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Fostering reflection in the training of speech-receptive action

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Abstract

This article discusses the training of communicative skills by fostering the reflection of speech-receptive action and the opportunities for using software for this purpose. Most frameworks for the training of communicative behavior focus on fostering the observable speech-productive action (i.e. speaking); the individual cognitive processes underlying speech-receptive action (hearing and understanding utterances) are often neglected. Computer-supported learning environments employed as cognitive tools can help to foster speech-receptive action. Seven success factors for the integration of software into the training of soft skills have been derived from empirical research. The computer-supported learning environment CaiMan© based on these ideas is presented. One central learning principle in this learning environment reflection of one's own action will be discussed from different perspectives. The article concludes with two empirical studies examining opportunities to foster reflection.

Keywords: speech receptive action, communication training, computer-supported learning environments, reflection, soft skills

Zusammenfassung

Dieser Aufsatz erörtert Möglichkeiten und Probleme der Förderung kommunikativer Fertigkeiten durch die Unterstützung der Reflexion eigenen sprachrezeptiven Handelns und des Einsatzes von computerunterstützten Lernumgebungen für dessen Förderung. Kommunikationstrainings widmen sich meistens der Förderung des beobachtbaren sprachproduktiven Handelns (Sprechen). Die individuellen kognitiven Prozesse, die dem sprachrezeptiven Handeln (Hören und Verstehen) zugrunde liegen, werden häufig vernachlässigt. Dies wird dadurch begründet, dass sprachrezeptives Handeln in einer kommunikativen Situation nur schwer zugänglich und die Förderung der individuellen Prozesse sprachrezeptiven Handelns sehr zeitaufwändig ist. Das zentrale Lernprinzip – die Reflexion des eigenen sprachlich-kommunikativen Handelns – wird aus verschiedenen Perspektiven diskutiert. Vor dem Hintergrund der Reflexionsmodelle wird die computerunterstützte Lernumgebung CaiMan© vorgestellt und beschrieben. Daran anschließend werden sieben Erfolgsfaktoren aus der empirischen Forschung zur Lernumgebung CaiMan© abgeleitet. Der Artikel endet mit der Vorstellung von zwei empirischen Studien, die Möglichkeiten der Reflexionsunterstützung untersuchen.

Schlüsselwörter: computerunterstützte Lernumgebung, Kommunikationstraining, Reflexion, Soft Skills

FOSTERING REFLECTION IN THE TRAINING OF SPEECH-RECEPTIVE ACTION

Soft skills - fostering of speech-receptive action

The term "soft skills" is a label which describes those skills and qualifications exceeding the "hard skills" of a job. Whereas hard skills describe the qualifications directly related to the job, soft skills involve qualifications such as teamwork, creativity, self-management, the ability to learn, flexibility, problem-solving and, most importantly, communicative skills (Picot, Reichwald, & Wigand, 1996). This article focuses on the training of communicative behavior - i.e. the underlying cognitive actions - by fostering reflective processes. Most concepts designed to foster communicative behavior take place in face-to-face settings. Interactive exercises, role play and group discussions are the dominant instructional techniques used in the training of communicative behavior (Brons-Albert, 1995; Fittkau & Schulz von Thun, 1994; Günther & Sperber, 1995). The learner's performance in exercises and role play is the focus of reflection and feedback. Yet, mostly it is only the observable part of performance which is addressed and discussed (Jaskolski, 1999). Communicative behavior, however, consists of two parts: speech-productice action (i.e. speaking), which is the more observable part of communicative behavior, and speech-receptive action (i.e. hearing and understanding utterances), which occurs more and which is a more covert process inside the person (Herrmann, 1992; Rummer, 1996).

Speech-productive parts of communicative behavior are mostly focused on in training concepts because they are more observable than the speech-receptive parts (Brons-Albert, 1995). Speech-receptive action occurs more covertly inside the person and consists of individual cognitive skills, which are less accessible. Thus, conventional forms of communication training are not applicable for the fostering of speech-receptive skills because they depend on the observability and accessibility of speech-related action. In this article, we will show that software can help in reflecting and changing not directly accessible or visible parts of social skills. To illustrate what this kind of software might look like, we describe a computer-based learning environment which is designed to train the individual cognitive skills of speech-receptive behavior. By embedding the software into communication training, it is possible to foster both parts of communicative behavior – speech-reception and speech-production.

As mentioned above, the individual and not unobservable part of communication, speech-receptive behavior, is rarely targeted in communication

training concepts. Training approaches dealing with speech-receptive action aim mainly at fostering active listening, which is in fact a hybrid of speech-receptive and speech-productive action. Active listening means listening to the other person carefully and then paraphrasing or asking questions with the intention of deeply understanding what the other has meant to convey with his or her utterance (Frey, 2000; Hargie, Saunders, & Dickson, 1994; Schulz von Thun, 1994). Thus it implies giving the other person feedback about what one has understood. This form of feedback is the topic of exercises and reflection-in-training concepts which aim at fostering active listening. Giving feedback, however, is a form of speech-productive action, even if it is based on speech-receptive action. Thus, it is again the more observable part of communicative behavior which is at the center of these training approaches. The individual cognitive processes of understanding utterances, again, are more or less neglected.

The individual cognitive processes involved in speech-receptive action occur on different levels. According to psycholinguistic theories (Herrmann, 1992), the processes involved range from the perception of acoustic elements via the semantic identification of words and syntactical identification of grammatical structures, to the pragmatic interpretation of utterances. For the training of communicative behavior, higher-order skills of speech-receptive action such as the pragmatic interpretation of utterances are more relevant. Looking at various psycholinguistic models, it can be seen that they all postulate different pragmatic aspects of meaning, which means that an utterance can have several different connotations. These different aspects of meaning can be found in every single utterance and thus can be the basis of interpretations. Interpretations of utterances focusing on the different connotations, however, can often be the cause of misunderstandings. This may be illustrated by an example:

In a car nearing a crossing, the following dialog takes place:
The husband says to his wife who is driving the car: "The traffic lights are red". As a reaction to this statement his wife explodes: "You always tell me how to drive. I'm able to drive without you constantly intervening. If you don't have confidence in the way I drive, you might as well walk home!"

If we look at this scene, we see that the situation escalates rapidly. What seems to happen is that the woman feels criticized by her husband's remark and that this particular understanding of his utterance causes her to react rather aggressively. In order to avoid such aggressive reactions, which might lead to a conflict, it is necessary to develop a more differentiated understanding of utterances. This implies that the speech-receptive skill includes differentiating between the various aspects of meaning contained in an utterance. In order to

develop such a differentiated and reflected understanding, learners need to be able to analyze speech utterances according to different aspects of meaning. But which aspects of meaning should be differentiated? According to which criteria? There are several models which can be found in literature. Among the most prominent approaches are the models of Bühler (1934), Watzlawick, Beavin, and Jackson (1967) and Schulz von Thun (1994).

Karl Bühler (1934) postulated three different aspects of speech in every utterance: what the speaker says about himself (expression), which objects or facts the speaker informs the listener of (representation) and what the speaker wants the listener to do or to think (appeal).

Watzlawick et al. (1967) make a distinction between two aspects of interpersonal communication by differentiating between the content of an utterance and what is said about the interpersonal relationship of the conversational partners.

The German psychologist Schulz von Thun (1994) combines the models of Bühler (1934) and Watzlawick and colleagues (1967) and postulates four different aspects of human language: the aspect of interpersonal relationship, the aspect of representation, the aspect of self-expression and the aspect of appeal.

In our training approach for fostering a differentiated understanding of speech utterances (see below), the participants learn how to analyze speech utterances according to the model of Bühler (1934). An earlier version of the learning environment worked with the model of Schulz von Thun (1994), but the problem was that the four levels could not be clearly distinguished by the learners. The model of Watzlawik et al. (1967) exceeds individual cognitive processes, because it emphasizes the level of interpersonal relationships. This level involves the history and backgrounds of the conversation partners, which is difficult for an outsider to analyze. Since our aim is to foster the individual cognitive processes of speech-receptive action, the theoretical framework of Bühler (1934) has been chosen: this model provides a comprehensive and practicable model of the different levels or functions of human language and is based on individual cognitive processes.

In everyday life, communicative behavior occurs quickly and the individual rarely has to think about how to speak or how to understand utterances. This is because the underlying communicative skills are highly automated (Antos, 1996; Herrmann, 1992; Leontiev, 1981). The individual is able to understand utterances even in complicated and stressful situations such as debates or controversies without having to think about how to do this. The automaticity of communicative behavior enables the use of language in complex situations, but

also makes communicative behavior difficult to change. According to the literature (Antos, 1992; Leontiev, 1981; Schooler, Ohlsson, & Brooks, 1993), automated skills can be de-automated by bringing the steps of action into consciousness. The de-automated skills can subsequently be changed by reflecting on one's own actions. In order to allow the learner to "function" in everyday life, the skills then have to be re-automated again. This can be achieved by repeatedly training and exercising the acquired or modified skills (Hacker, 1998; Leontiev, 1981). In short, because of the automaticity of communicative behavior, the following steps are necessary for changing it:

- bringing the actual action into consciousness
- reflecting on one's own action
- exercising and practicing the new forms of communicative behavior, i.e. speech receptive and speech productive action.

Since reflection is a central aspect in bringing knowledge into action, we will explicate this cognitive activity. After the following chapter on reflection, we will focus on our specific training concept of soft skills in which reflection plays an important role in changing communicative behavior.

Theoretical models of reflection

Questioning one's thinking and acting and reflecting on thoughts and behavior is important in coping with complex problems and tasks (e.g. constructing a house, negotiating). The self-reflexivity of thinking is even considered to be the very characteristic that distinguishes humans from other creatures. Since reflection is regarded as crucial for human cognitive functioning, it seems reasonable to wonder to what extent it is possible to train reflection as a skill. In order to analyze this question in detail, we will first describe some theoretical approaches to reflection.

For Dewey (1925/1981, 1933/1986), reflection is a form of thinking triggered by the doubt and perplexity perceived in a situation, and results in problem solution in the light of previous experiences. According to Vygotsky's (1978; 1987/1998) definition, reflection is the transferal of argumentation from a social level to an internal one. Schön (1987) describes reflection as an internal dialogue of thinking and acting through which performance can be enhanced. The reasons for the differences in the definitions of reflection lie in the varying temporal dimensions of reflection, i.e. reflection can refer to present time but can also be anticipative or retrospective in nature.

Reflection is a dynamic, cognitive process that can link past, present and future activities. Reflection enables planning before an action, making it possible for

the acting person to revise or regulate the prospective course of activity. This kind of proactive reflection can prepare the agent for a wide range of unforeseen contingencies. During action, reflection can optimize the course of activity and at the same time enable the process of learning. After action, reflection provides a basis for evaluating the activities performed. Additionally, reflection can foster the transfer of insight and knowledge from previous experiences to future actions in different situations. Reflection can also facilitate knowledge transfer by supporting the de-contextualization of knowledge. Furthermore, the awareness of the characteristics of acquired cognitive strategies and their applicability in a novel situation can be increased by reflection. In sum, reflection plays a regulatory, adaptive, integrative, organizational and anticipatory as well as an evaluative role in cognitive activities.

In this article the following elements are regarded as fundamental for reflection: consciousness of thought and action, contextualized problem-setting, problem-relevant experiences, and possibilities for action. With these components, an operational definition can be formulated: reflection is a process during which a person addresses a problem, evaluates this problem against a previously-set goal and his/her past experiences, generates options for action, relates the possible outcomes of these options to the present situation and makes decisions for future actions with the aim of solving the problem.

The wide definition of the term reflection makes it difficult to choose and present the ideas of authors who have dealt with this subject. After all, the subject of reflection concerns all fields of psychology and extends to philosophy. The presentation below will therefore be restricted to three models that are closely linked to one another and roughly mirror the temporal development of the deliberations on reflection. The starting point will be Dewey’s work "How we think" (1933/1986) which is considered to be the basis for current research on thinking. Dewey’s contemplations can be related to those of Vygotsky (1978) who considers the development of higher-level cognitive skills to be mediated by social interactions, i.e. through the use of speech and other cultural tools. The latest and most comprehensive analysis of reflection has been provided by Schön (1983, 1987; Schön & Rein, 1994). All three social-constructivist theories share the assumption that knowledge and action are social in nature and situated in specific contexts with respect to their origin, organization and application. While Dewey's theory is mostly philosophically oriented, Schön includes Vygotsky's considerations of the guided interaction of teachers and students in his work and thereby extends Dewey's model. Thus, practical approaches can be derived from various theoretical ideas.

Reflective inquiry: Dewey's pragmatic view of reflection

Dewey is considered to be a key figure in relation to the concept of reflection. Historically, his work is rooted in the conjectures of famous philosophers such as Socrates, Plato and Locke. For Dewey, reflection can be understood as a form of special thinking involving the active linking of evolving ideas and is caused by a "state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates" (Dewey, 1933/1986, p. 121). With regard to the topic of this book 'knowledge and action' the role of reflection can be described as a process of regulating the dialectic relationship between knowing and acting. Judging by its function, reflective thinking is a tool for problem-solving. It can be seen as a cycle of repeated inquiry about one's thinking and action. This process of inquiry is a goal-oriented drive to determine a course of action in such a way that the instability perceived in a situation can be counteracted. According to Dewey, there exist two types of inquiry: perceptual and reflective. Perceptual inquiry means adapting to the perceived constraints of a situation, and leading to situation-specific, ad hoc-actions. Reflective inquiry entails the manipulation of the person's inner symbolic representations and leads to reflected actions (Burke, 1994; Dewey, 1933/1986). However, this dichotomization of thinking into reflective and non-reflective thinking, the latter in the sense of idle and chaotic thinking, seems to be problematic. Reflection is probably not a bi-polar process, but ought to be conceived as a continuum (Kompf & Bond, 1995). It seems evident that non-reflective and reflective thinking are complementary rather than mutually exclusive (Korthagen, 1993). According to Dewey, reflective behavior is a consequence of sustained doubts about one's thinking or acting and entails the integration of this reflection process into further inquiries. Dewey specified three attitudes required for reflection: the inquirer should be open-minded to new information, truly interested in the subject, and prepared to take the responsibility for his or her actions.

Dewey considers speech to be a particularly important tool for reflection: "being the tool of tools, [it] is the cherishing mother of all significance" (Dewey, 1933/1986, p. 146). Reflective thinking is represented in linguistic expression. In correspondence with Dewey's pragmatic social behaviorism (Garrison, 1995), communication and action in a social setting can be regarded as external manifestations of reflective thinking. Dewey distinguishes reflective thinking, which leads to planned action, from non-reflective thinking which results in impulsive action. Based on Dewey's original model (Baron, 1981), five phases of reflective thinking can be derived: (1) problem recognition; (2) specification of possibilities for new actions or beliefs; (3) evaluation of these possibilities by drawing on memory, questioning or experimentation; (4) revision of the possibilities; (5) deciding whether to continue to look for evidence or to proceed

with one of the found possibilities. These phases can vary in their duration, depending on the type of inquiry, and can overlap in time.

Dewey's deliberations about reflective thinking lead to an analysis of the reciprocal relationship between the agent and the world. In particular, his conviction that the mind has a social origin has important implications for the development of a cooperative learning paradigm. Dewey (1938/1986) considers reflection a tendency that can be influenced by values, expectations and habits. This view implies that reflective inquiry ought to be included in the process of education and development as early as possible and should be supported throughout school and adult life. The attitudinal variables mentioned above (open-mindedness, interest, responsibility) as well as the skills involved in the phases of reflection (problem recognition, specification of options, evaluation, revision, decision) could be starting points for fostering reflection. Verbalizing and explaining thinking or action are particularly important tools for promoting reflection.

Self-regulated learning: Vygotsky's socio-linguistic perspective on reflection

Vygotsky's theory of development (1978, 1987/1998), as one of the pillars upon which constructivist learning theories are built, addresses the question of how psychological processes or metacognitive skills can be fostered. Particular emphasis is placed on the importance of self-regulation as a crucial educational goal. Vygotsky considers reflection as self-regulation, a skill that is developed as follows: first, the individual experiences regulation by others, which occurs in the zone of proximal development. Learning is facilitated by adult guidance or collaboration with more capable peers. Vygotsky emphasizes that conscious awareness is an essential precondition for this kind of learning influenced by modeling. Through this special mode of social interaction in the zone of proximal development, the form and content of self-regulation are gradually transferred from the more competent partner and internalized by the learner. The Vygotskian view also stresses that sociolinguistic experience is indispensable for the development of metacognition and that intersubjectivity is a primary means for knowledge construction. This implies that reflection can be strongly facilitated by modeling and verbal communication. Vygotsky claims that reflection plays a mediating role by transforming meaningful experiences into abstracted knowledge. These developmental transformations are enabled by verbal communication, i.e. the inner speech of the learner supports the internalization of socially mediated problem solutions by re-formulating or explaining the perceived problem solutions in the learner's own words. Reflection has a strong impact on self-regulative strategies such as planning, self-monitoring, self-evaluation and self-corrective behavior. By assuming a

social origin of learning – in other words, the co-construction of knowledge – Vygotsky answers the question of how complex cognitive competencies emerge from less complex skills.

Like Dewey (1933/1986), Vygotsky regarded speech as the most potent cultural tool in achieving convergence of meaning and co-construction of knowledge during social interaction. The dialectic relationship and the reciprocal transformations between intra- and interpsychological processes are central ideas in Vygotsky's theory. According to this approach, high-level cognitive processes like reflection develop through continual, dynamic interactions between the agent and the world. Furthermore, Vygotsky assumes that not only the content but also the form of psychological processes changes dynamically in the course of the ontogenetic development.

Reflective practitioner: Schön's communicative view of reflection

In the contemporary domain of professional education, Schön's (1983, 1987) notion of the "reflective practitioner" has an impact on many fields, including teacher education (e.g. Grimmet & Erickson, 1988), social work education (e.g. Hallett, 1997) and managerial training (e.g. Daudelin, 1996). Schön claims that reflection-on-action and reflection-in-action should be considered more strongly as essential factors for the development of professional artistry. This professional artistry refers to the embodied expertise that practitioners demonstrate in problematic situations of practice. Reflection-on-action means thinking back on the action already accomplished or pausing in the midst of an action to "stop-and-think" (i.e. offline). Reflection-in-action, on the other hand, occurs while an action is being undertaken (i.e. online) and implies moment-by-moment "active experimentation". Generally, reflection-in-action is conceptually more complex, developmentally more mature, and functionally more significant than reflection-on-action (cf. Schön, 1983, 1987). According to Schön, an internship is a good example of a learning situation that enables reflection: the participation in an expert culture on a trial basis[1]. Yet, the effectiveness of an internship mainly depends on the social interactions between the students and experts. Particularly important are reciprocally reflective dialogues between the coaching expert and the student. This view of externally initiated self-reflection can also be found in the works of Dörner (1976, 1979, 1982) and Putz-Osterloh (1985). They both emphasize that self-reflection, i.e. reflecting on one's own thoughts, actions or the results of one's actions, can be encouraged by others. The learner is either asked to reflect on something at a specific time or another person interrupts his/her actions with questions and thus causes the reflection.

[1] There are relations to the concept of ”legitimate peripheral participation“ by Lave and Wenger (1991).

Through this kind of communication, the persons involved can gradually bring their interpretations of the concepts concerned into line. According to Schön, the development of professional artistry can be depicted as three phases: technical rationality, reflection-on-action, and reflection-in-action. Each of these phases is characterized by certain verbal and behavioral performances. Schön writes, for instance, about the particularly important reflection-in-action: "… when practitioners reflect-in-action, they describe their own intuitive understanding" (Schön, 1983, p. 276). According to Schön, the reflection on one's actions includes the perception, the framing and the reframing of the problem with respect to the inquirer's repertoire of relevant knowledge and experiences, and eventually the generation of new possibilities for action. It needs to be mentioned that the skills which are decisive for successful reflection-on-action and reflection-in-action generally are very similar to the skills of thinking and problem-solving. There exists a range of approaches as to how these skills can be fostered (cf. Lipman, 1987; Bransford, Sherwood, & Sturdevant, 1987) but they will not be presented here.

Summary of the three theories on reflection

From the arguments of the three scholars, certain general features of reflection can be extracted. First, reflection entails consciousness, experience and action. Second, reflection is stimulated by a problem and the context in which it is embedded. Third, reflection is developmental in nature. It can be portrayed as Dewey's evolutionary view about perceptual and reflective inquiry (Dewey, 1933/1986), or Vygotsky's transformation from social dialogue to inner speech. Fourth, reflection can be fostered: all three authors claim that reflective processes are supported by verbal activities, e.g. verbalizations or self-explanations, and by giving modeling cues related to action. Sixth, reflection is recursive or cyclical in nature. This feature of reflection becomes particularly evident in Dewey's five phases and in Schön's framing and reframing of the problem concerned.

The description of the three approaches makes clear that reflection is of high significance for cognitive problem-solving activities and for changing automated action. Therefore, the question of how these theoretical ideas can be transferred into practice is relevant not only from a scientific but also from a pragmatic point of view. In the following sections, we will sketch instructional possibilities for fostering reflection and thereafter introduce a training framework for this goal of fostering reflection.

Instructional conditions for a training of reflection

The three theoretical models described above focus on the central role of social guidance and negotiation processes for fostering reflection. These "social processes" as well as the reflection itself are strongly influenced by speech. Yet, the links to the support or training of reflection remain unclear. Concrete instructional suggestions can be found in the approaches of situated learning since they also deal with reflection (cf. Henninger, Mandl, Pommer, & Linz, 1999). The basic assumption of situated learning is that cognition and context, knowledge and action, and individual and socio-cultural development cannot be separated. Situated learning can, for example, mean that a novice is introduced into a "community of practice" or that the acquisition of skills is supported by coaching, modeling and reflected imitation of experts (Collins & Brown, 1988; cf. Vygotsky's concept of the zone of proximal development). The situated learning principles relevant for the support of reflection will be explained below. Subsequently, the method of modeling will be analyzed with respect to the training of reflection. Finally, the potentials of new media for this purpose will be dealt with.

Principles of situated learning approaches

Since the approaches of situated learning emphasize reflection as a main learning principle (e.g. Bransford, Franks, Vye, & Sherwood, 1989; Collins, 1996; Gerstenmaier & Mandl, 1999), it seems reasonable to investigate them in order to derive suggestions for the support of reflection. The following instructional approaches of situated learning concentrate on different aspects: According to Bransford's Anchored Instruction-Approach (Bransford et al., 1989; Cognition and Technology Group at Vanderbilt, 1992, 1993, 1994), a "narrative anchor" is particularly important for learning. The Cognitive Flexibility Theory (Spiro, Feltovich, Jacobson, & Coulson, 1992) underlines the significance of multiple perspectives. The Cognitive Apprenticeship-Approach (Collins, Brown, & Newman, 1989) applies the principles that have long been successful in the training of craftsmen to the systematic teaching of cognitive skills.

From these situated approaches to learning, especially from the Cognitive Apprenticeship Approach (Collins et al., 1989), principles for the design of learning environments can be extracted. They refer to content, sequencing, social embedding and teaching methods. Here, we will concentrate on those methods that seem to be especially appropriate for fostering reflection: modeling, coaching, articulation and exploration.

For modeling, the expert needs to externalize the internal cognitive processes while carrying out a certain activity. This makes the individual steps of thinking

and learning for the learner tangible and comprehensible. Coaching is a method that requires the expert to carry out several activities, for example, giving feedback, providing support (e.g. clues for the problem solution) and offering new problem settings. In this way, the learner is supported in gradually approaching the level of the expert's problem-solving skills. Articulation comprises all methods that aim at the learner's communication of his cognitive processes and knowledge, with the purpose of refining them. Exploration is a method that induces the learner to tackle a problem by him- or herself and to pursue their goals. In the end, the training of reflection will be successful only after the learner's successful completion of an exploration phase, i.e. if he or she has succeeded in regulating their reflection processes and actions by themselves.

Role modeling as a method for fostering reflection

There is a large variety of cognitive strategies that can facilitate reflection. The effectiveness of these strategies depends not only on their features, but also on how skillfully the user can apply these strategies. The modeling method for fostering reflection, mentioned above in the context of situated learning environments, can involve problems. First, modeling does not guarantee that the learner really learns reflective thinking. If a big imbalance between the expert's and the learner's knowledge exists (Jarvis, 1987), this method might lead to cognitive overload on the part of the learner (Sweller, 1988). Similarly, modeling does not lead to learning success when the learner pays attention to irrelevant aspects of the expert's actions or misinterprets them. Possible differences between the expert's and the learner's way of reflecting can also lead to difficulties. It has been shown that an expert's reflection includes the profound structure of problem solutions, whereas the reflection of learners who are less familiar with a domain is based rather more superficial features (hierarchies of reflection: Hatton & Smith, 1995). Comprehension gaps of the learner can on the one hand be supportive in that they induce cognitive conflicts that motivate the creation or modification of knowledge. On the other hand, the gaps can be so immense that the learner is incapable of following the expert. In order to prevent or minimize comprehension problems and to help the learner represent and externalize his or her thoughts, it would be useful to guide the learner with individual support, according to the cognitive apprenticeship approach (e.g. coaching, see Collins et al., 1989).

Use of new media for the training of reflection

Reflection as a complex cognitive activity seems predestined to be conducted using new media. The increased access to information, the possibility of externalize cognitive activities as well as the documentation of reflective thinking, all of which can be achieved with computer programs, can facilitate, deepen and expand reflection. In the following sections, we will elaborate on the technological aspects of the tutorial support of reflection, questions concerning the modality of the offered information, aspects of collaboration within the framework of new media, and the accessibility of information.

Tutorial support. An important field for the use of new media is tutoring. In correspondence with Vygotsky's concept of the zone of proximal development and Schön's "reflective internship" (1987; Schön & Rein, 1994), it is assumed that one tutor per learner presents the most effective means to foster reflection. This method is most costly, of course. In order to take advantage of this method, but with less efforts and costs, so-called virtual tutors were developed. This form of tutoring has been so refined now that it can compete with physically present tutors (cf. Anderson and the ACT* group, 1995). Fundamental for both forms of tutoring is that learners receive prompt feedback. The use of new media in this respect is mainly restricted to well-structured domains such as algebra, geometry and programming (cf. Geyken, Mandl, & Reiter, 1995). Whether virtual tutors can also be applied to less well-structured domains such as reading and writing still has to be investigated empirically.

Choice of modality of information on offer. With the use of new media, access to information has been much increased, yet the choice of a modality of information (textual, auditory, visual or multimodal) for a specific target group remains a challenge. A large part of the information is still presented in the textual modality (cf. Heflich, 1997; Henninger et al., 1999; Hoel & Gudmundsdóttir, 1996). If learners are supposed to externalize their reflections, those whose capability of expression is limited will be discriminated against. An alternative in this respect is the auditory modality, i.e. the recording of learners' verbal reflections. The inter-individual variations in the use of the different modalities have been neglected so far in the development of instructional designs. Consequently, disadvantageous effects can show in learning with multimedia if a learner is forced to use information in a representation system that is not apt for her or him (Mayer, 1997). Although visual forms of representation have proved particularly suitable for the acquisition of abstract concepts because they induce profound reflection processes (cf. Collins & Brown, 1988; Stenning & Oberlander, 1995), their undifferentiated use can nevertheless cause a fixation of the learner on certain problem-solving strategies (cf. Greene & Petre, 1992). Furthermore, the advantages and disadvantages of

synchronous and asynchronous communication have to be considered. Synchronous communication enables a constant flow of ideas and immediate feedback, whereas asynchronous communication leaves more time for organizing and reflecting on ideas. On the other hand, the latter form of communication could lead to misunderstandings and disruptions in comprehension because of the lack of immediate feedback.

Collaborative modality of reflection. Collaborative learning is well compatible with the approaches to the fostering of reflection. The articulation of one's reflection and the exchange with others support the creation and clarification of one's own thoughts. Particularly, the use of video-mediated communication can promote the impression of co-presence (Dillenbourg, 1999; Finn, Sellen, & Wilbur, 1997) which is a central factor in the negotiation process (Clark & Brennan, 1991). One of the advantages of discussion groups is that members can draw on different knowledge backgrounds and take up different views, which can further encourage reflection.

Increased accessibility of information. If a learning environment – as, for example, our web-based training tool CaiManOnline©[2] – offers connectivity to the WorldWideWeb, learners have access to a tremendous wealth of information that can serve as a basis for reflection. Yet, a sensible use of such information requires a high reflective ability. Especially for novices, whose domain-specific knowledge is still often poor, it is difficult to make use of the potentials of new media. Therefore it would be advantageous to provide learners with additional tutorial and/or technological services so that they can find and use the relevant information (Roschelle & Pea, 1999).

Reflection as a tool for changing soft skills with software

An examination of the literature leads to the conclusion that the theoretical models and instructional approaches described above have had a strong influence on the design of reflection training (cf. Brown & Palincsar, 1989; Francis, 1995; Friedman & Lipshitz, 1992; Heflich, 1997; Henninger, 1999; Henninger & Mandl, 2000; Hoel & Gudmundsdóttir, 1996; Lehtinen & Repo, 1996; Scardamalia & Bereiter, 1987; Schoenfeld, 1985; Zeichner & Liston, 1987). In the following paragraphs, we present our approach for the support of reflection in the training of soft skills.

The learning environment CaiMan©[3] aims at fostering a differentiated analysis of conversational utterances on the basis of the model of Karl Bühler (1934).

[2] For further information, see http://www.caimanonline.de
[3] "CaiMan" stands for "Computer-aided multimedia applications"

Learners should not only gain knowledge about Bühler's model but learn to apply it as well. However, it is easier to gain knowledge about communicative behavior than to change the actual action in everyday situations (Henninger & Mandl, 2000). This means that the learner often knows which action might be effective and adequate in certain situations, but is not able to perform this action and reverts to an older, often dysfunctional action. One of the reasons for the described gap between the knowledge about action and the actual performance of this behavior can be the automaticity of communicative behavior (Antos, 1996; Herrmann, 1992; Leontiev, 1981). To change automated action, you first have to bring aspects of the action into consciousness, for example, single processes or the results of the automated action.

One way to bring automated cognitive processes such as speech receptive or productive action into consciousness is to verbalize them (Schooler et al., 1993). With respect to the de-automation of speech-receptive action, this means that learners should verbalize what they have understood. Reflection of these processes can be supported by supplying learners with other solutions such as those of an expert, for example. The learners can compare their own verbalized solutions with the expert's solutions and thus gain a basis for their reflection (Henninger & Mandl, 2000).

It would be difficult, however, to bring speech-receptive processes into consciousness, reflect on them and take part in a conversation at the same time. All these processes together would place too high a cognitive load on the learner (Rummer, 1996). To lower the cognitive load for the learner, it is necessary to reduce the cognitive tasks with which the learner has to deal while changing his or her action. In the case of speech-receptive action, these tasks are: remembering the utterance, formulating one's own analysis, revising and refining the analysis, and comparing it with an expert's solutions. Only the relevant tasks should be "in the mind" of the learner. Less relevant tasks, such as remembering the utterances or the own one's analysis, could be achieved using software.

For the fostering of de-automation and reflection, computer programs can serve as cognitive tools (Jonassen, 1992; Mandl, Gruber, & Renkl, 1995) by supporting cognitive processing and sharing "the cognitive burden of carrying out an intellectual task" (Salomon, 1993, p. 182). By storing the learner's solutions, for example, the computer can relieve the learner of the cognitive burden of having to remember his/her solution, leaving the learner to concentrate on his or her solution. This reflection can be supported by supplying the learner with the opportunity to compare his/her own solution with the solution of an expert. By supporting the reflection of one's own action, computer-supported learning environments can help to de-automate this action.

Software can also be employed when it comes to re-automation. Re-automation can be achieved by training and exercising the acquired or changed skills, a task for which computer programs have been used since their early days (Kremer & Sloane, 1998; Mandl et al., 1995). Thus, computer programs can help the learner to carry out those activities which have been identified as central for changing communicative behavior.

Summarizing the points above, a computer-supported learning environment which is designed to foster speech-receptive action has to support the de-automation of the action by:

- supporting the learner in bringing his/her own action into consciousness
- supporting the reflection of the learner's action
- reducing the cognitive load caused by reflection.

The re-automation of communicative behavior can be supported by:
providing the learner with the opportunity to repeatedly exercise the changed or newly acquired action processes.

In the following section we will take a closer look at the possibilities and limitations of software programs for the training of communicative behavior.

Software for training communicative behavior?

We have seen that instructional reasons suggest the use of software to help foster more differentiated analyses of speech utterances. As discussed above, computer-supported learning environments can support the de- and re-automation of communicative behavior. Yet, for many learners, it does not seem natural to foster communicative behavior and other soft skills with the help of computers. Just as with other soft skills, communicative behavior is social in nature and is part of human interaction. According to a situated view of learning, skills should be taught in the setting in which they are embedded in everyday life or at least in settings which come as close as possible to the respective real-life context (Collins et al., 1989; Greeno & The Middle School Mathematics Through Application Project Group, 1998; Law, 2000). Thus, communicative behavior - i.e. the underlying action processes - should be fostered in the setting in which they are applied: human interaction.

According to Barron (1998), the shortcomings of multimedia products for the training of soft skills lie in their inability to depict the complexity of social interaction. He hopes that these shortcomings can be overcome by progress in technical development which will produce more complex simulations of social interactions as well as more interactivity for the learner. This may occur to some

extent but it seems doubtful that computer simulations will ever come close to the authenticity of real social settings in face-to-face training situations.

A different view regarding the use of software for the training of soft skills is the integration of software into course settings. The advantages of both – classroom learning and computer-supported learning – can thus be combined. The trainer can focus on training social situations, face-to-face discussions, on exercises and on giving feedback about the contributions of learners, while the software can be used to train the individual cognitive skills underlying the social competencies (Cohen & Rustad, 1998).

A growing number of authors state that the use of computer-supported learning environments makes most sense if these learning environments are integrated into curricula and combined with cooperative and other forms of learning (Glowalla & Häfele, 1997; Kerres, 2000). By carrying out time-consuming cognitive activities with the help of computer-supported learning environments, time can be gained for cooperative classroom activities (DeCorte, 1994, 1996). Kerres (2000) argues for the use of hybrid learning arrangements. This term "hybrid learning arrangements" stands for a combination of computer-supported learning environments and other forms of teaching and training. Another term used for this type of learning arrangements is "blended learning concepts" (Barbian, 2002). This combination should be designed on the basis of didactic concepts. According to his view, medial learning arrangements are meant to be part of didactic problem solutions. Reusser (1993) states that computer programs should be used in education "as supportive cognitive tools in the service of explicit pedagogical goals" (p. 145). The software should be designed on the basis of a cognitive analysis of curricular tasks and processes. Schofield (1999) also stresses the importance of explicit educational goals to determine where and how the use of computers is likely to be most effective. Her claim is that "we need to think more carefully about exactly how computer use can change instruction and when and where such changes are most likely to promote valued outcomes" (p. 174). This means that software should not be used in an unreflective way, but should be used as a tool in order to reach specific instructional goals.

To summarize, the authors quoted above demand that the integration of computer-supported learning environments into classroom settings and collaborative forms of learning should depend on an explicit cognitive analysis of the curricular tasks and instructional goals. This cognitive analysis includes a detailed description of the subject matter (van Merrienboer, 1997). The learning goals and, subsequently, the learning activities can be determined after classifying and describing the specific skills and types of knowledge relevant to the subject matter.

Looking at the domain communication (see above), two major aspects have to be taken into account: a) the division of communicative behavior in speech-receptive and speech-productive action; b) the high level of automation of the underlying cognitive processes. The first aspect makes it necessary to offer both individual and social forms of learning. The second point requires a learning scenario which allows de- and re-automation of communicative processes. We consider both these aspects in our training program, which integrates a multimedia learning environment into a face-to-face course setting. In the following chapter, we present the integration of our computer-supported learning environment CaiMan© into a face-to-face training of communicative behavior and describe it in closer detail.

Training speech-receptive action with the aid of the computer-supported learning environment CaiMan©

Integrating CaiMan© into a communication training program. Communicative behavior does not only consist of speech-receptive processes, which are fostered with the help of the computer-supported learning environment CaiMan©, but also includes speech-productive processes (Hermann, 1992). In order to profit from the fostered speech-receptive skills, the learners have to be able to employ these skills in social interactions – by reacting to the utterances they are now able to analyze in a more differentiated way. As shown above, the observable communicative behavior in social interactions is best trained in face-to-face settings. With this in mind, the learning sessions with the computer-supported learning environment CaiMan© are framed by two face-to-face training modules, each with a duration of two days. The schedule of the training is depicted in figure 1.

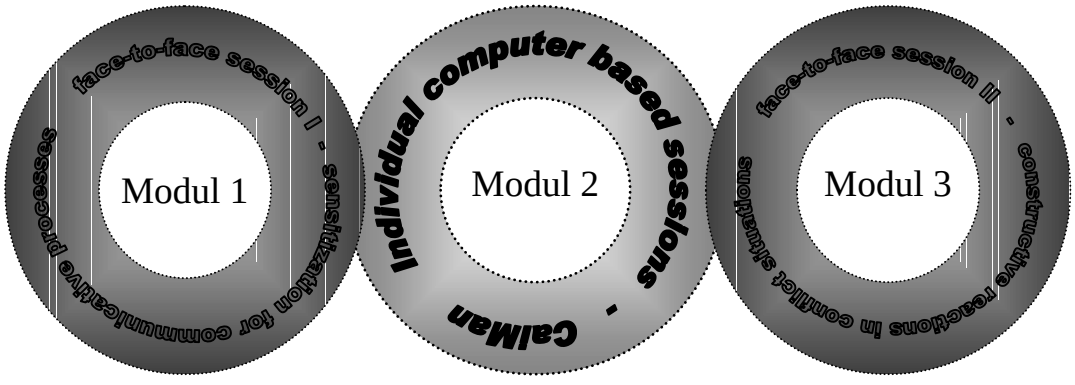

Figure 1: Training schedule.

The first face-to-face group session aims at sensitizing learners to communicative processes. With the help of various exercises, learners consciously experience their own communicative behavior and reflect upon their

performance. The last exercise of the first group session aims at demonstrating the difficulties and problems that arise when analyzing and understanding the utterances of others, thus making the learning goal of the computer-supported learning environment CaiMan© apparent to learners. After the first group session, learners attend six individual learning sessions using the learning environment CaiMan©. In the second group session, the students learn and practice how to react to the utterances of others in a constructive way. They learn how to react to utterances based on the differentiated analysis which they have learned with the help of the computer-supported learning environment CaiMan©. In the following paragraphs, the design criteria of this learning environment will be described.

The use of multimedia for de-automation. As shown above, changing and fostering speech-receptive action such as the analysis of conversational utterances demands de-automation by bringing an action into consciousness and reflecting on it, and re-automation by repeatedly exercising the new forms of speech-related action processes. Because all of this cannot be done while the learner is in the midst of a conversation, a computer-supported learning environment has been designed to foster the ability to analyze conversational utterances. Computer-supported learning environments allow the repeated use of video-sequences and can help to reduce cognitive load. By writing down and documenting the analysesing, learners do not need to memorize them but can still use them as a basis for their reflection.

Structuring the analysis of utterances. The computer-supported learning environment CaiMan© was developed to foster the ability to analyze conversational utterances in a differentiated way. The learners are no longer asked to analyze utterances in an unreflective way but to differentiate the utterances according to the three functions of speech postulated by Karl Bühler (1934) – appeal, expression and representation. In using this model, the subject asks himself/herself the following questions: "What does the speaker want the listener to do?" (appeal), "What does the speaker express about himself/herself?" (expression) and "About what objects or facts does the speaker inform the listener?" (representation). These three functions of speech can be found in every utterance. While learning with CaiMan©, learners have to analyze utterances regarding each of the three functions.

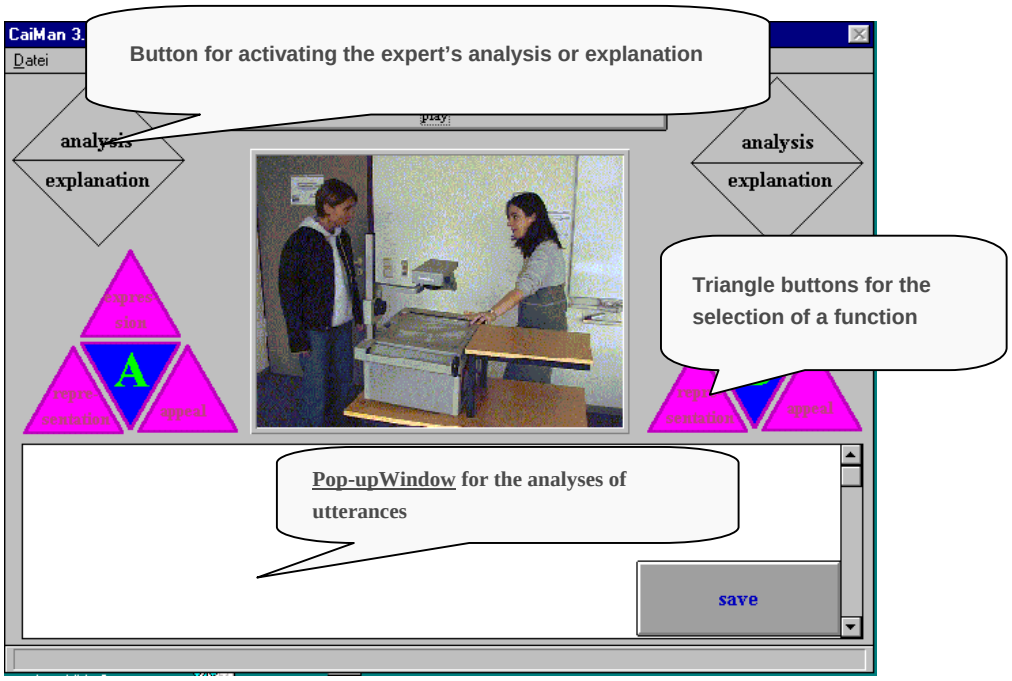

Figure 2: Screenshot of the computer-supported learning environment CaiMan©.

The use of video-sequences. Conversational utterances are part of dialogs. In dialogs information is not only transmitted by verbal speech but also by intonation and nonverbal action (Argyle, 1988; Foppa, 1994). In order to properly analyze utterances in dialogs, the learner needs to process the information which is transmitted verbally, nonverbally and by intonation. This information can be displayed with the help of video-sequences. Another advantage of video-sequences is that they can be displayed repeatedly. Watching a video-sequence several times can help the learner to analyze the utterances.

Externalizing the analyses. The analyses need to be externalized and documented for them to be tangible for reflection. This can best be achieved by having learners write down their analyses. Lammon, Secules, Petrosino, Hackett, Bransford, and Goldman (1996) describe the advantages of having learners write down their ideas and solutions: "...articulating ideas in writing encourages students to formulate their theories explicitly; it clearly facilitates memory, and it supports reflection and revision" (p. 249). The computer-supported learning environment CaiMan© enables the externalization and documentation of analyses by providing learners with the opportunity to enter their analyses for each function of speech and to recall these analyses later.

Explaining the analyses. Verbalizing the analyses is only the first step towards the de-automation of speech-receptive action. The externalization of the analyses documents the final product but not the processes or the cues which were used to arrive at the analyses. The explanation of one's own action

constitutes a central part of reflection (Henninger, Mandl, & Law, 2000; Law, Mandl, & Henninger, 1998). According to various authors, the explanation of one's action or solution provides learners with a powerful opportunity for learning (Chi, 2000; Dominowski, 1998; Ericsson & Simon, 1998). Our learning environment supports the reflection of the analyses by requesting learners to enter explanations for each of their analyses.

Fostering reflection by providing an expert's analyses and explanations. In order to give the learners an orientation for the reflection of their analyses, they are provided with the analyses and explanations of an expert for each function of speech. They can compare their own analyses with those of the expert. Thus, the expert provides a model of how conversational utterances can be analyzed (Bandura, 1971; Collins et al., 1989). By reflecting the expert's analyses and explanations, the learner creates a mental model of how analyses and explanations might be done. Therefore, by providing learners with the opportunity to verbalize and reflect on their analyses of conversational utterances, the computer-supported learning environment CaiMan© constitutes a suitable tool for the de-automation of speech-receptive action. Different ways of fostering reflection have been examined in experimental studies.

Re-automation by repeated exercise. (Re-)Automation of skills is achieved by repeatedly exercising those skills (Hacker, 1998; Leontiev, 1981). Correspondingly, the learning environment CaiMan© provides learners with the opportunity to repeatedly practice the analyses of conversational utterances. In each session with the learning environment the learners analyze two different video-sequences depicting a dyadic conflict situation. In both sequences, learners have to analyze the utterances of both conversational partners. CaiMan© is applied during six sessions in each course. Thus, learners undergo a number of learning cycles in which they practice the analysis of conversational utterances. This provides learners with a basis for re-automating the analysis of conversational utterances.

Factors of success in integrating software into the training of soft skills

The learning software CaiMan© has been integrated into programs for the training of communicative behavior for several years now. During this time, it has been subject to educational and psychological research. Instructional and motivational factors have also been investigated in studies dealing with CaiMan©. This research has shown that this learning software is successful in improving the differentiated analysis of conversational utterances and that it is highly accepted by learners (Henninger, 1999; Henninger & Mandl, 1993, 2000;

Henninger, Mandl, & Pommer, 1994; Henninger, Mandl, Pommer, & Linz, 1999). Seven factors can be identified the success of the learning environment CaiMan©:

1) *Description of the subject matter:* The accurate description of the subject allows the definition of learning goals and the identification of the kind of knowledge and/or skills to be taught. The learning environment CaiMan© has been designed on the basis of an explicit description of the subject matter. This description leads to the learning goal of differentiated understanding. Furthermore, the instructional design is affected by the description of the subject matter. The subject matter of speech-reception requires the de- and re-automation of the skills which are to be fostered (Henninger, 1999; Henninger & Mandl, 2000).

2) *Software as a tool:* Software should not be used as an end in itself. Only the thoughtful integration of learning software into an instructional schemework will lead to success (Kerres, 2000; Reusser, 1993; Schofield, 1999). Learners have to realize by themselves the necessity for using the software for learning. In our case, the learning gains of the CaiMan© software connect the two face-to-face training sessions, and learners can realize that it is necessary to work with CaiMan© in order to succeed in the second face-to-face group session (Henninger, 1999).

3) *Integration of software into a course setting:* The use of software makes most sense if it is integrated into conventional forms of learning and teaching (Kerres, 2000). This is especially the case with the training of soft skills because they consist of both individual cognitive skills and social interactive skills. The computer-supported learning environment CaiMan© is integrated into a face-to-face course setting. Thus, the fostering of speech-productive and of speech-receptive action can be related to each other. This is important because there is no conversational situation in everyday life which consists only of one of the two parts of communicative behavior.

4) *Authentic learning scenarios:* A basic assumption of situated learning approaches is the authenticity of the learning scenario (Collins et al., 1989; Greeno & The Middle School Mathematics Through Application Project Group, 1998; Law, 2000). The context of learning should be similar to the context in which the acquired knowledge and skills are used in everyday life. The computer-supported learning environment CaiMan© is embedded in an authentic learning scenario: the analysis of conversational utterances is conducted on the basis of realistic conversational situations. These scenarios are displayed in the form of video-sequences. A high degree of authenticity in the integrated video-sequences did not, however, have a positive impact on learning results (Henninger et al., 1999).

5) *Easy to use:* The purpose of using learning software as a cognitive tool is to support the learner's reflection by reducing the cognitive load the learner is confronted with. This can only be the case, however, if the application of the software itself is easy and comprehensible. The computer-supported learning environment CaiMan© is easy to use and does not offer more features than necessary.

6) *Obligatory participation:* The learner can only profit from software if he/she uses it. We do not consider it helpful if the use of learning environments is voluntary. Particularly if the computer-supported learning environment is embedded into a course setting, it is necessary to establish the same or a similar level of knowledge amongst all learners. Learning with CaiMan© is obligatory for participants of communication training. Several studies (Linz, 2000; Pommer, 2000) have shown that the learning environment CaiMan© is successful in teaching a differentiated analysis of conversational utterances independent of the learners' motivation.

7) *Adaptability of the software:* No training program is exactly like another. In many cases, it is important to emphasize different contents and to adapt training concepts to the situation of the clients. Accordingly, it is necessary for a computer-supported learning environment, which is part of such a program, to be adaptable to particular situations. The computer-supported learning environment CaiMan© can be adapted to the knowledge and interests of the learner: The instructor is able to integrate different video-sequences into the learning environment and to activate various instructional features, such as the request for the learner's explanations or the accessibility and content of the expert's analyses and explanations, as desired.

To sum up, although the use of computer-supported learning environments for the training of soft skills might initially sound paradoxical, we argue that the integration of such software can be successful, and we identify seven factors involved in this success. The drawback most often voiced by learners is that they miss direct support and the opportunity to discuss their analyses. Consequently, a further development of the computer-supported learning environment CaiMan© focuses on providing online-coaching via the internet.

Searching for ways to foster reflection: Two empirical studies

As mentioned above, reflection is an important process in modifying one's own actions. According to all three models of reflection, verbalization or explanation of action is one of the key elements of reflection. And, following Schön, reflection-in-action (i.e. online), implying moment-by-moment "active experimentation", is conceptually more complex, developmentally more mature, and functionally more significant than reflection-on-action (cf. Schön, 1983, 1987). Thus we have used our learning tool CaiMan© to create a learning scenario which enables the learners to reflect-in-action, e.g. analyze utterances by using explanations or verbalizations of their action. In two studies we have examined whether different operationalizations of fostering reflection have effects on learning results (speech-receptive action).

Study 1: Examination of reflection support by providing an extended opportunity for reflection (with additional explanation from an expert)

Goal

In this study, we investigated how far the supporting reflective processes with the help of extended opportunities for reflection leads to better learning gains. It is, for example, unclear which degree of information density the expert's modeling should have, and also which modality (textual, auditory, visual, or multimodal) should be used for the information transmission.

Theoretical background and research questions

Speech-receptive action, i.e. the analysis of communicative utterances, is largely automated. In order to be able to change this speech-receptive action, it therefore first needs to be de-automated. This de-automation can be achieved by bringing the speech-receptive action and its consequences into consciousness with the help of the multimedia learning environment CaiMan©. The learning environment provides learners with opportunities to make them aware of their own speech-receptive action. It is the task of learners to analyze communicative utterances according to the three functions of speech referred to by Bühler (1934): appeal, expression and representation. Reflection acts as a central learning principle: with its help, learners become aware of their communicative behavior and its background. According to Collins and his colleagues (1989), reflection is the central principle for changing cognitive processes. Because of the interlocked nature of cognitive processes, reflection needs to be supported. Collins and Brown (1988) call a method which supports reflection "abstracted replay", i.e. the cognitive reflecting on one's own problem solution and its comparison with that of an expert.

The research question was the following: is there a greater increase in the quality of speech-receptive action in the learning condition "extended opportunity for reflection" than in the learning condition "limited opportunity for reflection"?

Method

Participants. 30 participants from the University of Munich participated in this training session as part of a communication training program. They were randomly assigned to one of the two learning conditions.

Description of the learning environment. The learning environment is the multimedia learning environment CaiMan©. Video-sequences of dyadic conflicts are implemented into the user interface. In each training session, the participants are given two conversation sequences (dialogue between person A and person B, with one change of speaker per sequence). It is the task of the participants to analyze each communicative utterance for both speakers (Person A and Person B) according to the three functions of speech mentioned by Bühler (1934): representation (what information is contained in the utterance), expression (what the speaker expresses about himself) and appeal (what the speaker wants the hearer to do). The analyses are entered in the respective windows. Immediately after giving their analyses, the participants can view an expert's analysis (and explanation). The participant follows these steps for each sequence, for all three functions of speech and for both communication partners in the video-sequence.

Variation of learning conditions. The learning conditions differed in the following way: learners in the "extended opportunity for reflection" condition could compare their analysis with an expert's analysis as well as an explanation. In this explanation, the expert describes which aspects in the utterance contributed to his analysis. In the "limited opportunity for reflection" condition, learners had only an expert's analysis to compare their analysis with.

Design. The training consists of 6 individual sessions, of which only sessions 1-4 are considered in this study. The training sessions have an average duration of about one hour and take place with at least one day in between. In each session, the participants work on two sequences of a conversation with one change of speaker (A-B, A-B). They analyze these sequences for each person (A and B) according to the three functions of speech (representation, expression, appeal).

Studied variables. The quality of analysis of the three functions of speech formed the dependent measure. The independent variable was the variation between the learning conditions "extended opportunity for reflection" and " limited opportunity for reflection".

Instruments. The quality of analysis was determined through a comparison by two raters of the number of arguments in the learner's analysis with those in the expert's analysis (interrater-reliability r=0.78).

Description of a training session

The written instruction was read out by the experimenter (giving an explanation of the learning environment and the task) at the beginning of a session.

Beginning of the learning session
Task: Analysis of video-sequence **1**
Comparison of learner's analysis with expert's analysis *(Learning condition " Limited opportunity for reflection")*
or
Comparison of learner's analysis with expert's analysis and explanation *(Learning condition: "Extended opportunity for reflection")*
Analysis of video-sequence **2** in an analogue fashion
End of the learning session

Results

Effects of the treatment variations on learning outcomes are detectable by looking at the interaction effect "learning condition x changes in the quality of analysis". We could not find any effect of the treatment variation.

Table 1: Analysis of variance; Influence of the variation of the learning conditions on changes in the quality of analysis.

		Function of speech					
		Representation		Expression		Appeal	
Source	df	F	p	F	p	F	p
Learning condition x Changes in the quality of analysis	1,28	0.19	n.s.	0.18	n.s.	0.84	n.s.

Note: N=30.

In addition, we conducted a t-test to look at the learning effects in each condition. In contrast to further studies (see Henninger et al., 1999), we found only one significant change in the function "expression" in the learning condition "extended opportunity for reflection". However, the decline of the mean

indicates not an improvement but a decline in the performance. The same effect – but only on a 10% level of significance – could be observed in the learning condition "limited opportunity for reflection".

Table 2: Comparison of means of the quality of analysis for the learning conditions (pre/post)

		Function of speech		
Learning condition		Representation	Expression	Appeal
Extended opportunity for reflection	t1	0.61	0.49	0.31
	t4	0.70	0.33	0.49
t-test		n.s.	*	*
Limited opportunity for reflection	t1	0.57	0.43	0.36
	t4	0.71	0.31	0.42
t-test		n.s	+	n.s

Note: $n_{\text{extended possibility for reflection}}$ =16; $n_{\text{non-extended possibility for reflection}}$ =14; + p<0.10; *p<0.05.

Discussion

Considering the theories on reflection, we expected positive effects from giving additional opportunities for reflection because learners would thus be able to reflect on their own action in a more differentiated way. Our expectation that the learning condition with an "extended opportunity for reflection" would lead to more changes in the quality of analysis of speech-receptive action than the learning condition with "limited opportunity for reflection" was not confirmed.

We have two possible explanations. The first is that the additional explanations given by an expert are too differentiated, too complex. Thus the learners – novices in describing and explaining speech-receptive action – could not make connections between their explanation and those of the expert. A deeper look into the logfiles shows that the expert's reflection includes the profound structure of problem solutions, whereas the reflection of learners who are less familiar with a domain is based rather more on superficial features (hierarchies of reflection: Hatton & Smith, 1995). Comprehension gaps of the learner can on the one hand be supportive in that they induce cognitive conflicts that motivate the creation or modification of knowledge. On the other hand, the gaps can be so immense that the learner is incapable of following the expert. The latter could be responsible for the failure of the extended opportunity for reflection condition to yield better results.

The second explanation follows a closer examination of the method. The learning environment offers the opportunity for reflection but whether or not this "knowledge offer" is taken up by the participants is their own decision.

Furthermore, the chosen instructional support is not directly connected to speech-receptive action. The participants have to analyze communicative utterances but do not have to explain these. Therefore, the "knowledge offer" does not have an equivalent on the level of action. Considering the results of this study, it remains open as to whether the instructional supporting of reflection cannot lead to enhanced performance. The problem of the lack of correspondence between the instructional support for knowledge and the action level described above leaves room for interpretation. In order to close this gap, another study was conducted where the participants were given the opportunity to explain their analysis as well. This study is described in the following section.

Study 2: Self-explanation as a method to support reflection

Goal

In this study, we wanted to answer the question of whether the reflection-supporting "self-explanations" would lead to better learning gains.

Theoretical background and research question

Nearly all studies about self-explanation show the positive influence of self-explanations on knowledge acquisition, performance and transfer. However, these studies have mostly been conducted in complex, well-structured and static domains, such as mathematics, physics or biology. Self-explanations seem to be superior to "pure" verbalizations (thinking aloud). With respect to verbalizations (thinking aloud), how far these represent "spontaneous self-explanations" needs to be examined. (cf. Chi, Bassok, Lewis, Reimann, & Glaser, 1989). Instructional explanations seem to have a positive effect when they encourage learners to give self-explanations; giving instructional explanations, therefore, does not replace the learners' own activities.

But what about the domain of changing skills? First, the question needs to be answered whether the results gained from studies on knowledge acquisition or knowledge application (problem solving) can be transferred to this area of changing skills. One example from the pedagogical domain where changing skills takes place is that of communicative behavior– understanding as well as speaking. Communicative behavior is highly automated in adult native speakers, therefore changes can only occur after de-automating the respective processes or action patterns (see above). The goal of knowledge acquisition or application often lies in enhancing or fostering behavior. Our learning situation, however, aims at changing the underlying cognitive processes of a certain behavior. The processes we are dealing with – processes of understanding – are highly automated. Therefore, changing these processes needs de-automation and reflection.

Studies have shown that verbalizations or self-explanations of automated action sequences can have negative effects on learners working on a task (cf. Schooler et al., 1993). This is explained by the fact that in this case, self-explanations compete with the behavioral goal itself. However, self-explanations can be helpful when de-automation and reflection of one's action are the goal – as is the case with changing behavior. For this behavior change, in a cyclic and sequential learning environment which includes repetitions within each learning phase and which comprises several sequential learning phases, it seems sensible to have the self-explanations after the goal behavior. Thus, two effects are achieved. First, (direct) competition between self-explanations and behavioral goals is avoided. Second, self-explanations foster de-automation and reflection. This again has an effect on the behavior - or sequences of action - in the next learning phase or cycle.

The research question was: do self-explanations in addition to instructional explanations facilitate the changing of speech receptive action?

Method

Participants. 20 students from the Technical University of Munich participated in this training session as part of a communication training course. The participants were randomly assigned to the learning conditions.

Description of the learning environment. The same learning environment was employed as in study 1.

Variation of learning conditions. The learning conditions differed in the following way: learners in the condition "with self-explanation" had to give an explanation for their analysis in addition to the analysis itself. In the learning condition "without self-explanation", the learners had to give an analysis but no explanation. Both conditions had access to an expert's analysis and explanation.

Design. The training session consisted of 6 individual sessions, of which only sessions 1-4 are considered in this study. The training sessions have an average duration of about one hour and take place with at least one day in between. In each session, the participants work on two sequences of a conversation with one change of speaker (A-B, A-B). They analyze these sequences for each person (A and B) according to the three functions of speech (representation, expression, appeal). In the learning condition "with self-explanation", the participants have to give an additional explanation for their analyses of communicative utterances.

Studied variables. The quality of analyses of the three functions of speech formed the dependent measure. The independent variable was the variation in the learning conditions "with self-explanations" and "without self-explanations".

Instruments. The quality of analyses of the communicative utterances was assessed with two experts' ratings. The number of arguments contained in the participants' analyses are compared to the number of arguments contained in the expert's analysis (interrater-reliability: r=.78).

Description of a training session

The written instruction was read out by the experimenter (containing an explanation of the learning environment and the task) at the beginning of a session.

Beginning of the learning session
Task: Analysis of video-sequence **1**
Comparison of own analysis with an expert's analysis and explanation *(Learning condition: "without self-explanations")*
or
Comparison of own analysis and explanation with an expert's analysis and explanation *(Learning condition: "with self-explanation")*
Analysis of video-sequence **2** in an analogue fashion
End of the learning session

Results

In this study we found a significant interaction effect between treatment and learning gains (function: representation, see table 3). But – comparable with study 1 – the treatment with self-explanations did not lead to higher learning gains. For the function "representation," the condition without self-explanations leads to better learning gains as compared with the condition with self-explanations. For the function "expression", a significant decline in the quality of analysis could be observed in both treatments. No significant change in the quality of analysis could be detected for the function "appeal" (see table 4).

Table 3: Analysis of variance; Effects of the variation in the learning conditions on changes in the quality of analysis

		Function of speech					
		Representation		Expression		Appeal	
Source	df	F	p	F	p	F	p
Learning condition x Changes in the quality of analysis	1,18	10.84	**	0.07	n.s.	0.02	n.s.

Note: N=20; **p<0.01.

Table 4: Comparison of means of the quality of analysis for the learning conditions (pre/post)

		Function of speech		
Learning condition		Representation	Expression	Appeal
Extended opportunity for reflection	t1	0.61	0.47	0.53
	t4	0.73	0.28	0.61
t-test		+	*	n.s.
Limited opportunity for reflection	t1	0.41	0.51	0.43
	t4	0.83	0.30	0.49
t-test		***	*	n.s

Note: Nextended opportunity for reflection =9; Nlimited opportunity for reflection =11; + p<0.10; *p<0.05; ***p<0.001.

Discussion

Our expectation that higher learning gains can be achieved by supporting reflection in the form of self-explanations than without this support of was not confirmed. There was even an advantage in the learning condition where learners had only to give an analysis but had an expert's analysis and explanation at hand, i.e. where the possibilities for action did not correspond.

The question remains, why were the participants not able to profit from the opportunity to compare their analysis with an expert's? One explanation might be that explaining their analysis claims more of the participants' cognitive resources, which might reduce the quality of their analyses. Such performance-reducing effects as the result of a complex learning situation where several behaviors are possible were also reported by Stark, Graf, Renkl, Gruber and Mandl (1995). Therefore, it seems sensible to assess the influence of task complexity in further studies.

Discussion of both studies

Considering the results, our assumption that reflection could be fostered by extending the opportunities for reflection additional experts' analyses or by creating direct links between information about action and the results of action – i.e. in the form of the analysis window and the explanation window could not be confirmed. Therefore, it is not surprising that an enhanced quality of analysis of speech-receptive action could not be observed in the "extended reflection" conditions.

What does this mean? Is reflection a cognitive activity which cannot be fostered? According to the leading theories in this field, there have to be ways to foster reflection. And it seems very unrealistic to assume that changing such complex cognitive behavior as communication could be succesful without a related cognitive activity, such as thinking about one's own action. In the light of previous studies in which substantial learning gains could be reported (see Henninger, 1999), it seems plausible to argue that the five phases of reflective thinking, based on Dewey, are supported by the learning environment CaiMan©:

1) problem recognition: the participants can find deficits in their analyses by comparing their solutions to those of an expert;
2) specification of possibilities for new action or beliefs: by comparing one's own solutions with those of an expert, participants are requested to specify alternatives for speech-receptive actions;
3) evaluation of these possibilities by drawing on memory;
4) revision of the possibilities by questioning or experimenting: participants can check and revise their solutions by comparing them with the expert's;
5) deciding whether to continue to look for evidence or to carry out one of the found possibilities, which may result in the change of communicative behavior: the participants are free to look more or less intensively at the explanations of the expert the evidence for his or her analysis.

The fact that the participants in all learning conditions were able to enhance their quality of analysis leads to the conclusion that they were able to profit from the comparison of their own behavior or action outcome with that of an expert, independent of the different learning conditions. This means that the methods chosen were not able to significantly enhance this process of comparison (points 3 to 5 in Dewey's model). Therefore, the question remains whether a more suitable application of the design principle "reflection" can be achieved by more direct supporting of this process of comparison. Or perhaps we are trapped in a ceiling effect: participants might profit from the general support of reflection – writing down their own analyses and thinking about them by

comparing them with the expert's – offered by CaiMan©. It may be possible that more reflection in the short learning sessions cannot be achieved by participants.

Considering our results and Schön's model, we favor searching for ways to foster reflection-in-action more than our "old" approach of looking for a way to foster reflection-on-action in the future. Reflection-on-action pausing in the midst of an action to "stop-and-think" (i.e. offline) is a first step in enhancing communicative behavior. But for a lasting and a stronger effect, it seems more fruitful to develop tools which foster reflection-in-action, i.e. reflection when an action is being undertaken (i.e. online), and which implies moment-by-moment "active experimentation".

Final remarks

In this article we have shown that communication skills can be taught using software but that there are several aspects which need to be paid attention to when designing a communication training program or framework. As demonstrated, a blended approach seems to be the best solution, combining the advantages of traditional face-to-face training with the possibilities offered by software and new technologies. With the help of didactically-designed software, traditional concepts can be optimized. However, it must not be forgotten that it has largely a supportive function. Face-to-face training cannot be replaced by it. A tool like CaiMan© cannot stand alone but has to be integrated into a training program.

One of the most important function of software-based training tools is the supporting of reflection. A multimedia learning environment like CaiMan© should serve as a tool for learners by offering them opportunities to think about their actions. One of the central aspects in changing automated action is being aware of the results and, if possible, of the underlying cognitive processes of the targeted action. Applying this to communicative action means that a person should be aware of the results and processes of speech-receptive action i.e. the understanding of utterances and speech-productive action i. e. using communication techniques. According to Schön (1983), training software should offer opportunities to break ongoing processes and fix the result so that a person can reflect on their own action and modify it.

Our research shows that it is very difficult to enhance reflection beyond the level which can be reached by realizing the five points suggested by Dewey, particularly if the experimental evidence is obtained in short-term intervention studies. With regard to the domain of communication with highly overlearned

action processes and keeping in mind the deliberations on reflection, we suggest that it can be very fruitful to develop and examine reflection-based learning scenarios in long-term studies. These learning scenarios should try to encourage reflection-in-action, for example, in the form of software tools which allow participants to reflect on their action in everyday settings and with ongoing support from trainers. Future research needs to show whether there are more ways to foster communication skills using software more than can be done in short-term intervention programs such as those using our tool CaiMan©.

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