

New learning: three ways to learn in a new balance.

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Abstract

Because people are learning all the time, we need criteria that can help us distinguish between better and worse kinds of learning. Organizations and societies as well as the psychology of learning ask for new learning outcomes, new learning processes and new forms of instruction. New learning outcomes as described by politicians and company representatives refer to outcomes that are durable, flexible, functional, meaningful, generalizable and application-oriented. Furthermore, new kinds of learning outcomes are generic outcomes like learning-, thinking-, collaboration and regulation-skills. In order to be able to reach the new learning outcomes mentioned above, new kinds of learning processes are needed: active, cumulative, constructive, goal-directed, diagnostic, reflective, discovery oriented, contextual, problem oriented, case based, social and intrinsically motivated kinds of learning. The first six of these have to do with action learning and the other six with experiential learning. Learning and instruction models for guided learning, action learning and experiential learning are described. It is concluded that a new kind of balance between guided learning, action learning and experiential learning is needed. For new instruction this means on the one hand more emphasis on action learning and experiential learning, on the other hand it means the organization of process-oriented instruction: a form of instruction with integrated attempts to teach the learning, thinking, collaboration and regulation skills.

Introduction

People are learning all the time. They can not even stop learning. The one learning experience, however, is not the other. There are various kinds of learning. Are some forms of learning better than other? When we want to decide whether there are differences in the quality of forms of learning, we need criteria for good learning. How can we come to these kinds of criteria?

There are, in our view, two ways. The one is looking at society at large (and its problems) and deriving criteria for good learning from there. The other is looking at empirical research on learning and instruction and the theories that were developed. Fortunately, the two ways tend to agree in the outcomes. From both sides similar ideas are put forward that can be summarized in the term "new learning". It is the word a use for: new learning outcomes, new kinds of learning processes and new instructional methods that are both wanted by society and stressed in psychological theory.

New learning outcomes

New learning outcomes as described by politicians and company representatives refer to outcomes that are *durable, flexible, functional, meaningful, generalizable* and *application-oriented* (see also Engeström, 1994; Lodewijks, 1993). Moreover new kinds of generic outcomes are needed (see below). They should be *durable* in the sense that they remain over a long period of time. Instead of learning for today and tomorrow people should be learning for months, years or even lifetime. Learning outcomes should be *flexible* in that they can be approached from different angles and

perspectives. Flexibility relates to internal relational networks between knowledge elements that are approachable in an easy way. The *functionality* of learning outcomes refers to their "just in time, just in place" character: the results of learning should come to the fore at the right time and place. People should learn what they need at a certain time and place, not less not more. (Mellander, 1993). Learning outcomes should also be *meaningful*: real understanding of a few basic principles with far-reaching importance for understanding is more important than superficial understanding of many facts that become obsolete anyhow. Learning outcomes should be *generalizable* in the sense that they are not restricted to one context or situation but reach out to other contexts and situations. Finally, learning outcomes should be *application-oriented*: people should know the possible applications and their conditions of use: when and where is application of the learning possible or necessary.

Furthermore, new learning asks for new *kinds* of learning outcomes: generic outcomes like learning-, thinking-, collaboration and regulation-skills. Next to information these kinds of skills will be needed because of the information overflow and the exponential increase of information. It will be impossible and unwise to focus on "taking in as much information as possible". Instead, a focus on the skills of learning, thinking, collaboration and regulation should prevail. It is more what people can do with information than the information itself that becomes important. Finding ones way in the growing body of knowledge becomes more important than having many factual details in memory.

From the side of learning psychology the kinds of outcomes that are wanted follow from some theoretical assumptions about representations in memory (Simons, 1993). A distinction is made between three ways to represent information in memory: episodic representation where concrete happenings and narrative kind of information (with a date and a place) are represented; conceptual representation, where generalized meaning and relations are represented and action information where procedural, action-related information is represented.

Episodic representations are based on personal, situated and affective experiences with instances of the concepts and principles (like I love the little bird that I have at home). *Conceptual* (semantic) representations refer to concepts and principles with their defining characteristics (like a bird is an animal with feathers). *Action* representations refer to the things one can do with the semantic and episodic information: solving certain kinds of problems, using the knowledge (like birds can bring over messages).

Good learning outcomes have to do with rich and complex memory representations showing a high degree of connectedness (see Prawat, 1989). Memory representations have a high degree of connectedness when there are many and strong relationships between the elements of the representations. These occur within the three kinds of representations and between them. Strong relations between semantic, episodic and action knowledge refer to conceptual representations with strong relations with examples and concrete experiences or to episodic representations fitting in a well-understood meaningful context or practical action-representations with a firm base in theory. Ideally both the connections within these three kinds of representations and between them are rich and strong. Furthermore, also connections with the three kinds of knowledge representations in other domains are thought to be important. Good learning outcomes are those that realize these kinds of connected representations. In our view the kinds of memory representations and their relations with high degrees of connectedness realize the kinds of outcomes that come from societal needs as described above. Thus conceptual, episodic and action representations with high

degrees of connectedness and with strong interrelations produce durable, flexible, functional, meaningful, generalizable and application-oriented learning outcomes.

New processes of learning

What kinds of new learning processes are needed in order to reach the new outcomes described above? First we will look at three different ways to learn and their occurrence in schools, work and other contexts. We will conclude that there are changes in the emphasis on the three in different contexts. Then we will go into twelve characteristics proposed in the literature. Are all of these needed and desirable? How do these relate to the three ways of learning?

Three ways to learn

In our view there are three different ways to learn: guided learning, experiential learning and action learning. They differ in many respects from each other and they may produce slightly different kinds of representations. These three ways to learn can be compared with three different ways to undertake a journey: travelling, trekking and exploring.

In organizing a collective *travelling* journey the guide is an expert who knows the way and who plans a trip. The guide tells about the various parts of the trip and acts as the decision-maker. What are important success-factors for such a trip? In analogy with a description by Schweiker (1993) the following factors may be deduced. It is important that the leader or guide looks carefully to the wishes and needs of all travelers and to bring in their ideas in an early stage. They have to be asked where the journey should go to and commit themselves to the destination chosen. When the trip starts, it should be possible to start at different moments: some flexibility of starting times is important. During the trip the group should stay together, thus some coordination of tempo is important. During the trip the guide and scouts in the group should monitor how the group is proceeding: are they still on the right road? Is the destination still valued or should a change of route or destination be considered? They should also look for necessities to change the plans when changes in the environment occur.

Likewise in *guided learning* a trainer or teacher takes all the relevant decisions and the learner can and should follow him or her. He decides about the goals of learning, the learning strategies, the way to measure learning outcomes and he takes care of feedback, judgment and rewards. The learners should commit themselves to the decisions made and should follow and obey the trainer or teacher.

Success factors for guided learning are then:

- Taking differences in interests, prior knowledge and abilities into account.
- Good commitment to learning goals through good communication about it.
- Good communication about learning strategies.
- Tolerance for differences in starting speed.
- Co-ordination of tempo while on the way: keeping the group together; helping each other.
- Openness for new strategies, new goals through metacognitive control by the trainer and the participants
- Timing and quality of reward and judgment systems. What is measured and rewarded determines learning strategies.

In a trekking journey a group of people undertakes a trip without planning and organizing at forehand. One might think of a group of (young) people with their back-

bags, walking or biking together. If a group member doesn't like the group anymore (s)he goes to another group or continues alone, perhaps meeting the group somewhere later on. They just go away on a certain date without any concrete destination planned. They just go where they agree to go and let their plans develop underway, depending on the circumstances like the weather, the people they meet, their feelings and so on. The group wants to be as flexible as possible and does not like to plan and organize. The main idea is going together and having fun. People agree to inspire each other and negotiate about the next steps on a day to day base. All members should, however, be heard and their needs should be fulfilled now and then. There is no fixed leader or guide. Everyone can and will be a leader, depending on the expertise available. Finding harmony is the main decision model. The group is very open and listens carefully to other groups of trekkers. Though the group members should share the essential values that guide the journey, there may be many differences outside of the group-life.

Likewise in *experiential learning* it is not so much a leader or even a predetermined goal that controls the learning. Rather circumstances, personal motivation, other people, innovations, discoveries, experiments etc. determine what and how one learns. There is not even an explicit set of learning goals. Instead, learning is a side effect of the activities one undertakes.

Success factors in trekking kinds of experiential learning are in our view:

- Interests, knowledge and action-plans of participants are put central.
- There are no explicit or very vague learning goals only.
- Long-term higher-order generic goals are thought more important than short-term goals.
- Learning from experiences is the key strategy.
- Each learner can have his / her own tempo.
- Team learning from and with each other is important.
- Metacognitive control of activities by the learners themselves.
- Extreme flexibility for new strategies, new goals: experimentation and innovation
- Reward and judgment systems tuned to discoveries and innovations

Between travelling and trekking one might discern a third way to travel: *exploring* like pioneers who explore new land. It is not having fun that guides them (as with trekking), but the need to get to find a suitable surrounding to start a new life. There is a sense of urgency that determines the route and destination in a certain perspective. It is looking for a place that fulfils certain criteria.

Likewise, there is in *action learning* (Revans, 1982) a much more active and explicit role for learners and learning goals than in experiential learning. Learning is central and not a side-effect, but the learners themselves determine the goals of learning according to needs arising in their actions (at work or elsewhere). Learning is not pre-organized and preplanned by an outsider or expert, nor is it depending on coincidental intrinsic motivations. It is self-organized and self-planned. Learners determine furthermore their own ways of self-testing. Reflection plays an important role in finding out what was learned and what should still be learned. Thus instead of letting the trainers decide about the learning goals, learning strategies and testing, these factors become not unplanned and unorganized as in trekking, but learners decide on their own, and they do this explicitly.

For action learning trainers the following seem to be success factors:

- opportunities to determine ones own learning goals explicitly

- opportunities to choose ones own learning strategies
- control of learning by learners
- self-responsibility for their own learning
- opportunities to learn independently
- opportunity for self-testing

The three ways to learn occur in school-situations and training as well as in work and life situations. The division of time over the three ways, however, is different in the different contexts mentioned. At work experiential learning prevails, in schools and training, however, guided learning gets more accent. But all three occur in all three different contexts. In home situations probably action learning is more prominent. We see tendencies at in the three contexts of learning (school, work, and home) to stress one of the other two ways of learning. Thus, in schools there is a plea for more independent learning (action learning and experiential learning). At work there is a tendency to return to still more experiential learning after we had a decade of emphasis on guided learning (training and workplace instruction).

It can be shown that current changes and tendencies in learning and instruction processes in the different contexts have to do with a change in the division of tasks and of time between the three ways to learn (see below).

New learning processes

In order to be able to reach the new learning outcomes mentioned above, new kinds of learning processes are needed. we will discuss twelve characteristics of these new kinds of learning *processes as* proposed in the literature. Ideal learning processes, as described in the literature about constructivism, in the psychology of learning and in theories about powerful learning environments, are the active, cumulative, constructive, goal-directed, diagnostic, reflective, discovery oriented, contextual, problem oriented, case based, social and intrinsically motivated kinds of learning.

Shuell (1988) formulated the main characteristics of good learning:

"...(constructive) learning is an active, constructive, cumulative and goal directed process.... It is active in that the student must do certain things while processing incoming information in order to learn the material in a meaningful manner. It is constructive in that new information must be elaborated and related to other information in order for the student to retain simple information and to understand complex material. It is cumulative in that all new learning builds upon and/or utilizes the learner's prior knowledge in ways that determine what and how much is learned. It is goal oriented in that learning is most likely to be successful if the learner is aware of the goal (at least in a general sense) toward which he or she is working and possesses expectations that are appropriate for attaining the desired outcome."(p277-278).

Two further characteristics of new learning are, in our view, that it is diagnostic and reflective (Simons, 1997). This means that learners should undertake activities like monitoring, self-testing and checking that help them diagnose and judge whether they are still pursuing the goal they had set. Because teachers and trainers can not look into the heads of the learners and are always at a certain distance of them, both physically and psychologically, learners better take care of their own monitoring and testing at least partially. Moreover, it means that learners should be or become aware of their way of learning through reflection. By thinking about their (way of) learning they acquire metacognitive knowledge that will help them master future learning.

Some times good learning is very active indeed, but at other time the amount and quality of activity drops to lower levels. Nobody can stay active all the time: activity levels should vary. Perhaps very active learning periods and more passive ones should follow each other for learners to hold on for longer periods of time.

In a similar way good learning cannot be cumulative all the time. Some times prior learning confuses new learning so much that it is better to build a wall between the two (Simons, 1998). Moreover, if you do not have much prior knowledge in a certain domain it is impossible to learn cumulatively. Of course you may then use prior knowledge of a general nature or from other domains (analogies; Simons, 1981). Thus also the amount of cumulativity possible and desirable should and will vary across learning situations.

Furthermore, learners cannot learn constructively all the time. Sometimes you have to concentrate on the specific subject matter that you have to learn without elaborating and integrating too much. As shown by Pask (1976) some learners act as globetrotters, who go everywhere without finding a place to rest or stay: they relate everything with everything else and end in total chaos and confusion because they do not focus on details and procedures. They are too constructive in a way.

Also, learning cannot and should not be goal-directed all the time. Sometimes one should be satisfied with a global, general learning goal and let the learning environment guide your discoveries (See experiential learning above). Sometimes it is even impossible to have clear learning goals: if there is no teacher to help you formulate goals reachable in a certain amount of time, you can only know what goals are possible when you have become an expert in the field.

Of course learning cannot be diagnostic all the time either. If a learner spends all the time diagnosing his own learning he has no time to learn. Focusing too much on the state of your mind may even hinder learning, as Kuhl (1983) showed.

Finally, the argument also holds for our last characteristic reflectivity. In learning reflective periods should occur, but not continuously.

When we look carefully to the six characteristics, described before, one may see a remarkable thing: they all have to do with a shift of emphasis from guided learning to action learning: involving learners in the process of learning by involving them in the decision-making, monitoring and testing process.

Some other characteristics of good learning, to be found in the recent literature, are that learning is discovery- oriented, contextual, problem oriented, case-based, social, and intrinsically motivated.

Discovering knowledge and insights oneself, or learning in an inductive, inquiry instead of deductive receptive way, brings, according to the literature all kinds of positive effects, like intrinsic motivation, durability, transfer etc. Although discovery learning can be very powerful and constructive, the research and debates in the educational psychology of the sixties, has clearly shown that we should not confine learning to discovery learning alone. It is too time-consuming and inefficient (Ausubel, 1968). Discovery learning can have an important place in a sequence of learning processes (especially in the beginning phases to motivate and in the final stages when application is the goal of learning), but it should not be the only learning model.

Another characteristic of good learning is contextualization. Many instances of school learning are too much decontextualized and many improvements can and should be made as to the contextualization of school learning. Real-life and connections with applications are important aspects of good learning. Contextualizing knowledge representations with episodic and action representations are, however,

only two of many instances of good learning. Building strong connections within semantic, episodic or action representations form equally important instances. Furthermore, also forming connections between different domains of (semantic) knowledge are important examples. Experiences we had with on the job training, discovery learning and simulations, being learning environments with a high context binding, learned that here decontextualization instead of contextualization is the main problem. Under these circumstances learning is often not constructive because there is no decontextualization. Learning remains bound to the context of the simulation, or some job contexts. The consequence is that the resulting memory representations are inflexibly related to one or a few contexts only. The key problem is that there should be a balance between contextualization and decontextualization. Not the question whether there is contextualization and decontextualization, but their interrelations and their timing are the important issues in learning. Finally, we have serious doubts whether the sequence contextualization first and decontextualization afterwards, is the optimal sequence for all kinds of subject matter (see higher mathematics) and is the optimal one for all kinds of students (see also Prawat, 1989).

Good learning should be problem oriented and case -based. Problem orientation and organizing learning around cases clearly is good for contextualization and motivation. Problem orientation strengthens the connections between semantic and action representations. Cases connect episodic and semantic representations. It is doubtful, however, whether all learning should be and can be problem-oriented and case-based.

The position that good learning is social or even that only social constructions of reality are possible is strongly defended. Learning together with other learners can be a very powerful form of learning, in which learners help each other's construction processes. Many studies show how powerful social learning environments can be (see for instance Palincsar and Brown, 1984). In our view, however, and according to our experience, social learning can also be very ineffective and inefficient (see also Salomon, 1988). Some teams do not function the way they ought to. Some learners (for instance the author of this paper) prefer to learn without social support. Some contents and domains do not lend themselves for social learning (see for instance Biemans and Simons, 1991). Besides, people can also discuss and interact with themselves and be social in this way. Finally, social aspects of learning can also be built into teaching materials and computers.

The last characteristic to be considered is intrinsic motivation. Good learning can have some connections with intrinsic motivation, but many times it will not. Convincing arguments were put forward by Brophy (1988). It is not the kind of motivation that comes out of the materials and the environment that is the most important, but the motivation to learn. This means being motivated to find out certain things, to have a desire for knowledge, to like learning and to keep on learning even if its relevance is not immediately clear or when it gets boring.

The last six characteristics all have to do with a shift from guided learning to experiential learning, where the learner is active in the second sense of the term activity mentioned: undergoing important personal experiences, actively thinking, solving problems, finding out things, thinking about concrete cases and learning intrinsically. The first group of six characteristics thus involved a shift towards action learning and the second group towards experiential learning.

Are all these twelve characteristics needed all the time? No they are not. we tried to show that all of them separately could be important at some times, but that they also may be destructive for learning. In our view, it would also not be good if all learning

would fulfil all of these twelve criteria all the time. For all 12 it would be unproductive if all learning would be according to the criterion proposed. On the other hand the value of all 12 can also be shown. In order to reach the new outcomes, a shift towards the 12 process criteria may be needed, but not a total replacement of the old kinds of learning processes by the new learning processes. Instead a new balance between old and new learning is what we really need. This new balance can also be described as new kinds of balances between guided learning, action learning and experiential learning.

New instruction

New instruction should be aiming for the new outcomes of learning through the facilitation of the new learning processes in which a new balance between guided learning, experiential learning and action learning occurs. How can we facilitate the three forms of learning through instruction? How can we improve the processes of learning?

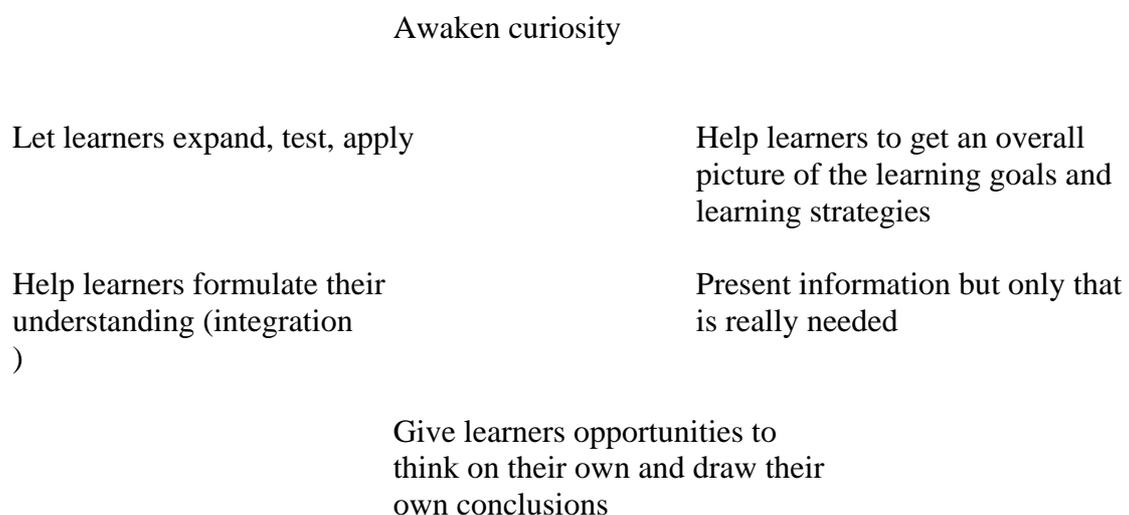
Instructional models for the three ways of learning

For guided learning we should help trainers and teachers to:

- make a good diagnosis of interests, prior knowledge and skills of participants
- communicate the goals to be reached and their relevance and involve learners in the choice
- communicate the learning strategies chosen and involve the learners in the choice
- deal with differences in starting speed
- keep the group together and let learners help each other
- be open for new strategies and new goals
- time rewards and judgment and to measure and reward what they really want to reach

At this point we would like to add six other trainer behaviors that are, in our view, important for guided learning. These are based on and deduced from a model of training that is a combination of the theories described by Mellander (1993) and Dixon (1994) (see Figure 1).

Figure 1: A model of training



Trainers and teachers should, according to this model, (be able to):

- awaken their learners' interest and curiosity
- give the course participants an overall picture at early stages of learning
- present only that information learners need and at the right time (when they are interested)
- give them opportunities to think on their own
- help them formulate their own understandings
- help them apply, expand, reinforce and experiment

When we want trainers to organize experiential learning they should (be able to):

- put interests, knowledge and plans of learners central
- have vague learning goals only: stressing higher order generic goals
- emphasize learning from experiences and on the job
- organize learning from and with each other
- tune reward and judgment systems to discoveries and innovations
- refrain from group testing
- be a group member
- be a coach for learning

The model for this experiential learning is depicted in Figure 2.

Figure 2: A model of experiential learning

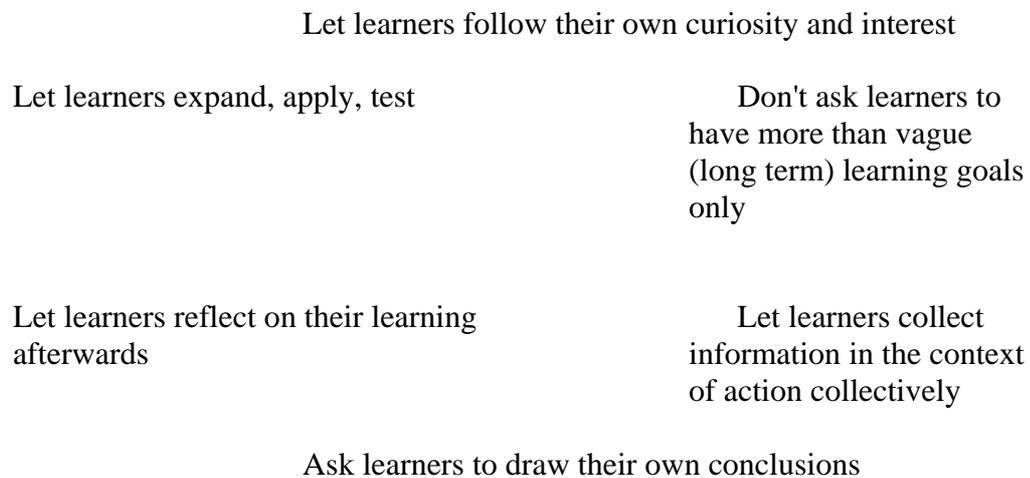
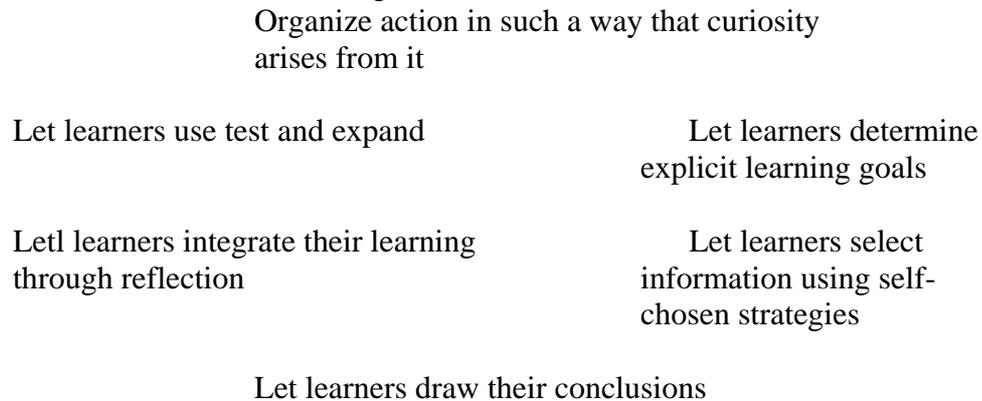


Figure 3 depicts the model of action learning. Trainers and teachers should (be able) to

- Organize activities that become the stimulus for explicit learning goals:
- Help learners to determine their own learning goals explicitly
- Help learners choose ones own learning strategies
- Leave the control of learning to the learners
- Hand over responsibility for learning to the learners
- Organize opportunities to learn independently
- introduce forms of self-testing

Figure 3: A model of action learning



Process-oriented instruction: what

Process-oriented instruction is instruction focusing on the further development of processes of thinking, learning and self-regulation of learning and thinking integrated in regular domain-specific instruction. Thus it is: integrated learning to think, integrated learning to learn and integrated learning to regulate learning and thinking. Moreover it is also learning to collaborate within instructional settings. Process-oriented instruction not only focuses on the kinds of general skills mentioned, it also tries to hand over responsibility for learning and teaching to the learner gradually. The more learning, thinking and regulation skills the learner acquires, the more freedom he gets to regulate his own learning and thinking. What kinds of skills are important? This question is treated in the current paragraph. The next one discusses how process-oriented instruction can proceed?

Learning to think

Two kinds of thinking skills can be discerned: general and discipline specific thinking skills. Examples of relevant general thinking skills are:

- analogical reasoning
- critical thinking
- logical reasoning

Discipline specific skills are skills that originate in specific domains, disciplines or subject matter areas. In history, for instance, there are some skills that relate to time and place of historical events: historians want students to consider the time and place dimensions of an event, almost as an automatism. Moreover, historical thinking and methodology stresses that one should always try to compare different sources and to take the perspective of the writer into account ("is the writer a king or a blue collar worker"?). In geography the correct analysis and interpretation of maps is a complex skill that resides close to the core of the discipline. In biology thinking in hierarchical schematic representations seems to be important. In foreign language learning it is important to take the culture of the country into account.

Learning to learn

There are various kinds of learning skills that could form the focus of process-oriented instruction: cognitive skills, metacognitive skills and affective-motivational skills. Examples of cognitive skills are deep learning strategies like comparing,

criticizing and structuring, overview skills like summarizing, schematizing, reviewing and generalizing and transfer skills like considering possible and necessary conditions of use. Examples of metacognitive learning skills are making a planning of times and strategies for learning, orientation on goals and outcomes, realistic goal-setting, regular checking and testing and finally restarting when problems occur and reflection on process and outcome.

Learning to collaborate

More and more co-operative jobs and tasks replace single ones. Learning to collaborate means acquiring skills like dividing tasks between group members, leading a group, learning together, monitoring group progress, defining group goals and group learning goals and creating a supportive climate.

Learning to regulate

Learning to regulate one's own learning and thinking means on the one hand having the learning, thinking and regulation skills that were described before. On the other hand it means a gradual increase of independence in learning and thinking. What we need is a systematic sequence of steps of increasing independence and a common set of words and concepts to denote these steps. In a previous publication Simons and Zuijlen (1995) proposed the following sequence: Working independently - Learning strategically - Self-directed learning. When working independently the learning goals, the learning strategy, the time and place of learning, the way of testing and feedback and judgement-procedures are fully determined by the teacher or learning environment. Students just have to fulfill assignments and learning will occur if and when they obey. When learning strategically, students have freedom of choice related to the learning strategy: what kinds of learning strategy to take, where and when learning takes place. The learning goals, ways of testing and feedback / judgement procedures, however, remain under teacher-control. In self-directed learning students have more freedom, for instance with respect to choice of learning goals, self-testing and or feedback / judgement procedures. Typically, in learning to regulate all these three kinds of independence should be taught: different kinds of skills are involved in each of them.

Gradual increase of independence

In beginning phases of teaching more emphasis should be laid upon learning to work independently, then how to learn strategically gets more attention gradually and finally, self-directed learning seems to be the most complex form of learning. This does not mean, however, that we should wait with the introduction of self-directed learning until strategic learning and the attached skills have been mastered fully. And similarly, it is, in our view, not necessary to wait with the introduction of strategic learning until independent working has been mastered. Instead, the main two principles of sequence should be a) that in beginning phases the simpler forms of independence should occupy more time than the more complex ones with a gradual increase of time for more complex forms; and b) more complex forms of independence can in the beginning phases of learning to regulate only be practiced with respect to themes where one has a relative high level of expertise. In other words in beginning phases there is more independent work and some strategic learning in relation to topics one has prior knowledge about. Later there comes more room for

strategic learning, also in relation to less familiar topics and some room for self-directed learning about familiar topics. Finally, there is also some self-directed learning related to unfamiliar themes.

The main motivational principle underlying all of these sequences is 'Freedom as reward': as long as a student shows that they can handle the freedom given, gradually more and more freedom of choice and regulation can be allowed. When students, however, misuse the freedom allowed they should be sent back to previous steps

A related and important question is whether students should work and learn in groups or individually. On the one hand one would think that it seems better to learn to work independently individually and then in groups (first in pairs then in bigger groups). After that one could learn to learn strategically individually and after that in pairs and bigger groups. Finally, students should then learn to learn in a self-directed way individually first and at last in pairs and groups. The sequence then would become:

1. Working independently a) alone - b) in pairs - c) in groups;
2. Learning strategically a) alone - b) in pairs - c) in groups;
3. Self-directed learning a) alone - b) in pairs - c) in groups.

There are, however, equally valid arguments, in our view for the opposite sequences. Learning to learn can be facilitated in groups as has been shown in reciprocal teaching procedures (Palincsar & Brown, 1984). New experimental evidence should clear this issue.

Process-oriented instruction: how

In process-oriented instruction the processes and skills to be learned are modeled, both by teacher and by fellow-students. This means that the important thinking, learning and regulation skills are made public, by demonstrating and discussing them with each other on a regular basis. One of the main obstacles to learning to learn and think is that these processes are hidden and remain invisible. Research shows that younger students take these processes for granted. They don't realize that people have many different ways to approach tasks. Moreover, they tend to believe that their own way is the only possible way. This has to change when one wants to teach learning, thinking and regulation skills. Fellow-students sometimes form better and more convincing models of learning, thinking and regulation than teachers, because they are better identification models and because their way of thinking is perhaps less automated and unconscious.

Furthermore, in process-oriented instruction teachers should be external monitors of the learning, thinking and regulation activities of students temporarily. As long as students are unable to monitor themselves adequately, the teacher should take this role for them and keep an eye on their processes. Through observations and questions the teacher tries to find out whether the processes are still on the right track, whether problems occur and whether students understand what they are doing.

Gradually, however, the teacher should withdraw these monitoring and other kinds of teacher control when students are ready. This is called scaffolding: after scaffolds have been built they can become the bases for new scaffolds to reach a higher part of the house that is being built. When parts of the house are ready, scaffolds can be removed.

Moreover, the process-oriented teacher should become a metacognitive guide of the students. This means trying to make them aware of their way of learning, thinking and regulation. It is only when they have this kind of metacognitive

awareness themselves that they can become self-regulators. Thus, the teachers's role is to help them develop this awareness.

Another role of teachers in process-oriented instruction is to organize positive self-evaluation by students. They should believe in themselves. They should believe that they could do it, because without this it is hard to learn and think independently. Orchestrating positive self-evaluation means to help students with goal setting: choosing goals that are reachable and still have a kind of challenge.

Of course, teachers should also provide for multiple opportunities to practice the various skills in various circumstances, getting lots of feedback, from fellow-students and from teachers. These practical applications should occur, preferably in authentic tasks: cases, simulations, real problems, in situ. First-hand experiences are very important.

Finally, students should be stimulated to reflect on their learning, thinking and regulation, both in action as well as on action. Reflection in action means reflecting during or immediately after task-execution, reflection on action means reflecting in a more general sense about one's actions in various circumstances.

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