DOCUMENT RESUME

ED 413 299 SP 037 602

AUTHOR Veenman, Simon; Beems, Danielle; Gerrits, Sandra; Op de Weegh, Gabby

TITLE Self-Regulated Learning: Effects of a Training Program for Secondary-School Teachers.

PUB DATE 1997-08-00

NOTE 26p.; Paper presented at the Biennial Meeting of the European Association for Research on Learning and Instruction (Athens, Greece, August 26-30, 1997).

PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.

DESCRIPTORS *Faculty Development; Foreign Countries; Independent Study; *Individualized Instruction; *Inservice Teacher Education; Outcomes of Education; *Pacing; Secondary Education; Secondary School Teachers; *Teacher Education Programs; Teacher Workshops

IDENTIFIERS Netherlands; *Self Regulated Learning

ABSTRACT

This study addresses the implementation effects of an in-service training program on self-regulated learning for secondary school teachers. A quasi-experimental, treatment-control group investigation was designed to test the effects of this program. Study results suggested that the in-service program on self-regulated learning had little or no effect on the application of regulation strategies by secondary school teachers in the lower grades of the comprehensive school. No significant differences between trained and untrained teachers were found for the Observation Scale for Self-Regulated Learning and the Student Scale for Self-Regulated Learning. Possible interpretations of this outcome are: (1) the training of the teachers may be too short in duration; (2) the generally passive character of student learning in secondary schools; (3) the workshops were conducted after school; and (4) the training on self-regulated learning was isolated from a more comprehensive training program involving a Dutch adaptation of the program "Dimensions of Learning" from the Association for Supervision and Curriculum Development (ASCD). (Contains 27 references.) (Author)

Self-regulated learning:
Effects of a training program for secondary-school teachers

Simon Veenman
Daniëlle Beems
Sandra Gerrits
Gabby Op de Weegh

Department of Educational Sciences
University of Nijmegen,
The Netherlands

Paper presented at the biennial meeting of the
European Association for Research on Learning and Instruction,
Athens - Greece, August 26 - 30, 1997

ABSTRACT

This study addresses the implementation effects of a in-service training program on self-regulated learning for secondary-school teachers. A quasi-experimental, treatment-control group investigation was designed to test the effects this program. The results of the present study suggest that the in-service program on self-regulated learning had little or no effect on the application of regulation strategies by secondary-school teachers in the lower grades of the comprehensive school. No significant differences between trained and untrained teachers were found for the Observation Scale for Self-Regulated Learning and the Student Scale for Self-Regulated Learning. Possible interpretations of this outcome are: the training of the teachers may be too short in duration, the generally passive character of student learning in secondary schools, the workshops were conducted after school, and the training on self-regulated learning was isolated from a more comprehensive training program involving a Dutch adaptation of the program *Dimensions of Learning* from the Association for Supervision and Curriculum Development (ASCD).

The importance of individuals assuming personal responsibility for and control over the acquisition of knowledge and skills is being increasingly stressed. The importance of personal initiative in learning has also recently been affirmed in a publication from the Dutch governmental committee responsible for the formulation of the guidelines for the restructuring of secondary education in The Netherlands (Stuurgroep Profiel Tweede Fase Voortgezet Onderwijs, 1994). The pedagogical, didactic, and organizational changes that this committee proposes are summarised by the concept of "the school as a study house." This includes notions of self-regulated learning, the interactive nature of teaching and learning, and the active participation of students in the achievement of learning outcomes.

Numerous definitions and various descriptions of self-regulated learning exist, and these can vary in accordance with the use of such different theoretical paradigms as the operant, phenomenological, social-cognitive, Vygotskian, volitional, attributional, information-processing or constructivist paradigms (c.f. Schunk & Zimmerman, 1994). Although definitions of self-regulated learning differ according to the theoretical orientation, Zimmerman (1990) has identified a common conceptualization of self-regulated students as metacognitively, motivationally and behaviourally active participants in their own learning. In terms of metacognitive processes, self-regulated learners plan, set goals, organise, self-monitor and self-evaluate at various points during the process of acquisition. According to Zimmerman moreover, these processes enable them to be self-aware, knowledgeable, and decisive in their approach to learning. In terms of motivational processes, these learners report high self-efficacy, positive self-attributions and intrinsic task interest (cf. Schunk, 1996). In their behavioural processes, self-regulated learners select, structure and create environments which optimise learning. They seek out advice, information and places where they are most likely to learn; they self-instruct during acquisition and self-reinforce during enactment (Zimmerman, 1990, 1994). Self-regulated learning reflects the systematic application of declarative, procedural and conditional knowledge to tasks (Schunk, 1991). In Boekaerts' (1995, 1997) view, self-regulated learning includes not only metacognitive skills but also metamotivational skills (motivation control or creating a positive experiential state and a learning intention; action control or enactment of the

learning intention and protection of it from competing action tendencies).

Most models of self-regulating learning include three general types of strategies: planning, monitoring and evaluating. Planning refers to such activities as setting goals for studying, skimming a text before reading, generating questions before reading a text, doing a task analysis of the problem, and selecting and sequencing a series of strategies and/or procedures for achieving the goal. Monitoring involves an awareness of what one is doing, an understanding of where it fits into the established sequence of steps, and anticipation and planning of what ought to be done next. Evaluating refers to the assessment of both the process employed and the product achieved (Ertmer & Newby, 1996; De Jong, 1992).

In the conception of De Jong and Simons (1990) and De Jong (1992), self-regulated learning pertains to being able to: a) prepare one's own learning; b) take the necessary steps to learn; c) regulate learning; d) provide for one's own feedback and judgement and e) keep oneself concentrated and motivated. The five tasks underlying these abilities can also be executed by the teachers in highly structured forms of teaching. In these situations, the teachers prepare the learning of the students; help them adopt the appropriate learning strategies; regulate the learning of the students through testing, questions, and observations; judge the learning process and provide feedback; and try to keep the students motivated and concentrated. According to these authors, a self-regulated student is able to be his own teacher.

A number of studies indicate the important role of self-regulated learning in academic achievement (cf. Winne, 1995; Boekaerts, 1997). In two studies by Zimmerman and Martinez-Pons (1986, 1988), the use of self-regulated learning strategies by high-school students was found to be strongly associated with superior academic functioning. De Jong (1992) examined the quantitative and qualitative differences between successful and less successful Dutch secondary-school students with regard to their use of regulation strategies and found the high-performing students used regulation strategies more often than the low-performing students. The use of regulation strategies explained a large amount (19% to 60%) of the variance in the learning outcomes. Moreover, the regulation strategies "process monitoring", "regulating" and "testing" appeared to be important determinants of the

differences in the learning outcomes. The use of a number of different regulation strategies also appeared to depend on the demands of the learning task (such as reproducing, problem solving, information application). A recent study by Bolhuis and Kluvers (1996) shows that learning in the highest grades of secondary education is highly regulated by the teachers or the textbooks being used. Students are given little room for self-regulated learning.

Given the importance of self-regulation strategies for student learning, the Protestant Educational Advisory Centre (CPS) and the Department of Educational Sciences at the University of Nijmegen developed an in-service training program concerned with self-regulated learning in secondary education. The program was conceived as part of a Dutch adaptation of the American instructional program *Dimensions of Learning* from the Association for Supervision and Curriculum Development (Marzano, 1992; Marzano et al., 1992).

Research Questions

In the present study, the following research questions were addressed: 1) Do teachers who participated in the course on self-regulated learning implement the regulation strategies presented in the training program? 2) Do the students of the teachers who participated in the course on self-regulated learning implement the desired self-regulation strategies? 3) Do the teachers appear to value the new course?

Method and Instrumentation

Design

The study consisted of an observational study using trained observers to observe teacher use of regulation strategies in the classroom and a questionnaire study focusing on student use of regulation strategies as reported by students. These two substudies were concentrated on the degree of implementation of the desired regulation strategies.

The observational substudy was set up as a pre-test-post-test field study with treatment (n = 25) and control (n = 14) groups of secondary-school teachers. The questionnaire substudy with ratings by the secondary-school students was also set up as a pre-test-post-test study with treatment (n = 587) and control (n = 324) students.

The questionnaire was also used to obtain information on the teacher perceptions of the training, their perceptions of the content of the training manual, and their experiences with the implementation of the described regulation strategies. The questionnaires were distributed to all 25 of the teachers who participated in the course on self-regulated learning (response rate of 100%).

Subjects

The participants in the study were secondary-school teachers and their students from three comprehensive schools. Schools A and B were located in the south-east of The Netherlands; school C was located in the middle of the country. The study was restricted to teachers who taught in the three lowest grades of the secondary school. The students were thus 12 to 14 years old. All of the teachers volunteered to participate in the study. All teaching subjects were included (foreign languages, science, and social studies). Each teacher from the treatment group was asked to apply the acquired regulation strategies to only one class appointed by the researchers, and each class was confronted with only one treatment teacher. The teachers from the control group were recruited from the same schools and comparable to the treatment teachers with regard to grade level and subject matter. They did not, however, participate in the training on self-regulated learning.

The treatment or experimental group consisted of 25 teachers and their students: 8 teachers and classes from school A, 12 teachers and classes from school B, and 5 teachers and classes from school C. The control group consisted of 14 teachers and their students: 6 teachers and classes from school A, 5 teachers and classes from school B, and 3 teachers and classes from school C.

Observation Scale for Self-Regulated Learning

After each observation, the Observation Scale for Self-Regulated Learning (OSSRL) was used by the observers to assess the teacher's behaviour with regard to a number of regulation strategies. The five-point scales addressed the strategies which were identified in the training manual and based on the literature on self-regulated learning. The variables from the OSSRL are listed in Table 1. Prior to the collection of the observational data, the three observers went through a training program consisting of about 40 hours. The program involved the live coding of 12 lessons at a comprehensive school not involved in the study. Inter-observer reliability checks based on the live coding of 9 lessons (including geometry and economy) conducted at a school not involved in the study and estimated through analysis of variance (cf. Winer, 1971) for the separate instructional variables were found to range from 0.65 to 1.00 (median 0.94). From the original scale with 23 items, two items with estimates lower than 0.60 were removed. After the collection of the observational data, another two items were removed because of their low degree of variability.

On conceptual grounds, the 19 items constituting the observation scale were divided into three subscales: (1) regulation strategies before learning, (2) regulation strategies during learning and (3) regulation strategies after learning. Measures of internal consistency (Cronbach's alpha) were computed for the entire scale and for each subscale. The alpha-coefficients ranged from 0.61 to 0.85 (see Table 1).

Student Scale for Self-Regulated Learning

Before and after training, the Student Scale for Self-Regulated Learning (SSSRL) was administered to assess the use of the regulation strategies by the students themselves and to assess the use of the regulation strategies by the teachers as seen by the students. The SSSRL thus consists of two parts: in part one, the students report their own use of the regulation strategies; in part two, the students report the teachers' use of the regulation strategies. The SSSRL ranged from a score of 1 for no application of the strategy to a score of 5 for clear application of the

skill. The SSSRL contained 52 items: 37 items concerning the use of regulation by the students and 15 items concerning the use of regulation strategies by the teachers. A number of items was derived from three existing scales measuring self-regulated behaviour: the Inventory Regulation Strategies (De Jong & Kluvers, 1991); the Homework Approach Questionnaire Tilburg (Place-van Tongerloo & Deijkers, 1987); and the Self-Regulation Skills Questionnaire (Hornman, Kluvers, Van Oirschot, & Van der Sanden, 1988).

On conceptual grounds, the 52 items constituting the student part and the teacher part of the SSSRL were divided into three subscales: (1) regulation strategies before learning, (2) regulation strategies during learning and (3) regulation strategies after learning. Measures of internal consistency (Cronbach's alpha) were computed for the entire scale and for each subscale. The alpha-coefficients for the entire scale and three subscales for the student part of the SSSRL ranged from 0.75 to 0.92; for the teacher part from 0.64 to 0.88 (see Table 2).

The In-Service Course

In the manual *Self-regulated learning in secondary education: Teacher's manual* (Beems, Gerrits, Op de Weegh, & Veenman, 1996), three groups of regulation strategies are discussed: regulation strategies before learning (orienting and planning), regulation strategies during learning (monitoring and regulating), and regulation strategies after learning (testing, repairing, feedback-seeking, and evaluating). The choice of these strategies was mainly based on the work of Simons and De Jong (1992) and De Jong (1992). The manual consists of two sections. In section one, the importance of metacognitive knowledge and self-regulated learning are discussed. Self-regulated learning is defined as learning in which the students perform the learning functions themselves. The relevant regulation strategies are illustrated using learning material from textbooks for secondary-school students. In section two, the way in which teachers can teach their students self-regulation strategies are considered. Examples for each regulation strategy are provided. A learning heuristic for self-regulated learning is also presented in the form of a flow chart containing several of the processes to execute when regulating one's own

learning (e.g., see what you have to do; make a plan; see whether you understand it; if not, see what you do not understand; and so on).

The content of the manual constituted the basis for four workshops. During the workshops (provided by an experienced teacher from the CPS), attention was paid to the content of the manual and the teacher's role in self-regulated learning. The training process was guided by the recommendations of Joyce and Showers (1995) and Sparks (1983) for effective staff training. The components of the training were: (1) presentation of theory; (2) modelling or demonstration; (3) practice (with peers); (4) feedback and (5) discussion and exchange of experiences. For logistical reasons (budget, time constraints), coaching as a form of assistance in the classroom could not be realised. In general, each workshop lasted three hours and was provided directly after school.

Data Collection

Before the start of the in-service course, each teacher was observed during one lesson (January - February 1996). After the course had been followed, each teacher was again observed for one lesson (April - May 1996). In the same periods, the SSSRL was administered in the classes of the participating teachers. The in-service course on self-regulated learning was conducted between February and April 1996. The evaluation questionnaires were distributed to all of the teachers who participated in the course on self-regulated learning.

The scores for the OSSRL and the SSSRL were averaged to test for differences. These scores were computed for the entire scales and the different subscales. A level of significance of 5% was used (one-tailed). The unit of analysis was the teacher or the student. For a more detailed description of the design, instrumentation and collection of data, see Beems, Gerrits and Op de Weegh (1997).

Results

When comparing the ratings of the trained observers and the students for the

treatment and control groups prior to training, no significant differences were found for the scores on the Observation Scale for Self-Regulated Learning (OSSRL) and the Student Scale for Self-Regulated Learning (SSSRL).

A one-tailed *t*-test for paired samples was used to examine the differences between the pre- and post-test data for the treatment and control groups. Independent one-tailed *t*-tests were used to examine the gain-scores (post-test scores minus pre-test scores) for the trained versus untrained groups.

A summary of the OSSRL scores from the trained observers and the results of the *t*-tests are presented in Table 1. The data displayed in this table show the course on self-regulated learning to not affect the use of regulation strategies by the trained teachers for the most part. Significant differences between the pre- and post-test scores for the treatment teachers were found for the total mean score on the OSSRL ($p < .05$) and for the subscale "regulation strategies during learning" ($p < .05$). No significant differences were found for the subscales "regulation strategies before learning" and "regulation strategies after learning." On average, the treatment teachers were found to use the regulation strategies during learning more effectively at post-test than at pre-test. No significant differences between the pre- and post-test scores for the control teachers were found for the total mean score on the OSSRL or the three subscales.

With regard to the individual items of the OSSRL, the post-test performance of the treatment teachers appeared to be better than their pre-test performance on only one item of the subscale "regulation strategies during learning," namely "the teacher stimulates the students to solve their problems by themselves" ($p < .05$). The same outcome was found for the control teachers, however.

When the gain scores for the treatment teachers are compared to those for the control teachers (see Table 1), no significant differences were found for the total mean score and the three subscales from the OSSRL. Only one significant difference in favour of the treatment teachers was found for the item "the teacher stimulates the students to define their own problems" ($p < .05$). Compared to the control teachers, the treatment teachers were not rated more effective in the use of regulation strategies.

In Table 2, the SSSRL results from the students of the treatment and control

teachers are presented. For the student part of the scale, no significant differences between the pre- and post-test scores for the treatment teachers were found. At post-test, the control teachers scored lower on the subscale "regulation strategies during learning" (p <.05) than at pre-test. For the teacher part of the scale, significant differences between pre- and post-test were found. The total mean score and the scores for the subscales "regulation strategies before and after learning" were lower at post-test than at pre-test for the treatment teachers; the total mean score and the scores for the subscales "regulation strategies before and during learning" were also lower at post-test than at pre-test for the control teachers, however (p < .05). When the ratings of the treatment teachers by the students are compared to the ratings of the control teachers using gain scores, no significant implementation effects were found for the total mean SSSRL score or the three subscales.

The results from the evaluation questionnaire (see Beems, Gerrits, & Op de Weegh, 1997) suggest that the manual was rated as fairly valuable because it provided concrete illustrations of how to implement the particular regulation strategies in a variety of subject areas. The four workshops were rated as moderately valuable. As the teachers found the first two sessions to be too theoretical, more practical guidelines and concrete examples were provided in the later sessions.

Discussion

The results of the present study suggest that the in-service program on self-regulated learning had little or no effect on the application of regulation strategies by secondary-school teachers in the lower grades of the comprehensive school. No significant differences between trained and untrained teachers were found for the Observation Scale for Self-Regulated Learning and the Student Scale for Self-Regulated Learning.

A number of explanations for the minimal effectiveness of the in-service program are available. First, the training of the teachers may be too short in duration. Negotiations with the school administrators prior to training revealed that

only four workshops were feasible. Discussions with the teachers in retrospect showed that they needed more time to practice the desired self-regulation strategies. The training period, interrupted by two holidays (carnival and Easter), spanned a period of about eight actual school weeks. Most of the teachers did not find enough time to implement the self-regulation strategies in their classrooms. Some of the teachers complained that the classes appointed to them by the researchers to practice the self-regulation strategies were not very cooperative. If they had been allowed to select their own classes for practice, they would have chosen classes with which they are on good terms and thereby made practice easier. The results of this study show that treatment teachers who did apply the regulation activities in many lessons to score higher on the Observation Scale for Self-Regulated Learning than the treatment teachers who did not apply the regulation activities in their lessons or who applied these activities only a few times ($p < .01$). This finding suggests that if teachers had found time to practice the self-regulation strategies in their classrooms, the training program might have been more successful. Future executions of the training program should provide teachers with enough time for practising the self-regulation strategies by enhancing the number of workshops and by making its exercises as practical as possible. In discussing the findings of this study with the teachers, all of the teachers subscribed to the importance of student-regulated learning. Although they were unable at this moment to implement the acquired self-regulation strategies at a satisfactory level in their lessons, they planned to continue their efforts to implement the strategies in the future. All of the teachers agreed that they had greater insight into the characteristics of self-regulated learning.

A second explanation for the failure to find a clear training effect may be the generally passive character of student learning. Most of the teachers reported that their students approached learning rather passively. A study by De Jong and Simons (1990) shows some students to think that self-regulated learning requires too much effort or energy. Students who do not believe that they are able to learn in a self-regulated manner and reach acceptable or even better results may not even try to engage in it. In this situation, the teacher takes over the metacognitive learning functions, prepares and regulates students' learning.

A third explanation for the minimal effectiveness of the in-service program may be that the workshops were conducted after school. After a hard day's work, most of the teachers were too tired to pay full attention to the content of the workshops and the exercises. Many of the teachers arrived too late. The rate of absenteeism was high. Only 44% of the teachers attended all four of the workshops. Future in-service activities should thus be conducted primarily during the normal working hours for the teachers.

A fourth explanation for the minimal effectiveness of the training program may be found in the fact that the training on self-regulated learning was the last part of the Dutch adaptation of the program *Dimensions of Learning* (Marzano, 1992; Marzano et al., 1992) from the Association for Supervision and Curriculum Development. The original American program consists of five dimensions: positive attitudes and perceptions about learning; acquiring and integrating knowledge, extending and refining knowledge; using knowledge meaningfully; and productive habits of mind. The dimension on productive habits of mind in the original program was replaced by a section on self-regulated learning and given a new content based on the work of Dutch researchers such as De Jong and Simons (1990) and De Jong (1992). As the last part of a more comprehensive program, the content of the training did not include the full range of important self-regulation strategies. An important characteristic of self-regulated learning, for example, is a focus on the metacognitive aspects of learning (Paris & Ayres, 1994; Schunk, 1991; Winne, 1995), which include declarative knowledge, procedural knowledge and conditional knowledge. Put differently: self-regulated students understand what strategies are available to help them, how these strategies operate and under which circumstances certain strategies apply. The systematic application of this declarative, procedural and conditional knowledge was not addressed in the training because the topic will be discussed in the first four parts of the Dutch adaptation of the program *Dimensions of Learning*. In the future, consideration of self-regulation strategies will be integrated into a more comprehensive training program which also includes consideration of declarative, procedural and conditional knowledge. It may then be hypothesized that this comprehensive program will be more effective than a single, isolated part of such a program.

In conclusion, it can be argued that if the workshops on self-regulated learning are integrated into a more comprehensive program, fusing self-regulation strategies with metacognitive aspects of learning and motivational orientations, and the workshops are conducted under more favourable conditions, these workshops can help teachers promote student-regulated learning. It is important that teachers participate in these workshops as members of a team. In this study, the teachers came from different departments and grade levels. In retrospect, the teachers remarked that the training would have been more successful if they had participated as a member of a team (i.e., department, grade level). This view is supported by Joyce and Showers (1995), who found that when faculties volunteer as a whole and teachers operate in small peer-study groups that allow them to share the learning process and support each other through peer-coaching, teachers are able to implement new teaching strategies in long-lasting ways. In the conduct of the Dutch version of *Dimensions of Learning* in the near future, small peer-study groups and coaching will be used to maximise the effectiveness of the program.

Acknowledgements

The research reported here was supported by the Protestant Educational Advisory Centre (CPS), Amersfoort. The authors gratefully acknowledge the following people for their contributions to this study: G. de Boer (CPS), B. Pruijt (CPS), L.Bouts (RTD KUN), F. de Jong (KUN), and also the participating schools, teachers and students. Gabby Op de Weegh is currently a staff member at the Royal Netherlands Military Academy, Breda, The Netherlands.

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Appendix

Examples of items from the *Student Scale for Self-Regulated Learning (SSSRL), Part One*:

When I start on a new assignment, I think about the best manner for doing the assignment. (before learning)

Before I start to read a text, I quickly look through the entire text. (before learning)

During learning, I ask myself what I am doing. (during learning)

During the reading of a text, I sometimes no longer know what the text is about. (during learning)

When I am done with an assignment, I consider whether I would tackle the assignment in a different manner or just the same manner the next time. (after learning)

When I notice that I do not know something very well, I study it one more time. (after learning)

Examples of items from the *Student Scale for Self-Regulated Learning (SSSRL), Part Two:*

The teacher tells me what I must do before I start on an assignment. (before learning)

The teacher tells me how I can best tackle the assignment. (before learning)

The teacher tells me that I must check to see if I am doing what I planned to do

when doing an assignment. (during learning)

When I run into a problem while doing an assignment, the teacher encourages me to solve it myself. (during learning)

When I am done with an assignment, the teacher first lets me check whether the solution is right. (after learning)

The teacher lets me, after finishing an assignment, say what I did to complete the assignment. (after learning)

TABLE 1

Mean ratings by trained observers on variables from the Observation Scale for Self-Regulated Learning (OSSRL), results of t -test on differences between pre- and post-test data, and on pre-post gain scores for treatment and control teachers

OSSRL/subscales/items	Treatment group				Control group				Pre-post gain				
	Pre-test		Post-test		Pre-test		Post-test		Treatment		Control		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*t*
OSSRL total (19 items, α = .85)	1.4	0.3	1.7*	0.6	1.5	0.3	1.5	0.3	0.3	0.7	-0.0	0.4	1.9
Subscale self-regulation before learning (6 items, α = .80)	1.6	0.5	1.9	0.9	1.7	0.6	1.6	0.4	0.2	0.9	-0.1	0.6	1.3
The teacher stimulates the students to examine exactly what they must do ahead of time.	2.1	1.0	2.6	1.2	1.9	1.3	2.1	1.3	0.5	1.6	0.3	1.1	0.5
The teacher stimulates the students to think about the manner in which they can best tackle the assignment ahead of time.	1.7	1.0	1.6	1.1	1.9	1.4	1.3	0.7	0.0	1.4	-0.6	1.7	1.1
The teacher stimulates the students to consider what supplemental materials they will need ahead of time.	1.5	0.9	1.6	1.1	1.7	1.0	1.9	1.0	0.1	1.3	0.1	1.5	-0.1
The teacher stimulates students to determine what they are going to do ahead of time.	1.6	1.1	2.1	1.4	1.3	0.7	1.3	0.7	0.4	1.6	0.0	1.1	1.0
The teacher stimulates students to consider the order in which they are going to work ahead of time.	1.6	1.1	1.7	1.2	1.8	1.1	1.6	0.9	0.0	1.4	-0.2	1.5	0.5
The teacher stimulates students to determine how much time they are going to take to complete the assignment ahead of time.	1.4	0.8	1.4	1.1	1.4	0.9	1.1	0.5	0.1	1.3	-0.3	1.1	1.0
Subscale self-regulation during learning (5 items, α = .61)	1.7	0.6	2.3*	1.0	1.7	0.4	1.8	0.7	0.6	1.0	0.1	0.5	1.9
The teacher stimulates students to check their understanding of the relevant material during the completion of an assignment or learning of a text.	2.4	0.9	2.3	1.2	2.6	0.9	1.9	1.0	-0.1	1.3	-0.6	1.2	1.3
The teacher stimulates students to check what they are doing during the completion of an assignment or learning of a text.	1.8	1.4	2.5	1.6	1.6	1.2	2.1	1.5	0.7	1.9	0.5	1.8	0.4
The teacher stimulates students to define their problem.	1.4	0.8	2.3	1.8	1.5	0.9	1.4	0.9	0.9	1.7	-0.1	1.0	2.5*

OSSRL/subscales/items	Treatment group				Control group				Pre-post gain				
	Pre-test		Post-test		Pre-test		Post-test		Treatment		Control		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*t*
The teacher stimulates students to solve the problem on their own.	2.1	1.5	3.2*	1.8	1.6	0.9	2.6*	1.5	1.1	2.2	0.9	1.0	0.4
The teacher stimulates students to ask themselves whether they now understand everything.	1.0	0.2	1.2	0.7	1.1	0.5	1.0	0.0	0.2	0.8	-0.1	0.5	1.5
Subscale self-regulation after learning (8 items, $\alpha = .81$)	1.1	0.1	1.2	0.6	1.3	0.4	1.2	0.3	0.1	0.6	-0.1	0.5	1.1
The teacher stimulates students to check what they do not understand after completing an assignment or learning a text.	1.2	0.5	1.1	0.4	1.1	0.5	1.1	0.5	-.01	0.4	0.0	0.0	-1.0
The teacher stimulates students to check exactly what was wrong after completing an assignment or learning a text.	1.0	0.2	1.3	0.8	1.1	0.5	1.3	1.1	0.2	0.8	0.1	1.2	0.3
When students do not understand part of a text after learning the text, the teacher stimulates them to consider how they are going to adequately complete the assignment after learning the text.	1.0	0.0	1.3	0.8	1.1	0.5	1.6	1.5	0.3	0.8	0.5	1.6	-0.4
The teacher stimulates students to check on their own what went well and what went less well after the completion of an assignment.	1.2	0.8	1.4	0.9	1.6	1.3	1.2	0.6	0.2	1.3	-0.4	1.5	1.1
The teacher stimulates students to determine for themselves what they will do the same and what they will do differently the next time.	1.3	0.7	1.2	0.6	1.7	1.5	1.4	0.5	-0.2	1.0	-0.6	1.2	1.1
The teacher stimulates students to check whether they have adequately gone through all steps upon the completion of an assignment or learning of a text.	1.0	0.0	1.1	0.4	1.1	0.5	1.0	0.0	0.1	0.4	-0.1	0.5	1.4
The teacher stimulates students to evaluate the steps that were followed after the completion of an assignment or learning of a text.	1.0	0.0	1.1	0.6	1.1	0.5	1.0	0.0	0.1	0.6	-0.1	0.5	1.4
The teacher stimulates students to use the heuristic for self-regulation (flow chart).	1.0	0.0	1.3	1.1	1.0	0.0	1.0	0.0	0.3	1.1	0.0	0.0	1.4

Note: Treatment group $n = 25$; control group $n = 14$. Means for the ratings are based on a five point scale: 1 = no application of the skill, 5 = clear apllication of the skill. *M* = Mean, *SD* = standard deviation. * $p \leq .05$.

TABLE 2

Mean ratings by students from the Student Scale for Self-Regulated Learning (SSSRL), results of t -test on differences between pre- and post-test data, and on pre-post gain scores for treatment and control students

Scale/subscales	Treatment group				Control group				Pre-post gain				
	Pre-test		Post-test		Pre-test		Post-test		Treatment		Control		
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*t*
SSSRL part 1 total: student use of regulation strategies (37 items, α = .92)	3.2	0.6	3.2	0.6	3.2	0.5	3.1	0.6	-0.0	0.7	-0.1	0.6	0.8
Subscale self-regulation before learning (10 items, α = .75)	2.8	0.7	2.8	0.7	2.8	0.7	2.8	0.7	-0.0	0.8	-0.0	0.8	-0.6
Subscale self-regulation during learning (11 items, α = .77)	3.4	0.6	3.4	0.7	3.3	0.6	3.2*	0.6	0.0	0.7	-0.1	0.7	1.7
Subscale self-regulation after learning (16 items, α = .86)	3.3	0.7	3.3	0.7	3.3	0.6	3.2	0.7	-0.0	0.7	-0.1	0.7	0.8
SSSRL part 2 total: teacher use of regulation strategies (15 items, α = .88)	2.9	0.7	2.8*	0.8	3.0	0.8	2.9*	0.9	-0.1	0.8	-0.1	0.7	0.2
Subscale self-regulation before learning (4 items, α = .65)	3.2	0.9	3.1*	0.9	3.3	0.9	3.1*	1.0	-0.1	1.0	-0.2	1.0	0.3
Subscale self-regulation during learning (4 items, α = 64)	2.8	0.8	2.8	0.9	2.9	0.8	2.8*	0.9	0.0	1.0	-0.1	0.9	1.8
Subscale self-regulation after learning (7 items, α = .78)	2.9	0.8	2.8*	0.9	2.9	0.8	2.9	0.9	-0.1	0.9	-0.0	0.9	-1.0

Note: SSSRL treament group $n = 587$; SSSRL control group $n = 324$. Means for the ratings are based on a five point-scale: 1 = no application of the skill, 5 = clear application of the skill. *M* = Mean, *SD* = standard deviation. * $p \leq .05$

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I. DOCUMENT IDENTIFICATION:

Title: Self-regulated learning: Effects of a training program for secondary-school teachers	
Author(s): Veenman, S., Beems, D., Gerrits, S. & Op de Weegh, G.	
Corporate Source: University of Nijmegen	Publication Date: August, 26, 1997

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Printed Name: Dr. Simon Veenman	Organization: University of Nijmegen
Address: Dep. of Educational Sciences, Spinoza Hall 4.27, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands	Telephone Number: +31 (24) 3612585
	Date: October, 1, 1997