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Constructivism and teaching: a new paradigm in general didactics?

EWALD TERHART

After a long period of paradigmatic stability in the field of general didactics (*Allgemeine Didaktik*) in Germany, the proponents of the 'constructivist didactics' claim to be formulating a new approach on the theoretical as well as practical levels. This claim is analysed and evaluated. Four background theories of constructivist didactics are sketched; the central arguments of these didactics are reconstructed; some examples of practical constructivist teaching recommendations presented; and, finally, constructivist didactics is critically analysed in the context of a theory of learning in schools. The conclusion is that constructivist didactics is not a new paradigm in the sense that its proponents claim it to be.

In Germany, it has become quiet around general didactics. The controversies of the late 1960s and early 1970s have died down; the theoretical situation has been basically stable for decades. The textbooks still present, with persistence and success, the 'theories and models of didactics' systematized by Blankertz (1969, 1991) 30 years ago. In teacher education, general didactics as well as discipline-focused didactics generally have a solid footing. In that sense, one can speak with some justification of a cessation of the theoretical discussion.

However, this is surprising because one might perhaps expect, given the widespread talk about the crisis in instruction, school, and the teaching profession, that the wheat of didactics would bloom on a theoretical level. Just the opposite is the case! In general didactics, there has been no theoretical discussion worth speaking of for around 2 decades. Two of the theoretical models Blankertz distinguishes—the approach centred around the concept of *Bildung* embedded in the hermeneutical theory of education (Westbury *et al*. 2000) and the approach centred around an empirical and more technological understanding to the teaching-learning-process—have been worked through several times. In the course of this process, they have moved much closer to each other—one could even say have started to lean on each other as if seeking protection. And, another thing has to be mentioned: genuine theoretical discussion has been largely

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replaced by the development and defence of certain teaching methods on a more practical level.

In this paradigmatically stable situation, a new kind of thinking and a new rhetoric have taken the spotlight with nothing less than the claim to represent a new approach or new paradigm in general didactics. I talk about a set of ideas, called by its protagonists 'constructivist didactics', which bases itself on various variants of constructivism in epistemology, on analogous arguments in the theory of general systems, in part also on micro-sociological theory (social constructionism), but particularly on concepts of brain physiology and cognitive science. It is significant that this constructivist understanding of teaching and learning, of instruction and didactics, manifests itself not as a specifically German phenomenon[1] but as a broad international development with a background both in didactic developments in special subject matter areas and certain developments in the psychology of learning and instruction (Duffy and Jonassen 1992, Tobin 1993, Steffe and Gale 1995). In particular, the constructivist approach was formulated and tested in the field of mathematics and science teaching, which has always had a relatively close relationship with empirical psychology of learning and cognitive psychology. However, this new movement should not be considered as limited to this content area in that it appears explicitly with the claim to present a new approach in general didactics.

In what follows, this claim will be more closely examined and placed in the context of a larger discussion of the theory of teaching and the school. First, I recapitulate the theoretical basis of (more or less radical) constructivist didactics. Next, I articulate the systematic conception of a constructivist didactics, and finally I attempt a critical dialogue with constructivist thought and action in the context of teaching and schooling.

Theoretical background of the constructivist argument in didactics

As already mentioned, constructivist didactics constructs the foundation on which it bases itself by drawing on different kinds of levels and areas of theory. Starting from there it arrives at a structure of core statements which include, in addition to strategic practical recommendations for classroom teaching, certain general normative assumptions regarding the goal of the enterprise of 'teaching and education'. Parallel to this (actually self-constructive) justification and development of its own 'new' starting point, this didactic also continually engages in a kind of criticism of real or imaginary opposing schools of didactic thought. Essentially, there are four very different theoretical contexts which represent the background for constructivist didactics, or which are being used by the protagonists of this movement: radical constructivism, the neurobiology of cognition, systems theories, and current conceptions of learning developed in the field of cognitive psychology. We have to remember, first, that, from a systematic point of view, these supporting theories are not all on the same level. Their relationship to each other will be judged as different depending

on the perspective or point of view. Secondly, these very different background positions are being used and combined by the various representatives of constructivist didactic thought in different ways and in different intensities. It is difficult, therefore, to make out what precisely the constructivist core ideas are: anyone who has been identified in some way or another denies immediately that he or she can be identified in this way! In the end, it not only becomes unclear what constructivism in its various variants really is; it also remains unclear what a constructivist didactics that is to be constructed on this difficult-to-determine basis *can* be.

Radical constructivism

The epistemology of radical constructivism finds its fundamental assumptions in a specific epistemology and philosophy of science. According to this epistemology, all human knowledge—from everyday observations to scientific knowledge-formation—as apprehension and representation of some kind of reality that lies outside of the knowing subject and existing as such by itself, is in principle impossible. Everything that can be known of this external reality is a creation of the observer. Knowing is bound to the perspective of the observer, and observing systems are only able, and, therefore, forced, to construct because they are 'operationally closed'. Reality 'as such' is unreachable; everything that we know of it is generated by human beings. Nothing of knowledge is ever discovered, everything is invented, even this sentence. Notice, of course, that this does not mean that the existence of the reality of objects existing outside us is being denied (radical constructivism is no simple solipsism!); it is only claimed that everything that human beings can know of this external reality is a construction. *We can understand our reality only in the form in which it has been constructed by ourselves*. The sum of all constructions is, so to speak, the 'experienced reality' (*Wirklichkeit*) in which we live. Even the distinction between a reality of things which possibly exist outside of our experienced reality and the construction of this experienced reality, which is the only thing that is possible for us, is itself such a mental construction. 'Reality' is a concept within our constructed experienced reality.

Constructions not only have an individual character; they take place as co-constructions in social contexts, and, thus, must be tested there. The formation of scientific knowledge is not in principle, but only in graduated steps, different from everyday knowledge. Hence it is—in spite of its special focus on producing knowledge and its efforts in testing it—not in a position to produce objective truths as 'correct' representations of an external given world. Scientific knowledge is constructed knowledge, which has to prove itself useful in regard to certain contexts, interests and problems as 'viable' (von Glasersfeld 1996) or 'operationally useful' (von Foerster 1985). In this respect, knowledge is also always an instrument of finding one's way around, of successful survival in a world which is itself never knowable 'as such', that is, directly. And, along the same lines, no form of knowing can make any kind of a claim to have a higher value or privileged position. Knowledge is used in so far as and as long as it is useful, can be 'lived', or

proves itself viable. In its ultimate metaphysical implication, this in principle always-constructed and always-provisional status of knowledge is considered to be a cogent call for tolerance between different systems of knowledge and convictions and their followers. There can be no certain beginning and no certain end of knowledge (cf. von Foerster 1984, Schmidt 1987, 1992, von Glasersfeld 1996, Bardmann 1997).

Many, if not all, of these arguments are old and have been advanced in the history of epistemological thought before, either in certain aspects or as a whole, although perhaps in different languages. Of course, radical constructivists concede this. The special and characteristic *Volte* of most of the representatives of radical constructivism consists in the fact that these statements are not regarded as philosophical speculations about the world and human knowledge, but as being supported by research on the physiology of the brain. In other words: the epistemological arguments have been naturalized.

The neurobiology of cognition

The neurobiology of cognition is used to support empirically the epistemological assumptions of radical constructivism. This naturalization of epistemology implies that empirical research on brain functions and so on—as it is seen by the radical constructivists who use this research—is also subject to the constructivist credo, a state of affairs which constructivists love to overlook. And, leading representatives of brain research (e.g. Roth 1994) also interpret their results at a theoretical level in a radical constructivist manner.

The research into the neurobiology of the brain used by radical constructivism says that the connection between the outer world, sense organs, and the brain is not such that the external world is, so to speak, transported through the sense organs into the brain and that the brain then builds a plain copy of the outer world. Rather, the starting point is an assumption that the brain, beginning with only a few pieces of information about the environment which are possibly distorted and full of gaps, builds up a world of experience (*Erlebniswelt*), an 'experienced reality' or actuality, *Wirklichkeit*. Because of the fact that the brain is determined by its own structure, this world is not determined by the outside (the 'reality out there', *Realität*) but by the inside, that is by the brain itself. In addition, this 'inside' also generates, through and for itself, an impression that the constructed world does not (so to speak) reside condensed and as a construction inside, but is experienced as located 'out there.' (Incidentally, the brain as a material object is itself also a part of this reality which is experienced as 'outside'.) Neuronal processes themselves are free of meaning and neutral in terms of content (i.e. the principle of the neutrality of the neuronal code). Meaning and 'experienced reality' or actuality, *Wirklichkeit*, are only generated by the brain's own work, which is capable of almost limitless complexity.

In its neuronal activity, the brain reacts for the very largest part only to itself, to its already-developed structures and elements (i.e. self-reference).

In this respect, the brain itself is our most important sense organ. It is only on the basis of the fact that experienced reality is neurally constructed that we have, subjectively, the impression of living in a complete, understandable and uninterrupted reality without 'holes' and 'gaps'. The perfection of the construction hides its character as construction. And, even this information about the constructive activity of our brain—or the thesis that we are an 'I' (a self) is simply reducible to a certain state or a certain level of neuronal processes—does not lead to a collapse of the usual ingrained experience of the outside world. This 'self-constituting', which is not determined by an outside, is called *autopoiesis* (in contrast to constitution by an external agency, *allopoiesis*) (cf. Oeser and Seitelberger 1988, Roth 1994, Roth and Prinz 1996).

Systems theory

Radical constructivists do not use the empirical insights about the brain only at an epistemological level. They also use general systems theory to extend the knowledge that has been gained about the events under the skull, or rather the metaphoric language in which this knowledge of neural events is clothed, to the whole event-space that we call 'world'.

The theory of autopoietic self-referential systems uses radical constructivist, neuro-biological, and cybernetic-information-theoretic concepts to develop a general systems theory. This systems theory, which is not especially connected with any specific subject-matter area, refers to 'systems' that are structured configurations which can be observed (by other systems) and are themselves able to observe (other systems). The maneouvre used to construct this systems theory is to free the concepts which have been developed in the neurobiology of the brain from their original context and generalize them to all entities that can be imagined. From this point of view, not only the brain but also a psychological system, a group structure, an apparatus, an institution, a society, and a whole world are closed self-referential, autopoietic systems which observe their environment. In this environment, there may be other systems which are, conversely, observing them. And, while systems are not transparent to each other, they are able, on the basis of the other systems' reactions to their own actions, to construct models of these other systems for themselves, or to model these other systems' models. They achieve, thereby, a certain measure of mutual understanding (or misunderstanding, which is a form of understanding!). The environment does not determine what happens inside the system—systems are autonomous in that it is not the environment but the structure of the system and its experiences up to a given point that determines the leeway in the set of possible developments within the system. However, there is a certain structural coupling to the environment so that sufficient information is generated to make adjustment by the system possible as well as the assimilation of the system into environments. Nevertheless, the fact that the way the system's own structure is determined always sets limits—not everything is possible.

However, all of these statements about systems and their structural loose-coupling to environments are relative to an observer. They are made by an external entity, which in turn has to count on the fact that the system that is being described by it will observe it and describe it. In this way, there arises the picture of the large space in which structured entities—always and necessarily delimited or identified by observers—are carefully moving about in a separate connectedness or a connected separateness. They are always engaged in mutual observation and narrow band-width communication, but are never able to completely grasp or understand themselves or anything else.

While brain research cultivates the cerebralization of the human being, systems theory goes a step further to extend the picture of cerebral network structures to the whole world. However, even if the whole world is a brain full of brains and so on, this description still pre-supposes the existence of a super-observer located analytically 'outside' this space. To this super-observer, the events still do not become transparent and she (it?) cannot know whether she herself is again merely the object of an even still-higher observing agency. However that may be, if the last observer vanishes, then ... everything vanishes (cf. Luhmann 1984, 1990, Krohn and Küppers 1992, Fischer 1993).

New conceptions of learning

Radical constructivism, the neurobiology of the brain and moderns systems theory can be naturally and easily integrated with modern cognitive conceptions of learning which are already, and largely, built on arguments from the above-mentioned theories and vice versa. The traditional behaviouristic understanding of learning started with purely external control—and, therefore, the manipulability of learning by means of appropriate stimulus constellations and reinforcements—and deliberately ignored internal mental processes. However, following the often-cited 'cognitive revolution', learning has become understood as information-processing. Now, an internal apparatus—usually conceived of as analogous to the computer—mediates between, on the one hand, perceived pieces of information from the external world, and action and decision-making of the learner *vis-à-vis*—or in—the external world on the other hand.

This internal apparatus is seen as having developed phylogenetically in the course of evolution, and its structure unfolds itself ontogenetically in the interplay between inside and outside. However, while many things can be received and processed directly, other things can be processed only after a certain internal structure has been built up in the course of development. While it is true that now the learner has herself become an active internal agent—whereby the degree of freedom in her actions and decisions has increased—ultimately the information-processing approach is basically still a kind of expanded behaviourism, which has become much more complicated and liberalized in respect to its model of the learning subject.

This changes when one moves from the conception of learning as information-processing to the conception of learning as a construction of

knowledge (*Wissen*). Now, thinking about learning is no longer determined by the 'box and arrow' models of information-processing theory (signal filter–decoding–short-term memory–long-term memory–decision points, and so on) or by the analogy with 'simple' computers connected 'in series'. Instead, the leading metaphor (inspired by neural networks) is the image of a network—without a fixed centre and without a fixed hierarchy—which is used with a view to computer programs as well as neural structure.

Accordingly, learning is an independently-performed activity that is strongly embedded in situations. Knowledge, contents, abilities, and so on are not being acquired or 'absorbed',' but *constructed*. This construction process never starts at ground zero, but always has its basis in an already-existing (knowledge-) structure. This existing knowledge, or in the widest sense experience, is the starting point for any interpretation of the pieces of information that lead to learning as a construction of knowledge. Of course, such learning is not determined by general laws but depends very much on the situation and the context in which it takes place. And, all this does not proceed without being grasped by the learner: she can make her learning process present to herself, or 'monitor' her learning process in the sense of forming meta-cognitive level conceptions of how she learns, under what conditions she learns best, how she can organize her learning, etc. The reflexive comprehension of one's own learning process becomes both an accelerating and structuring element in learning itself.

If one looks at this evolution of the understanding of learning, then one sees that the idea of learning as controlled by external factors has completely receded in favour of the idea of learning as influenced by internal structuredness. Further, the participation of the learner in the learning process has changed from largely passive to (hyper)active. And, finally, the possibility of formulating general laws of learning—which was the promise of the now-outdated behavioural orientation, and even of the information-processing approach—has dropped to zero (on the newer conceptions of learning, cf. the reviews by Shuell (1996), Weinert (1996a, b), Reinmann-Rothmeier and Mandl (1998)).

If we now look at these four theoretical contexts from a somewhat larger distance, it becomes apparent that together they represent—at least roughly, and each in a specific way—a movement from a deterministic or mechanistic, hierarchically-organized world-view emphasizing centralized decision-making, rationality, and control towards a world-view that is non-deterministic, probabilistic, and decentralized. In this new view, the world is made up of many simple units compounded into networks which follow partly continuous, partly discrete, jump-like, but in any case only conditionally predictable, courses of events. Both world-views are distinctly different, but they have one important characteristic in common: they can be formulated and advocated with different degrees of radicalness. (Incidentally, the more radical factions of each group tend to a certain holism, that is they have a tendency to explain the overall order of the universe, in the small as well as in the large, from a single root, a single principle. This leads, of course, to the idea that everything is completely and naturally connected with everything else, i.e. the macro is mirrored in the micro and

the converse, and that everything has its meaning, its significance, and its order—even if that is one of dis-order.)

The systematic core of constructivist didactics

Using the background theories just outlined, we can now, with all due caution, more closely determine the systematic core of constructivist didactics. Here, we are not dealing with a new kind of psychological didactics which would consist of deducing a new form of teaching from a specific view of learning. Nor are we dealing with an effort which starts with the knowledge and lesson elements which are to be taught or learned—in other words, we are not dealing with something that comes out of the subject matter. The central aspect is not a specific form of instruction as a social situation which has certain pre-suppositions and consequences. In a constructivist didactics, we are dealing with a revisiting of the total field of didactics in that it develops comprehensive conceptions of the learning process, of the character of the content of instruction, of the instructional situation and interaction, of the task of the teacher, and of the overall perspective and goal of didactic activity. These are inspired by the following fundamental ideas.

Since reality as it is 'as such' is in principle inaccessible to human beings, there can be no absolute knowledge and no absolute truths. Human knowledge must always be regarded as only a currently adequate, currently useful result of socially-shared construction processes. Hence, it is harmful if not impossible and meaningless to try to structure the learning of others by teaching on the basis of a model of transmitting and receiving information, i.e. the concept of *instructivism*. On the other hand, it is possible and responsible to understand teaching, and the practice of teaching, as something that makes stimulating environments available, which make things easier. Through these environments, independent learning can be facilitated, both in the form of acts of constructing and reconstructing knowledge and acts of gaining insight and understanding, i.e. the concept of *constructivism*. Learning should not be directed from the outside: it does not consist of 'processing' pieces of information or knowledge which—kept ready and available outside—are actively 'taken in' by the learner. Learning, in the real sense of the word, is never controlled in its course and result but always involves an individual—but in social contexts—constructing and reconstructing inner-worlds. This process can only be touched or influenced from the outside (through perturbation—a concept already used by Piaget). The responsibility for learning lies with the learner.

This allows and demands a new, relaxed attitude on the part of the teacher. There can be no more teaching in the sense of transmitting prepared packages of knowledge divorced from concrete situations—nor can such teaching be morally justified. However, teaching can stimulate and (hopefully) trigger learning—and is, therefore, able to contribute to truly high-level, permanent learning. The task of the teacher consists of setting up, or staging, learning environments in which learning as co-constructing and restructuring in social and situated context becomes more

probable. The learning environments particularly suited for this purpose are those that take into account the situation-bound and constructive character of any kind of learning in which learners can independently make their own way. For a constructive didactics, the highest general goal of teaching and learning in school is to help build a world in which human beings are able to leave behind all dogmatism, lead a self-determined existence, and live in tolerant and relaxed togetherness with other human beings and nature—all on the basis of insight into and experience with the constructedness of all knowledge.

Having reconstructed the core of the starting point of constructivist didactics in this way, it becomes surprising that there is nothing that is really surprising in this 'new' paradigm. Anyone familiar with the history of didactic thought will easily have many associations with every formulation of the doctrine and practice, and make many connections with well-known themes, problems, and ways of thinking from the general repertoire of didactics. Why—after a radical beginning—this normalcy? As I have already suggested, 'constructivism' includes a broad and heterogeneous bundle of propositions; this repeats itself in the context of didactics. Wolff (1994: 412) differentiates rather simply between 'moderate' and 'really radical' starting points, while Phillips (1995) distinguishes three grades of radical and less radical positions. In didactic contexts, constructivism is never championed in its radical form, but always only in an already-moderated form, as a 'moderate constructivism' (Jonassen 1991, Merrill 1991, Dubs 1995).

To the extent that constructivist didactics limits itself to the claim that all learning starts from already existing knowledge, and the teacher, therefore, has to start always with students' pre-existing knowledge in order to facilitate construction processes in the direction of the acknowledged instructional goal of transmitting book and scientific knowledge, it is dismissed by more radical exponents of constructivism with some justification as 'trivial constructivism' (von Glasersfeld 1996). Nevertheless, constructivist didactics is clearly dominated by moderate positions whose influence grows in proportion to the extent to which they pursue concrete research and practical projects, not just programmatic arguments.

However, one does not only show moderation for political reasons connected with theory, say to calm down a concerned theorist. Only a moderate position is able to open up, systematically and practically, the possibility and legitimacy of an activity like teaching—and, thereby, give a *raison d'être* for constructivist-didactic thinking in the first place. 'Really radical' constructivism (Wolff 1994) would ultimately render didactic thought and activity in specific subjects impossible as well as morally illegitimate, and, thus, completely superfluous to begin with. However, in cases where one makes decisive and extremely ambitious attempts to promote students' learning as a construction process, to accompany it, and to support it, particularly if one does so in conjunction with constructivist learning psychology, the effect is just the opposite. In such cases, bringing in arguments and concepts from the psychology of learning has had a distinctly de-radicalizing effect on any too-strictly advocated constructivism.

What does class instruction based on constructivist principles actually look like? I present three examples which illustrate at the same time a decreasing degree of radicalness in their claims:

- Wolff (1994) enumerates the following constructivist learning principles for the school:
  (1) Contents to be learned should not be fixed and systematized beforehand, for then they cannot be connected (or can only be accidentally connected) with the subjective experience and knowledge which the students bring with them. Only the core content of the curriculum can be fixed, 'for otherwise it would be impossible to properly work with the contents of knowledge' (Wolff 1994: 417). And, further, 'it is then also not meaningful to work with textbooks which fix such contents. Authentic materials, which illumine a topic from different perspectives, provide a better opportunity, that the learner can bring his individual experiential knowledge into play in the construction of what is to be learned' (Wolff 1994: 47).
  (2) Learning goals in constructivist didactics are guided by the fundamental principle that 'the interaction with the environment (its subjective construction) has the sole goal of securing the survival of the learner as an autopoietic system' (Wolff 1994: 418). The aim is to develop skills or abilities 'which can be used in real life' (Wolff 1994: 418).
  (3) Learning environments (instructional materials, classrooms, media, and other aids, and, ultimately, the school itself as an organization) have to be structured in such a way that they 'are authentic and complex in the sense of real-world experience', that by starting with different initial individual abilities they make construction processes possible, that contents of learning can be embedded in them, and that what has been learned can, in such a learning environment, be made useful in a concrete way (Wolff 1994: 418).
  (4) The learning of learning, that is the development of always-individual thinking tools, as well as generally becoming aware of one's own thinking and learning as well as its processes, is one of the highest-level characteristics of constructivist learning. Wolff considers that the new teaching-and-learning technology, that is, learning by computer or rather in complex hypermedia networks, is probably most suitable to facilitate not only the learner's construction of knowledge, but also the experience, recognition and further development of her own characteristic style of learning inquiry. The development of meta-cognitive abilities and insights is a parallel process which continuously accompanies all constructivist learning.
  (5) As a fifth element, Wolff emphasizes the necessity of co-operative learning. The learner needs interaction with others in order to achieve consensus regarding the way in which the environment is constructed. Here, constructivist thinking

connects with the 'reform pedagogical thoughts of John Dewey ... who called learning a social process not just in school contexts' (Wolff 1994: 421–422). In addition, Wolff points out that constructivist didactics is compatible with web-based pedagogy as well as with the philosophy of learning in the work-place. It is notable that, in this context, the proposals for implementing constructivist learning principles point in the direction of the arguments and forms of didactic methodology which are known from both old and new reform pedagogy.

- Dubs (1995: 890–891) formulates the following principles of constructivist instruction:

  In terms of content, instruction has to look to complex problem domains which are close to real life and occupations and have to be dealt with holistically. The foundation of instruction should not be simplified problem formulations, but the reality that requires structuring and re-structuring problems. For one can only understand something if one grasps it in its complex total context, then considers the details and understands them in their overall relationship, and finally brings them back into the total context.

  Hence learning should be understood as an active process, during which the individually-existing knowledge and skills are adapted and personalized through the individual's own new experiences, that is, become adjusted to the learner's own interpretation and understanding. Only in this way is high-level thinking possible, because the knowledge that is necessary for it is newly constructed in the context of one's pre-existing knowledge and one's own experience.

  In these learning processes collective learning is of great importance, because only discussion of the individual interpretation of a complex learning situation, or of the proposed hypotheses or possible solutions, contributes to reflection about one's own interpretation or meaning, or helps one to structure what one has learned so far differently (better). In this sense the students regulate their learning themselves and keep it constantly going.

  In this kind of self-regulated learning—in contrast to traditional pedagogy—errors play an important role. Discussions in small groups are only meaningful when errors occur and when these are then discussed and corrected. For occupation with wrong reasoning has the effect of promoting understanding and contributes to construction of knowledge that is better understood.

  These complex learning domains have to be set up with an eye to the prior experiences and interests of learners. The contents to be learned are most challenging when they are adjusted to the repertoire of real experience and the interests of the students.

  Constructivism does not confine itself only to the cognitive aspects of learning. Feeling, i.e. dealing with joys and anxiety, as well as personal identification (with learning contents) are important. For

> things like co-operative learning, handling errors in complex learning situations, self-directedness and learning how one's own experience can be useful to oneself require more than just rationality.
>
> Because the goal is the students' own construction of knowledge and not their production of knowledge, the evaluation of the success of learning cannot be based primarily on the products of learning (with solutions that are always either right or wrong). Rather one has to examine the individual's progress in processes of learning, and in complex learning situations. For that the traditional types of examinations are not suitable. Self-evaluation, where the student evaluates her own progress in learning and thereby the improvement in her own learning strategies, is more meaningful.

- Meixner (1997: 97) summarizes the principles more briefly:

> Place the units of knowledge that are to be learned into a situative context. ... Add to this relevant context materials that are as authentic as possible and make the learner take ownership of the material to be learned. ... Use as many motor aspects and different sensory channels as possible. ... Place the learning task into a surrounding social field. ... Establish maieutically conducted discourse as the form of dialogue in the classroom. ... Bring the learner to the point where she builds her knowledge autonomously from the context and interactions and where she learns from her own mistakes. Aim at flexible application of the knowledge; generate learning environments which promote knowledge transfer. There are no preplanned end-points for learning.

If one compares these characteristics of constructivist instruction with instructional principles promoted in other conceptions of general didactics, then one spontaneously asks oneself what is it that is truly different in instruction in a constructivist framework. This seems to be also on Dubs' (1995: 902) mind when he points out that it is difficult in actual instruction to 'distinguish cognitivism and constructivism'. However, in addition, the above-mentioned principles of constructivist instruction—formulated so summarily—would certainly find immediate approval on the part of anyone who is interested in good teaching, particularly if one strives for a certain quality of learning in the school. At most, there is a noticeably greater emphasis on formal elements in learning and education while the importance of subject matter has receded. However, in the framework of this type of didactic thinking this is, after all, only logical—for, as the constructivist 'bulldozer' approaches any kind of subject matter-ness, or any 'having content', it loses its character of offering orientation, a direction to follow, and connection. The protagonists of constructivist didactics don't seem to want to be that logical either. For them, the aspect which is constitutive for all instruction, the aspect of content—the themes, the topics, the elements of knowledge would drop out—and, thus, any reason for instruction (and didactics).

Problems of constructivist didactic thought in the context of school and teaching—some critical considerations

I now take the discussion of selected problem areas of constructivist didactic thought as an opportunity to formulate some fundamental principles regarding the mandates and limits of school and instruction.

Learning as inventing—learning as discovering: the claim of subject matter

In constructivist literature, one often plays with the relationship between invention and discovery at an epistemological level. From a radical constructivist point of view, producing knowledge is always only an inventing, and never a discovering, because access to the 'world out there'—in which there might possibly be something that exists independently by itself which should be discovered—is in principle barred. However, we should not throw out the child with the bath water as a result of our constructivist enthusiasm. Columbus didn't invent the land mass which he encountered between Europe, Africa, and Asia: he discovered it, or rather, only rediscovered it. The 'new world' existed independently of whether it was known in Europe or not. At the same time, he did invent the new continent as 'India' (which was logical for him, but erroneous from our point of view today), and he did invent its inhabitants as 'Indians' (likewise logical then but misleading today). (This second misleading invention has, incidentally, proved viable until today.) Human perception and knowledge are always in principle doubly-determined by object and subject, by the claim of the subject matter and the perspective of observer! Moderate constructivists have the same understanding, but it is somewhat irritating that they immediately celebrate it as a description of a seemingly new 'middle path of knowledge' (Varela and Thompson 1992).

If we look at the learning of children, adolescents, and adults, then the issue of discovery vs invention does present itself in a new light. Everywhere newborns, children, and adolescents become, through socialization processes, integrated members in their respective societies and ready to act on their own. In modern societies, a part of the 'natural' socialization process is made special, that is, it is differentiated out, institutionalized, and increasingly made into an occupation of specialists. The amount of learning which a new member has to engage in, or the amount of institutionalized instruction or enculturation which in view of the constantly arriving new members a society have to accomplish, increases to the extent that a highly complex and specialized body of knowledge has accumulated whose mastery is a pre-requisite for competent participation in culture. To let every single member work him- or herself through this accumulated store of knowledge individually, and without guidance, would be as uneconomical as it is risky for all concerned. For that reason, teaching and learning are institutionalized and specialized (i.e. schools, curricula, teachers, textbooks, certificates, etc.). All this is supposed to guarantee that the developing or growing members of the society do not have to re-invent all of this

accumulated knowledge, or, to put it more generally, all the achieved levels of knowledge and understanding, by themselves, but acquire the accumulated experience in an orderly, objectified, systematic, economical form—as if they were rediscovering it. The ultimate goal is that they themselves will contribute to further accumulation and restructuring of experience and knowledge.

To lead individuals to the attained level, with the goal of enabling them to develop that level further, requires their incorporation into the attained levels of thought, knowledge, and experience. Certainly in the course of individual development and learning, new understandings and new constructions of individual experience and knowledge take place. This construction process is, however, at first only an again-constructing of what is already available in accumulated experience. Even if one understands learning to be an independent, active constructing of structures, this constructing does not start from ground zero. Rather it proceeds along the universally valid tracks reconstructed in developmental psychology and is, as regards subject matter, not arbitrary but rather always bound to it. (The subject matter has certainly arisen historically, although it makes at first free-standing claims.)

This claim of subject matter is in my view constitutive for organized teaching and learning in the school, and in this respect cannot be dismissed. To this must be added another serious point: the school, as a compulsory institution which affects all members of society, can only be legitimated ultimately through what one learns there, and what one would not be able to learn at all, or would only learn less well, elsewhere. *The subject matter is the matter of the school. In school matters matter.* (*Die Sache der Schule ist die Sache.*) That does not mean that 'the subject matter' stands in space as something eternal and changeless. However, it does mean that this subject matter has to be at first entered, penetrated, worked through—of course on the basis of diverse perspectives—before it can be futher developed.

If this claim of subject matter is dissolved or 'virtualized' for all content areas and for all levels of schooling, then school learning is, so to speak, dematerialized (or loses its substance); it becomes formal in a bad sense, and ultimately arbitrary. Under such conditions, a non-subjectivist form of engagement with subject matter claims ceases to be possible. Instead of finding reasons, understanding, there can only be encounters; substance becomes process; engagement and further development of the achieved reservoirs of knowledge and experience would not then be possible. Students and teachers would collide directly with each other without the neutralizing effect of a subject matter that stands between them—and they would be forced to do so on a daily basis! In view of this, forms of participation that are not required by subject matter are—wisely—made voluntary, or dependent on the decisions of clients that they will participate.

Situated learning—systematic learning: the purpose of the school

As I have already indicated, learning research has, for several years, as a kind of counter-movement to 'cold cognitions', emphasized the situated-

ness of learning. This orientation in research in learning and cognition relies heavily on ethnographic and anthropological analysis of natural or everyday (i.e. not institutionalized) learning strategies and learning situations used, encountered, and handled by so-called JPFs or 'just plain folks' (Lave and Wenger 1991). Critics of the current state of learning in schools argue that the presentation and practice of bodies and structures of knowledge without taking into account their applicability, usefulness in specific situations, etc., merely leads to superficially digested, 'inert' knowledge which might be activated for a short while for purposes of examinations and tests, but which would never be mobilized in problem and applied situations. Thinking and learning are always wrapped in concrete situations (i.e. 'situated cognition') and hence—so runs the argument—learning in school should be based more distinctly on authentic, 'genuine' problem situations so that the value of using what is learned may be more strongly experienced. The first principle of instruction should be to anchor learning and learning principles in concrete situations (i.e. 'anchored instruction'). Through participation in and co-operative execution of concrete problem-solving processes and through supervised 'learning along' with always immediate implications for action (analogous to what used to be called 'cognitive apprenticeship'), it is possible to achieve a much higher degree of effectiveness in teaching and learning in school.

However, both as a critique of the traditional and as an outline of a new, better way of learning in school, this line of argument (derived from current psychology of learning and instruction) largely is in line with analogues from the progressive education movement (*Reformpädagogik*). In this connection, we may recall the earlier point that the praxis of moderate constructivist didactics essentially aims at a reformed, pedagogically inspired teaching which is close to experience and action.

A central problem with teaching that is strongly, or even exclusively, oriented toward situated learning lies in the question of the extent to which such learning processes, and the transfer of the learning that results, are cumulative. Situated learning is always bound to the current, the given situation: true generalization beyond the current situation in the direction of a systematic cumulative learning is not a central concern. Transfer of what has been learned in and with the help of a particular situation to other situations is only possible insofar as the new situations are structurally similar to the old. However, learning which is oriented only to immediate use in a specific immediate situation *cannot* be the purpose of the school, and/or cannot reflect the quality of learning desired there. The school aims *to overcome* learning that is tied to given situations and, thus, merely 'situated' (cf. Bereiter 1997). By institutionalizing learning, by systematizing it, and, finally, by making it deliberately artificial, by equalizing the accidents of origin and of actual connection with experience, the school consciously seals itself off from 'life'. Only by doing so does it give itself the possibility of transcending situated, local, 'close-to-life' everyday learning that is intended for direct use.

This is the real purpose and the primary strength of the school as an organizational frame for learning, teaching, and interaction processes. Connecting with 'life' and reconnecting with the immediately valued

experience in actual use is structurally difficult in the school, and only possible within certain limits. On this issue, Baumert (1997: 2) contends that the institutional separation from 'life' is in fact

> the prerequisite of the real strength of the school, namely to implement learning systematically, cumulatively, long-term, and explicitly, that is reflexively referring to itself. This is achieved at the expense of the structural problem of making students' learning capable of being experienced as a personal and meaningful experience. ... For the school it is constitutive to find a balance between narrowly led systematic learning in circumscribed knowledge domains on the one hand and learning in concrete situations handling practical problems of the real world.

Reports on the learning process—assessment of achievement: questions of comparability

Assessment and evaluation of student achievement is one of the fixed and unavoidable—for both teacher and student—elements of the school and of instruction. This element of the school is important in terms of the general selection function which schools perform, and in terms of the socially (and for individual careers) still significant privileges that accrue from schooling, certificates, etc. However, assessment and evaluation are also important for the individual teacher for the purpose of diagnosing pre-suppositions in learning and the results of leaning on the part of the students, for advising students and parents, and, last but not least, for evaluating and checking the effectiveness of her own instruction. In this sense, control of the learning process and evaluation of the results of learning do not represent elements which are foreign to the nature of the school, imposed on it by force from the outside. Rather, they are constitutive of teaching and learning in school.

However, how should we conceptualize this in the framework of a (radical) constructivist understanding of didactics? 'If learning outcomes are individually constructed, how do we evaluate them?' (Jonassen 1992: 139). When there is no such thing as 'the subject matter' that is to be covered, when learning is an idiosyncratic process that proceeds according to its own laws and initiatives (at most to be given a little occasional push from the outside), when reality is ever individually constructed and every construction has its right and validity (as long as it doesn't seek to be the only 'true' construction), and when finally the subjectively experienced reality of another person is only conditionally intelligible—when one, that is to say, starts with all this, then it becomes impossible to justify any assessment or comparative evaluation of learner outcomes. For when this line of thought is carried to its conclusion, assessment and the comparative evaluation of learner outcomes have to be abandoned altogether in that, under these conditions, there can be no right or wrong (von Glasersfeld in Schmidt 1987: 427: ' ''right'' is ... a misleading word'). Learning cannot be really grasped from the outside, but only observed. And, finally, on this basis there is no conceivable reference point and no system of measurement based on it that would allow and make possible objectified comparisons of achievement.

However, throughout the world, apart from some specific rare exceptions, grading and evaluating student achievement are *de facto* stable and unavoidable elements of the praxis of school and the profession of teaching. And so, constructivist didactics also here moves quickly away from any all-too-radical position and speaks in a moderate voice, in order to preserve its chance of any real placement in the system school, instruction, the work of teachers (for a prototypical example, see Kösel 1997: 220–226).

Conclusion

Let us recall the original question: Are we facing a really new development or paradigm in general didactics when we look at constructivist didactics? At this point, the answer can be only this: The rather extravagant background of arguments in support of constructivist didactics does not provide in itself any homogeneous new theory of general didactics. Rather, this background of arguments must be described as an agglomeration of heterogeneous, partly mutually-compatible and partly contradictory pieces. The main problem with any more precise analysis of these 'foundations' is the fact that the central concept—construction/constructivism—is used in a very unhomogeneous and inconsistent way. At the one end of the spectrum, we have radical constructivism. In the middle area, we have a moderate and/or trivial constructivism, and at the opposite end some kind of pseudo-constructivism. The last position still sticks to traditional instructivism but masks this with a constructivist jargon. *So on the level of theory (i.e. reflection) we do not see a new paradigm.* What we see instead is a fuzzy combination of different lines of thought only held together by the fact that they all, in a way, include 'construction' or 'constructivism' as concepts.

So, there is no new theoretical approach in general didactics. So, what is it, then? The constructivist reservoir of arguments does provide a *language* in the light of which some well-known problems in the organization of teaching and learning in schools appear in a new way. That is not nothing. (Constructivists would say that we cannot expect more anyway!) While the language in which the constructivist–didactic spectrum of ideas is articulated is admittedly not totally systematic and precise, it, nevertheless, offers the old familiar critique of 'instructivism' a new language and new opportunity for articulation. This new critique is directed against the broad tradition of regular didactic practice as well as against the corresponding everyday understanding of teachers, students, and parents. In this way, the (of course) equally rich traditional critique of this daily educational life and its (scientific and professional) forms of thought are spelled out anew.

If we move from this evaluation of the level of theory (reflection) to the level of praxis (operations), i.e. if we ask about the nature and quality of the concrete proposals to remove the constructivist-described deficits and inadequacies at the level of instructional practice itself, we can make two observations. First, the transition from the level of reflection to the level of operation is accompanied by a distinct weakening of the radicalness of the constructivist argument. In the world of didacticians, radical

constructivism is suffering the same fate that has also befallen other background theories (e.g. *Bildung* theories, learning theories). They regularly have been fixed up for the needs of praxis—instrumentalized in a way—and by this have been turned into useable concepts of action. This raises questions: Is such instrumentalizing systematically necessary when moving from theory to praxis, or is it 'only' a simple mistake? Does one necessarily have to accept in this process a shrinking of the possible potential for reflection or can this be avoided—and with what consequences? What is, ultimately, the cause of the tendency in didactic contexts to fit theoretical proposals with instrumental possibilities?

Secondly, constructivist didactics really does not have any genuine new ideas to offer to the praxis of teaching. Rather, it recommends the well-known teaching methods and arrangements of self-directed learning, discovery learning, practical learning, co-operative learning in groups. I think that 'new' constructivist didactics in the end is merely *an assembly of long-known teaching methods (albeit not practised!)*. In a way, this concentration on process and method is consequential: In the framework of even half-way radical constructivist-didactic thinking, the questions of content and substance, the question of what subject matter is of worth and needed, etc., cannot be a central problem any longer. This is due to the fact that constructivist didactic thinking transforms questions of substance into those of process and perspective. Basically, this has given rise to some kind of process-didactics largely stripped of any concern for content.

In its proposals for the arrangement of teaching–learning processes, constructivism could have easily come out of a synthesis of the ideas of Dewey, Piaget, and Wagenschein. This is exactly *not* how a real *new* general didactics comes into being. However, instead of a genuine creation of a new didactics, we see in constructivism the familiar, old, and romantic conceptions of learning and teaching well-known in 'progressive education' (*Reformpädagogik*). These ideas are presented in a new language, thus receiving new justification, new inspiration, and a new power of conviction, this time using the latest ideas from neurophysiology, systems theory, and cognitive learning theory research. Thus, we have another illustration of the thesis that 'progressive education' (*Reformpädagogik*) is not a specific phase in the history of education, schooling, and teaching, but represents a continuously on-going perspective on the reality of education and in the thinking of educators and teachers. *Reform* as an ever-standing motif in pedagogical discourse and praxis—ancient and still always young! But that is another story.

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Note

1. In Germany, the concept 'constructivist didactics' was first mentioned by Siebert (1994) and then by von Glasersfeld (1996), Müller (1996), and Reich (1996). The first thoughts in this direction were developed by Kösel (1997). In Germany, Siebert, Reich, Kösel, and Müller can be regarded as the main proponents of constructivist didactics. A first critical analysis was written by Kuhl (1993). For a comprehensive and thorough analysis of radical constructivism in the field of educational theory and praxis, see Diesbergen (1998).

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