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ABSTRACT

When discussing the current state of the art with regard to the use of new technologies in the foreign language classroom, two issues tend to come up again and again. On the one hand, it cannot be denied that even today, in the so-called post-communicative era, the effects of traditional instructivist theories of language learning with their transmission-based modes of learning are still somewhat dominant, in particular at the grassroots level. This is all the more surprising, as a discussion of constructivism as an appropriate platform for new approaches to language learning and acquisition seems to have dominated the debate at least on a theoretical level in recent years. On the other hand, it is becoming more and more apparent that the available offline and online software tools offer exciting opportunities for the language classroom that cannot be adequately attended to without calling the paradigm of instruction into question.

This paper is an attempt to contribute to the ongoing debate on this crucial issue by offering some key principles that move the discussion further in the direction of constructivist learning theories. A few of the theoretical issues discussed in Germany in the context of CALL and TELL are presented. New information and communication technologies will be touched upon, but the main focus will be an assessment of constructivism as the appropriate paradigm for language learning in the new millennium. In addition, the paper considers using Papert's term *constructionism* as a basis for putting theory into practice and in order to keep separate the theoretical platform of such an approach and its practical implementation in the knowledge society. On a methodological level, construction of knowledge and information processing are regarded as key activities in language learning. In conclusion, template-based learning is discussed as a possible metaphor for the design of technology-enhanced learning materials for the next millennium aimed at providing learners with constructionist learning scenarios.

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1. LEARNING AND THE KNOWLEDGE SOCIETY

Although the growing availability of the new information and communication technologies played a major part in starting the debate, we do not really feel at ease with the commonly used term information society but prefer to describe the world of tomorrow as a knowledge society. The resulting challenge to education has been discussed by Costa and Liebmann who explain

> that with knowledge doubling every five years—every 73 days by the year 2020—we can no longer attempt to anticipate future information requirements. If students are to keep pace with the rapid increase of knowledge, we cannot continue to organise curriculum in discrete compartments,... the disciplines as we have known them, no longer exist. They are being replaced by human inquiry that draws upon generalised transdisciplinary bodies of knowledge and relationships (Costa & Liebmann, 1995, p.23).

Considering such lines of thought, one of the authors of this article published the book mentioned above on recent developments in language learning theory and TELL (Technology Enhanced Language Learning) entitled *Fremdsprachenlernen in der Wissensgesellschaft*, i.e., language learning in the knowledge society (Rüschoff & Wolff 1999).

Based on the deliberations in that publication, we will now briefly discuss the educational challenge posed by the emerging knowledge society. Discussing this challenge created by the advent of new information and communication technologies, it is often said that we need a radical change in our approaches to teaching and learning in order to best prepare future generations for living and working in tomorrow's world. The French philosopher Pierre Levy pointed out for instance that the advent of information technologies would initiate a process of rethinking educational and training procedures, and also uses the term 'Knowledge Society' to describe the outcome of recent technological and social developments (cf. Authier & Levy, 1996). This seems to be logical, because, even though we live in a society in which information becomes more widely available, globally networked, and more freely accessible than ever before, information technologies and global access to information are only one aspect of the changing times we live in. Information needs to be processed and transformed into knowledge.

Therefore, traditional skills of information gathering and storing as well as the mere learning of facts will no longer be sufficient in order to live, work, and learn in the coming centuries. Consequently, the ultimate aim of teaching and learning will be to assist learners in their need to develop strategies of knowledge retrieval, production, and dissemination. As a result, the traditional transmission model of learning must be replaced by models of information processing and knowledge construction. Learning must be viewed more in terms of 'an active, creative, and socially interactive process and . . . knowledge as something children must construct and less like something that can be transferred' (Harper, 1996).

Education in the knowledge society can no longer be reduced to 'the act, process, or art of imparting knowledge and skill' as Roget's Thesaurus proposes, but learning must be recognised as an act in which a learner plays the role of an active constructor of knowledge. Within a constructivist framework, learning is defined as an active process in which learners construct new knowledge and awareness based upon current and past knowledge and experience. And as far as much needed changes in the way learning is organised are concerned, new scenarios for the language classroom and new types of materials need to be defined. Project-based and process-oriented learning with teachers as moderators in a rich learning environment are but a few keywords to be mentioned here.

2. LANGUAGE LEARNING AND CONSTRUCTIVISM

Language learning has often been described as one of the most impressive mental operations of the human mind in view of the complexity of grammatical structures, the size of the mental lexicon, and the multiple functionality learners of any language are confronted with (e.g. Schwarz, 1992, p.102). As a result, a lot of controversy has arisen as to how a language can best be learned. Various theories of learning and cognition have influenced numerous approaches to language learning, and acts of learning as opposed to processes of acquisition have dominated foreign language learning for a long time. Knowledge construction as a further aspect has only recently been added to the concepts discussed.

Following a long period in which behaviouristic rote pattern learning based on Skinner supplied the basis for easily controlled learning scenarios, cognition in the context of situational, functional–notional, and generally

communicative foreign language learning and acquisition has been the main influence on materials development and curriculum design over the past decades. Teacher control was the dominating principle of behavioural learning. Behaviourists reasoned that teachers could link together responses involving lower level skills and create a learning 'chain' to teach higher skills. The teacher would determine all of the skills needed and ensure that students learned these skills in a step-by-step manner (cf. Roblyer et al., 1997, p.59). The limitations of such an approach became apparent because problem solving and strategy learning were missing in behavioural learning. Consequently, cognitive approaches emerged which focus on building a learner's experiences and providing challenging learning tasks which can function as 'intellectual scaffolding' (Roblyer et al., 1997) to help learners learn and progress through the different stages of the curriculum.

Purely cognitivistic theories are now being challenged by an approach which is not solely based on the findings of SLA (second language acquisition) research. In addition, this approach, constructivism, is fully integrated into cognitive science, constructivist philosophy, neurology, and biology as well as computer science. This approach 'perceives students as active learners who come to . . . lessons already holding ideas . . . which they use to make sense of everyday experiences. Such a process is one in which learners actively make sense of the world by constructing meaning' (Scott, 1987, p.4). In contrast to such a constructivist viewpoint, previous and more traditional approaches to learning can be described as objectivist. Such models are based on the assumption that a subject can be categorised and organised into clearly defined units which can be explicitly taught as part of a carefully designed curriculum. Such explicit teaching 'is a systematic method for presenting material in small steps, pausing to check for student understanding and eliciting active and successful participation from all students' (Rosenshine, 1986, p.60). Obviously, cognitive learning goes somewhat further than purely objectivist methods, because cognitivists do not simply propose the learning of facts and skills, but add cognitive apprenticeship to the learning process. The focus of such learning-through-guided-experience is on cognitive and metacognitive skills in addition to purely factual learning (cf. Collins et al., 1989). Therefore, cognitive approaches can be placed somewhere in the middle of the scale between behavioural and constructivist learning. One of the major shortcomings of purely cognitive learning is the fact that explicit teaching and instruction are still very much part of such approaches. However, active learning in terms of

knowledge construction rather than traditional instruction is essential for the development of a coherent conceptual framework in a learner's mind, much needed in order to cope with the mental challenges posed by the knowledge society.

Constructivists go further than pure cognitive approaches by recommending 'that we help [learners] to construct meaningful and conceptually functional representations of the external world' (Jonassen, 1991, p.29). They view learning as an active, creative, and socially interactive process and view knowledge as something children must construct and less like something that can be transferred (e.g. Florin, 1990). The difference can be further explained by quoting Jonassen who discusses the outcome of mental activities in predominantly objectivist learning as *externally mediated reality* rather than the *internally mediated reality* in constructivist learning (cf. Jonassen, 1991, p.28). Learning based on constructivist principles will allow learners to tap into resources and acquire knowledge rather than force them to function as recipients of instruction. Such approaches are gaining approval and are regarded by many educational thinkers as a suitable theoretical framework for the learning environment of the future.

As far as foreign language learning is concerned, research into language learning and acquisition processes suggest that mere training in structural (grammatical) and vocabulary knowledge will not result in real linguistic competence and language proficiency. However, apart from basic communicative competences, favoured in the communicative classroom of the 80s, developing strategies of language processing and learning competence as much as language awareness and skills in knowledge perception, production and knowledge construction are needed for the successful outcome of any language curriculum. Such competences, often discussed in the context of learner autonomy, are of utmost importance for language learning. Therefore, those suggesting a rethinking of a purely communicative methodology discuss the post-communicative era of foreign language learning not in terms of a return to traditional concepts of drill (and kill) practice, quite the contrary. Apart from simply rejecting a traditional instructivist paradigm the constructivist paradigm is seen as an important methodological basis for real innovation in foreign language learning. Lewis (1993, p.vii) is very much in line with this position by stating programmatically: 'The Present-Practise-Produce paradigm is rejected, in favour of a paradigm based on the Observe-Hypothesise-Experiment cycle'.

3. BASIC PRINCIPLES OF CONSTRUCTIVISM

A methodology based on such principles focuses on 'learner orientation, process orientation, and learner autonomy' (Wolff, 1994, p.407), all of which ought to be regarded as extremely important in the context of language learning and acquisition. Learning should be regarded as a process of information gathering and knowledge processing. In such a process, the interaction between knowledge previously acquired and new information gathered leads to the acquisition and even to the production of new knowledge. Learning is an active process in which learners construct new ideas based upon their current and past knowledge (cf. Bruner, 1990).

Wheatley suggests two principles of learning through constructivist theory:

> Principle one states that 'knowledge is not passively received, but is actively built up by the cognizing subject . . . That is, as much as we would like to, we cannot put ideas into student's heads, they will and must construct their own meanings . . . Principle two states the function of cognition is adaptive and serves the organization of the experimental world . . .' (Wheatley, 1991, p. 9).

Consequently, we consider process-based learning as one of the fundamental principles of constructivist theory and propose the following additional principles as the major contribution of constructivism to the current debate on learning theory as follows:

- learning must be regarded as an active and collaborative process of knowledge construction;
- learning is to be seen as an autonomous process, to be regulated by the learners' expectations, goals, existing schemata and intentions;
- learning is a process of experimentation based on previous knowledge and experience;
- learning is a process of socially negotiated construction of meaning;
- learning is a process which must be supported by a rich learning environment rooted in real life and authentic situations.

Therefore, language learning as well as learning in general should be described as an interactive, dynamic process, in which new knowledge is most fruitfully acquired when learners are placed in a situation where they can

explore sources and resources rather than in a context of mere formal instruction. In such a scenario, learners combine new information with previous factual (declarative) and procedural knowledge and draw new conclusions from this process. Such a process-oriented approach to learning will not simply lead to a better understanding of linguistic facts (e.g. structure and vocabulary) and more effective acquisition of language proficiency; it will also lead to more learning competence and learning awareness.

Awareness-raising is one of the major aims of a learning scenario based on constructivist theory, particularly in view of the constant integration of new technologies into the day-to-day life of the knowledge society. Salomon and Gardner describe the impact of information technologies on human mental capacities as very significant; '. . . information technologies allow individuals to accomplish tasks that might otherwise be difficult or even impossible to contemplate, and they affect not only knowledge structures but also cognitive operations' (Salomon & Gardner, 1986, p.13). As far as language learning is concerned, awareness must, therefore, be developed on communicative, linguistic and strategic levels. The question remains, however, as to how the theoretical framework discussed above can be put into practice.

4. CONSTRUCTIVISM AND CONSTRUCTIONISM

How can the principle of 'learning without being taught' as proposed by Piaget (cf. Papert, 1980, p.7) be integrated into the learning environment of the future? In order to keep a discussion of theoretical principles and considerations as to practical implementation both separate and clearly focused, we would like to come back to the term constructionism as introduced by Papert (1991). He defines the difference between constructivism and constructionism as follows:

> We understand 'constructionism' as including, but going beyond, what Piaget would call 'constructivism'. The word with the v expresses the theory that knowledge is built by the learner, not supplied by the teacher. The word with the n expresses the further idea that this happens especially felicitously when the learner is engaged in the construction of something external or at least shareable . . . a sand castle, a machine, a computer program, a book. This leads us to a model using a cycle of internalization of what is

outside, then externalization of what is inside and so on (Papert, 1991, p.3).

Consequently, the trick to a successful transfer of constructivist theory onto a constructionist platform can be described as finding appropriate tasks which get the learner 'engaged in the construction of something shareable'. One way of doing this is by means of problem-solving tasks, hypothesis formation and validation. Such activities of knowledge construction make both the content of learning materials and the learning process itself more transparent and perceivable. In addition, constructionism puts a lot of emphasis on task-based learning. It has been stated time and again that the best learning results are achieved if learners work as much as possible with authentic and semi-authentic materials which are being put in the context of authentic, real-world-based situations or at least simulations and thus supported by authentic tasks.

As stated above, constructionism favours play and experimentation, involving self-structured and self-motivated processes of learning. Both declarative and procedural knowledge need to be developed, thus adding to and increasing the cognitive apparatus of the learner, constant cognitive growth and cognitive flexibility being of utmost importance for living and learning in the knowledge society. As far as a rich and rewarding learning environment is concerned, Florin (1990) proposes the creation of information landscapes, of virtual towns, or intellectual amusement parks, an intriguing metaphor for the learning material for the future.

As far as learning materials are concerned, one suggestion for turning theory into practice is the use of so-called cognitive tools, particularly when using new technologies in language learning. Such views are mirrored by Jonassen and Reeves, who have summarised the importance of cognitive tools as follows:

> Cognitive tools empower learners to design their own representations of knowledge rather than absorbing knowledge representations preconceived by others. Cognitive tools can be used to support the deep reflective thinking that is necessary for meaningful learning. Ideally, tasks or problems for the application of cognitive tools should be situated in realistic contexts with results that are personally meaningful for learners (Jonassen & Reeves, 1996, p.693).

Typical and often quoted examples of cognitive tools for language learning are concordancers and authoring tools for creating class-based learner dictionaries or similar data-bases. The use of wordprocessors with appropriate add-on features, such as integrated dictionaries or style-checkers is another example. In addition, wordprocessors with integrated templates for thought collection or brainstorming and organizing ideas and vocabulary as part of text production tasks are a further possibility to put into practice a tools-based approach to materials design very much in line with the theoretical framework discussed above. A further example for a particular type of cognitive tool is the learning tool described in the second paper of this special issue of CALL by Annette Groß and Dieter Wolff, reporting on the results of the READERS project. The READERS software was developed jointly by a team of researchers from the universities of Essen and Wuppertal headed by Bernd Rüschoff and Dieter Wolff. It is a multimedia program designed to help university students—not necessarily language students—with the difficult business of understanding texts in a foreign language. The software which is presented in more detail in the paper mentioned is an L2 reading trainer. It consists of a set of tools which are related to a corpus of texts. A tool which makes it possible for learners to increase and improve their foreign language proficiency autonomously and on their own responsibility. The program is not designed according to grammatical or communicative grading principles which are normally related to batteries of more or less formal exercises. It is an open package of tools intended to assist learners in raising their awareness of learning strategies and strategies of 'text processing' and additional such tools which are meant to help learners with reading, and at a later stage also with writing, a foreign language text.

5. TEMPLATE-BASED LEARNING AND KNOWLEDGE CONSTRUCTION

Based on such ideas, we would like to introduce the term template-based learning, which is by no means to be restricted to the use of new technologies. Such a concept goes somewhat further than just using any tools, such as electronic encyclopaedia or straight wordprocessors as part of the learning process. It entails the principle that any material we provide learners with should be open and flexible, and also provide learners with a frame to assist them in structuring and co-ordinating acts of knowledge construction. Tem-

plates can be designed in the format of advanced organisers as well as tools and tasks which encourage 'on-the-fly' recording of thoughts and impressions whilst examining learning materials.

Such templates provide

> the potential for students to reorganise or revise their thoughts to better 'make sense' of what they see and hear. Students are able to document their emerging ideas in support of an investigation or problem solving exercise whilst viewing different media. This provides support in the formulation of new schemata in the process of accommodating the new information (Harper, 1996).

In our opinion, the principle function of template-based learning is to provide a framework for gathering information, stimulating recall of prior knowledge, and for guiding processes of knowledge construction. Templates help in creating more authentic tasks for learning and require the kind of high order thinking skills which are needed in the knowledge society. Effective use of templates on the part of the learner

> (a) causes focusing on important points; (b) helps students gain familiarity with text structure; (c) aids retention; (d) generates useful alternative texts to supplement materials read; and (e) causes active participation in learning (Bianco & McCormick, 1989 in Schroeder & Kenny, 1994, p.966).

Thus, the use of templates is of vital importance when attempting to generate more learner autonomy in the language classroom. Learner autonomy is, of course, a concept which goes much further than simply 'offering the possibility of self-study' (Holec, 1988); templates in the form of technology enhanced resources can be supportive of autonomy, but texbook-based tasks can also be designed in terms of the template metaphor. Such learnware, 'technologies of education in the broadest sense (from the textbook to the computer)' (Benson & Voller, 1997, p.10) permits the learner to proactively participate in the process of language learning and acquisition and knowledge construction, thus enabling him/her to gradually decide individually upon the materials and strategies of learning best suited to a given aim. As far as the use of new technologies is concerned, learner autonomy does not imply simple self-access tutorials or individualised learning:

> The new technologies of language learning have tended to latch on to autonomy as one justification for their existence. Computer software for language learning is an example of a technology which claims to promote autonomy simply by offering the possibility of self-study. Such claims are often dubious, because of the limited range of options and roles offered to the learner. Nevertheless, technologies of education in the broadest sense (from the textbook to the computer) can be considered to be either more or less supportive of autonomy (see Benson & Voller, 1997, p.10).

As far as template-based learning is concerned, it can be also assumed that computer tools will facilitate the implementation of such a methodological framework and contribute to solve a large number of practical problems, particularly in the area of exploiting authentic resources. An important principle to be followed when designing learnware is, of course, to ensure (i) authenticity in learner-software interaction; (ii) clear tutorial strategies; and (iii) easy navigational procedures. After all, authenticity both in content, task, and classroom interaction is 'a crucial issue' in language learning methodology (cf. van Lier, 1996, p.123). It can therefore be argued that educational technologies in the broadest sense as defined by Benson and Voller (1997) based on a template-based metaphor are the perfect aid to assist teachers in their 'need to broaden their scope for creative pedagogical initiatives' (Little et al., 1989, p.I).

6. AN INTEGRATED MULTIMODAL LEARNING ENVIRONMENT

Finally, we would like to take the theoretical concept of constructivism and its more practical counterpart of template-based learning one step further and consider the ideal set-up of a modern language classroom that reflects this approach towards language learning in an institutionalized context. Clearly, with regard to the heterogeneous needs and prerequisites of the learners, this can only be very programmatic, and various methodological implications of our claims have already been made above (cf. learner and process orientation, experimentation, and authenticity). Hence, what would an integrated, multimodal language learning environment look like from a very

practical point of view, and what would this imply from a technological perspective?

Following Legutke's (1998) attempts to categorize the multitude of learner endeavours, at least six levels of action can be distinguished: The classroom can be thought of as a *project room* where relevant materials and media are available for free access in the various working areas. This undoubtedly calls for the use of multimedia and the Internet as cognitive tools, as outlined above. It can also be envisaged as a *training centre* where guidance is offered for more individualized awareness-raising activities, eventually leading to more learner autonomy. This metaphor, however, must not be misconceived as a simple call for more self-study; rather it envisages the teacher as a 'coordinator and facilitator' (Legutke & Thomas, 1991, p.287) who still 'carries the responsibility for the learning process as a whole and retains the right to intervene with help, advice or to set fresh targets' (Legutke & Thomas, 1991, p.287). Thirdly, the classroom may be perceived as an *observatory*, enabling the learners to focus on the intercultural dimension of the language learning process. In this context online and offline databases and encyclopaedias as well as authentic web-based materials serve to equip the learner with the necessary resources to pinpoint cultural phenomena. We said before that the idea of 'constructionism' accentuates a task-based and product-oriented approach towards the learning scenarios. This calls for the classroom as a *workshop* where software tools such as word-processors, presentation tools etc. are used to create a productive, goal-oriented learning atmosphere. The various means of computer-mediated communication (e.g. e-mail and tandem projects, video-conferencing) add a further dimension to the workshop idea by empowering learners to go beyond traditional boundaries. Hence the classroom can be conceived as a *communication centre*. Finally though, we should not completely abandon the notion of the classroom as a *teaching centre* where the teacher acts as an instructor—even though to a much lesser degree than is normally the case. We are convinced that by balancing this final metaphor against the five aforementioned, this more 'traditional' role is likely to set the teacher in an altogether new light.

It should become clear from this brief depiction of our idea of an integrated learning environment that such a classroom is by no means exclusively technology-driven. Rather, it is 'multimodal' in the best sense of the word by offering all kinds of modes that are conducive to an open and flexible learning environment, including the true integration of the new media—or in other words, it is technology-enhanced.

7. SUMMARY

Over the past decade, language learning theory has seen a shift from the highly guided to the more open learning environment with constructivism as a new and very much learner-centred paradigm for learning. Learning is seen as a self-structured and self-motivated process of knowledge construction and the learner is regarded as a self-governed creator of knowledge. In addition to the need to achieve instructional goals, the development of cognitive abilities towards a cognitive apparatus (cf. Wheatley, 1991) suitable for the knowledge society is defined as one of the principle aims of a learning process based on knowledge construction and discovery learning. In order to facilitate the practical implementation of such an approach, the term constructionism is suggested in order to describe construction of knowledge as a process that arises from the physical creation of objects (cf. Harel et al., 1991). Translated into language learning, such an approach favours project-based, process-oriented, product-centred learning within a rich and facilitative multimodal learning environment.

Papert, who introduced the term constructionism, in his own words boils 'constructionism down to demanding everything to be understood by being constructed' (Papert, 1991, p.3). In our opinion, such a formula could, in the future, serve as the guiding principles for curriculum design, materials development, and classroom practice. Not just technology enhanced tools, as Bruner proposed, but any technology of education from textbook to computer (Benson & Voller 1997) needs to 'let the learner go beyond the information given' (Bruner, 1990). In addition, tasks set and exercises given in such materials need to be developed in such a way that they stimulate construction of knowledge and aid processes of internalisation and externalisation of knowledge as defined by Papert. The metaphor of template-based or even template-enhanced learning proposed in this paper might be a suitable basis for future deliberations in this area, eventually leading to a foreign language classroom as an 'integrated multimodal learning environment' where the new media are but one tool for enhancing the language learning process.

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