings to the learning situation, that is, what they know or think they know and can do; it "refers to influential processes and beliefs that precede efforts to learn and set the stage for such learning" In *the performance phase*, students actually execute a task, while they monitor how they are progressing, and use a number of self-control strategies to keep themselves cognitively engaged and motivated to finish a task. The performance or volitional control phase is basically the ability to stay on a task no matter the distractions or challenges; it "involves processes that occur during learning efforts and affect concentration and performance" (Zimmerman, 2000). Finally, in *the self-reflection phase*, students assess how they have performed a task, making attributions about their success or failure. The self-reflection phase involves learners in self-assessing and reflecting on their progress as well as adapting and formulating their next learning steps. It "involves processes that occur after learning efforts and influence a learner's reactions to that experience". These attributions generate self-reactions that can positively or negatively influence how students approach a task in later performances (Zimmerman, 2000).

Figure-1. Zimmerman (2000)Zimmerman's SRL Cyclical Phases model (2000)

TABLE 1   Phase Structure and Subprocesses of Self-Regulation

Cyclical self-regulatory phases		
Forethought	**Performance/volitional control**	**Self-reflection**
Task analysis	**Self-control**	**Self-judgment**
Goal setting	Self-instruction	Self-evaluation
Strategic planning	Imagery	Causal attribution
	Attention focusing	
Self-motivation beliefs	Task strategies	**Self-reaction**
Self-efficacy		Self-satisfaction/affect
Outcome expectations	**Self-observation**	Adaptive-defensive
Intrinsic interest/value	Self-recording	
Goal orientation	Self-experimentation	

An important aspect of SRL involves a student developing a repertoire of strategies for learning, studying, controlling emotions, pursuing goals, and so forth.

Bandura (1986) ascribed much importance to a learner's use of self-regulation strategies. In his view, strategy applications could provide a learner with valuable self-efficacy knowledge. This knowledge, in turn, was assumed to determine subsequent strategy selections and enactments; "such representation knowledge is put to heavy use in forming judgments and in constructing and selecting courses of actions" (Bandura, 1986).

Zimmerman broadly distinguished SRL strategies according to three phases of learning: the forethought phase, the performance phase, and the self-reflection phase. Table 1 below displayed the processes occurring during each phase and strategies and tools at the particular phase of Zimmerman's SRL Cycle (Zimmerman, 2000).

Table-1. Zimmerman (2000) and Strategy/tool Integration

SRL Phase Processes	SRL Strategies and Tools
Forethought phase	
Task Analysis: *Goal-setting*: deciding on specific outcomes of learning *Strategic planning*: selecting learning strategies or methods designed to attain desired goals **Self-motivation beliefs:** *Influenced by*: self-efficacy, outcome expectations, intrinsic interest value, and learning goal orientation	Sharing learning intentions, developing success criteria, setting goals, referring to a model/exemplar, and referring to using tools
Performance phase	
Self-control: *Imagery:* forming mental pictures to enhance learning and recall *Attention focusing*: focusing on a task, protecting student's intention to learn from distractions and from competing intentions *Self-instruction*: telling oneself how to proceed during a learning task *Task strategy:* choosing an appropriate strategy **Self-observation:** *Self-recording:* recording personal events about learning *Self-experimentation:* simple inquiry about one's own learning *Self-monitoring (covertly)*: cognitive tracking of personal functioning	Goal monitoring, using tools (carrels, CD players with baroque music, STARS, timeout capsule, and on task/off task checks), referring to a model/exemplar, referring to the learning intentions and success criteria, and performance/sharing time
Self-reflection phase	
Self-judgment: *Self-evaluation:* comparing self-monitored information with a standard or goal *Causal attribution*: attributing success or failure to results, identifying sources of errors, and identifying successful strategies **Self-reaction:** *Self-satisfaction/affect*: applying positive or negative self-reactions to strategy use *Adaptive/defensive*: evaluating the whole process, adapting different strategies, and refining the process	Reflecting on goals, setting new goals, self-assessing against learning intentions and success criteria, performance/sharing time, peer-assessment against learning intentions and success criteria, and developing next learning steps

3.2. Pintrich's Model of SRL

Pintrich's work is considered important in this field as he made a major contribution to clarifying SRL conceptual framework. He conducted crucial empirical work on the relationship between SRL and motivation, and his questionnaire, MSLQ, is widely used. Pintrich was one of the first to analyze the relationship between SRL and motivation empirically, theoretically, as well as lack of connections between motivation and cognition (Pintrich *et al.*, 1993).

In terms of the model itself, there is only one version of it, the one presented in the first handbook of SRL. According to Pintrich (2000) model, SRL is compounded by four phases: (1) Forethought, planning, and activation; (2) Monitoring; (3) Control; and (4) Reaction and reflection. Each of them contains four different areas for regulation: cognition, motivation/affect, behavior, and context. A combination of phases and areas can offer a comprehensive picture that includes a significant number of SRL processes (e.g., prior content knowledge activation, efficacy judgments, and self-observations of behavior) (see Figure 2) (Pintrich, 2000).

In a special issue dedicated to his memory, Schunk (2005) reviewed Pintrich's major contributions to the SRL field identifying six different areas: (a) a conceptual framework and model for SRL; (b) role of motivation in SRL with a special focus on goal orientation; (c) relationship between SRL, motivation, and learning outcomes; (d) role of classroom contexts in SRL and motivation; (e) development of SRL through empirical studies; and (f) development of an instrument to measure SRL (MSLQ) (Schunk, 2005).

Figure-2. Pintrich (2000)

TABLE 1 Phases and Areas for Self-Regulated Learning

Phases	Areas for regulation			
	Cognition	Motivation/affect	Behavior	Context
1. Forethought, planning, and activation	Target goal setting	Goal orientation adoption	[Time and effort planning]	[Perceptions of task]
	Prior content knowledge activation	Efficacy judgments	[Planning for self-observations of behavior]	[Perceptions of context]
	Metacognitive knowledge activation	Ease of learning judgements (EOLs); perceptions of task difficulty		
		Task value activation		
		Interest activation		
2. Monitoring	Metacognitive awareness and monitoring of cognition (FOKs, JOLs)	Awareness and monitoring of motivation and affect	Awareness and monitoring of effort, time use, need for help	Monitoring changing task and context conditions
			Self-observation of behavior	
3. Control	Selection and adaptation of cognitive strategies for learning, thinking	Selection and adaptation of strategies for managing motivation and affect	Increase/decrease effort	Change or renegotiate task
			Persist, give up	Change or leave context
			Help-seeking behavior	
4. Reaction and reflection	Cognitive judgments	Affective reactions	Choice behavior	Evaluation of task
	Attributions	Attributions		Evaluation of context

One major contribution to the SRL field is the MSLQ. One of the strengths of the MSLQ is its combination of SRL and motivation, which offers detailed information about students' use of learning strategies. Two versions of the questionnaire have been developed for college and high school. More recently, two reviews found that the MSLQ was the most used instrument in SRL measurement (Roth *et al.*, 2016) which emphasized the highly significant impact of Pintrich's work in SRL (Panadero, 2017).

3.2. Efklides' MASRL Model

Efklides presented the Metacognitive and Affective Model of SRL (MASRL) in 2011 (Efklides, 2011).

In the MASRL, there are two levels (see Figure 3). First, there is the Person level, also called macro-level, which comprehends the personal characteristics of the student. It is composed of: (a) cognition, (b) motivation, (c) self-concept, (d) affect, (e) volition, (f) metacognition in the form of metacognitive knowledge, and (g) metacognition in the form of metacognitive skills. A key aspect is that Efklides considered the Person level to be top-down because it is structured around students' goals for a task (Top-down is the mastery/growth pathway in which learning/task goals are more relevant for a student. On the other hand, bottom-up is the well-being pathway in which students activate goals to protect their self-concept (i.e. self-esteem) from being damaged, also known as ego protection. In other words, the thrust of student's goals "guides cognitive processing and the amount of effort" the student will invest; a decision based "on the interactions of the person's competences, self-concept in a task domain, motivation, and affect, vis-à-vis the perception of a task and its demands" (Abdrafikova *et al.*, 2015; Efklides, 2011; Panadero, 2017).

The second level, the Task-Person level, also known as micro-level, is where the interaction between the type of task and student's characteristics takes place. This level is bottom-up, as the metacognitive activity takes control of a student's actions, which causes activity to be "data-driven" with focus on addressing demands of a specific task. To put it more simply, student's attention moves towards specific mechanisms of performing a task, and the general learning goal (e.g., finishing a summary) is subsumed in a more specific goal (e.g., checking for spelling mistakes). Here, the micro-level monitoring is the main process; motivation and affect reactions depend on the evolution of the metacognitive resources and the feedback that comes from the person's performance - i.e., if s/he is progressing appropriately. Finally, Efklides identified four basic functions at this level: (a) cognition, (b) metacognition, (c) affect, and (d) regulation of affect and effort, which could be conceptualized independently, vertically, or, in an integrative way, horizontally.

Figure-3. Efklides (2011)
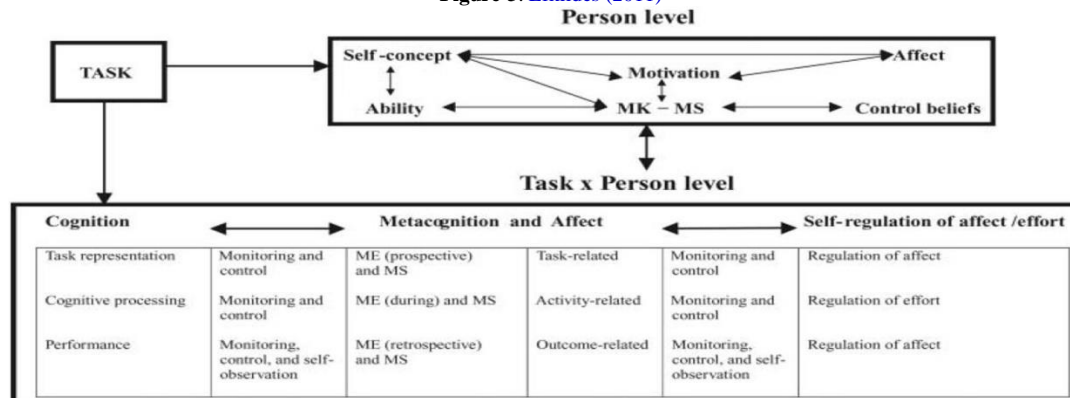
4. Summary

The aim of this review was to analyze SRL models. To achieve this goal, the three models of SRL developed by Zimmerman, Pintrich, and Efklides were presented. All of the models had empirical evidence supporting validity to some of their main aspects.

As developing their models; both Pintrich and Zimmerman, and partly Efklides drew on the same background theory, and their models reflected Bandura's 1986 Social Cognitive Theory, underlining social foundations of thinking and behavior (Bandura, 1986).

The terminology also varied from one model to another, but all the authors assumed SRL to proceed from a preparatory or preliminary phase, through the actual performance or task completion phase, to an appraisal or adaptation one.

5. Conclusion

The present study was based on a literature review regarding self-regulation. The focus was made on theories and approaches developed by Zimmermann, Pintrich, and Efklides. The given theories are useful to the degree that they raise specific issues that can be resolved through research. The authors offered, on the whole, a complementary view of the key sub-processes in a student's SRL. Ultimately, of course, the importance of each sub-process, even its further definition, will be established by further research.

The most important limitation of the current study was its descriptive design in nature and no attempts to explain a cause and effect relationship. Nevertheless, this study provided a hint as to where to start investigations and indicated those methods that appeared more promising for achieving improvements in SRL skills.

Acknowledgements

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