LEERSTIJLEN EN STUREN VAN LEERPROCESSEN IN HET HOGER ONDERWIJS

Naar procesgerichte instructie in zelfstandig denken

PROEFSCHRIFT

ter verkrijging van de graad van doctor aan de Katholieke Universiteit Brabant, op gezag van de rector magnificus, prof. dr. L.F.W. de Klerk, in het openbaar te verdedigen ten overstaan van een door het college van dekanen aangewezen commissie in de aula van de Universiteit, op vrijdag 9 oktober 1992 te 14.15 uur,

door

Johannes Dominicus Hyacinthus Maria Vermunt

geboren te Breda.

SWETS & ZEITLINGER B Y AMSTERDAM / LISSE
Summary

The ability to learn independently is becoming more and more an obstacle for a successful school career. Metacognition appears to play an important role in that framework. Flavell introduced this concept as the knowledge about one's own cognitive processes and as the regulation of those processes. The importance of the regulation component is especially emphasized by Brown et al. What she has in mind is the student's tuning as efficiently and effectively as possible of learning activities, student characteristics, task demands and material characteristics. Kluwe, too, emphasizes the regulation component, but he sees it more as an 'executive control' process, with a limited accent on reflective awareness.

This dissertation joins the metacognitive points of view described above. However, the importance of the affective and motivational components of the learning process are emphasized more than has been done by the authors mentioned. Moreover, the student's responsibility for his own learning process is accentuated, i.e. he must be able to intervene in his own learning process in a constructive, cumulative and purposeful way on the basis of metacognitive knowledge, 'executive control' feed-back and judgements.

From studies described in chapter 1 it appears that the older, more gifted or successful the students are, the better they orientate on assignments, organise their learning processes and guard the effectiveness of their learning activities. Because little process-oriented research has been done with regard to individual differences in the regulation of learning processes the regulation processes in question have seldom been described in terms of concrete regulation activities.

This dissertation is, among other things, an attempt to fill that gap. Therefore, my working definition of the concept of metacognition has been: Metacognition comprises the concrete, perceptible cognitive activities the students use to orientate on a learning task, to guard their learning process, to test, to diagnose and to direct during performing a learning task.

The question in two explorative studies concerned the quantitative and qualitative differences between successful and less successful first-form secondary-school students with regard to their use of regulation processes and regulation activities. Also examined was the connection between regulation processes and regulation activities on the one hand and learning results on the other.

In six other studies the question concerned the stimulation and/or improvement of the self-regulation process by means of training. Also examined was whether the training influenced the learning results.

64 and 36 students, respectively, participated in the two studies described in chapter 2. Students studied a list of 40 English words and their Dutch equivalents (reproduce), an informative text about burns or hair growth (reading...
comprehension), a text about probability calculus (problem solving) and an
instruction text about the keyboard or the
editor of a personal computer (application). Both studies comprised the analysis
of about 675 thinking-aloud protocols in total with a length of 15 to 30 minutes
each.

First the thinking-aloud method is gone into. This method was used to register the
regulation processes and activities. It was examined whether the verbalisation of
thoughts is stimulated by giving a clear explanation of thinking-aloud (specific
instruction) and/or by putting symbols in texts as a hint to think aloud.

Giving specific instruction had no effect on the amount of verbalisations. The use
of symbols, on the other hand, resulted in more verbalisations, but also in
students verbalising more irrelevant and already verbalised spontaneous
thoughts. The specific instruction and the use of symbols had no effect on the
learning results.

A clear explanation of the thinking-aloud method and training the ability to think
aloud appear, for the time being, the best way to stimulate the verbalisations of
thoughts.

From correlation analyses it appeared that the analysis scheme used produced
little difference between analysers. Correlations between regulation activities and
study time indicated that the regulation activities identified and assimilated into
the scheme were not epiphenomena. The conclusion can be that the
thinking-aloud method is a valuable instrument for analysing students’
self-regulation process.

From statistical analyses of the thinking-aloud data it appeared with regard to the
theme of self-regulation that:

— students with a high cito-level (performance in a national examination)
or with high results for the learning tasks in question used regulation
activities more often than students with a lower cito-level or with low
results;

— regulation activities in which successful and less successful students differ
were dependent on the learning task they had to study;

— the use of a number of regulation activities appeared to be dependent on
the demands of the learning task (such as reproducing, gaining insight,
solving (probability) problems, applying information);

— the use of other regulation activities was dependent on certain text
characteristics (difficult and strange words, practice exercises, table of
contents, schemes and tables, etc.).
the use of regulation activities explained a large amount (19 to 60 per cent) of the variance in learning results;

— the regulation processes 'Process monitoring', 'Directing' and 'Testing' appeared to be important determinants of the differences in learning results;

— sets of regulation activities better explained the differences in learning results than students' cito -scores, fear of failure, concentration parameters, action orientation and situation orientation.

The conclusion can be that the self-regulation process of successful students qualitatively and quantitatively differs from that of less successful students. Differences in learning results are connected with differences in the use of regulation activities. Differences in self-regulation constitute a better explanation for differences in learning results than certain student characteristics.

In chapter 3, several intervention studies in which regulation strategies are taught are described and categorised on the basis of the division of learning environments described by Pressley et al. This concerns the division into discovery learning, guided discovery learning, observational learning, guided participation, strategy instruction through books and courses, direct explanation and dyadic instruction. The first four accentuate the spontaneous, implicit learning of regulation strategies. The last two accentuate the explicit learning of regulation strategies. The transition from one accent to the other is represented by the intermezzo in which blind, informed and self-regulation instruction is gone into.

From the categorisation it appeared that teaching regulation processes and regulation activities leads to the best results with dyadic instruction (responsive social-interactive learning environment). It also appeared that 'scaffolding', role-changing instruction, overt verbalization (inner-speech) and self-regulation instruction best promote the transfer of self-regulation processes and regulation activities.

Six intervention studies are reported on in chapter 4. A heuristic of the self-regulation process developed on the basis of the results of the exploratory studies constituted the basis for the training. The heuristic consisted of three representation levels. The first level consisted of a flow chart with imperative propositions. On the second level the first level is represented by questions students can ask themselves. On the third representation level the questions are worked out into information blocks about what is meant, how to solve the questions (tips and activities) and why such questions should be asked and answered. Learning results were measured by the scores to the tests belonging to the learning task. The change in students' self-regulation process was measured by the analysis of thinking-aloud protocols.

26 first-form vwo -students participated in the first study. The training was integrated into the extra homework for mathematics and came close to a dyadic
instruction. Students who took part in the training had more metacognitive knowledge after the training. They more often tested the progress of the learning process by paraphrasing and by checking the solutions to practice exercises. They performed better on the training exercises than students who did not take part in the training and only did extra practice exercises (control students). The more the training advanced, the smaller the differences between their learning results became compared to those of the control students.

In contrast with the vwo-study the other studies comprised computer-assisted training. Students had the opportunity to consult the different levels of the heuristic (the 'Learning Aid’) at any moment. Students were stimulated all the time to ask themselves questions leading to regulation activities. The 'Learning Aid' itself also intervened and did so of its own accord. These interventions were aimed at stimulating orientating, process-monitoring, directing and testing activities. They consisted among other things of asking reflective questions about the students’ own learning process linked to confrontations with results from the concerning learning process. It furthermore consisted of questions aimed at insight in the self-regulation process, activations to read certain levels of the heuristic, and presenting hints on the monitor to stimulate regulation activities. Interventions took place at certain moments in the learning process, on the basis of students’ answers to questions about their learning process or its progress, and on the basis of either consulting the heuristic or not.

From the study with 24 primary-school students (seventh and eighth form) it appeared that the students more often used the regulation activity 'Rereading a word’ after taking part in the computer-assisted training. Taking part in the computer-assisted training individually or pairwise had no effect on the results.

From the two studies with 20 ilo-students and 40 lto-students, respectively, it appeared that these were not more skilful in regulating their learning process after the computer-assisted training than students who had read the texts without help. In contrast with the ilo-students the lto-students performed better on the posttest after the training than students who had not taken part in the training.

After acknowledging the results of the three latter studies the training was integrated into the homework for the programme 'Main Idea' which was given to 40 ilo/las-students. This did not have the effect that the students more often used regulation activities after the training. However, they did have more metacognitive knowledge than students who did not take part in the training.

In the last intervention study the training was given to 41 first-form meao-students. In contrast with the other intervention studies, changes in the regulation process were measured by means of questionnaires: Huiswerkaanpakvragenlijst Tilburg (havt, homework approach questionnaire) en de Inventaris Leerstijlen (ils, inventory learning styles). meao-students taking part in the computer-assisted training had more metacognitive knowledge after the training, were more action-orientated, more action-regulation-orientated and less situation-orientated. Their learning conceptions tended more towards
self-regulation and less to ***aimlessness***. Less successful students profited more from the training. They performed better on the posttest, compared to the results of the pretest. This is in contrast with the successful students.

On the basis of the intervention studies with vwo - and meao -students the conclusion can be that self-regulation consists of processes and activities that can be stimulated and/or taught. The training influenced their handling of regulation activities and their learning style and tended towards better learning results. With students with bigger learning problems the training did not yield, for the time being, convincing positive results. Level of intelligence, of learning and of development of cognitive and/or reading skills are primarily seen to be the explanatory factors.

Chapter 5 deals with an unusual way of data analysis within psychology, viz. concordance analysis. This analysis has been applied to determine in another way the task dependence and individual differences in handling series of regulation activities. In contrast with the testing analyses this analysis technique has the advantage that the temporal succession of the activities remains as it is. The results support the findings resulting from the testing analyses.

Only few identical series of regulation activities appeared to exist in all four learning tasks. The way in which learning and regulation activities succeeded one another appeared to be highly dependent on the learning task. Moreover, successful students appeared to handle regulation activities much more flexibly than less successful students, especially during learning vocabulary.

The results with regard to the thinking-aloud method, differences in students' self-regulation processes and the intervention studies are discussed in chapter 6.

Thinking aloud is seen as a suitable research method for the exploration of (meta)cognitive processes and activities. Furthermore, it is stated that it is better not to use symbols and that a clear instruction and habituation to the method are more effective.

With regard to the theme of self-regulation it is noted that the research results give cause for assuming a connection between the use of regulation activities and learning results. Furthermore, it is concluded that both successful and less successful hardly orientate themselves on a learning task and hardly plan their learning activities. Students have a probleem-orientated learning style. They only regulate their behaviour when problems occur during learning. This is fatal for less successful students, because they handle less regulation activities and the interaction of regulation activities and task, text and student characteristics is less developed with them than with successful students. A research framework is proposed (the 'regulation cube') to analyse further that interaction process. Prescriptions can be deduced from the descriptions resulting from such research, and these prescriptions could support teachers and curriculum designers in making explicit regulation behaviour and in curricula aimed at promoting learning to regulate and/or to learn.
The disappointing training results with ilo - and lto -students, in contrast with the results with vwo - and meao -students, are attributed to too little attention the programmes had for the affective components of the learning process.

Future research would have to check whether interventions have more effect on students with learning problems if the interventions stimulate the correct attribution of learning results and emotionally-coping behaviour and if they try to bend the result orientation from students to process orientation. Within that framework it is worth the trouble to check what the profit of the 'Comprehensive Interaction-Dynamic Strategy' is with anticipating negative learning experiences. Developing a less time-consuming and labour-intensive instrument to diagnose the students' self-regulation process is not only to the benefit of such research, but also to the development and evaluation of educational programmes.

It is also important to investigate systematically the interactions between text characteristics, student characteristics, task demands and regulation activities. It is furthermore important to examine how skills can best be passed on, skills which promote that students actively construct knowledge and flexibly use this knowledge in different situations.

Finally, the important role the teacher can play during learning self-regulation skills is gone into and a number of suggestions is made for the educational practice.

Learning skills that enable people, in ever-changing situations, to restructure their knowledge and insights and to acquire new knowledge and to integrate it is of crucial importance to a successful learning process.