

Chapter 10

THEORIES AND PRINCIPLES OF LEARNING TO LEARN

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The subject of this chapter is learning to learn. A theory is presented concerning learning functions and media that can be fulfilled either by teachers, books, or computers, or by the students themselves. From the viewpoint of learning to learn it matters who initiates and controls the learning functions. Interaction among teachers, expert systems, and adult learners influences the development of thinking and learning skills. In many situations, however, the desired patterns of interaction do not occur. If the goal is to increase the number of people who know and can apply the principles of learning how to learn then the fostering of learning skills and habits should form part of all teaching and learning situations. The main purpose of this chapter is to discuss some principles of an integrated approach to learning to learn.

Learning Functions

Shuell (1988) has defined learning functions as psychological functions to be performed by the learner. In his view it is not so much how the function is performed that is important, but that it is accomplished. There are, for instance, different ways of attracting the attention of students: by physically pointing, by using different colours, or by means of a verbal prompt. Furthermore, learning functions can be initiated by the teacher or by the learner. Expectations concerning learning outcomes, for example, can be specified by the teacher through instructional objectives or they can be initiated by the learner. Shuell distinguishes between 10 functions: expectations, attention, encoding, comparison, hypothesis generation, repetition, feedback, evaluation, monitoring, and what is termed "combination/integration synthesis".

Shuell's ideas considerably resemble those developed in this chapter. As can be seen from Table 10.1, his list of functions overlaps with our categorization of self-regulatory abilities. Expectation and attention correspond to our preparatory abilities. Encoding, comparison, hypothesis generation, repetition and combination/integration synthesis come close to our notion of learning steps to be achieved. Feedback, of course, corresponds to our performance and feedback category. Evaluation and monitoring fit into our regulation processes category.

Table 10.1. List of learning functions

Main Category	Subcategories	Shuell's category
1 Preparation of learning	orientation on goals and action	Expectation
	choice of goals	---
	relevance of goals	Expectation
	self-confidence	Expectation
	planning of learning activities	---
	motivating students to learn	---
	getting started	attention
	getting attention	attention
	recalling prior learning	---
	2 Learning steps	comprehension
integration		comparison/repetition hypothesis generation combination/integration synthesis
application		---
3 Regulation processes	monitoring	evaluation/monitoring
	testing	evaluation/monitoring
	revision	---
	reflection	---
	evaluation	---
4 Performance judgement and feedback	feedback	feedback
	judgement	---
5 Motivation and concentration management	---	---

Even though the two approaches show some agreements, there are some important differences too. It can be inferred from Table 10.1 that our list may be more comprehensive and more differentiated than Shuell's categorization of learning functions. In our system the two phases of learning (i.e. before and during the activity) are better distinguished. Our system also accommodates the motivational, volitional and emotional aspects of learning to a greater extent (cf. Paris, 1988; Keller and Kopp, 1986). On the other hand, the concept of learning function seems useful and can easily be incorporated in our approach. Therefore, Table 10.1 presents the learning functions considered to be essential elements of any learning situation.

Table 10.2. Examples of the categories, when initiated by the teachers

Category	Teacher action:
Orientation on goals and actions	Presents information on goals
Choice of goals	Chooses goals for students
Relevance of goals	Explains why goals are relevant
Self-confidence	Reassures students that the goals are within their reach
Planning of learning activities	Chooses learning activities and their sequence
Motivating students to learn	Makes learning appear interesting, for example through story telling
Getting started	Gives the sign to start
Getting attention	Attracts students' attention through voice raising
Recalling prior learning	Gives an overview of prior learning that has relevance
Comprehension	Presents information in a structured way
Integration	Relates new information to old; presents a scheme
Application	Demonstrates how one can apply a certain principle in practice
Monitoring	Observes whether students understand
Testing	Poses a question
Revision	Presents information a second time in a new way
Reflection	Tells students why they learned in a certain way
Evaluation	Judges the process of learning
Feedback	Gives feedback on student response
Judgement	Judges students performance
Motivation	Promises a reward
Concentration management	Stimulates students to keep on

Table 10.3. Examples of the categories, when initiated by learners

Category	Learner action:
Orientation on goals and actions	Thinks of possible goals and activities
Choice of goals	Chooses personal learning goals
Relevance of goals	Realizes why goals are relevant
Self-confidence	Is self-confident; promotes self-confidence
Planning of learning activities	Plans and chooses learning activities
Motivating students to learn	Is motivated to learn; promotes motivation
Getting started	Has an adequate starting strategy
Getting attention	Pays attention
Recalling prior learning	Recalls prior learning
Comprehension	Reads, listens, analyzes
Integration	Relates, makes a scheme
Application	Applies to a new situation, thinks of possible applications
Monitoring	Consults feeling of knowing
Testing	Paraphrases in order to test comprehension
Revision	Tries a new strategy
Reflection	Thinks of possible reasons for succeeding this time
Evaluation	Evaluates the process of learning
Feedback	Uses external feedback possibilities
Judgement	Judges own performance
Motivation	Thinks of future rewards
Concentration management	Takes a break

The learning functions indicated in Table 10.1 can be initiated and accomplished either by the teacher or by the learner. Table 10.2 presents examples of actions initiated by the teacher and shows how these correspond to the main categories of the theoretical model. Table 10.3 lists similar examples indicating how various actions initiated by adult learners may fit in with the model.

There is of course a third possibility, namely of shared control of teachers and students. In this case the teachers will give specific assignments in order to give meaning to the various learning functions. An example of this type of learning activation is when teachers ask students to choose some learning goals from a list of possible goals, or when they ask students to study a given text in a specified way, for example, using paraphrasing or underlining.

The examples listed in Table 10.3 constitute learner initiations of the learning functions. These can occur in all kinds of teaching-learning

situations. In some, however, they occur more readily than in others. If teachers fully control the activation of the learning functions, then the students will be less active than when they are given opportunities for self-regulation. When teachers do not assume responsibility for one or more of the functions, then the students are forced to do it on their own. Formulated somewhat differently, the categories presented in Table 10.3 can be seen as the skills and habits of self-regulated or independent learning. Thus independent learning skills comprise, for instance, the ability to think about learning goals and activities, the capacity to choose learning goals, and to understand the relevance of these goals.

Interaction Among Teachers and Students

Shuell (1988) stated that it does not matter who fulfils the learning functions discussed above as long as they are adequately fulfilled. On this point one may disagree. Although it is true that all of the functions should indeed be accomplished in one way or the other, it does matter who is the initiator. This may not be so important in the short as the long run. If teachers initiate and control all of the learning functions, then students will not learn how to fulfil them on their own. They will rely on teachers more and more. They will even come to believe that teachers are persons who are there to make you learn: to motivate you, to inform you, to give you assignments and to control and evaluate your learning. In other words, if teachers initiate and control all of the learning functions, then students may come to believe that this is the only feasible division of tasks between teachers and learners, and that their role in learning is a passive one. They do not develop their independent learning skills and they will not be able to fulfil the learning functions independently. It is our experience that interactive patterns in many schools, including the institutions catering for adult students, are organized so that teachers are the principal initiators and controllers of almost all activities that are of relevance to learning. Therefore many people, and especially those adults who have a negative recollection of their previous encounter with school, develop passive ideas about learning in line with the examples discussed above.

The interaction among teachers and students can also be examined from a teacher's perspective (cf. Larsson 1983). On a theoretical level many teachers believe that it is important to teach students how to learn independently. In one of our studies over 80 per cent of a group of teachers agreed with statements that independent learning is an important goal to be achieved. Many teachers also attempt to draw upon independent learning abilities, at least now and then. However, more often than not they become disappointed in the results of these endeavours, since

many students apparently are not able to fulfil the necessary learning functions on their own. This is a result of the ideas about learning that adults develop in school situations. The teaching-learning processes commonly used in school inhibit the development of independent learning abilities, or the students unlearn how to apply them. If schools do not offer the opportunity to practise these skills, and students come to believe that they are no longer needed, then this development does not come as a surprise. Teachers tend to find a rather curious solution to this problem. Instead of trying actively to teach their students how to learn, they are more likely to decide that learning can be optimized if they take full control of the situation and fulfil most of the learning functions themselves.

In school situations, then, few students are taught how to learn. Yet many students master the principles of how learning can be accomplished. In a recent study, Leseman (1989) concluded that children learn these skills not in school but through interactions with adults that largely take place before they even attend school. Some children, especially those coming from homes with low socioeconomic status, do not learn how to think and learn independently. This finding has led some authors to conclude that parental training programmes are the only solution. In this chapter this conclusion is challenged on several grounds, although it is agreed that small-scale interactions with experts are indeed very important for the development of thinking and learning skills in children. This has been shown by experimental studies carried out by, for instance, Palincsar and Brown (1984), Scardamalia et al. (1984) and Schoenfeld (1985).

We disagree, however, with the conclusions drawn as to the necessity of parental training. First, the studies mentioned above are all performed in school settings. Thus the interactive patterns among adults and students that are conducive to learning to learn can also take place in school, and these interactions can have lasting effects. Secondly, we can not conclude from the fact that certain patterns between teachers and students fail to occur, that they can not be organized in schools. Aarnoutse (1989) and Moely et al. (1986) show that only a very small portion of school time and energy is devoted to learning to think and learning to learn. When teachers do not even try then they cannot expect to achieve the desired results. Finally, it cannot be concluded from the fact that certain interactive patterns which occur in families when children are very young have lasting effects, that these interactions cannot and will not take place again at a later stage in the lifespan. It is our belief that interaction between parents and children concerning homework, motivation to learn, and so on, which occur when children are between about seven and 14 years of age, are as important as adult-child interaction during early childhood. Moreover, interactions between

experts and novices are important for all learners. Relevant research is scarcely available, however. Consequently it is not known whether schools can and should aim at organizing the relevant interactive patterns.

In conclusion, many people do not learn how to learn because the necessary interactive patterns do not occur during early childhood. Moreover, schools fail in compensating for this handicap because the interactive patterns between teachers and students, which are discussed above, inhibit learning to learn. However, there is some evidence that the required patterns can be organized in school settings, even at a late age, and that this can be effective.

Aspects of Teaching How to Learn

From the perspective of lifelong learning it seems very important that as many people as possible will develop the skills of independent learning. It is of course impossible to educate all adults who want or need to change in some respects in the same way school-aged children are educated. Hence new ways of fostering learning to learn have to be found, both in school and subsequently. The following ideas may be helpful in this respect.

First, it is important that all teaching and learning situations be evaluated in terms of the short- and long-term consequences they may have for the development of independent learning skills. A second challenge is to agree on a set of essential learning skills that may be focussed on. The categories listed in Table 10.3 may be considered a starting point. A third aspect is to define the goal of imparting learning skills in a developmental context. The position at present seems to be that children forget the independent learning skills they mastered in elementary school once they attend secondary school. It needs to be established when children should be able to fulfil certain learning functions on their own and at a specified level. Our approach to teaching and learning should be adjusted accordingly.

An important implication of the discussion so far is that individuals are never too old to learn how to learn. Hence it is not entirely fair to blame the school for failing to instill the appropriate learning skills in their students, since adults can acquire these skills as well. It may be more difficult to foster independent learning skills in older adults, in part because they have already developed fixed ideas that may be in the way of independent learning. Yet this is no excuse for not trying. Finally, it means that attempts should be made to organize educative situations in such a way that emphasis is put on those interactive patterns between

teachers and learners that are known from research to be important for the development of independent thinking and learning skills.

An Approach to Teaching How to Learn

Some general principles constituting a teaching how to learn approach are presented in the paragraphs that follow. Two general features characterize this approach. First, it takes both existing learning skills and habits as well as a developmental perspective as its two main points of departure. Second, it attempts to reach both domain specific learning goals and goals associated with learning to learn. This means calling upon the learning skills and habits that are available to children and adults, and providing opportunities to practise them. A next step can be taken only after new skills and habits have developed. In this way the vicious circle discussed before can be broken.

The principles constituting a teaching how to learn approach can be divided in two sets. First there are four principles that concern the way learning should proceed in ideal cases. Shuell (1988) formulated this as follows:

... learning is an active, constructive, cumulative and goal directed process... . It is *active* 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 (Shuell, 1988, pp. 277-278).

Then there is a set of principles that prescribe how one can organize learning to learn or, in other words, how the learning of students can be made more active, cumulative, constructive, goal-directed and diagnostic.

Four Principles for Successful Learning

1. Activity principle

Instruction is designed in such a way that there is an optimal balance between the quality and quantity of learning activity.

One aspect of learning skill that is stressed by many researchers is that it should be active. Students should think while learning, they should make decisions about their learning, and so on. Thus in instruction that aims to develop learning-to-learn behaviour, opportunities should be given for active learning by the students themselves. Nobody, however,

can be active all the time. Therefore, an adequate balance should be found between more active and more passive learning periods. It is in other words not the quantity of learning activity (such as the amount of effort), but its quality (e.g., the kind of questions posed, or the way one is active) that counts (see also Como and Snow, 1986).

2. Constructivist principle

Higher cognitive learning goals requiring deep processing are stressed.

Instead of memorization and learning by heart, constructive learning is stimulated. Students are encouraged to think while learning and to find meaningful relations (cf. Simons, 1992; Simons and Verschaffel, 1992). Some of the techniques that can be used to develop constructive learning in students are: posing higher level questions, discussing memory organization, activating all kinds of integration processes, helping students to find memory aids, stimulating problem solving, and contextualizing learning by relating knowledge and skills to possibilities for application.

3. Cumulativity principle

New subject matter becomes anchored to existing preknowledge and pre-conceptions of students.

Relations between the information to be learnt and the existing preconceptions of students should be stressed and students should be activated to search for these relations themselves (see De Klerk et al. 1991).

4. Goal principle

The students know what they are learning and why it is considered important.

In many school situations students do not know why they have to learn certain information or skills. This is neither good for motivation nor for learning to learn. Instead, learning should be functional in the sense that students are informed of its short- and/or long-term relevance. Students should know where there are going and why (see also Shuell, 1988; De Klerk, 1990).

Nine Principles for Learning to Learn

1. Process principle

Learning activities and processes are stressed instead of learning outcomes.

Because students should learn the thinking and learning skills at the same time as they are using them, they should receive explicit attention. The covert processes of learning and thinking should become overt. This

can happen at all phases of learning (the embedding approach) or afterwards, when looking back at the learning process (the immersion approach). The advantage of the immersion approach is that less confusion and interference will occur (Prawat, 1991).

2. Reflectivity principle

Learning is "thematized" and students become aware of learning strategies, self-regulation skills, and their relations to the learning goals.

One reason why learning skills and habits do not develop is because they are taken for granted. Students do not think about learning. They automatically tend to assume that everybody learns in the same way and that there is only one way to learn. Students can be expected to learn how to learn only if they are aware of and can think about the different forms of learning, the various learning goals and the several ways to reach these goals.

3. Affectivity principle

The interaction of cognitive, metacognitive and affective/motivational aspects is central.

Learning as a process is closely connected to personality. It is related to self-concept (of ability). People have fears of changing their learning approach. Learning can give rise to stress. We cannot change peoples' cognitions and metacognitions when we do not take their emotions, motivations, and desires into account.

4. Transfer principle

Explicitly one strives for transfer and generalization, without expecting these to occur without practice in a concrete context.

Learning skills and habits, like other skills and habits, will not automatically transfer from one situation to another. Many studies on the phenomenon of transfer have made clear that spontaneous transfer is rare, but that it is possible to reach it when adequate measures are taken (Simons and Verschaffel, 1992). This means that learning skills and habits learned in one situation or domain will not automatically be used in another situation or domain. They should be practised and integrated in different situations and domains. Separate learning-to-learn courses cannot be expected to be successful in the absence of curriculum led appointments for transfer and generalization.

5. Context principle

Learning skills and habits are practised regularly, during longer times and in context.

One persistent misconception is that learning skills and habits can be learnt easily. It takes a long time to change one's way of learning. There-

fore these changes can only be expected to occur if regular education (and feedback) are given in a context in which the learning skills can be used or contexts that closely resemble such actual use.

6. Self-diagnostic principle

Students are taught how they can regulate, diagnose and revise their own learning.

As may be clear from Table 10.3 an important part of independent learning refers to self-regulation and self-diagnosis by students. Thus, self-regulatory skills such as comprehension-monitoring, self-testing, and the revision of learning strategies should also be practised and taught.

7. Scaffolding principle

The responsibility for learning is gradually shifted to the students.

This is perhaps the most important, but also most difficult principle of all. To break the vicious circle that characterizes many teaching and learning interactions, it is essential that students should receive opportunities to develop their learning and self-regulation skills, and that these are called upon when the students reach a sufficient level of learning and self-regulation expertise. Hence the teachers should attempt to construct scaffolds that allow the students to bear responsibility for their own learning. On these learning platforms new scaffolds can be based that eventually will also make other levels reachable.

8. Supervision principle

There are, especially in the case of younger students, good cooperation with parents and others about the supervision of self-regulated learning and thinking activities.

Many adults are involved in guiding the learning of primary and secondary students. Over and above the parents there may be up to 20 different teachers and support staff. If these do not communicate and cooperate in guiding the growth of learning and self-regulation skills (as is often the case, especially in secondary education), students are bound to get confused and to follow their own course. Often this will mean adhering to old habits and skills. Developing learning and self-regulation skills and habits in students therefore asks for effective cooperation and communication between the various actors involved.

9. Cooperation principle

Cooperation and discussions between students, closely supervised by experts, form essential ingredients of instruction.

As stated previously in this chapter certain small-scale interactive patterns between students and adults or experts are very important for the development of learning and thinking skills. By observing the strategies

and ways of thinking of other students, teachers, and adults, students can learn how to go about it, and what is essential. By discussing these strategies and procedures with peers and adults in small-scale interactions, students are given a chance to compare their approaches with those of others and practise new skills in a guided learning situation. Research shows that reciprocal teaching is effective in this respect (Palincsar and Brown, 1984). The teacher and a small group of students take turns in executing the role of the teacher when discussing and practising thinking and learning skills.

Conclusions

The main argument put forward in this chapter is that learning to learn is an important topic, not only for children but also for adult learners. Learning and thinking skills can develop spontaneously in small-scale interactions between adults (mostly parents) and children even before children enter schools. This does not mean, however, that it is not possible to learn learning and thinking skills within the teaching learning context and at later ages. Learning and thinking skills can be learned within a school-like context, but this asks for a new didactical approach. Such an approach is important for learners of all ages. Even many adult learners are not able to fulfil all of the learning functions themselves. On the one hand this has to do with their school experiences; on the other hand it is because even adult educators do not always aim for independent learning by students themselves. Some may believe that it is too late for learning and thinking skills to develop. Others may think that these skills develop automatically given adequate opportunities for independent learning and thinking.

Adult educators should realize that the best short-term solutions for educational problems are often detrimental for long-term effects on learning and thinking skills. Moreover, they should realize that there is a need for more than just opportunities to learn or think independently. Learning to learn and think asks for an integrated approach with an emphasis on the division of tasks between teachers and learners and on a gradual shift from teaching to learning, giving students responsibility for their own learning when they are ready to bear it. The 13 principles presented above may help teachers in devising learning environments that build the necessary scaffolds that learners need.

This is only possible when interactive patterns between teachers and students change. Typically, teachers fill in the missing learning functions they believe their students cannot handle on their own. By doing this, however, they achieve perhaps short-term effects, but they fail to develop the necessary learning and thinking skills. Learning to learn thus

involves the pursuit of two goals at the same time: aiming for the normal learning goals, and aiming for learning-to-learn type of goals. This chapter has contributed some insights into the kinds of learning and thinking skills that may be important as well as into a possible didactic approach.

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