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ARTICLES

The challenge of promoting self-regulated learning among primary school children with a low socioeconomic and immigrant background

Sabrina Vandevelde, Hilde Van Keer, and Emmelien Merchie

Department of Educational Studies, Ghent University, Ghent, Belgium

ABSTRACT

The authors explore the effects of student tutoring as an approach to provide support on self-regulated learning (SRL) to fifth- and sixth-grade students with a low socioeconomic or immigrant background. In total, 401 Flemish (Belgium) students participated. A quasi-experimental study with pretest, posttest, and retention test control group design was used, combining teacher ratings, self-report questionnaires, and think-aloud protocols. The teacher rating results show a significantly positive effect from pretest to posttest for the experimental condition, but this was not maintained at the retention test. The questionnaire and think-aloud results reveal no significant effects on students' SRL. However, differential effects depending on students' motivational profile were found. This study illustrates the complexity of promoting SRL among primary school children with a low socioeconomic or immigrant background, recommending further research into conditions and factors influencing the effectiveness of student tutoring programs promoting SRL.

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As research documented significant educational disadvantages for students with a lower socioeconomic or immigrant background (Organization for Economic Cooperation and Development, 2004, 2013b; Park & Sandefur, 2010), providing an equitable distribution of educational opportunities has become an important challenge for educational systems. This calls for an examination of educational methods that can enhance the educational opportunities of these target groups. As studies have indicated that learners who possess and display self-regulated learning (SRL) strategies experience more successful educational trajectories (Artelt, Baumert, McElvany, & Peschar, 2003; Pintrich, 2004; Winne, 2005; Zimmerman, 2002), providing students with a low socioeconomic or immigrant background additional instructional resources regarding SRL might improve their educational position. Unfortunately, while these students require more instruction and practice in SRL, teachers of disadvantaged students seem to opt more frequently for teacher-centered learning environments which are less in line with conditions promoting SRL (Hornstra, 2013). In promoting SRL, close and individualized guidance seems to be preferable (Butler, 2002; Veenman, Van Hout-Wolters, & Afflerbach, 2006). Student tutoring, a method in which children receive guidance in small groups from higher education students, might be an interesting approach to provide such individual support to students at risk of educational failure (Vandevelde et al., 2011; Barley et al., 2002; Cassio, 2008; Hock, Pulvers, Deshler, & Schumaker, 2001; Ritter et al., 2009). However, to our knowledge, the potential of enhancing SRL by means of student tutoring has not been explored yet (for an exception see Vandevelde et al., 2011). The present study intends to fill this gap by investigating the effects of student tutoring as a method to provide support on SRL to fifth- and sixth-grade students with a low socioeconomic or immigrant background.

Theoretical framework

Educational inequality

With respect to educational inequality, student background remains one of the most powerful factors influencing performance (Dronkers, 2010; Organization for Economic Cooperation and Development, 2004, 2013b). Research reveals that students with a low socioeconomic background on average tend to perform less well at school than their peers (Organization for Economic Cooperation and Development, 2004, 2013b). Although Flanders (Belgium) has high average performance levels, student performance is comparatively strongly related to socioeconomic background (Organization for Economic Cooperation and Development, 2004, 2013a) and shows one of the largest disparities between native and immigrant students, even when students' socioeconomic background is taken into account (Organization for Economic Cooperation and Development, 2006, 2013b; Park & Sandefur, 2010; Sierens, Van Houtte, Loobuyck, Delrue, & Pelleriaux, 2006). In comparison with their more privileged peers, students with low socioeconomic and immigrant backgrounds are less frequently enrolled in preprimary education, are over-represented in technically and vocationally oriented programs, are underrepresented in higher education and educational delay at primary and secondary level is more often observed within this student

CONTACT Sabrina Vandevelde sabrina.vandevelde@ugent.be Department of Educational Studies, Ghent University, Henri Dunantlaan 2, 9000 Ghent, Belgium.
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group (Groenez, Van den Brande, & Nicaise, 2003; Sierens, Van Houtte, Loobuyck, Delrue, & Pelleriaux, 2006).

In sum, despite several policy actions in the past decades undertaken by the Flemish government (Nicaise & Desmedt, 2008), the performance of these students generally lies behind the performance of students with a higher socioeconomic or nonimmigrant background. Providing additional instructional resources for students with a more socioeconomically disadvantaged or immigrant background, is one of the possibilities proposed in the literature to enhance their educational opportunities (Organization for Economic Cooperation and Development, 2013a). Offering additional support to acquire and strengthen their SRL might help them to fulfill their educational trajectories more successfully. Additional attention to SRL is especially warranted since research shows that these target groups encounter more difficulties with displaying SRL (Pappas, Ginsburg, & Jiang, 2003) and that teachers find it more difficult to foster SRL in these groups (Hornstra, 2013). In the following sections, we elaborate further on this matter.

Self-regulated learning

As the concept of SRL has received a great deal of attention in educational research and educational psychology and has been studied from diverse theoretical perspectives, different models, conceptions, and definitions of SRL have emerged in the literature (Boekaerts & Corno, 2005; Dinsmore, Alexander, & Loughlin, 2008; Martin & McLellan, 2008; Pintrich, 2004; Schunk, 2005; Zeidner, Boekaerts, & Pintrich, 2000). Based on general assumptions shared by different models of SRL, Pintrich (2000) described SRL as "an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment" (p. 453).

This description illustrates the complexity and multicomponent character of SRL, including a metacognitive, cognitive, and motivational component. The metacognitive component refers to planning, setting goals, organizing, self-monitoring, and self-evaluating during the learning process (Boekaerts, 1999; Pintrich, 2004; Veenman, 2011b). The strategic or cognitive component describes how learners approach their learning tasks, choosing from a repertoire of tactics and learning strategies they believe are best suited to tackle the task and subsequently applying them appropriately (Azevedo & Cromley, 2004; Boekaerts, 1999; Hadwin, Wozney, & Pontin, 2005; Pintrich, 2004) and how they select, structure, and create environments that optimize learning (Perry, Phillips, & Dowler, 2004; Winne, 2001; Zimmerman, 1990). In addition, students' use of (meta)cognitive strategies is not merely a question of skills, but also a question of motivation (Boekaerts, 1995; Pintrich, 1999; Wolters, 2003; Zimmerman & Moylan, 2009). Consequently, SRL involves motivational aspects as well, such as self-efficacy beliefs and task interest (Pintrich, 2004; Wolters, 2003; Zimmerman & Schunk, 2008).

Following the multicomponent character of SRL, students will ideally analyze the task requirements, mobilize and evaluate their prior knowledge, and select appropriate strategies before engaging in a task. These actions enable them to monitor their behavior in terms of their goals and self-reflect on their increasing effectiveness. Students showing high levels of SRL, during task performance, will use effective strategies to organize, code and rehearse information. They establish a productive work environment, manage their time effectively, monitor their motivational beliefs, and persist despite hindrances or distractions. These learners will also display high levels of self-motivation and hold positive beliefs about their capabilities. After a task, they preferably self-evaluate their performance and make strategy attributions instead of ability attributions. This leads to greater personal satisfaction with their learning progress and to further efforts to improve their performance (De Corte, Mason, Depaepe, & Verschaffel, 2011; Schunk & Ertmer, 2000; Zimmerman, Bonner, & Kovack, 2002).

As research has shown that SRL leads to success in and beyond school (Pintrich, 2004; Zimmerman, 2002), SRL has become an important educational goal (Boekaerts, 1999; Zimmerman, 2002). Within the research field of SRL, most studies have involved students from secondary or higher education (Winne & Perry, 2000) due to the long-held belief that young children (i.e., preschool and early primary school children) are unable to self-regulate their learning (Paris & Newman, 1990; Schunk, 2001; Zimmerman, 2001) and that important SRL skills, such as metacognitive skills, only emerge at the age of 8–10 years old, and develop during the years thereafter (Veenman et al., 2006). Consequently, research on primary school children's SRL remains limited (Winne & Perry, 2000; Zeidner et al., 2000).

During the last decade, however, an increasing number of studies provided empirical support indicating that young children can and do engage in SRL-activities (e.g., Annevirta & Vauras, 2006; Perry et al., 2004; Schneider, 2008; Whitebread et al., 2009; Wigfield, Klauda, & Cambria, 2011) and that SRL can already be fostered by instructional guidance at primary school (Dignath, Buettner, & Langfeldt, 2008; Perels, Gürtler, & Schmitz, 2005; Stoeger & Ziegler, 2008). SRL and fostering SRL become increasingly important in transition periods in which students switch from a more closely monitored environment (i.e., primary education) to an environment (e.g., secondary education) in which greater independence is expected and students have to plan, monitor, and evaluate larger portions of learning by themselves (Cleary & Zimmerman, 2004; Dembo & Eaton, 2000; Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013; Wingate, 2007). Therefore, early adolescence represents a critical period for the acquisition of an effective study method, which students will need when confronted with the increased expectations for academic productivity and more intensive and demanding learning environments (Cornford, 2002; Hamman, Berthelot, Saia, & Crowley, 2000; Meneghetti, De Beni, & Cornoldi, 2007). To meet these expectations, students need a repertoire of SRL strategies they can access and utilize.

Unfortunately, however, research indicates that students encounter difficulties applying these strategies in an effective and efficient way (Pintrich, 2002, 2004; Schunk & Ertmer, 2000; Winne & Nesbit, 2009). The use of SRL strategies largely varies among learners (Annevirta & Vauras, 2006; Perry et al., 2004; Winne, 2005; Zimmerman, 2002), possibly due to a deficiency of the necessary metacognitive knowledge and skills,

students' beliefs that they cannot successfully execute SRL strategies, or a lack of motivation to apply the more demanding strategies (Veenman et al., 2006; Zimmerman, 2001). Moreover, many students develop negative self-motivational beliefs (e.g., decreasing self-efficacy beliefs regarding their SRL) or show a decline in their motivation when they transit to secondary school (Cleary & Chen, 2009; Corpus, McClintic-Gilbert, & Hayenga, 2009; Eccles, 2005; Pajares, 2002; Spinath & Spinath, 2005; Usher & Pajares, 2008). This is worrisome, because as students lose motivation for, and confidence in, their SRL strategies and practices, they are less likely to employ them and will struggle to deal with more demanding learning environments. Although research specifically focusing on SRL among specific groups is scarce (Pintrich & Zusho, 2007; Zeidner et al., 2000), students from more socioeconomically disadvantaged backgrounds have been found to show less SRL behavior (Pappas et al., 2003). Students from a low socioeconomic background and ethnic minority students also have more difficulty engaging in motivated behavior and investing effort in school toward the end of primary school (Hornstra, 2013). Given these findings, researchers and educational practitioners emphasize the importance of promoting SRL already in primary education (Dignath et al., 2008; Perry et al., 2004; Postholm, 2010; Stoeger & Ziegler, 2011).

Promoting self-regulated learning

Although children in most cases do not spontaneously or effectively regulate their learning (Schneider, 2008; Schunk, 2001), research indicates that SRL is trainable (Dignath et al., 2008; Paris & Paris, 2001; Perels et al., 2005; Schneider, 2008; Stoeger & Ziegler, 2008; Zimmerman et al., 2002). Based on the literature, several guidelines can be deduced regarding how to guide and coach students' SRL processes.

First, according to a social cognitive perspective, the development of SRL starts on an observational level (i.e., vicarious induction of a skill from a proficient model), then progresses to an emulation level (i.e., imitative performance of the general pattern or style of a model's skill receiving guidance, feedback, and social reinforcement during practice from the model to increase accuracy), then evolves to a self-controlled level (i.e., independent display of the skill under structured conditions), and finally reaches a self-regulated level (i.e., adaptive use of skill across changing personal and environmental conditions; Zimmerman, 2001). This sociocognitive model suggests that the development of SRL begins with the most extensive social guidance at the first level, and this social support is systematically reduced as learners acquire underlying SRL skills (Schunk, 2001; Winne, 2005; Zimmerman, 2001). Consequently, there should be a shift from external modeling of the regulation toward students taking control and demonstrating SRL (Hadwin et al., 2005). To evolve from external regulation to coregulation and finally reach self-regulation, scaffolding is a critical issue whereby models provide calibrated support based on an ongoing diagnosis of the students' level of understanding (Puntambekar & Hübscher, 2005). In educational settings, teachers can serve as models by demonstrating the use of strategies and verbalizing their thought processes (Kistner et al., 2010; Zimmerman, 2000). In a latter phase, they can encourage students to take more responsibility by prompting them to perform SRL while providing feedback and challenging the student to analyze, plan, monitor his thinking, and to evaluate the outcome. In those cases, the teacher reverts from being a model to a more coaching role (Larkin, 2009).

Second, besides modeling-scaffolding-fading, teachers can also create a supportive learning environment that enables students to engage actively in their learning process (Kistner et al., 2010; Perry et al., 2004). Such a powerful environment gives students the opportunities to seek challenges, to take responsibility, and to reflect on their progress (Paris & Paris, 2001). More concretely, teachers (a) engage students in complex, open-ended activities and offer them choices and opportunities to control the level of difficulty and challenge (Boekaerts, 1997; Paris & Paris, 2001; Perry et al., 2004); (b) provide instrumental support to ensure students' application of independent, academically effective forms of learning and encourage support through peers (Perry et al., 2004); (c) create situations that make strategy use observable and salient (such as during discussion, tutoring; Paris & Paris, 2001); (d) provoke students to engage reflectively in their cognitive, motivational, and metacognitive strategy use and as such evocate students' explicit awareness and reflection (Askell-Williams, Lawson, & Skrzypiec, 2012; Butler, 2002); (e) support attribution of improved performance to strategy use instead of to ability or luck (Butler, 2002; Pintrich, 2004); and (f) use nonthreatening evaluation practices that encourage students to focus on personal progress and promote a climate in which errors are opportunities from which to learn (Perry et al., 2004).

Third, although both modeling and creating powerful learning environments are important to enhance students' SRL, it is mostly not sufficient. In these cases, explicit instruction of the strategies is needed, especially for low achievers and students who encounter more difficulties with SRL (Kistner et al., 2010; Weinstein, Husman, & Dierking, 2000). During explicit instruction, teachers do not only model the strategies, but also provide specific strategy information so that students become aware of the how, when, and why to apply strategies (Kistner et al., 2010; Paris & Paris, 2001).

Ideally, the above described guidelines to promote SRL are combined by (a) introducing SRL strategies by modeling; (b) providing explicit instruction so students acquire knowledge on the how, when, and why to apply strategies; and (c) providing various practice opportunities by creating powerful learning environments accompanied by close guidance and feedback to optimize students' SRL strategies (Pressley & Woloshyn, 1995). Unfortunately, research shows that in today's classrooms few teachers effectively and explicitly prepare their pupils to learn on their own and external regulation prevails largely over self-regulation (Vandevelde et al., 2012; Boekaerts, 1997; Cornford, 2002; De Corte et al., 2011; Pintrich, 2002; Zimmerman, 2002). Especially teachers of disadvantaged students seem to opt more frequently for teacher-centered learning environments, partly due to their beliefs that their students lack the characteristics necessary for more innovative, and autonomy-supportive learning environments (Hornstra, 2013). Consequently, students from ethnic minorities or socioeconomically disadvantaged backgrounds may be more accustomed to traditional ways of teaching, which are less in line with conditions

promoting SRL. However, these students actually require more instruction and practice in SRL (Dembo & Eaton, 2000; Veenman & Verheij, 2003; Weinstein et al., 2000), as they have less experience and prior knowledge about effective strategies (Dembo & Eaton, 2000; Larkin, 2009).

The previously mentioned research findings highlight the importance of discovering ways to promote SRL, preferably from primary education on. Consequently, numerous studies and self-regulation training programs were set up and different approaches were examined: classroom-based training (e.g., Perels, Dignath, & Schmitz, 2009; Stoeger & Ziegler, 2008), computer-based training (e.g., Graesser, McNamara, & VanLehn, 2005; Kramarski & Gutman, 2006), and school-based programs (e.g., Cleary & Zimmerman, 2004). However, to our knowledge, the potential of enhancing SRL by means of student tutoring has not yet been explored (for an exception see Vandevelde et al., 2011). Moreover, most previous intervention studies have combined the instruction of SRL strategies with domain-specific strategies, such as mathematics (e.g., Fuchs et al., 2003; Mevarech & Kramarski, 2003; Perels et al., 2009), reading and writing (e.g., Bimmel, Bergh, & Oostdam, 2001; Schünemann, Spörer, & Brunstein, 2013; Souvignier & Mokhlesgerami, 2006), and science (e.g., Leopold, den Elzen-Rump, & Leutner, 2007), reporting on the effects of SRL training on (domain-specific) learning performance, without assessing its impact on students' SRL as such (Veenman et al., 2006).

Promoting self-regulated learning by means of student tutoring

Student tutoring refers to the practice of having students from universities and colleges tutor pupils in primary and high school classrooms under the guidance of the class teacher (Topping & Hill, 1995). Student tutoring is often confused with peer tutoring, which is defined as people from similar social groupings who are not professional teachers helping each other to learn, and learning themselves by teaching (Topping, 1996). The term peer implies equality of age and position. Within peer tutoring, the tutor (i.e., the student taking a supportive role) and tutee (i.e., the student receiving help and support) can be from the same class (i.e., same-age peer tutoring) or a different class (cross-age peer tutoring). In the case of student tutoring, however, tutor (i.e., student from higher education) and tutee (i.e., student from primary or secondary education) have a clearly different educational level and differ more in age and position compared to peer tutoring. Although student tutors are not professional tutors or regular school teachers, the student tutor is the more capable, knowledgeable, and experienced student with a supportive role, while tutees are less experienced pupils receiving help (Topping & Hill, 1995). Student tutoring programs can vary according to a number of dimensions: tutee characteristics (e.g., learning delayed, socioeconomically disadvantaged, dropout risk), tutor characteristics (e.g., community volunteers, preservice teachers), curriculum (e.g., reading, mathematics, science), contact arrangements (e.g., one-to-one, small groups), and time (e.g., class time, recess time, after school; Gordon, Morgan, O'Malley, & Ponticell, 2007; Topping & Hill, 1995).

Taking the general characteristics of student tutoring into account, student tutoring can provide a valuable learning context to promote SRL. A first important characteristic is the more individualized help tutees receive, as tutoring occurs in one-to-one settings or in small groups. When promoting SRL, it is important to build from students' existing knowledge and skills and to provide calibrated support based on an ongoing diagnosis of the students' level of understanding (Butler, 2002; Puntambekar & Hübscher, 2005). This support is individualized not only for different learners with various levels of prior knowledge and skills, but it also changes for each learner over a particular task (Puntambekar & Hübscher, 2005). Especially young children seem to profit from a more close and individualized guidance to refine their SRL processes (Zimmerman & Martinez-Pons, 1990). However, tailoring instruction to each student's needs is a challenge in today's increasingly diverse classrooms (Butler, 2002). In this respect, teachers experience the diversity between their pupils—in combination with time pressure—as a factor hampering SRL stimulation (Vandevelde et al., 2012). These individual differences and the need for personal guidance appear to be of particular relevance to advocate tutoring initiatives. Because student tutoring mostly occurs in small groups or in one-to-one settings, tutors can act as models and provide explicit instruction when needed, and are equipped to assess individual differences among their tutees, to fine-tune their support based on students' changing knowledge and skills, and in doing so to establish the zone of proximal development and to engineer stimulating learning environments (cf. modeling-scaffolding-fading and explicit instruction; Gordon et al., 2007; Graesser, Person, & Magliano, 1995).

Second, the benefits of student tutoring can be explained by a greater social involvement between tutor and tutee, tutors serving as a role model, the provision of immediate and relevant feedback, more active and interactive learning, increased time on task, and a better alignment between what students know and the instructional task (Chi, Siler, Jeong, Yamauchi, & Hausmann, 2001; Gaustad, 1992; Gordon et al., 2007). Due to these specific features of tutoring, a powerful learning environment is created in which tutees are empowered to take ownership of their learning (Topping & Ehly, 2001) and in this way, tutees are encouraged to regulate their learning process.

Third, the affective component of tutoring might be a powerful steppingstone for important motivational concepts regarding SRL. A trusting relationship with a tutor who holds no position of authority might facilitate self-disclosure of ignorance and misconception, enabling subsequent diagnosis and correction (Topping & Ehly, 2001). The tutor's modeling of enthusiasm, competence, and the possibility of success can influence the self-confidence and self-esteem of the tutee. As the tutoring occurs in small groups, it is expected that the students receive more praise and encouragement than in group instruction. The additional attention itself can be motivating. These affective processes can foster greater learning motivation, self-esteem, and self-confidence (Gaustad, 1992). These aspects of tutoring are particularly valuable when considering students at-risk of school failure, frequently characterized by low self-esteem or in need of attention and relatedness (Hamre & Pianta, 2001; Karsenty, 2010). As these characteristics of student tutoring are in line with the key instructional tools

promoting SRL (modeling, scaffolding, explicit instruction, creating powerful learning environments), student tutoring might be a cost-effective avenue to provide additional assistance to educationally disadvantaged students in order to optimize their SRL.

Notwithstanding the many effect studies on peer tutoring, research on the effects of student tutoring remains rather scarce despite the wide use in practice (Morris, 2006; Ritter, Barnett, Denny, & Albin, 2009). Although outcomes vary according to the particular student tutoring program's design, research generally shows positive outcomes for both tutees and tutors on the cognitive, affective, and social level (Cohen, Kulik, & Kulik, 1982; Gordon et al., 2007; Ritter et al., 2009; Topping & Hill, 1995). Positive outcomes for tutees include increased aspirations, improved basic skills, deeper learning, improved motivation, affective and attitudinal gains, intrinsic interest in the subject matter, and a reduction in tutee dropout (Cohen et al., 1982; Elbaum, Vaughn, Hughes, & Moody, 2000; Gordon et al., 2007; Ritter et al., 2009; Slavin, Lake, Davis, & Madden, 2011; Topping & Hill, 1995). However, these positive effects mainly result from studies focusing on reading. Student tutoring programs regarding other subjects, such as mathematics, reveal limited effects (Smith, Cobb, Farran, Cordray, & Munter, 2013; Vadasy, Jenkins, Antil, Wayne, & O'Connor, 1997). Concluding, studies on the effectiveness of student tutoring are rather scarce and inconclusive as the magnitude of effects varies considerably. These findings stress the need for further research (Gordon et al., 2007; Ritter et al., 2009). Additionally, previous student tutoring studies have focused on specific subjects as the curriculum of tutoring and not on cross-curricular skills, such as SRL (Gordon et al., 2007; Topping, 1998). Therefore, we explore whether student tutoring is an effective strategy for improving SRL.

The role of motivation

To gain more insight into the complexity of SRL and why some students do or do not engage in SRL, numerous researchers have studied the interactive relations between student characteristics and SRL, including gender (e.g., Kitsantas, Steen, & Huie, 2009; Virtanen & Nevgi, 2010), prior knowledge (e.g., Greene, Costa, Robertson, Pan, & Deekens, 2010; Moos & Azevedo, 2008), epistemic beliefs (e.g., Muis & Franco, 2009; Pieschl, Stahl, & Bromme, 2008), and motivational aspects (e.g., Braten, Samuelstuen, & Stromso, 2005; Pajares, 2008). In this study, we focus on the motivational aspects as a great deal of studies have examined and confirmed the significant role of motivational aspects with regard to students' engagement in SRL and the promotion of SRL (Butler, 2002; Pintrich, 2004; Schunk & Ertmer, 2000; Weinstein, Jung, & Acee, 2011; Wolters, 2003; Zimmerman & Schunk, 2008). In previous studies, different motivational aspects have been identified and investigated as to the function they serve in SRL, such as task value (e.g., Neuville, Frenay, & Bourgeois, 2007), self-efficacy (e.g., Pajares, 2008), causal attributions (e.g., Zimmerman & Kitsantas, 1997), motivational strategies (e.g., Wolters, 2003), and motives for learning (e.g., Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). The present study focuses on two key motivational constructs frequently addressed in research, namely students' self-efficacy beliefs and their motives to engage in learning tasks.

Following the social-cognitive perspective, self-efficacy is considered a powerful motivational factor in SRL and refers to students' personal beliefs about their abilities to perform tasks and succeed in activities (Pajares & Valiante, 2002; Usher & Pajares, 2006; Zimmerman, 2000). Students who believe that they are capable of performing academic tasks use more cognitive and metacognitive strategies, and, regardless of previous achievement or ability, they work harder and persist longer when confronted with academic challenges or difficulties (Pajares, 2008; Schunk & Ertmer, 2000).

In conceptualizing students' motives to engage in learning tasks, we build on self-determination theory, which has been established as a well-validated and coherent theoretical framework for the conceptualization and investigation of motivation (Deci & Ryan, 2004; Reeve, 2002; Vansteenkiste & Lens, 2006). Self-determination theory integrates both social-cognitive constructs and human needs (Pintrich, 2003) and expands the traditional distinction between intrinsic and extrinsic motivation by differentiating extrinsic motivation into types of regulation that vary in their degree of relative autonomy (Ryan & Deci, 2000). Autonomous motivation refers to engaging in an activity for its own enjoyment or inherent satisfaction (i.e., intrinsic motivation) or because one identifies with the personal importance of a behavior (i.e., identified regulation). In contrast, when a student undertakes an activity for some instrumental value or external reason (i.e., extrinsic regulation) or to comply with internal pressure or to avoid feelings of guilt and shame (i.e., introjected regulation) he or she is motivated for controlled reasons (Deci & Ryan, 2000; Ryan & Deci, 2000). Several studies show that autonomous motivation is associated with a variety of positive learning outcomes, like greater intention to persist (Hardre & Reeve, 2003), more deep-level learning (Vansteenkiste, Zhou, Lens, & Soenens, 2005), and more frequent use of adaptive metacognitive strategies, such as planning and time management (Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009; Vansteenkiste et al., 2005).

These findings result from a variable-oriented approach examining the unique effects of different types of motivation (e.g., autonomous motivation or controlled motivation; Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009). However, multiple reasons might drive study behavior simultaneously and students can combine diverse motives or types of motivation. This has led researchers to examine motivational components via a more person-centered approach by identifying motivational profiles. Based on self-determination theory, Vansteenkiste et al., for example, found four motivational profiles in students: a good quality motivation group (i.e., high autonomous, low controlled motivation), a poor quality motivation group (i.e., low autonomous, high controlled), a low-quantity motivation group (i.e., low autonomous, low controlled), and a high-quantity motivation group (i.e., high autonomous, high controlled). The good quality motivation group displayed the most optimal learning pattern.

Given the positive relation between students' motivational profile and their learning, one might expect that students' motivational profiles also relate to their responsiveness to educational interventions, and an intervention on SRL in particular.

Exploring this possible influence might also inform us on the complex interplay between student characteristics and the effectiveness of an intervention targeting SRL. However, to our knowledge, prior research has not yet explored such group-specific evolutions of SRL.

The present study

Given the disadvantaged educational position of students with a low socioeconomic or immigrant background, providing additional instruction and support regarding SRL may be a valuable strategy to empower them. As research underlines the importance of effectively promoting SRL in primary education and indicates that SRL becomes increasingly important during transition periods, the present study specifically focuses on fifth- and sixth-grade students, as at this age children are approaching the transition from primary to secondary school in Flemish education. We opted for student tutoring as an approach to stimulate SRL for several reasons. First, the characteristics of student tutoring, and especially the individualized help, are in line with the main recommendations regarding the promotion of SRL. Second, within the research field of SRL, stimulating SRL by means of student tutoring has not been studied before. Similarly, within the research field of tutoring, studies into the effects of student tutoring programs on SRL instead of specific subjects, do not exist. As such, student tutoring can be considered as an innovative approach to stimulate SRL.

In sum, the main aim of the present study is to investigate the effectiveness of student tutoring as an innovative approach to stimulate late primary school children's SRL skills applied across specific task boundaries and domains of SRL and explicitly focusing on the assessment of SRL itself. More particularly, the focus is on fifth- and sixth-grade students with a low socioeconomic or immigrant background. Given the potential influence of students' self-efficacy beliefs and motives to learn in this respect, we also study the differential effects of student tutoring for groups of students clustered on both their motivation and self-efficacy. The following research questions are addressed: (a) What is the initial state of SRL among students with a low socioeconomic or immigrant background? (b) How effective is a student tutoring program at promoting SRL among students with a low socioeconomic or immigrant background? and (c) To what extent does the effectiveness of the program vary for students with different motivational profiles?

Method

Participants

In the experimental group, 106 students (63 fifth-grade students, 43 sixth-grade students; M_{age} = 10.94 years, SD_{age} = 0.82 years) from six classes from four Flemish (Belgium) inner-city schools participated as tutees in a student tutoring program. Thirty-eight first master students in Educational Sciences at Ghent University (35 women, three men) were engaged as tutors. In the control group, 295 students (152 fifth- and 143 sixth-grade students; M_{age} = 10.65 years, SD_{age} = 0.88 years) from 16 classes from five Flemish (Belgium) inner-city schools participated. In total, 22 classroom teachers participated (M_{age} = 41.34 years, SD_{age} = 8.95 years). Based on criteria of the Flemish Department of Education 85% of the participants were students with low socioeconomic or immigrant background.

Design

A quasi-experimental study with a pretest, posttest, and retention test control group design was used. Schools were randomly assigned to either the experimental condition or the control condition. The intervention took place during three successive months: 10 student tutoring sessions of 100 min each were organized once a week. Before the intervention, the pretest was administered (September 2010). Immediately after the intervention (December 2010) and two months after the intervention (March 2011), the posttest and retention test were administered respectively.

Intervention

The intervention was characterized by student tutoring focusing on SRL. The aim of the intervention was to empower students with a low socioeconomic or immigrant background by cultivating positive self-motivational beliefs, expanding their repertoire of learning strategies, and helping them to apply these to school-related tasks in a self-regulated manner. As the vast majority of the students of the participating classes were students from low socioeconomic or immigrant background, all students from the participating classes participated as tutees and no further selection of tutees took place. Tutoring sessions took place during school hours in small groups of two or three tutees per tutor. Tutees' classroom teachers were responsible for composing the groups and tutors were randomly assigned to these groups. For the tutors, the tutoring assignment was a formal part of a seven-credit course on coaching and guidance.

First, the intervention was developed taking into account theoretical and empirical preconditions promoting SRL (Schunk, 2001; Zimmerman, 2002). These insights were incorporated into the intervention by (a) tutors functioning as models providing explicit instruction and scaffolding and fading their support throughout the intervention, (b) tutoring in small groups guaranteeing close guidance and feedback, and (c) alternation between explicit instruction and deliberate practice applying the strategies across multiple contexts and tasks. Further, as research on SRL indicates that addressing all three main components of SRL is more effective than training selected components (Dignath et al., 2008; Leopold et al., 2007; Perels et al., 2005; Schunk & Ertmer, 2000), a multidimensional approach was opted for and all three SRL components were addressed (for an overview of the sessions, see Appendix A).

Second, the characteristics of effective student tutoring were incorporated. As researchers have consistently reported that well-structured tutoring programs are more effective (Cohen et al., 1982; Gordon et al., 2007; Ritter et al., 2009), a tutoring curriculum script was designed, structuring the content of the sessions and ensuring deliberate practice and structure. The curriculum script consisted of learning material for the tutees and a manual for the tutors detailing the learning goals and providing the tutors with scenarios with which to address the

selected SRL components (see Appendix A). As the curriculum script structured the content of the sessions, the tutors had to be responsive to adjust the tutoring process to the needs of the tutees by means of dynamic scaffolding. Further, to ensure the quality of tutoring and taking into account that tutoring programs in which tutors receive prior training yield better outcomes (Cohen et al., 1982; Goodland, 1995; Gordon et al., 2007), the tutors received prior training and ongoing support. The training's content was twofold. On the one hand the tutors were trained in generic tutoring skills (e.g., questioning, prompting, scaffolding, providing feedback, and establishing a supportive relation; Gordon et al., 2007; Graesser et al., 1995; King, 1997). On the other hand, the training addressed promoting autonomous motivation and SRL (e.g., offering choices, opportunities for students to evaluate themselves and others, creating intrinsically motivating learning contexts, fading support). To provide ongoing support for the tutors, two interim small-group supervision sessions with the university instructors, three group meetings with the tutees' teacher, and individual feedback sessions with the university instructors were organized. Based on individual feedback, tutors were encouraged to optimize their tutoring actions.

The fidelity of implementation was assessed in terms of surface (i.e., amount and duration of sessions, coverage of topics in the curriculum) and quality features (i.e., quality of tutoring; Gersten et al., 2005). First, weekly reports of both the classroom teachers and the tutors, confirmed that the duration and amount of tutoring sessions was respected by the tutors and that all the topics of the curriculum script were covered. Second, observations of the student tutoring activities were conducted on a weekly basis by the researchers throughout the entire the intervention duration and both students' general tutoring skills as their specific activities to promote SRL were evaluated. In total, each student was observed twice. Based on these observations, tutors received a score from 0 to 20, with a mean score of 13.47 ($SD = 1.63$). As international objective standards regarding the quality of tutoring activities are lacking, Ghent University standards were applied. In this respect, the quality of the tutoring activities generally can be described as average to good since a score of 14 is equivalent to a distinction' degree at Ghent University.

Instruments

In line with the recommendations to apply multimethod designs when assessing SRL (Veenman, 2005; Winne & Perry, 2000), teacher ratings, offline self-report questionnaires, and online think-aloud protocol analysis were combined. First, classroom teachers were asked to rate students' use of SRL strategies at the three measurement occasions. Second, all students completed the Children's Perceived use of SRL Inventory (CP-SRLI; Vandevelde et al., 2013). Third, 41 students across conditions were randomly selected to individually perform a think-aloud task at each measurement occasion. The protocols of two participants were removed due to their reluctance to perform the tasks or to verbalize their thought processes during task performance. As such, think-aloud protocols of 19 control group students (nine fifth- and 10 sixth-grade students; seven boys and 12 girls) and 20 experimental group students (11 fifth- and 10 sixth-grade students; 12 boys, eight girls) were analyzed. Both teacher ratings and students' self-report questionnaires collect quantitative information. By means of the think-aloud protocols qualitative data are gathered which were quantified afterwards, reflecting the occurrence of students' use of SRL strategies.

Teacher rating

The teacher rating instrument, developed for this study and in line with the strategies in the CP-SRLI (see further), comprises 19 items describing specific SRL strategies (e.g., "During task performance, the student monitors his/her comprehension"). The items were scored on a 5-point Likert-type scale ranging from 1 (*never*) to 5 (*always*). Cronbach's alphas were .96, .97, and .98 for pretest, posttest, and retention test, respectively.

Offline self-report questionnaire

All students completed the CP-SRLI (Vandevelde et al., 2013) at the three measurement occasions. The CP-SRLI consists of 15 subscales reflecting nine components of SRL (see Table 1) and assesses children's perceptions regarding their use of SRL strategies. As can be seen in Table 1, the internal consistency of the (sub)scales was acceptable to good, except for the subscale planning. The 75 items were scored on a 5-point Likert-type scale.

Online think-aloud protocol analysis

Think-aloud protocol analysis (TAPA) was used to assess and analyze students' actual and spontaneous use of SRL strategies. The think-aloud data complement the more general view of students' SRL obtained by the teacher ratings and the self-report questionnaire. The 39 participants individually performed a think-aloud task containing two different subtasks (i.e., Sudoku and text studying). Prior to task performance, participants received brief training in verbalizing their thoughts, whereby the researcher modeled thinking aloud followed by practice opportunities (Caldwell & Leslie, 2010; Greene, Robertson, & Croker Costa, 2011; van Someren, Barnard, & Sandberg, 1994). The thinking-aloud sessions were audio- and videotaped.

Tasks

During the thinking-aloud session, the participants were asked to (a) solve a Sudoku and (b) study an informative text in the same way as they usually do in preparing for a test. They were instructed to verbalize their thought processes, actions, and feelings concurrent to task execution. The researcher only interfered when the participant fell silent by prompting them to keep on thinking aloud. No time constraints or instructions regarding the order in which the tasks should be completed were given. In order to avoid both automated processes (occurring with unchallenging tasks) and cognitive overload (occurring with too complex tasks), attention was paid to the complexity of the tasks ensuring that the tasks were challenging yet comprehensible for students (Bannert & Mengelkamp, 2008; van Someren et al., 1994). Prior to administration, the comprehensibility and level of difficulty of the tasks was tested within one class. No adjustments were necessary.

During the Sudoku-task students had to solve a Sudoku. This task also contained a description of the three main rules of the game, illustrated by an example of a solved Sudoku. At pretest, a

Table 1. Description of the subscales of the CP-SRLI and corresponding Cronbach's alphas at pretest, posttest, and retention test.

Subscale	Description	Example item	N_{items}	Cronbach's α		
				Pretest	Posttest	Retention test
Task orientation	Analyzing task demands, activation of prior (content/metacognitive) knowledge, perceptions of task (task difficulty, interest)	Before I start my schoolwork, I read the instructions carefully.	6	.70	.76	.78
Planning	Strategic planning, time planning	Before I start my schoolwork, I decide what to do first and what later.	4	.53	.58	.61
Motivation						
External regulation	External rewards and punishments	I do my best for school, because I am supposed to do so by others (my parents, the teacher, etc.).	3	.81	.83	.83
Introjected regulation	Internal rewards and punishments	I do my best for school, because I would feel guilty if I didn't do my best.	4	.72	.69	.72
Identified regulation	Personal importance, conscious valuing	I do my best for school, because I want to learn new things.	4	.80	.68	.79
Intrinsic regulation	Interest, enjoyment, inherent satisfaction	I do my best for school, because I find it very interesting.	3	.71	.69	.78
Self-efficacy						
Self-efficacy regulation	Judgments of capability to regulate learning	I'm good at planning the timing of my schoolwork before I start making it.	9	.80	.76	.78
Self-efficacy motivation	Judgments of capability to regulate motivation	I'm good at making my schoolwork, even if I find it boring or difficult.	4	.76	.68	.70
Learning strategies						
Deep-level strategies	Elaboration strategies, organizational strategies	When studying, I make a summary.	9	.84	.84	.84
Superficial strategies	Rehearsal strategies	When studying, I copy everything until I know it by heart.	4	.75	.76	.75
Monitoring	Awareness and monitoring of cognition, motivation, behavior and context/ effort	During my schoolwork, I ask myself: 'Do I still understand everything?'	7	.71	.77	.73
Persistence	Persistence, concentration	Even if I would rather do other things, I finish my schoolwork.	6	.84	.83	.86
Motivational strategies	Self-reinforcement, positive self-talk, interest enhancement	During my schoolwork, I say to myself: 'Just a little more and it is finished!'	4	.62	.65	.65
Self-evaluation						
Product	Evaluation of the learning outcomes	After finishing my schoolwork, I check that I haven't forgotten anything.	3	.78	.79	.78
Process	Evaluation of the learning process, affective reactions	After finishing my schoolwork, I ask myself: 'Will I use a similar approach next time. Or should I choose a different approach?'	4	.79	.81	.81

traditional Sudoku was used. At subsequent measurement occasions, variations were used (i.e., Puzzle Sudoku and X-Sudoku) to avoid familiarity with the tasks and to ensure the relevance for students to engage in analyzing task instructions. The Sudoku's were of medium difficulty level (pretest: 27 empty fields; posttest: 28 empty fields; retention test: 29 empty fields).

The learning task comprised an informative text giving general background information regarding an animal (pretest: penguin, 434 words; posttest: barn owl, 486 words; retention test: seahorse, 487 words). Students had little or no prior knowledge regarding these subjects. At each measurement occasion, the informative texts consisted of five subtopics: general description, specific physical characteristics, feeding habits, predators and threats of extinction, and reproduction. Headings and subheadings further organized each text and contained several illustrations. Students were allowed, but not obligated to use a scratch paper for making notes. To orient the students toward learning from the text, they also received a recall test after studying. However, the analysis of these data are not incorporated in the current study.

Coding scheme

Based on a literature review and in line with the CP-SRLI conceptual framework (Vandevelde et al., 2013), the coding scheme for analyzing the think-aloud protocols was developed. The coding scheme reflects ten main categories, each further specified by multiple subcategories. At the lowest operational level, specific indicators of SRL activities were formulated. Some of these activities reflected task-specific SRL activities either performed (a) during solving the Sudoku or (b) during text studying. Appendix B presents a detailed overview of the (sub)categories in the coding scheme.

Coding strategy

In total, 2,767 min of audio- and videotape were collected across the three measurement occasions. To increase the accuracy of coding, both verbal and nonverbal behavior (e.g., highlighting key words, using scratch paper) was transcribed (Annevirta & Vauras, 2006) and coded qualitatively using the coding scheme. As a unit of analysis, we opted for units of meaning, defined as a unit representing a thematically consisted verbalization of a single SRL strategy (Chi, 1997; van Someren et al., 1994). Each unit of meaning received only one code. When students performed a particular action successively, for example highlighting key words, these actions were not approached as one single segment, but as separate units. In this way, we were able to differentiate between students who

only highlighted some keywords from those who used the strategy more extensively. In total, 1,609 units of meaning were identified at pretest, 1,907 units at posttest, and 2,036 units at retention test. Two trained coders independently double-coded 38% of the protocols, resulting in high interrater reliability for the main categories (Krippendorff's $\alpha = .97$) and subcategories (Krippendorff's $\alpha = .96$) of the coding scheme (Hayes & Krippendorff, 2007). Some actions were initially coded but not included in the further analysis, namely the occurrence of participants' first time text reading before performing subsequent learning activities, specific Sudoku rules applied to solve the Sudoku (e.g. filling in a number from 1 to 9 so that each horizontal row contains each number only once), and off-task behavior (e.g., looking outside, asking practical questions). By way of illustration, some descriptives are provided regarding these actions: all students read the study text at least once, 69% of the students applied a combination of two or three game rules to solve the Sudoku, and 8.07% of the units reflected off-task behavior (pretest: 7.68%; posttest: 8.67%; retention test: 7.82%).

Data analysis

To investigate the first research question (i.e., investigating the initial state of SRL among students with a low socioeconomic or immigrant background), descriptive analyses were performed on the teacher ratings, the CP-SRLI, and the occurrence of displayed strategies during the think-aloud tasks.

As to the second (i.e., investigating the effectiveness of the student tutoring program) and third research questions (i.e., presence of differential effects of students' motivational profile on the effectiveness of the student tutoring program), first, the presence of different motivational profiles was examined by means of hierarchical cluster analysis in SPSS 20. The following CP-SRLI subscales scores at pretest were used as clustering variables: external regulation, introjected regulation, identified regulation, intrinsic motivation, self-efficacy motivation, and self-efficacy regulation. In hierarchical agglomerative clustering, each case starts out as a separate cluster and the closest cases are combined into a new aggregated cluster in subsequent steps. This process continues until all cases form a single homogeneous cluster. The Ward hierarchical method was adopted implying that within-cluster differences are minimized. The squared Euclidean was used as a similarity measure (Hair, Anderson, Tatham, & Black, 1998; Henry, Tolan, & Gorman-Smith, 2005). As the scale measurements were comparable for all variables, data were not standardized. To validate the number of clusters identified, a k-means cluster analysis was conducted on the same cluster variables (Gore, 2000; Henry et al., 2005). In addition, multivariate analysis of variance (MANOVA) was performed to test the differences between the motivational profiles on the variables included in the cluster analysis.

Second, to further study the effectiveness of the student tutoring intervention and the differential effects of students' motivational profile on the effectiveness of intervention, mixed ANOVA with condition (i.e., experimental and control group) and cluster memberships as between-subjects factors and measurement occasions (i.e., pre-, post-, and retention test) as within-subjects factor was used to analyze the questionnaire data (i.e., teacher ratings and students' self-report). When a significant interaction effect was shown, further analyses were performed to investigate this interaction more in depth and specific group means were compared by conducting linear hypothesizing. Regarding the think-aloud data, the protocols were first coded qualitatively as described above. Next, the actual occurrence of SRL strategies at the different measurement occasions were analyzed and compared quantitatively using two-way mixed ANOVA. As research stresses the domain-specificity of SRL (Veenman et al., 2006), the SRL activities performed during Sudoku and text studying were reported and analyzed separately. Given the small sample size of students involved in the think-aloud protocols, the differential effects of the effectiveness of the intervention could not be studied.

Results

Students' SRL—descriptive results

Teacher rating

According to the teacher judgments at pretest, students regulated their learning only on a moderate level (see Table 5). Remarkably, compared to the control condition, the teachers in the experimental condition rate their pupils' use of SRL strategies significantly lower at pretest, $F(1, 359) = 19$, $p < .001$.

Self-report questionnaire

Descriptive analyses of the CP-SRLI data show that students report moderate to relatively high levels of SRL strategies at pretest (see Table 6). Regarding the subscales deep-level strategies', $t(378) = 2$, $p = .046$, and superficial strategies', $t(378) = 2.56$, $p = .011$, the experimental group reported a significantly lower use than the control group.

Think-aloud protocols

The perceived use of SRL strategies was furthermore linked to students' actual use, reflected in the results of the think-aloud protocol analysis. Tables 2 and 3 present the occurrence of students' use of SRL strategies during solving the Sudoku and text studying respectively. First, regarding the metacognitive aspects of SRL across both tasks at pretest, the results show a predominant use of monitoring activities (26.3%), followed by adaptive strategy use (15.60%) across both tasks. In contrast, a limited use of task orientation (13.7%), planning (0.32%), and evaluation (4.84%) is shown at pretest. Based on the subcategories of the coding scheme a more detailed view arises showing that these metacognitive activities were performed on a rather basic level. For instance, activities regarding task orientation mainly reflect detecting task demands. However, in detecting task demands, students merely routinely read the task instructions without processing the demands thoroughly by, for example, paraphrasing the task instructions or activating prior knowledge. Further, the metacognitive activities, such as task orientation, monitoring, and self-evaluation, were generally more frequently applied during the Sudoku than during text studying.

Concerning the cognitive learning strategies applied during text studying, students mostly demonstrate rehearsal (30%) and organizational strategies (27.11%). However, the occurrence of the strategies must be nuanced when inspecting the number of protocols showing these activities and the large

Table 2. Occurrence of students' actual use of self-regulatory learning activities—sudoku.

	Pretest				Posttest				Retention test			
	CG		EG		CG		EG		CG		EG	
Dependent variables	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]
Task orientation	68 (21.86)	19 (13)	85 (30.36)	19 (16)	56 (29.32)	19 (15)	40 (24.69)	17 (15)	56 (26.67)	17 (11)	51 (26.98)	17 (9)
Exploring the task	1 (0.32)	1 (1)	1 (0.36)	1 (1)	1 (0.52)	1 (1)	2 (1.23)	2 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Detecting task demands	51 (16.40)	19 (11)	75 (26.79)	19 (14)	41 (21.47)	16 (14)	33 (20.37)	17 (3)	37 (17.62)	16 (6)	42 (22.22)	17 (9)
Prior knowledge	7 (2.25)	7 (1)	4 (1.43)	4 (1)	9 (4.71)	8 (2)	4 (2.47)	4 (1)	17 (8.10)	13 (4)	7 (3.70)	7 (1)
Task perceptions	8 (2.57)	5 (3)	5 (1.79)	3 (2)	5 (2.62)	5 (1)	1 (0.62)	1 (1)	2 (0.95)	2 (1)	2 (1.06)	1 (2)
Planning	1 (0.32)	1 (1)	0 (0.00)	0 (0)	2 (1.05)	18 (2)	2 (1.23)	2 (1)	0 (0.00)	0 (0)	2 (1.06)	2 (1)
Time management	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Strategic planning	1 (0.32)	1 (1)	0 (0.00)	0 (0)	2 (1.05)	1 (2)	2 (1.23)	2 (1)	0 (0.00)	0 (0)	2 (1.06)	2 (1)
Self-efficacy	4 (1.29)	3 (2)	7 (2.50)	5 (2)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	1 (0.16)	1 (1)	1 (0.53)	1 (1)
Motivational strategies	1 (0.32)	1 (1)	0 (0.00)	0 (0)	2 (1.05)	1 (2)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Positive self-talk	1 (0.32)	1 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Making task more interesting	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Increasing task value	0 (0.00)	0 (0)	0 (0.00)	0 (0)	1 (0.52)	1 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Self-reinforcement	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Monitoring	130 (41.80)	18 (38)	95 (33.93)	17 (15)	70 (36.65)	14 (15)	53 (32.72)	14 (9)	80 (38.10)	17 (12)	66 (34.92)	14 (13)
Comprehension monitoring	86 (27.65)	15 (25)	63 (22.50)	15 (13)	39 (20.42)	13 (6)	46 (28.40)	14 (7)	46 (21.90)	14 (9)	44 (23.28)	12 (8)
Monitoring of progress	20 (6.43)	15 (7)	5 (1.79)	5 (1)	16 (8.38)	10 (4)	2 (1.23)	2 (1)	12.(5.71)	5 (3)	12 (6.35)	4 (1)
Interim checking	12 (3.86)	5 (6)	11 (3.93)	6 (3)	10 (5.24)	4 (6)	3 (1.85)	2 (2)	13 (6.19)	5 (4)	0 (0.00)	0 (0)
Affective monitoring	12 (3.86)	7 (3)	16 (5.71)	4 (11)	5 (2.62)	3 (3)	2 (1.23)	2 (1)	9 (4.29)	4 (4)	10 (5.29)	4 (4)
Adaptive strategy use	87 (27.97)	16 (18)	69 (24.64)	17 (12)	51 (26.70)	14 (10)	59 (36.42)	15 (8)	65 (30.95)	17 (12)	59 (31.22)	14 (13)
Correcting mistakes	30 (9.65)	10 (10)	31 (11.07)	10 (6)	17 (8.90)	8 (3)	43 (26.54)	13 (7)	22 (10.48)	12 (6)	44 (23.28)	13 (10)
Selective navigation	30 (9.65)	7 (10)	17 (6.07)	8 (5)	16 (8.38)	7 (6)	8 (4.94)	6 (2)	29 (13.81)	7 (12)	6 (3.17)	3 (4)
Self-questioning	27 (8.68)	10 (8)	21 (7.50)	10 (6)	18 (9.42)	7 (8)	8 (4.94)	5 (4)	14 (6.67)	4 (8)	9 (4.76)	4 (3)
Self-evaluation	20 (6.43)	7 (14)	24 (8.57)	9 (5)	10 (5.24)	12 (3)	8 (4.94)	7 (2)	8 (3.81)	8 (1)	10 (5.29)	7 (3)
Learning outcomes	19 (6.11)	7 (13)	16 (5.71)	8 (5)	9 (4.71)	7 (3)	7 (4.32)	7 (1)	8 (3.81)	8 (1)	10 (5.29)	7 (3)
Learning processes	1 (0.32)	1 (1)	2 (0.71)	2 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Affective reactions	0 (0.00)	0 (0)	6 (2.14)	3 (3)	1 (0.52)	1 (1)	1 (0.62)	1 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)

Note. CG = control group, $n = 19$; EG = experimental group involving a student tutoring program focusing on SRL, $n = 20$.
[a]*N* refers to the number of protocols showing a particular activity and the maximum number of occurrence within one protocol.

variation between students. As such, it can be noticed that some strategies were performed by a limited number of students applying the strategies extensively.

Beside the metacognitive and cognitive aspects, the results of the think-aloud protocol analysis reveal limited motivational aspects of SRL. During task performance, students hardly ever reflected on their competence to perform the task (1.08%) or used motivational strategies to regulate their motivation (0.34%).

In conclusion, at the beginning of the intervention, the teacher ratings reveal that students regulated their learning only on a moderate level. The CP-SRLI data also show that students report moderate to relatively high levels of SRL. In-depth analysis of the pretest think-aloud data, however, indicates that students' SRL strategies were performed on a rather superficial level and varied considerably across students and tasks. Motivational aspects of SRL were hardly observed in the think-aloud data.

Cluster analysis

To explore the differential effects of student tutoring, the presence of different motivational profiles was explored using a hierarchical cluster analysis ($N = 380$). Relatively small changes in the agglomeration coefficients occurred until the four-cluster solution collapses into a three-cluster solution. Therefore, a four-cluster solution was chosen which was also confirmed by a visual inspection of the dendrogram. Based on an examination of the subscale means in each cluster (see Table 4 and Figure 1), four motivational profiles were identified: (a) a high-quantity motivation and high self-efficacy cluster (HMS) with high scores on all cluster variables ($n = 55$, 14.5%), (b) a moderate-quality motivation and moderate self-

Table 3. Occurrence of students' actual use of self-regulatory learning activities—text studying.

	Pretest				Posttest				Retention test			
	CG		EG		CG		EG		CG		EG	
Dependent variables	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]	Frequency (%)	*N* (Maximum)[a]
Task orientation	1 (0.19)	1 (1)	10 (2.62)	6 (3)	7 (1.01)	6 (2)	4 (0.58)	4 (1)	5 (0.78)	4 (2)	3 (0.36)	2 (2)
Exploring the task	1 (0.19)	1 (1)	4 (1.05)	3 (2)	3 (0.43)	3 (1)	3 (0.44)	3 (1)	2 (0.31)	2 (1)	0 (0.00)	0 (0)
Detecting task demands	0 (0.00)	0 (0)	3 (0.79)	3 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Prior knowledge	0 (0.00)	0 (0)	1 (0.26)	1 (1)	3 (0.43)	3 (1)	1 (0.15)	1 (1)	2 (0.31)	2 (1)	2 (0.24)	2(1)
Task perceptions	0 (0.00)	0 (0)	2 (0.52)	2 (1)	1 (0.14)	1 (1)	0 (0.00)	0 (0)	1 (0.16)	1 (1)	1 (0.12)	1 (1)
Planning	2 (0.39)	1 (2)	6 (1.57)	3 (4)	7 (1.00)	4 (2)	14 (2.04)	8 (5)	5 (0.78)	4 (2)	2 (0.24)	2 (1)
Time management	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Strategic planning	2 (0.39)	1 (2)	6 (1.57)	3 (4)	7 (1.00)	4 (2)	14 (2.04)	8 (5)	5 (0.78)	4 (2)	2 (0.24)	2 (1)
Self-efficacy	0 (0.00)	0 (0)	1 (0.26)	1 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Rehearsal strategies	256 (49.52)	14 (83)	40 (10.47)	13 (6)	109 (15.66)	12 (46)	60 (8.75)	12 (28)	145 (22.69)	13 (31)	41 (4.87)	12 (9)
(Re)reading	48 (9.28)	13 (15)	33 (8.64)	12 (6)	56 (8.02)	9 (24)	45 (6.56)	12 (14)	24 (3.76)	8 (8)	25 (2.97)	10 (6)
Memorizing	208 (40.23)	8 (82)	7 (1.83)	4 (3)	53 (7.59)	6 (22)	15 (2.19)	2 (14)	121 (18.94)	9 (30)	16 (1.90)	4 (6)
Organizational strategies	15 (2.90)	1 (15)	196 (51.31)	6 (70)	450 (64.66)	9 (95)	504 (73.47)	9 (152)	285 (44.60)	13 (45)	679 (80.64)	13 (149)
Structuring source text	3 (0.58)	1 (3)	117 (30.63)	4 (70)	244 (34.96)	7 (75)	193 (28.13)	6 (106)	169 (26.45)	7 (45)	248 (29.45)	6 (63)
Making notes	12 (2.32)	1 (12)	79 (20.68)	3 (40)	206 (29.51)	5 (86)	311 (45.34)	6 (110)	116 (18.15)	5 (45)	431 (51.19)	10 (125)
Elaboration strategies	117 (22.63)	17 (28)	50 (13.09)	14 (10)	89 (12.79)	13 (22)	44 (6.41)	9 (14)	101 (15.81)	16 (22)	53 (6.29)	10 (17)
Paraphrasing	35 (6.77)	9 (16)	26 (6.81)	9 (6)	52 (7.45)	10 (22)	30 (4.37)	7 (11)	41 (6.42)	11 (17)	38 (4.51)	6 (15)
Relating to prior knowledge	20 (3.87)	10 (5)	8 (2.09)	5 (4)	5 (0.72)	5 (2)	2 (0.29)	1 (2)	11 (1.72)	7 (3)	3 (0.36)	2 (1)
Relating text contents	21 (4.06)	6 (8)	7 (1.83)	5 (2)	6 (0.86)	6 (1)	6 (0.87)	5 (2)	0 (0.00)	0 (0)	2 (0.24)	2 (1)
Providing personal remarks	41 (7.93)	15 (7)	9 (2.36)	3 (4)	26 (3.72)	7 (9)	6 (0.87)	6 (5)	49 (7.67)	12 (12)	10 (1.19)	5 (3)
Motivational strategies	1 (0.19)	1 (1)	2 (0.52)	2 (1)	1 (0.14)	1 (1)	0 (0.00)	0 (0)	1 (0.16)	1 (1)	0 (0.00)	0 (0)
Positive self-talk	1 (0.19)	1 (1)	0 (0.00)	0 (0)	1 (0.14)	1 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Making task more interesting	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Increasing task value	0 (0.00)	0 (0)	2 (0.52)	2 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Self-reinforcement	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	1 (0.16)	1 (1)	0 (0.00)	0 (0)
Monitoring	99 (19.15)	14 (22)	39 (10.21)	12 (14)	26 (3.74)	10 (10)	21 (3.06)	6 (7)	86 (13.46)	12 (26)	46 (5.46)	11 (11)
Comprehension monitoring	25 (4.84)	8 (6)	25 (6.54)	7 (13)	2 (0.29)	2 (1)	3 (0.44)	1 (3)	4 (0.63)	3 (2)	15 (1.78)	7 (7)
Monitoring of progress	5 (0.97)	5 (1)	1 (0.26)	1 (1)	13 (1.86)	4 (8)	5 (0.73)	3 (2)	6 (0.94)	5 (2)	13 (1.54)	6 (4)
Interim checking	65 (12.57)	8 (18)	10 (2.62)	6 (5)	8 (1.15)	6 (2)	9 (1.13)	3 (5)	74 (11.58)	8 (24)	18 (2.14)	5 (8)
Affective monitoring	4 (0.77)	1 (4)	3 (0.79)	2 (2)	2 (0.29)	3 (1)	4 (0.58)	3 (2)	2 (0.31)	2 (1)	0 (0.00)	0 (0)
Adaptive strategy use	16 (3.09)	5 (8)	28 (7.33)	5 (20)	2 (0.29)	2 (1)	30 (4.37)	5 (20)	2 (0.31)	2 (1)	11 (1.31)	7 (4)
Rereading after confusion	2 (0.39)	2 (1)	2 (0.52)	2 (1)	0 (0.00)	0 (0)	1 (0.15)	1 (1)	1 (0.16)	1 (1)	4 (0.48)	3 (2)
Correcting mistakes	7 (1.35)	2 (6)	18 (4.71)	2 (15)	0 (0.00)	0 (0)	2 (0.29)	2 (1)	0 (0.00)	0 (0)	4 (0.48)	4 (1)
Self-questioning	7 (1.35)	2 (5)	8 (2.09)	3 (4)	2 (0.29)	2 (1)	27 (3.94)	3 (19)	1 (0.16)	1 (1)	3 (0.36)	1 (3)
Self-evaluation	9 (1.74)	5 (3)	10 (2.62)	8 (2)	5 (0.72)	5 (1)	9 (1.31)	5 (3)	9 (1.41)	8 (2)	7 (0.83)	4 (4)
Learning outcomes	3 (0.58)	3 (1)	5 (1.31)	5 (1)	3 (0.43)	3 (1)	6 (0.87)	4 (2)	8 (1.25)	8 (1)	3 (0.36)	3 (1)
Learning processes	1 (0.19)	1 (1)	1 (0.26)	1 (1)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)	0 (0.00)	0 (0)
Affective reactions	5 (0.97)	3 (3)	4 (1.05)	4 (1)	2 (0.29)	2 (1)	3 (0.44)	3 (1)	1 (0.16)	1 (1)	4 (0.48)	1 (4)

Note. CG = control group, $n = 19$; EG = experimental group involving a student tutoring program focusing on SRL, $n = 20$.
[a]*N* refers to the number of protocols showing a particular activity and the maximum number of occurrence within one protocol.

Table 4. Means of the clustering variables per cluster.

	Hierarchical clustering				K-means clustering			
Cluster variables	Cluster 1 HMS ($n = 55$)	Cluster 2 MMS ($n = 197$)	Cluster 3 LMS ($n = 29$)	Cluster 4 GMS ($n = 99$)	Cluster 1 HMS ($n = 86$)	Cluster 2 MMS ($n = 135$)	Cluster 3 LMS ($n = 41$)	Cluster 4 GMS ($n = 118$)
External regulation	4.26	2.58	2.62	1.83	3.86	2.91	2.52	1.45
Introjected regulation	4.31	3.22	2.17	3.25	4.14	3.25	2.37	3.09
Identified regulation	4.62	4.24	2.81	4.74	4.63	4.26	3.03	4.59
Intrinsic regulation	4.08	3.10	2.06	4.00	4.18	3.04	2.06	3.69
Self-efficacy regulation	4.11	3.40	2.44	3.98	4.09	3.42	2.53	3.76
Self-efficacy motivation	4.48	3.84	2.66	4.48	4.40	3.84	2.87	4.31

Note. GMS = high levels of autonomous motivation and self-efficacy beliefs; HMS = high levels of motivation and self-efficacy beliefs; LMS = low levels of motivation and self-efficacy beliefs; MMS = moderate levels of autonomous motivation and self-efficacy beliefs.

efficacy cluster (MMS) with high scores on identified regulation and moderate scores on self-efficacy for regulation and motivation ($n = 197$, 51.8%), (c) a low-quantity motivation and self-efficacy cluster (LMS) characterized by low scores on all cluster variables ($n = 29$, 7.6%), and (d) a good-quality motivation and high self-efficacy cluster (GMS) which has, comparable to HMS, high scores on identified regulation, intrinsic motivation, self-efficacy of regulation and self-efficacy motivation, but low scores on external and introjected regulation ($n = 99$, 26.1%). The multivariate test of MANOVA (Wilks' lambda criterion) shows significant differences between the motivational profiles on the cluster variables as well as on the other subscales of CP-SRLI ($F(45, 1067) = 21.86$; $p < .001$; partial $\eta^2 = 0.476$). The univariate tests also reveal significant differences for the clusters on external regulation ($F(3, 373) = 94.39$; $p < .001$; partial $\eta^2 = 0.432$), introjected regulation ($F(3, 373) = 44.79$; $p < .001$; partial $\eta^2 = 0.265$), identified regulation ($F(3, 373) = 114.93$; $p < .001$; partial $\eta^2 = 0.480$), intrinsic regulation ($F(3, 373) = 87.40$; $p < .001$; partial $\eta^2 = 0.413$), self-efficacy regulation ($F(3, 373) = 90.34$; $p < .001$; partial $\eta^2 = 0.421$), self-efficacy motivation ($F(3, 373) = 89.08$; $p < .001$; partial $\eta^2 = 0.417$).

To validate the clusters identified in the hierarchical cluster analysis, a k-means cluster analysis was performed on the data, specifying a four-cluster solution. As shown in Table 4, the results suggested four similar profiles (22.6% HMS, 35.5% MMS, 10.8% LMS, 31.1% GMS). A comparison of hierarchical and k-means clustering, indicates that 73.95% of the cases were similarly classified, suggesting relatively robust cluster groups (Steele, Cushing, Bender, & Richards, 2008).

In sum, four motivational profiles can be distinguished in the student sample. The profiles can be described as: (a) a high-quantity motivation group (i.e., high levels of motivation and self-efficacy beliefs; HMS); (b) a moderate-quality motivation group (i.e., moderate levels of autonomous motivation and self-efficacy beliefs; MMS); (c) a low-quantity motivation group (i.e., low levels of motivation and self-efficacy beliefs; LMS); and (d) a good-quality motivation group (i.e., high levels of autonomous motivation and self-efficacy beliefs; GMS).

Effectiveness of student tutoring program on the evolution of students' SRL

Teacher rating

With respect to the effectiveness of the intervention, the results of the mixed ANOVA on the teacher ratings show a significant interaction of measurement occasion and condition, $F(2, 232) = 9.97$, $p < .001$ (see Table 5). As shown in Figure 2, the results indicate that, according to the teachers, students in the experimental group show significantly greater progress from pretest to posttest than control-group students, $F(1, 249) = 16.16$, $p < .001$. However, the results also indicate a significant decrease for the experimental group from posttest to retention test compared to control-group students, $F(1, 249) = 27.54$, $p < .001$.

Self-report questionnaire

The results of the mixed ANOVA on students' self-report data reveal only a significant interaction effect of measurement occasion and condition for the subscale external regulation, $F(2, 337) = 7.18$, $p < .001$ (see Table 6). Further analyses reveal that this interaction effect only concerns the evolution from pretest to posttest, showing a significantly

Table 5. Results of the mixed ANOVA of teacher ratings.

	Pretest				Posttest				Retention test			
	CG		EG		CG		EG		CG		EG	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
HMS	3.35	0.61	2.83	0.60	3.40	0.61	3.03	0.68	3.38	0.81	2.74	0.69
MMS	3.34	0.68	2.93	0.58	3.45	0.63	3.21	0.73	3.55	0.68	3.03	0.85
LMS	2.87	0.73	2.67	0.97	3.17	0.45	3.19	0.94	3.27	0.54	3.12	0.93
GMS	3.53	0.64	3.12	0.69	3.55	0.72	3.44	0.80	3.66	0.68	3.28	0.78
Total	3.36	0.67	2.93	0.67	3.44	0.64	3.24	0.77	3.53	0.70	3.06	0.82

Note. CG = control group; EG = experimental group involving a student tutoring program focusing on SRL; HMS = high levels of motivation and self-efficacy beliefs; MMS = moderate levels of autonomous motivation and self-efficacy beliefs; LMS = low levels of motivation and self-efficacy beliefs; GMS = high levels of autonomous motivation and self-efficacy beliefs.

Table 6. Results of the mixed ANOVA of the CP-SRLI.

	Pretest				Posttest				Retention test			
	CG		EG		CG		EG		CG		EG	
Dependent variables	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Task orientation												
HMS	3.81	0.66	3.51	0.83	3.98	0.63	4.05	0.64	3.56	0.87	3.73	0.81
MMS	3.30	0.61	3.23	0.59	3.30	0.73	3.32	0.76	3.24	0.74	3.18	0.80
LMS	2.44	0.54	2.81	1.26	2.55	0.77	2.93	0.89	2.52	0.83	3.00	0.95
GMS	3.64	0.69	3.68	0.72	3.54	0.74	3.73	0.86	3.42	0.81	3.61	0.84
Total	3.40	0.71	3.38	0.77	3.40	0.79	3.53	0.84	3.28	0.81	3.38	0.86
Planning												
HMS	3.71	0.92	3.43	0.78	3.86	0.63	3.61	0.89	3.84	0.72	3.14	1.10
MMS	3.24	0.70	3.14	0.72	3.38	0.75	3.29	0.77	3.32	0.80	3.43	0.85
LMS	2.58	1.00	2.96	0.91	3.08	0.86	2.57	1.03	2.84	0.88	3.68	1.26
GMS	3.65	0.84	3.54	0.78	3.55	0.90	3.53	1.03	3.75	0.79	3.46	1.01
Total	3.36	0.83	3.29	0.78	3.47	0.80	3.35	0.92	3.47	0.83	3.41	0.97
Motivation												
External regulation												
HMS	4.20	0.49	4.30	0.58	2.88	1.27	3.31	1.02	2.91	1.30	3.24	1.16
MMS	2.61	0.88	2.45	0.85	2.33	0.97	2.15	1.07	2.29	1.01	2.04	0.99
LMS	2.94	1.31	2.14	0.86	2.46	1.17	3.19	1.07	2.13	0.72	2.52	1.18
GMS	1.88	0.86	1.69	0.73	1.97	1.00	2.32	1.11	1.91	1.11	2.11	1.00
Total	2.66	1.10	2.50	1.16	2.32	1.06	2.48	1.15	2.27	1.10	2.30	1.11
Introjected regulation												
HMS	4.18	0.55	4.52	0.49	3.72	0.76	3.76	0.79	3.74	0.87	3.68	0.98
MMS	3.24	0.74	3.14	0.75	3.19	0.85	3.16	0.92	3.21	0.83	3.05	0.99
LMS	2.11	0.77	2.11	0.59	2.45	0.97	2.64	0.91	2.08	0.91	3.14	1.61
GMS	3.20	1.12	3.43	1.08	3.29	1.12	3.37	0.94	3.17	1.10	3.33	0.95
Total	3.29	0.94	3.37	1.01	3.24	0.95	3.28	0.94	3.20	0.97	3.25	1.04
Identified regulation												
HMS	4.61	0.50	4.55	0.44	4.60	0.46	4.32	0.71	4.61	0.54	4.34	0.54
MMS	4.28	0.59	4.15	0.50	4.29	0.57	4.37	0.44	4.19	0.69	4.22	0.60
LMS	2.78	0.88	3.00	0.63	3.49	0.77	3.82	0.81	3.25	1.01	4.14	0.88
GMS	4.75	0.34	4.73	0.36	4.64	0.39	4.66	0.46	4.58	0.55	4.58	0.45
Total	4.35	0.71	4.29	0.65	4.37	0.60	4.40	0.57	4.29	0.73	4.34	0.59
Intrinsic regulation												
HMS	4.10	0.55	3.83	0.89	4.05	0.75	3.67	0.95	3.91	0.76	3.21	1.02
MMS	3.05	0.66	3.25	0.80	3.30	0.73	3.29	0.82	3.06	0.80	3.16	0.97
LMS	1.96	0.74	1.86	0.81	2.31	1.04	2.43	0.99	1.96	0.95	3.38	1.21
GMS	3.98	0.72	4.01	0.88	3.77	0.85	3.65	0.88	3.81	0.88	3.69	0.91
Total	3.36	0.89	3.46	1.02	3.39	0.89	3.39	0.92	3.29	0.97	3.35	0.99
Self-efficacy												
Self-efficacy regulation												
HMS	4.10	0.41	4.11	0.49	4.06	0.40	3.79	0.54	3.73	0.68	3.63	0.55
MMS	3.43	0.54	3.35	0.49	3.46	0.53	3.48	0.57	3.40	0.63	3.22	0.68
LMS	2.58	0.73	2.44	0.62	2.69	0.74	3.23	0.84	2.67	0.76	3.25	0.67
GMS	3.93	0.53	4.08	0.50	3.78	0.58	3.64	0.68	3.69	0.58	3.68	0.73
Total	3.59	0.65	3.62	0.70	3.58	0.62	3.56	0.63	3.47	0.68	3.43	0.70
Self-efficacy motivation												
HMS	4.41	0.50	4.66	0.41	4.41	0.54	4.41	0.41	4.26	0.64	4.13	0.47
MMS	3.84	0.64	3.84	0.61	4.01	0.63	4.06	0.57	3.92	0.63	4.00	0.64
LMS	2.73	0.64	2.61	0.83	3.38	0.95	3.86	0.76	3.27	0.84	4.00	1.23
GMS	4.43	0.57	4.67	0.41	4.25	0.63	4.17	0.88	4.29	0.49	4.31	0.57
Total	4.00	0.74	4.12	0.81	4.08	0.68	4.14	0.68	4.02	0.66	4.11	0.67
Learning strategies												
Deep-level strategies												
HMS	3.88	0.59	3.49	0.66	3.83	0.63	3.87	0.63	3.45	0.91	3.55	0.76
MMS	3.27	0.64	3.01	0.65	3.29	0.70	3.04	0.72	3.19	0.62	3.03	0.86
LMS	2.60	0.73	2.36	0.54	2.73	0.54	2.70	0.56	2.64	0.67	2.77	1.11
GMS	3.68	0.76	3.53	0.76	3.59	0.73	3.44	0.91	3.52	0.73	3.25	0.90
Total	3.41	0.74	3.19	0.75	3.40	0.73	3.27	0.83	3.27	0.73	3.16	0.89
Superficial strategies												
HMS	3.93	0.91	3.84	0.73	3.97	0.83	3.88	1.09	3.98	0.87	3.79	1.14
MMS	3.68	0.71	3.51	0.74	3.81	0.77	3.62	0.68	3.77	0.72	3.60	0.82
LMS	3.02	0.83	2.71	1.02	3.20	0.78	3.43	0.79	3.53	0.78	3.54	0.73
GMS	4.05	0.82	3.92	0.91	4.06	0.75	3.99	0.88	4.07	0.77	3.90	0.85
Total	3.77	0.81	3.62	0.87	3.86	0.80	3.76	0.84	3.86	0.77	3.71	0.88
Monitoring												
HMS	4.12	0.67	3.75	0.71	4.04	0.62	3.80	0.81	3.92	0.81	3.50	0.71
MMS	3.48	0.57	3.44	0.58	3.55	0.60	3.35	0.79	3.49	0.62	3.27	0.74
LMS	2.87	0.56	2.90	0.73	3.17	0.59	3.10	0.89	2.84	0.86	3.14	0.97
GMS	3.90	0.61	3.92	0.71	3.72	0.82	3.68	0.92	3.72	0.67	3.50	0.76

(*Continued on next page*)

Table 6. (Continued)

	Pretest				Posttest				Retention test			
	CG		EG		CG		EG		CG		EG	
Dependent variables	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Total	3.63	0.67	3.59	0.71	3.63	0.69	3.50	0.86	3.56	0.71	3.37	0.76
Persistence												
HMS	4.46	0.57	4.64	0.40	4.38	0.72	4.61	0.38	4.43	0.71	4.15	0.59
MMS	4.10	0.62	4.03	0.76	4.08	0.64	4.21	0.54	4.00	0.67	4.16	0.69
LMS	3.39	0.85	3.55	0.55	3.35	0.98	3.90	0.93	3.45	0.76	4.48	0.50
GMS	4.52	0.60	4.70	0.46	4.40	0.64	4.44	0.45	4.32	0.65	4.51	0.52
Total	4.21	0.68	4.30	0.72	4.16	0.72	4.32	0.56	4.10	0.72	4.29	0.63
Motivational strategies												
HMS	4.14	0.78	4.21	0.51	4.21	0.76	3.82	0.68	4.04	0.94	3.79	0.81
MMS	3.59	0.73	3.57	0.66	3.72	0.70	3.55	0.66	3.58	0.80	3.60	0.80
LMS	3.02	0.78	2.75	1.02	3.05	0.87	3.07	1.19	3.17	0.84	3.29	1.33
GMS	4.07	0.76	4.06	0.71	4.00	0.91	3.94	0.93	3.82	0.80	3.91	0.94
Total	3.75	0.81	3.75	0.79	3.81	0.82	3.67	0.83	3.68	0.84	3.70	0.90
Self-evaluation												
Product												
HMS	4.34	0.68	4.38	0.71	4.43	0.65	4.26	1.04	4.30	0.81	4.29	0.79
MMS	3.89	0.82	3.48	0.96	3.86	0.71	3.74	0.82	3.78	0.78	3.68	0.95
LMS	3.06	0.60	2.71	0.78	3.31	0.88	3.48	1.03	3.48	0.94	3.66	1.44
GMS	4.16	0.87	4.06	0.71	4.21	0.72	4.19	1.00	3.98	0.96	4.21	0.76
Total	3.96	0.85	3.83	1.05	3.99	0.77	3.94	0.96	3.88	0.86	3.94	0.95
Process												
HMS	3.78	0.94	3.89	0.70	3.81	0.99	4.09	0.89	3.66	1.00	3.75	0.73
MMS	3.00	0.87	2.89	1.01	3.04	0.99	3.11	1.02	2.88	0.95	3.04	1.03
LMS	2.13	0.84	2.04	0.82	2.36	0.76	2.43	1.52	2.16	0.92	2.64	1.59
GMS	3.43	0.93	3.82	0.84	3.38	1.03	3.60	0.92	3.17	1.11	3.53	1.07
Total	3.16	0.97	3.26	1.07	3.19	1.04	3.36	1.10	3.01	1.05	3.27	1.09

Note. CG = control group; EG = experimental group involving a student tutoring program focusing on SRL; HMS = high levels of motivation and self-efficacy beliefs; MMS = moderate levels of autonomous motivation and self-efficacy beliefs; LMS = low levels of motivation and self-efficacy beliefs; GMS = high levels of autonomous motivation and self-efficacy beliefs.

higher decrease for the control group compared to the experimental group, $F(3, 337) = 20.31$, $p < .001$ (see Figure 3). Regarding the other subscales, no significant trends could be observed in favor of the experimental group. Especially striking, however, are the large variations between individual change patterns from pretest to posttest and retention test. Figure 4, for example, shows students' individual change patterns on the subscale task orientation.

Think-aloud protocols

Based on the TAPA data, the results of the mixed ANOVA reveal no significant differences between the experimental and the control condition regarding students' actual use of SRL while solving the Sudoku (see Table 7). During text studying, the only significant difference was found with respect to the subcategory memorizing, $F(1, 337) = 8.55$, $p < .001$ (see Table 8). Further analyses reveal only a

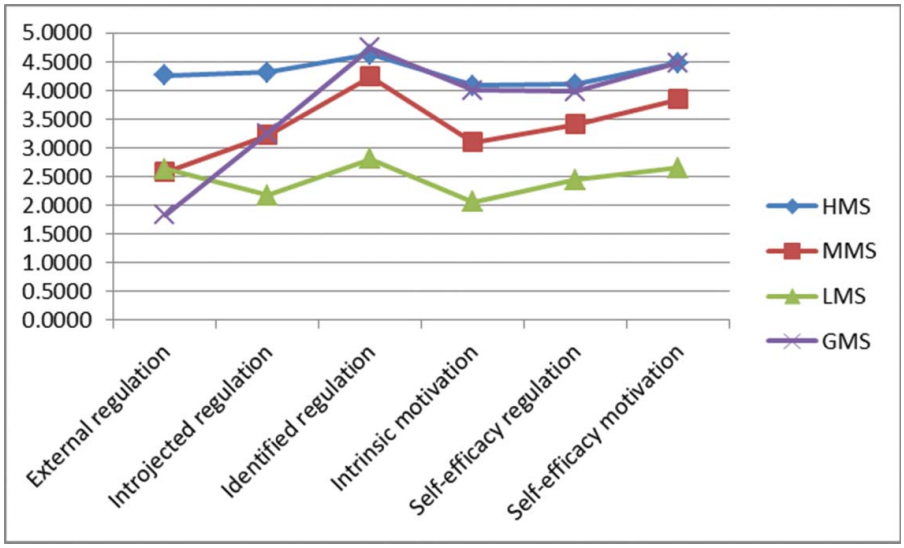

Figure 1. Means scores of the four clusters on the cluster variables. HMS = high levels of motivation and self-efficacy beliefs; MMS = moderate levels of autonomous motivation and self-efficacy beliefs; LMS = low levels of motivation and self-efficacy beliefs; GMS = high levels of autonomous motivation and self-efficacy beliefs.

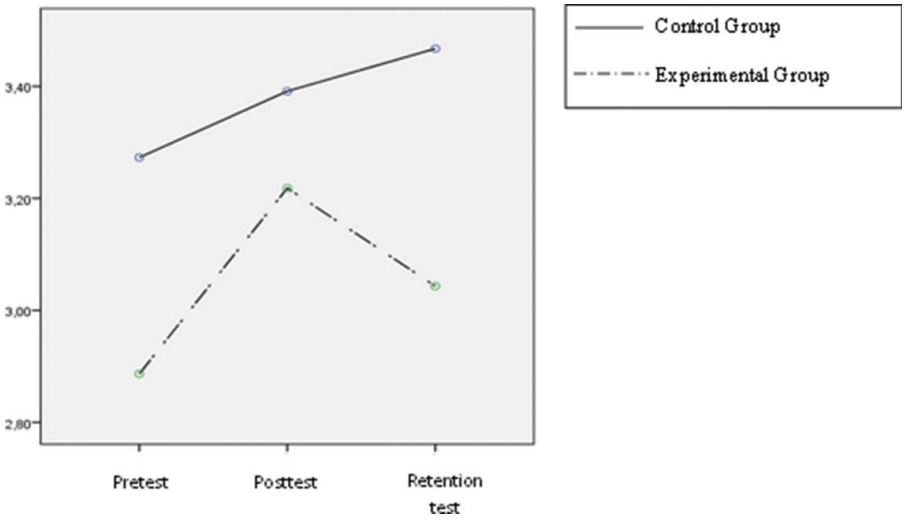

Figure 2. Evolution in students' SRL strategies as rated by the teachers.

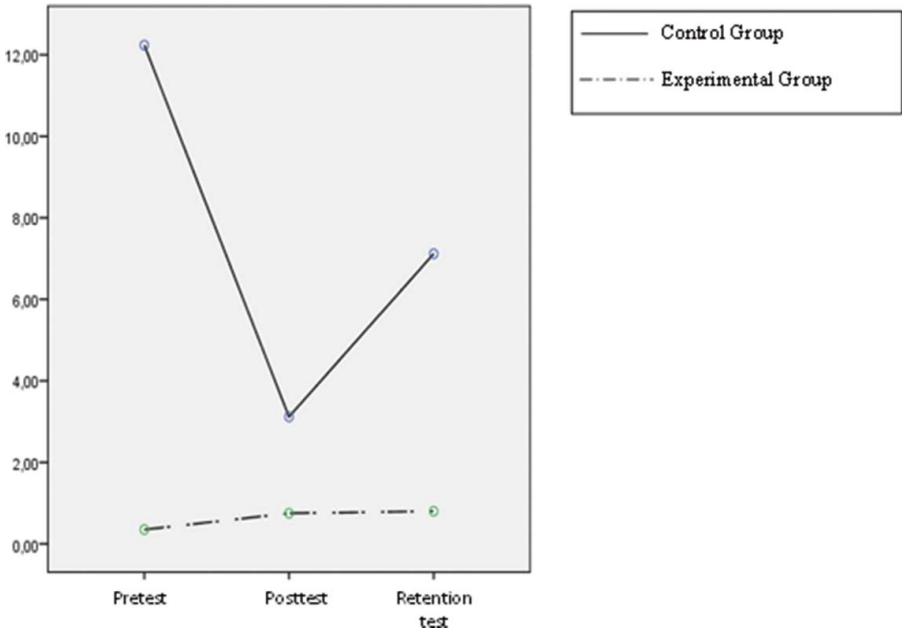

Figure 3. Evolution in students' self-reported use of SRL strategies: External regulation.

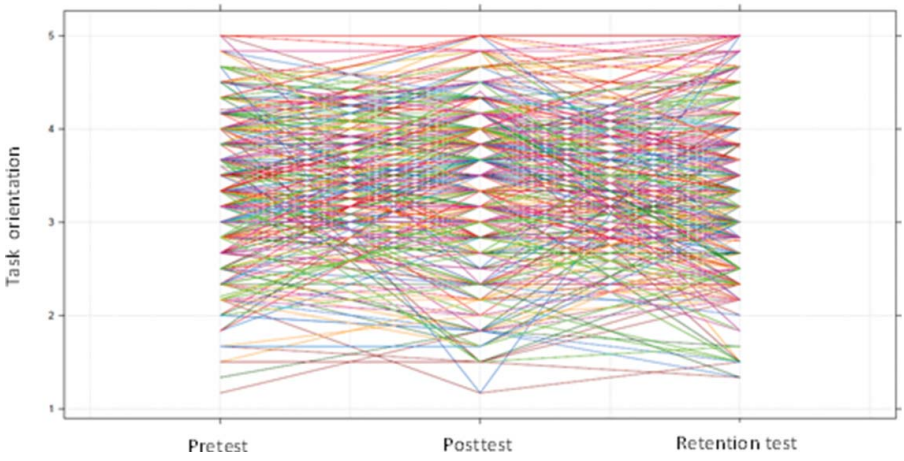

Figure 4. Individual patterns of evolution from pretest to posttest and retention test: Task orientation.

Table 7. Results of the mixed ANOVA of the think-aloud protocol analysis—sudoku.

	Pretest				Posttest				Retention test			
	CG		EG		CG		EG		CG		EG	
Dependent variables	M^a	*SD*	M^a	*SD*	M^a	*SD*	M^a	*SD*	M^a	*SD*	M^a	*SD*
Task orientation	3.59	2.81	4.25	4.54	3.53	3.10	2.05	1.23	2.55	3.01	3.18	2.70
Exploring the task	0.00	0.00	0.05	0.22	0.06	0.24	0.10	0.31	0.00	0.00	0.00	0.00
Detecting task demands	2.82	2.40	3.75	3.86	2.64	3.10	1.70	0.98	2.06	1.78	2.10	2.13
Activation prior knowledge	0.29	0.47	0.20	0.41	0.53	0.62	0.20	0.41	1.00	1.17	0.35	0.49
Task perceptions	0.47	0.87	0.25	0.64	0.29	0.47	0.05	0.22	0.12	0.33	0.10	045
Planning	0.06	0.24	0.00	0.00	0.12	0.49	0.10	0.31	0.00	0.00	0.10	0.31
Time management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Strategic planning	0.06	0.24	0.00	0.00	0.12	0.49	0.10	0.31	0.00	0.00	0.10	0.31
Self-efficacy	0.21	0.54	0.35	0.67	0.00	0.00	0.00	0.00	0.06	0.24	0.05	0.22
Monitoring	7.29	9.30	4.75	5.00	4.12	4.03	2.65	2.64	3.94	3.77	3.30	3.44
Comprehension monitoring	4.82	7.01	3.15	3.73	2.29	2.17	2.30	2.38	2.35	2.62	2.20	2.57
Monitoring of progress	1.18	2.35	0.25	0.44	0.94	1.30	0.10	0.31	0.53	1.07	0.60	1.23
Interim checking	0.71	1.57	0.55	0.94	0.59	1.50	0.15	0.49	0.00	0.00	0.00	0.00
Affective monitoring	0.59	0.94	0.80	2.50	0.29	0.77	0.10	0.31	0.53	1.18	0.50	1.15
Motivational strategies	0.59	0.24	0.00	0.00	0.12	0.49	0.00	0.00	0.00	0.00	0.00	0.00
Positive self-talk	0.06	0.24	0.00	0.00	0.06	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Making task more interesting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Increasing task value	0.00	0.00	0.00	0.00	0.06	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Self-reinforcement	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Adaptive strategy use	3.65	3.98	3.45	3.20	3.00	2.74	2.95	2.74	3.47	3.33	2.95	3.10
Correcting mistakes	1.65	2.91	1.55	2.04	1.00	1.22	2.15	2.37	1.23	1.60	2.20	2.53
Selective navigation	1.18	2.40	0.85	1.39	0.68	1.60	0.40	0.94	1.41	3.10	0.30	0.92
Self-questioning	0.82	1.07	1.05	1.61	1.06	2.01	0.40	0.94	0.82	2.10	0.45	0.94
Self-evaluation	1.12	3.35	1.20	1.74	0.59	0.87	0.40	0.60	0.35	0.49	0.50	0.83
Learning outcomes	1.06	3.11	0.80	1.32	0.53	0.80	0.35	0.49	0.35	0.49	0.50	0.83
Learning processes	0.06	0.24	0.10	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Affective reactions	0.00	0.00	0.30	0.80	0.06	0.24	0.05	0.22	0.00	0.00	0.00	0.00

Note. CG = control group; EG = experimental group involving a student tutoring program focusing on SRL.
[a] *M* refers to how often an individual student on average displayed a self-regulatory learning activity.

significant difference between pretest and posttest scores showing that the control group decreases as compared to the experimental group, $F(1, 35) = 4.83$, $p = .035$ (see Figure 5).

In sum, teacher ratings show a significantly positive effect of the intervention from pretest to posttest. Based on the self-report data, however, only a significantly higher decrease from pretest to posttest for the control group was found regarding the subscale external regulation. Based on the TAPA data, only a significant decrease for the control group regarding memorizing' was found from pretest to posttest.

Relation of students' motivational profiles with responsiveness to the intervention

Teacher rating

In order to study whether the effectiveness of the intervention varies according to students' motivational profile, the interaction of measurement occasion, condition, and cluster membership' was studied in the mixed ANOVA for the teacher ratings and self-reported use of SRL. With respect to the teacher rating, no significant interaction of measurement occasion, condition, and cluster membership' was found (see Table 5).

Self-report questionnaire

With regard to the CP-SRLI data (see Table 6), the results show a significant interaction effect for the following subscales: planning, $F(6, 672) = 3.43$, $p = .002$; intrinsic motivation, $F(6, 672) = 3.41$, $p = .003$; self-efficacy regulation, $F(6, 672) = 3.24$, $p = .004$; and persistence, $F(6, 672) = 3.17$, $p = .005$. Regarding planning, further analyses show a significantly different progress for experimental versus control-group students with an LMS profile (see Figure 6). More specifically, compared to the control group, a decrease for the experimental group from pretest to posttest, $F(1, 337) = 5.24$, $p = .023$, can be seen, but an increase is noted from posttest to retention test, $F(1, 337) = 12.88$, $p < .001$. From pretest to retention test no significant difference was found between students from both conditions with an LMS profile, $F(1, 337) = 1.24$, $p = .266$. Also concerning intrinsic motivation' the results indicate a differential effect for students with an LMS profile, showing a significant difference between both conditions from posttest to retention test, $F(1, 337) = 13.85$, $p < .001$, and from pretest to retention test, $F(1, 337) = 12.87$, $p < .001$, in favor of the experimental group (see Figure 6). With respect to self-efficacy regulation, the results indicate a positive evolution for the LMS students in the experimental group from pretest to posttest, $F(1, 337) = 7.29$, $p = .007$, and from pretest to retention test, $F(1, 337) = 6.28$, $p = .013$ (see Figure 6). In contrast, a decrease from pretest to posttest is observed for the GMS experimental students, $F(1, 337) = 4.98$, $p = .026$ (see Figure 6). With respect to persistence, the analyses show a significant difference between the conditions for students with an HMS profile. More specifically, the experimental group show a decrease from posttest to retention test, $F(1, 337) = 5.78$, $p = .017$, and from pretest to retention test, $F(1, 337) = 4.81$, $p = .029$ (see Figure 6). Also for students with an LMS profile, differences in the evolution in

Table 8. Results of the mixed ANOVA of the think-aloud protocol analysis—text studying.

	Pretest				Posttest				Retention test			
	CG		EG		CG		EG		CG		EG	
Dependent variables	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*	*M*[a]	*SD*
Task orientation	0.06	0.24	0.50	0.89	0.41	0.62	0.20	0.41	0.00	0.00	0.00	0.00
Exploring the task	0.06	0.24	0.20	0.52	0.18	0.39	0.15	0.37	0.06	0.24	0.00	0.00
Detecting task demands	0.00	0.00	0.15	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Activation prior knowledge	0.00	0.00	0.05	0.22	0.18	0.39	0.05	0.22	0.12	0.33	0.10	0.31
Task perceptions	0.00	0.00	0.10	0.31	0.06	0.24	0.00	0.00	0.06	0.24	0.05	0.22
Planning	0.12	0.49	0.30	0.92	0.41	0.80	0.70	1.22	0.29	0.59	0.10	0.31
Time management	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Strategic planning	0.12	0.49	0.30	0.92	0.41	0.80	0.70	1.22	0.29	0.59	0.10	0.31
Self-efficacy	0.00	0.00	0.50	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rehearsal strategies	15.00	24.00	2.00	2.22	6.41	11.71	3.00	6.13	8.24	9.89	2.05	2.54
Rereading	2.76	4.19	1.65	1.95	3.29	6.11	2.25	3.26	1.12	2.12	1.25	1.68
Memorizing	12.24	23.74	0.35	0.81	3.12	6.91	0.75	3.13	7.12	9.63	0.80	1.79
Organizational strategies	0.88	3.64	9.80	21.71	26.47	30.50	25.20	43.39	13.76	17.45	33.95	45.37
Structuring source text	0.18	0.73	5.85	17.66	14.35	21.60	9.65	24.62	8.47	15.36	12.40	21.63
Making notes	0.71	2.91	3.95	10.45	12.12	24.99	15.50	30.81	5.29	12.59	21.55	34.79
Elaboration strategies	6.29	7.29	2.50	2.74	5.24	5.91	2.20	4.06	5.53	6.46	2.65	4.51
Paraphrasing	2.00	3.86	1.30	2.00	3.06	5.58	1.50	2.96	2.24	4.19	1.90	4.19
Relating to prior knowledge	0.94	1.48	0.40	0.94	0.29	0.69	0.10	0.45	0.47	0.80	0.15	0.49
Relating text contents	1.24	2.61	0.35	0.67	0.35	0.49	0.30	0.57	0.00	0.00	0.10	0.31
Providing personal remarks	2.12	2.03	0.45	1.23	1.53	2.65	0.30	1.13	2.82	3.59	0.50	1.00
Motivational strategies	0.06	0.24	0.10	0.31	0.06	0.24	0.00	0.00	0.06	0.24	0.00	0.00
Positive self-talk	0.06	0.24	0.00	0.00	0.06	0.24	0.00	0.00	0.00	0.00	0.00	0.00
Making task more interesting	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Increasing task value	0.00	0.00	0.10	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Self-reinforcement	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.24	0.00	0.00
Monitoring	5.71	7.41	1.95	3.24	1.53	2.48	1.05	2.19	4.82	7.90	2.30	3.20
Comprehension monitoring	1.35	2.12	1.25	2.98	0.12	0.33	0.15	0.67	0.24	0.56	0.75	1.62
Monitoring of progress	0.29	0.47	0.05	0.22	0.76	1.98	0.25	0.64	0.18	0.39	0.65	1.27
Interim checking	3.82	6.15	0.50	1.15	0.47	0.72	0.45	1.28	4.29	7.59	0.90	2.17
Affective monitoring	0.24	0.97	0.15	0.49	0.18	0.39	0.20	0.52	0.12	0.33	0.00	0.00
Adaptive strategy use	0.88	2.21	1.40	4.47	0.12	0.33	1.50	4.63	0.12	0.33	0.55	1.00
Rereading after confusion	0.06	0.24	0.10	0.31	0.00	0.00	0.05	0.22	0.06	0.24	0.20	0.52
Correcting mistakes	0.41	1.46	0.90	3.39	1.00	1.22	2.15	2.37	0.00	0.00	0.20	0.41
Self-questioning	0.41	1.28	0.40	0.99	0.12	0.33	1.35	4.44	0.06	0.24	0.15	0.67
Self-evaluation	0.29	0.77	0.50	0.69	0.29	0.47	0.45	0.83	0.53	0.62	0.35	0.93
Learning outcomes	0.18	0.39	0.25	0.44	0.18	0.39	0.30	0.66	0.47	0.51	0.15	0.37
Learning processes	0.06	0.24	0.05	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Affective reactions	0.06	0.24	0.20	0.41	0.12	0.33	0.15	0.37	0.06	0.24	0.20	0.89

Note. CG = control group; EG = experimental group involving a student tutoring program focusing on SRL.
[a]*M* refers to how often an individual student on average displayed a self-regulatory learning activity.

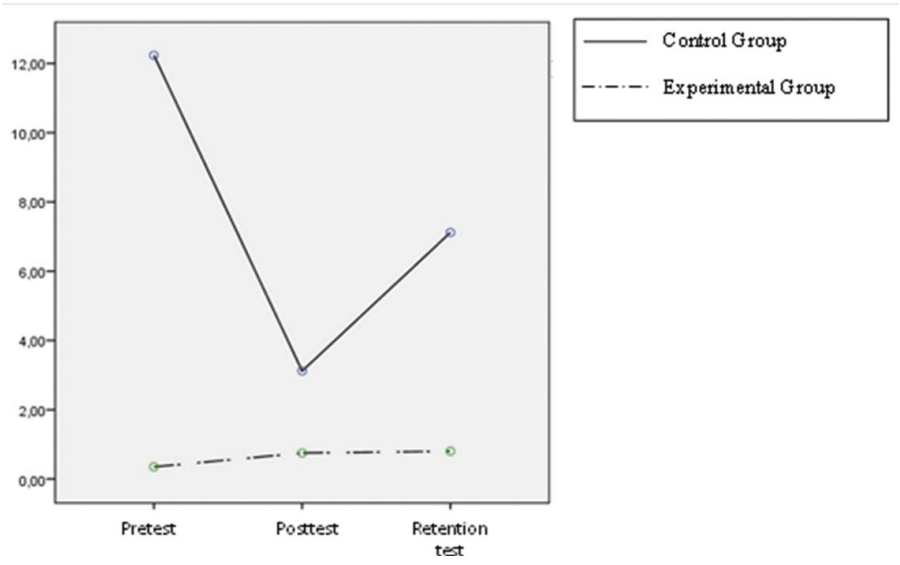

Figure 5. Evolution in students' self-actual use of SRL strategies: Memorizing.

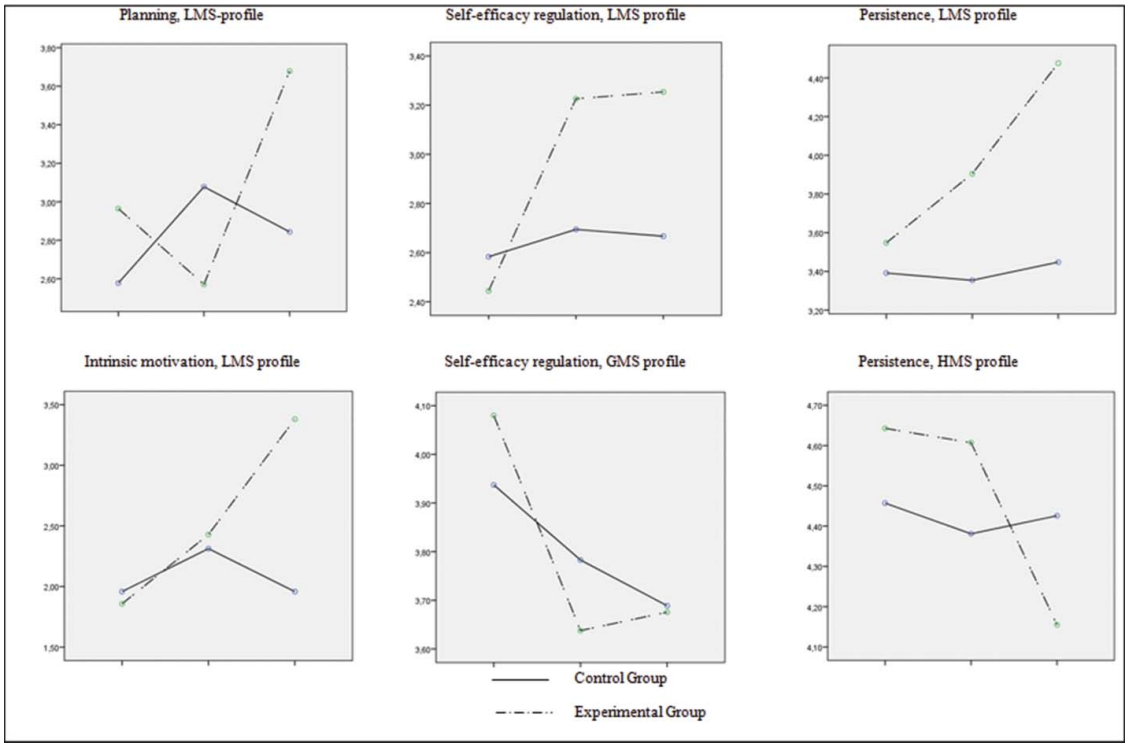

Figure 6. Interaction measurement occasion x condition x cluster: Planning, intrinsic motivation, self-efficacy regulation, and persistence.

persistence' between both conditions can be detected, namely a positive evolution from pretest to retention test for the experimental group, $F(1, 337) = 8.55$, $p = .004$ (see Figure 6).

Concluding, based on the teacher ratings no relationship was found between students' motivational profiles and their responsiveness to the intervention. Based on the self-report data, however, differential effects were found regarding planning, intrinsic motivation, self-efficacy regulation, and persistence. Students in the experimental condition with an LMS profile more particularly show a significant (a) decrease from pretest to posttest regarding planning, (b) increase from posttest to retention test regarding planning, (c) increase from posttest to retention test and from pretest to retention test regarding intrinsic motivation, (d) increase from pretest to posttest and from pretest to retention test regarding self-efficacy regulation, and (e) increase from pretest to retention test regarding persistence. Students in the experimental condition with a GMS profile show a significant decrease from pretest to posttest regarding self-efficacy regulation. Students in the experimental condition with an HMS profile display a decrease with respect to persistence from posttest to retention test and from pretest to retention test.

Discussion

Students' ability to actively engage during learning, for example by means of setting appropriate goals, maintaining motivation, accurately monitoring learning, and adjusting the use of strategies, are critical competencies that should be a central and explicit aim in education. Despite the importance of these SRL activities and the call for promoting SRL early in students' school career (Perry et al., 2004; Veenman & Spaans, 2005), primary school teachers stimulate SRL only to a limited extent (Hamman et al., 2000; Lombaerts, Engels, & Vanderfaeillie, 2007; Zimmerman, 2002). Especially students from more disadvantaged backgrounds seem to struggle with regulating their learning effectively (Boekaerts, Pintrich, & Zeidner, 2000; Zimmerman, 2002). This study particularly aimed to describe socioeconomically disadvantaged and immigrant students' SRL and to explore the effectiveness of student tutoring as an innovative approach to stimulate SRL among these late-primary school students. Fifth- and sixth-grade students were tutored in small groups by master students during 10 successive weeks. A quasi-experimental study with a pretest, posttest, and retention test control group design was used, combining teacher ratings, self-report questionnaires, and think-aloud protocol analysis to assess children's (evolution in) SRL. Further, it was investigated whether students' motivational profiles related to their responsiveness to the intervention. Subsequently, the results of the present study are discussed in conjunction with suggestions for future research.

Initial state of students' SRL

The descriptive results of the present study fit in with prior studies evidencing that young children are capable of performing SRL behavior (e.g., Perry et al., 2004; Whitebread et al., 2009). More specifically, the CP-SRLI data portrayed the most optimistic view as students report moderate to relatively high levels of SRL strategies at the beginning of the intervention. However, these results should be nuanced based on the results of the teacher ratings and especially the think-aloud data. The descriptive analyses of the teacher ratings revealed that the students regulated their learning only on a moderate level. In-

depth analysis of the pretest think-aloud protocols indicates that the strategies were performed on a rather basic level, and were not yet sophisticated and academically oriented. Furthermore, strategy application largely varies between students and some SRL activities were rarely (e.g., motivational aspects of SRL) or never observed (e.g., time planning and time monitoring). The discrepancy between the self-report and the think-aloud data confirms the tendency of students to overestimate their actual strategy use in self-reports (Boekaerts & Corno, 2005; Cromley & Azevedo, 2006; Schellings & Van Hout-Wolters, 2011; Veenman, 2011a). However, the value of self-report data should be acknowledged as well, as it provides insight into self-perceived propensities of using a particular tactic or strategy (Vandevelde et al., 2013; Perry & Winne, 2006; Pintrich, 2004; Richardson, 2004; Zimmerman, 2008). As students monitor their learning in relation to these personal perceptions of their learning approach and its outcomes (Winne & Jamieson-Noel, 2002), misinterpretations of SRL (i.e., overestimation) can result in persistent use of inadequate strategies, as they will not experience the need for more productive forms of SRL (Winne, 2004). This also implies a suggestion for the design of further training programs, and in this case student tutoring programs, namely confronting students' perceptions and beliefs about their SRL practices with their actual SRL behavior at the beginning of the intervention (Credé & Phillips, 2011; Pajares & Valiante, 2002; Perry & Rahim, 2011; Turner & Patrick, 2008).

In conclusion, the descriptive findings confirm that children from low socioeconomic or immigrant families encounter difficulties regulating their learning purposefully and profoundly and that additional support is needed to become more effective learners (Dembo & Eaton, 2000; Weinstein et al., 2000). Regarding the assessment of SRL, the study corroborates that by using a multimethod approach, one can profit from the power of different methods to obtain a broader picture and deeper insights into learners' SRL strategies.

Effectiveness of a student tutoring program on the evolution of students' SRL

In line with previous research on SRL interventions (Dignath et al., 2008; Perels et al., 2005; Stoegler & Ziegler, 2008), the present results of the teacher ratings show a positive effect of the intervention from pretest to posttest. However, this positive effect was not maintained in the long term, confirming that struggling learners, as our target group, have difficulty maintaining and generalizing learned skills and strategies (Graham, Harris, & Mason, 2005). These results also indicate that long-term support will be necessary to effect meaningful changes in SRL among these students.

Moreover, the results of students' self-report and think-aloud data generally reveal no significant positive effects of student tutoring on students' SRL. Based on these results one could conclude that student tutoring is not an effective approach to promote SRL among primary school children with low socioeconomic or immigrant backgrounds. However, we would like to address some hypotheses to more fully interpret the current results and to provide input for further research regarding this topic.

First, as to the effectiveness of student tutoring interventions in general, it is difficult to compare the current results with previous findings as prior student tutoring interventions did not specifically focus on SRL. Prior research reveals that student tutoring interventions addressing low-level skills (e.g., computational skills in math) have been found to be more effective than interventions addressing the development of higher-level skills (e.g., reading comprehension; Gordon et al., 2007) and that long-lasting effects are not a matter of course (Slavin et al., 2011). In this respect, the current results illustrate that student tutoring is not that promising to stimulate higher-level skills, like SRL.

Second, it might be possible that experimental condition students have acquired sufficient and increased metacognitive knowledge and skills, but do not yet perform them spontaneously (i.e., production deficiency), possibly due to a lack of motivation or a lack of a sense of necessity to perform these more demanding strategies (e.g., Veenman et al., 2006; Zimmerman, 2001). As to the latter, the present results indeed indicate that students might not have felt the necessity to adjust their learning behavior, as they claim to self-regulate their learning already on a rather high level, while the think-aloud data showed a rather superficial strategy use. However, further investigation is required to confirm this hypothesis. Moreover, Zimmerman and Schunk (2001) suggested that the benefits of self-regulatory training efforts in primary school may not lead to immediate results and only become evident during middle-school years and thereafter. In this respect, it can be hypothesized that the effects of student tutoring may become evident later on when students are confronted with more demanding learning environments and experience that their current repertoire of SRL is insufficient. This brings up the issue regarding the critical period to stimulate SRL. On the one hand, researchers stress the importance of fostering SRL already during primary education rather than waiting until secondary education in order to prevent children from developing ineffective learning habits (Dignath et al., 2008; Perry et al., 2004; Postholm, 2010; Stoeger & Ziegler, 2011). On the other hand, however, primary school children are less confronted with complex tasks and demanding learning environments. Consequently, they seem to experience the benefits and necessity of applying effective SRL strategies and to adjust their learning behavior to a lesser extent. Exploring the effects over a longer period (i.e., following students in their transition to secondary school) and replicating this study design with secondary students could shed light on this matter.

Third, besides the age of the target group in the present study, their specific background characteristics also have to be taken into account when discussing the study findings. We must recognize the multiple sources (i.e., child and family characteristics, sociocultural factors, and schooling factors) influencing the academic trajectories of children with a low socioeconomic or immigrant background, while during the intervention the main focus was solely on schooling factors. For these students, it may be necessary to consider the broader family and sociocultural context in the intervention as well to obtain sustained effects (McClelland, Acock, & Morrison, 2006). Comparing the current intervention with an intervention taking into account the broader family and sociocultural context might be a valuable approach for future research

design. Further, some studies indicate that disadvantaged student populations can benefit from innovative and learner-centered learning environments (such as student tutoring) in terms of both academic and self-regulatory outcomes (Salinas & Garr, 2009). However, other studies state that students from a low socioeconomic status and ethnic minority seem to benefit more from traditional learning environments (Hopkins & Reynolds, 2001). Hornstra (2013), for example, found that ethnic minority students showed less investment in school when the learning context relied more on self-regulation of their learning process. For these students it may be more difficult to find a suitable balance between transferring responsibility to the student, while still providing an optimal level of guidance (Hornstra, 2013). Further research could compare the effectiveness of student tutoring initiatives for students at-risk due to their low socioeconomic status or ethnic minority background with comparable initiatives for students with a middle to high socioeconomic status and native background.

Fourth, although important preconditions were taken into account to ensure qualitative student tutoring processes and training of SRL, some additional suggestions might be formulated for further research. In line with the recommendations in the literature, the (meta)cognitive and motivational components of SRL were simultaneously trained and practiced (e.g., Dignath et al., 2008; Schunk & Ertmer, 2000) across multiple disciplinary domains (e.g., Kron-Sperl, Schneider, & Hasselhorn, 2008). Although there was an alternation between modeling, explicit instruction, and hands-on practice, it is possible that the intervention was too brief to address all targeted learning strategies profoundly and to provide sufficient practice and experiences regarding the multiple strategies. As suggested previously, longer and more intensive interventions are needed in order to ensure that primary school students incorporate the instructed learning strategies into their learning repertoire.

However, the success of a student tutoring program may depend as much or even more on the selection, training, and supervision of tutors as it does on the design of session contents (Vadasy et al., 1997). Even though studies show that under specific conditions positive effects can be obtained with minimally trained tutors (Fitzgerald, 2001; Karsenty, 2010; Morris, 2006), one cannot underestimate the degree of pedagogical knowledge required to guide a small group of vulnerable learners due to their low socioeconomic or immigrant background, especially when tutoring focuses on complex and multifaceted skills, such as SRL. Notwithstanding the fact that the tutors in the present study had a background in educational sciences, and received prior training and ongoing support, they may have encountered difficulties in encouraging sophisticated SRL among their tutees (Graesser & McNamara, 2010). Although the observations of the sessions revealed that the quality of tutoring was rather good, a closer analysis of the behavior of effective student tutors and the ongoing tutor–tutee interaction, will be interesting to identify their qualities and the instructional practices that enable student tutors to create a positive and powerful learning environment (Cobb & Allen, 2001). This type of research should not only focus on generic tutoring skills (Chi et al., 2001; Graesser et al., 1995), but also on specific skills to promote SRL within small-group instruction. This information will also provide valuable input to optimize tutor training and ongoing support. Additionally, future research could also, explore the differential effects of tutor training by comparing the effects of student tutoring programs in which tutors received (a) training regarding general tutoring skills only and (b) training on both general tutoring skills and activities promoting SRL, and compare those conditions to a control group, as in the present study.

In the present study design, student tutoring occurred in small-group settings. As it is plausible that learning effects for tutees can not only result from support and interaction with the tutor, but also from interaction with the other tutees, further research can also take into account tutees' interaction to investigate whether this provides supplementary learning opportunities in addition to the support of the tutors (i.e., by comparing the current experimental condition with a condition implementing a one-on-one training on SRL).

Finally, it should be noted that in the present think-aloud protocol analysis only the occurrence of SRL strategies was analyzed. For example, we could only investigate whether students highlighted key words more frequently after the intervention, but not whether they highlighted more relevant keywords. In further research, a more profound analysis could be performed in which not only the quantity or the degree of occurrence is considered, but also the quality of the performed strategies. As such, trace methodology could be combined with think-aloud protocol analysis (Winne, 2010). Another methodological limitation is the considerable dropout of teacher ratings from the control group as not all of them completed the questionnaire on the subsequent measurement occasions. Although teacher ratings are considered to provide valuable additional information on children's SRL (Desoete, 2008; Winne & Perry, 2000), a considerable group of teachers reported not to feel competent in providing these judgments.

Relation of students' motivational profiles with responsiveness to the intervention

As the present results indicate remarkably large inter-individual differences, it is likely that the results at group level are not fully representative for individual gains. Hence, adapting a person-centered approach and studying individual patterns of change may yield quite different results than focusing on general group trends (Kron-Sperl et al., 2008). In this respect, the present study also investigated whether the effectiveness of student tutoring varied according to students' specific motivational profiles, which is a unique approach within this research field. Comparable to previous studies (Ratelle, Guay, Vallerand, Larose, & Senecal, 2007; Vansteenkiste et al., 2009), we found four different motivational profiles (i.e., high quantity, moderate quality, low quantity, and good quality motivation groups). This person-centered approach is valuable as researchers indicate that students combine different motives in a relatively unique way (Vansteenkiste et al., 2009) and that learning behavior can be the result of a combination of several motives (Pintrich, 2003).

When considering the results of the differential effectiveness of student tutoring in promoting SRL, the picture becomes more complex. For students with an HMS and GMS profile, a negative effect was found regarding persistence and self-efficacy regulation respectively. In contrast, students with an LMS

profile, which can be considered as most at risk due to their low levels of motivation and self-efficacy beliefs, seem to profit the most from the intervention compared to the other groups. This is a promising finding, as these students rated their strategy use as very low at the beginning of the intervention. Due to their participation in the student tutoring program, these students become more intrinsically motivated, have more confidence in their ability to regulate their learning, and show a higher persistence in engaging in school tasks. As research shows that intrinsic motivation and self-efficacy have a positive effect on the use of cognitive and metacognitive strategies (Pintrich, 2000), this is a positive outcome. These results confirm the importance of considering students' motivational profile when designing interventions and indicate that the affective component of student tutoring might be a powerful stepping stone for important motivational concepts regarding SRL as the current differential effects were mainly found regarding motivational aspects of SRL. Notwithstanding the positive outcome that the present student tutoring program could empower the most vulnerable motivational group, future researchers should explore how the student tutoring design can be optimized in order to be beneficial for a larger group of students. As such, this study confirms the adherence to evidence-based practice and rigorous evaluations testing the effectiveness of student tutoring programs (Ritter et al., 2009). Further research can play an important role in comparing methods of implementation, analyzing success and failure in different applications of student tutoring, and effectively communicating these findings back to educational research and practice in order to guide the development of new initiatives. Further, given the complexity of SRL, we believe that the alignment between student tutoring initiatives and the classroom practice can be fruitful (Wasik, 1998) so that tutors can be complementary in providing more individualized help and that teachers can provide additional support to facilitate the maintenance of the effects of student tutoring programs. In this respect and in line with the response to the intervention-approach, in which all children receive the general curriculum and then a subset of children identified as at-risk receive supplemental tiers of instruction (small groups or one-on-one; Fuchs & Vaughn, 2012), further research can, for example, explore whether student tutoring is an adequate method to provide additional and more intensive guidance to students who did not respond to classroom instruction regarding SRL.

Conclusion

This study provides an innovative scope within the research field of SRL by investigating the effectiveness of student tutoring on the SRL among fifth- and sixth-grade students who are at risk for school failure due to their socioeconomic or immigrant background. In doing so, this study provides more insight into the emerging research area studying primary school students' SRL, and more specifically SRL among students with low socioeconomic or immigrant backgrounds, which is currently an underexposed research area. This study points out that SRL strategy acquisition among these children is more complex and variable than originally assumed and that—unfortunately—student tutoring as a method to promote SRL among these children did not fully meet expectations. In line with Slavin et al. (2011), the present results create caution for the expectation that a relatively brief, small-group student tutoring intervention can have the power to put all students with low socioeconomic or immigrant backgrounds permanently on track. This does not necessarily imply that focusing on SRL cannot be effective for these students. Therefore, further research should elaborate on the most effective ways to do so. In our view, there will be no one panacea to stimulate complex and multifaceted skills like SRL among socioeconomically disadvantaged and immigrant students. Instead, high-quality and continuous support combining different kinds of promotion tailored to the specific needs and profiles of the students will be needed to obtain lasting effects.

In this respect, we have advocated and made suggestions for further research in order to gain more insight into substantial conditions and factors influencing the effectiveness of student tutoring programs promoting higher-level skills, such as SRL, on the one hand. On the other hand, it is important to consider how, for whom, and to what extent student tutoring can be complementary to daily class practice in order to realize the promotion of SRL in primary education. Regarding the latter, the present results indicate that student tutoring is particularly beneficial to empower low-motivated learners regarding motivational aspects of SRL, but further research will be needed to verify these results. In the present study we sought to understand how SRL among students with low socioeconomic or immigrant backgrounds can be promoted by means of a student tutoring program. However, future research is recommended to further unravel this complex matter.

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Appendix A

Table A1. Overview of the intervention content.

Session	Content	SRL component[a]	Example of activities
1	Self-reflection on one's own learning	Metacognitive and motivational component	Identifying personal strengths and weaknesses in study behavior
2	SRL cyclical phases: use of forethought, performance control, and self-reflection processes. Operationalized as: task definition; goal setting and planning; execution of the task and monitoring; global evaluation	Metacognitive component	Performing an activity according to a step-by-step plan
3	Goal setting and time-management	Metacognitive component	Estimating duration of a task and comparison with actual time-use
4	Activating prior knowledge, text comprehension, asking questions	Cognitive component	Predicting the content of a text by scanning
5	Distinguishing main issues from side-issues, structuring texts through indicating keywords	Cognitive component	Highlighting key words in text
6	Representing texts schematically through mind mapping	Cognitive component	Making a mind map of a text
7	Memorizing techniques	Cognitive component	Practicing mnemonics techniques
8 +9[b]	Preparing an oral presentation about a self-selected theme (integrating and applying the learned self-regulatory strategies)[b]	Motivational metacognitive and cognitive component	

Note: [a]The different components of SRL are explicitly addressed during particular sessions. Moreover, the metacognitive and motivational component are integrated throughout all sessions. Regarding the motivational component, it is expected that the affective processes during tutoring (e.g., trusting relationship with a tutor, modeling of enthusiasm, receiving more praise) will foster important motivational aspects (Topping & Ehly, 2001). Therefore, the motivational component is not explicitly addressed during a particular session, but is embedded in the process of tutoring throughout all sessions.

[b]Following the statement of Perry, Phillips, and Dowler (2004) that complex tasks are effective forms promoting SRL, the last two sessions were reserved for a complex assignment, namely preparing an oral presentation about a self-selected theme giving the students the opportunity to integrate and apply the learned self-regulated strategies. As the sixth-grade students had already participated in the student tutoring program during the previous school year, they started with this assignment in session 4.

Appendix B

Table B1. Categories of the coding scheme for think-aloud protocols.

Main coding categories	Subcategories	Specific indicators
Task orientation	Exploring the task subject and constitution	Global document screening
	Detecting task demands	Reading the instructions[a]
		Rereading the instructions before commencing on the task[a]
		Paraphrasing task instructions
		Examining and discussing the Sudoku-example[a]
		Asking for additional information before commencing on the task
		Rereading the instructions after commencing on the task[a]
	Activation prior knowledge	Activating prior content knowledge
		Activating prior metacognitive knowledge
	Becoming aware of one's task perceptions	Reflecting on task difficulty
		Reflecting on task interest or value
Planning	Time management	Making a time schedule/allocating time
	Strategic planning	Depicting how to approach the task
Self-efficacy	Reflecting on their competence to perform the task	
Rehearsal strategies[b]	(Re)reading[b]	Rereading the source text[b]
		Scanning and generating hypotheses[b]
		(Re)reading one's own notes[b]
	Memorizing[b]	Rereading for memorizing[b]
		Copying source text[b]
		Reciting source text[b]
		Reciting one's own notes[b]
Organizational strategies[b]	Structuring text[b]	Highlighting key words during first-time reading of source text[b]
		Highlighting key words during subsequent reading of source text[b]
		Structuring one's own notes[b]
	Making notes[b]	Noting key words or key sentences during first time text reading[b]
		Noting key words or key sentences during subsequent text reading[b]
		Making a summary during first time text reading[b]
		Making a summary during subsequent text reading[b]
		Making a graphical summary during first-time text reading[b]
		Making a graphical summary during subsequent text reading[b]
Elaboration strategies[b]	Paraphrasing text content[b]	
	Relating text content to prior knowledge[b]	
	Relating text contents[b]	
	Providing personal remarks to the text content[b]	
Motivational strategies	Positive self-talk	
	Making task more interesting	
	Increasing task value	
	Self-reinforcement by promising themselves rewards	
Monitoring	Comprehension monitoring	Noting lack of comprehension
		Noting understanding
	Monitoring of progress	Reflecting on the progress made
		Reflecting on the available time and time schedule
		Reflecting on the quality of the strategy use
	Interim checking	Quickly checking source text during reciting[b]
		Interim checking of correctness or completeness of task performance
	Affective monitoring	Reflecting on task difficulty
		Reflecting on one's self-efficacy
		Reflecting on task interest or value
Adaptive strategy use	Rereading source text after confusion[b]	
	Correcting errors	
	Selective navigation during solving the Sudoku[a]	
	Self-questioning to support one's learning process	
Self-evaluation	Evaluating learning outcomes after task performance	Checking completeness of task performance
		Checking correctness of solution
		Recapitulating task instructions
		Scanning source text to check memorization[b]
	Evaluating learning processes after task performance	
	Affective reactions	Reflecting on task difficulty
		Reflecting on self-efficacy
		Reflection on task interest or value
Off-task behavior		Asking practical questions, looking outside, etc.

Note. [a]Sudoku-specific behavior. [b]Text studying-specific behaviors.