Lehrstuhl für Wirtschaftspädagogik
Univ.-Prof. Dr. Klaus Beck · Univ.-Prof. Dr. Klaus Breuer
Fachbereich Rechts- und Wirtschaftswissenschaften
❍ Reihe: Arbeitspapiere WP ❍

29

Eveline Wuttke

Cognitive, Emotional and Motivational Processes in an Open Learning Environment – How to improve vocational education

JOHANNES GUTENBERG-UNIVERSITÄT MAINZ

Herausgeber:

Lehrstuhl für Wirtschaftspädagogik
Univ.-Prof. Dr. Klaus Beck
Univ.-Prof. Dr. Klaus Breuer
Fachbereich 03: Rechts- und Wirtschaftswissenschaften
Johannes Gutenberg-Universität Mainz
Welderweg 9
D-55099 Mainz
Telefon: +49 6131 392-2009; Telefax: +49 6131 392-2095
email: beck@mail.uni-mainz.de

Wuttke, E. (2000): *Cognitive, Emotional and Motivational Processes in an Open Learning Environment – How to improve vocational education*

Die Arbeitspapiere stehen auch als downloads zur Verfügung:
http://wiwi.uni-mainz.de/wipaed/beck/publicat/Frame_Publikationen.htm

EVELINE WUTTKE

Cognitive, Emotional and Motivational Processes in an Open Learning Environment – How to improve vocational education[1]

[1] Paper presented at AERA annual meeting, Tuesday April 25 2000, New Orleans. LA.

1. Introduction

Adolescents today are faced with a rapidly changing, increasingly complex world. Especially when they enter professional life, they have to cope with the fact, that the knowledge they acquire today, might be obsolete before long. Therefore - with regard to (future) job demands – they should be able to obtain certain basic skills during vocational training, e.g.:

- ➲ The willingness to *lifelong learning* and the ability to do so *Self-organized*.
- ➲ *Problem solving-competence*, which will enable them to cope with complex situations during their training and in their future jobs.

In contrast to these demands, traditional learning at schools is usually prepared, organized and controlled by teachers and concentrates mainly on knowledge reproduction (SEMBILL/ WOLF/ WUTTKE/ SCHUMACHER 2000). The learning process and the students' approaches to problems are often neglected. Thereby a central intellectual competence is removed from the learning process: the use of judgement to recognize complex problems and the use of knowledge to solve them (BARROW 1993, 148). We therefore need a reengineering process of classroom teaching with powerful learning environments (as described by BEREITER and SCARDEMELIA 1989, BROWN/ COLLINS/ DUGUID 1989 and de CORTE 1995, 72) and compatible didactical methods. The question is, how such new ways of learning can be initiated – learning that includes problem solving and supports the motivation to keep on learning.

2. A new way of learning in a rapidly changing world

New ways of learning can be achieved, when students are given the opportunity to learn Self-organized, to deal with complex problems, to organize their own learning process and to assume responsibility for the results (SEMBILL 1995, 131). Such processes have to be supported by adequate learning environments, that are open for students activities and based on complex real-world problems. The concept of Self-organized learning[1] in an open learning environment is based on four dimensions,

[1] This work has been supported in part by a grant from the Deutsche Forschungsgemeinschaft (DFG - AZ.: SE 573/4-1/ 4-2)

that are to be seen as basic requirements for the implementation of a learning environment[2] (SEMBILL 1992a, 75):

Learning for oneself: The learning environment has to be created in a way, that students have to reflect about the sense and purpose of own learning processes *and* their personal responsibility for general values.

Learning with others: Includes the requirement to assess the relevance of given learning contents for oneself and communicating this relevance actively in lateral co-operation processes with fellow learners.

Learning for others: Through externalization of cognitive, emotional and motivational skills during the learning process, students can profit from each other.

Learning with risk: Learning processes involve complex problem solving activities, that include the possibility of mistakes and inadequate ways of problem solving. If necessary, teachers coach the learning process and advise students about problem solving strategies[3].

Learning by solving complex, ill-defined problems means that students:

- have to define the problem (analyze given situations and specify goals),
- use their pre-knowledge,
- collect necessary information ,
- propose solutions,
- analyze side- and subsequent effects in relation to the main effects,
- realize proposed solutions and
- control the learning outcome.

[2] For a more detailed description of the basic assumptions of the underlying learning theory of Self-organized learning see SEMBILL/ WOLF/ WUTTKE/ SCHUMACHER 2000.

[3] These characteristics show a strong similarity to the way learning is organized when based on the concept of anchored instruction (Cognition and Technology Group at Vanderbilt 1997) or situated learning/cognition (RESNICK 1987; BROWN/ COLLINS/ DUGUID 1989). They have in common that learning processes are based on complex, real-world problems (authentic activities). Facts, that help solving the problem, must be collected (facts hidden in the material students receive and facts they have to collect externally). Students have to reach a solution for the problem. An active generation of knowledge structures and problem solving strategies is encouraged which will enable students to transfer their abilities to other problems/ tasks.

These basic requirements are reflected in the concrete realization of our learning environment (didactic design) with industrial clerks in training. Contents were situated in "materials administration", which is a central part of their curriculum.

The didactic design was organized in *five steps* during which students acquire their skills (WUTTKE 1996, WUTTKE 1999), 154):

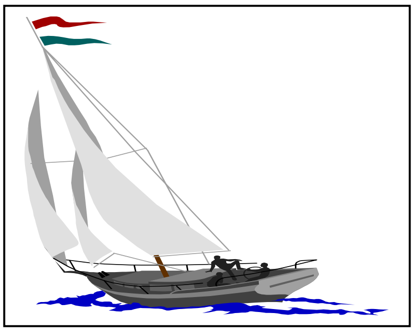
1. Definition of objectives:

Before the learning process actually started, teachers and students defined co-operatively the contents to be learned and objectives that should be reached[4]. Rights and duties were specified.

2. Self-organized learning – Phase I:

The first phase of Self-organized learning can be characterized by a reduced complexity to give students the chance to adapt to Self-organized learning and to get used to problem solving activities. The students worked in groups on the same problem (see Fig. 1).

Young Travels
Post Box 112
35394 Gießen



Max-Weber-Büromöbelfabrik
Post Box 45
35357 Gießen

September 21, 1994

Office equipment

Ladies and Gentlemen,

we have learned from the trade journal "Business Table", that you are offering complete solutions for office equipment. We are part of a chain of travel agencies for young people, and we plan to open a subsidiary in the student village in Gießen. We will specialize in three kinds of travels:

1. Organized travels to foreign countries for young people
2. Single meets single all over the world
3. Last-minute travels

We have already purchased rooms in Gießen. In our main room (about 72 m^2) we would like to have four workplaces. One should be a kind of reception area where we can find out about clients interests. At the remaining workplaces clients will be able to get information according to our three kinds of travels and to book their journeys.

4 This process is partly restricted due to curriculum requirements.

For every workplace we need a desk, a desk-chair, lights and a filing cabinet. Furthermore there should be bookcases and shelves for our catalogues. Apart from the furniture, we will need telephones for all workplaces, a fax-machine and four PCs with printers and modems. Standard software (Windows) should be provided as well. Our parent branch will deliver the special software for travel agencies.

We are looking forward to your offer.

With friendly regards

Young Travels

Fig. 1: Problem to be solved in the first phase of Self-organized learning

Even with reduced complexity, all components of a complex problem were given. Students had to analyze the given problem, collect information, develop and realize solutions and evaluate the results.

First presentation and evaluation:

Because groups have different approaches to problems and probably reach different results, an integral part of such a learning environment is the presentation of findings and solutions. Therefore, after the first phase of Self-organized learning, group presentations took place. All results were discussed and, if necessary, the teacher provided additional information.

Self-organized learning – Phase II:

This phase is characterized by an increased amount of complexity, which is partly the result of groups working on different problems.

Second presentation and evaluation:

The second presentation was even more important, because the groups had worked on different problems with different contents. All contents are part of the curriculum and relevant for their exams. Therefore teachers have to guarantee, that students deal with all aspects of the problem and that all parts of the curriculum are sufficiently taken into account.

Learning environments based on complex real-world problems can only be successful on condition that enough information for adequate solutions is provided. In traditional learning processes teachers are the source of information. In Self-organized learning processes other sources of information are to be provided. In our study, 'traditional' sources of information (books, trade journals, yellow pages etc.) were available in the classroom. Furthermore, we implemented a computer mediated learning environment (WOLF 1995; 1996).

This learning environment enables students to:

- *create* their own documents and *construct* links between documents without further knowledge of the underlying Hypertext Markup Language (HTML);
- *communicate* with each other:
- *co-operate* and *collaborate* on their work/ learning.

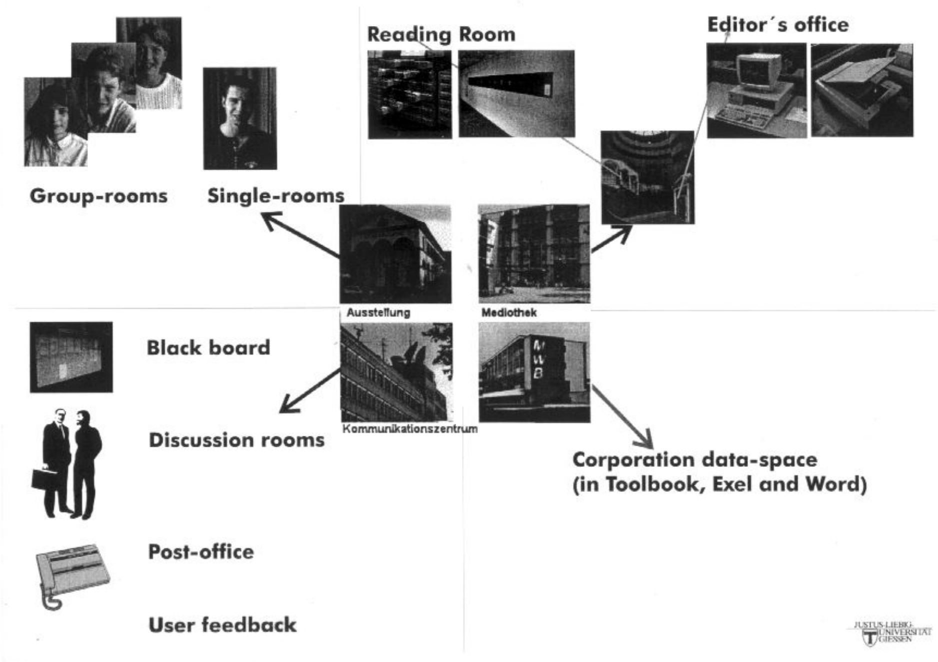


Fig. 2: Overview of the 2nd generation web based learning environment 1994-95 (SoLe/W3)[5]

1. Inside the *media center* students can either access hyper-structured media (reading room) or create their own media (editor's office). The media consist of text-, audio- and video-documents. A very important feature of the system is the easy creation of own content by students. A link to the newly made documents is automatically inserted into the register of student-created documents and into the expo of the student group. Enabling students to create and structure their own knowledge space supports learning in a more holistic, networked way.

[5] More information about a third generation learning community server can be found at http://www.eduserf.de) (WOLF 1999, WOLF 2000).

2. Self-organized learning stands for learning for oneself, with others and for others (see page 2). It also means presenting own learning results to fellow students and teachers to get feedback. In the *expo,* students' pieces of work are collected and displayed in group- or single-rooms. Students can visit the exposition and study the creations of their peers.

3. In the *communication center* students find:

   - a blackboard, where they can display information of general interest;
   - discussion rooms, where they can talk about specific problems. It is also possible, to create own discussion rooms;
   - a post office, where they can send mail to other students, the teacher and the research group.
   - a mailbox, where they can give feedback about the system to the webmaster;

4. The *corporation* was especially implemented for the materials administration course of our participants. The teachers had created a description of an office furniture manufacturer in toolbook, a hypermedia authoring system with several Excel- and Word-files describing inventories etc. In the corporation, student groups can start their copy of this external hypermedia-document and work with Excel and Word.

3. How to define successful learning and why the learning process should be analyzed

The benefits of learning in a complex authentic context have been suggested by many sources from DEWEY (1938) to the recent discussions of for example Self-organized learning, anchored instruction, situated learning and situated cognition. Context provides meaning, enriches perception and affords development of complex problem solving and higher level thinking skills. If this is seen as a fact, we must develop means to assess the effects of such learning environments (YOUNG/ KULIKOWICH/ BARAB 1992). It certainly won't be enough to assess the amount of knowledge reproduction and call this "successful learning". If, for example, problem solving competence is stated as central objective of learning processes, problem solving competence should be evaluated.

Our evaluation of problem solving competence is based on four steps that have been identified as integral parts of complex problems by problem solving research (DÖRNER 1976; DÖRNER 1983; SEMBILL 1992a):

1. Analysis of the given situation;
2. Specification of goals;
3. Development of adequate measures to solve the problem;
4. Mental control, if the solutions are adequate and the problem is solved.

After the learning process, students were given problem descriptions and they were asked to produce written solutions. In a first approach, these solutions were evaluated quantitatively (do students mention all four steps of problem solving, how many measures do they propose etc.). Then the categories were added up to a score called "Analytic Ideal Type" (AIT, see SEMBILL 1992b; WUTTKE/ SANTJER 1996). The higher this score is, the more successful students are in problem solving. The second step was an analysis of quality (do the students offer *correct* solutions, can it be expected that solutions are *successful* in a real-life problem, do students consider side and subsequent effects in addition to the main effect etc.). The method of this part of the evaluation is an expert rating.

Apart from having adequate criteria to assess successful learning, it is important to analyze the *learning process* itself. By doing this, relevant components of the learning process and their influence on the learning outcome can be identified. For that reason we registered self-reported emotional, motivational and cognitive state variables of learners in five-minute intervals (see Fig. 4). With the help of this information, substantial evidence for successful learning can be found. The focus of our study was:

➲ To investigate, whether a learning environment, that is open to Self-organized learning, supports successful learning.

➲ To find out, how these effects can be described in detail and how they might be explained.

4. Method

4.1 Design Overview

We realized and evaluated Self-organized learning together with teachers of a vocational school. During two increasingly complex phases (40 hours), students had to deal with problems situated in materials administration (as an example see Fig. 1), which is an important part of their vocational education. For comparison, the same contents were taught by the same teacher in a control-class under rather traditional conditions (teacher centered).

4.2 Participants

The participants were future industrial clerks in their second year of education in the German dual system. They are at vocational school for 1 ½ days per week, the remaining part of the week they are working/learning in companies. In the experimental class we had 21 participants, in the control class there were 14 participants. There was a definite advantage of the control class: they were better educated, with higher intelligence and a better pre-knowledge (for details see WUTTKE 1999, 190).

4.3 Procedure

The methodological design followed a product-process-product approach (Fig. 3). In both classes we collected data before ("Start" = t_0) and a after ("End" = t_1) the treatment about students' motivation, their learning strategies, their prior knowledge (t_0) and their knowledge and problem solving competence (t_1). To evaluate problem solving, students were confronted with two problem descriptions, to which they were asked to find solutions (see chapter 3). Apart from the treatment or learning environment (Self-organized learning vs. traditional learning) both classes learnt under the same conditions (same teacher, same contents).

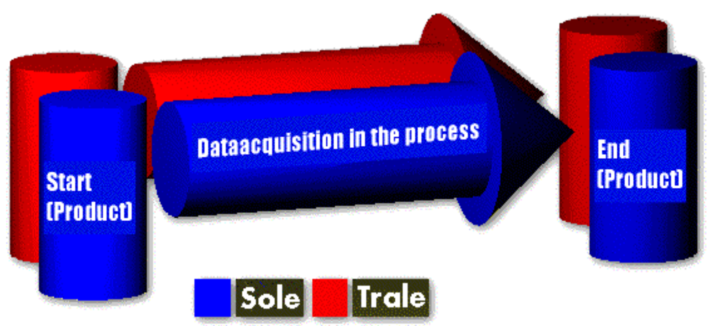


Fig. 3 Methodological design. SoLe = Self-organized learning; TraLe = traditional learning.

In the process we acquired data from five different sources (Fig. 4).

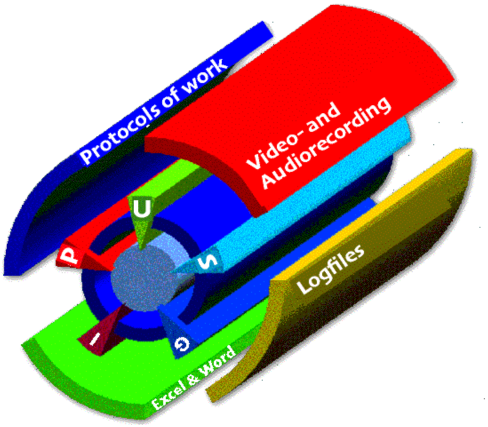


Fig. 4: Sources of process data

Most important (in the center) were self-reported emotional, motivational and cognitive state variables of learners, that were registered in five-minute intervals by a 4-scaled rating in a mobile mini-computer[6]:

Emotion: "Others take me seriously" (S)

"I feel good" (G)

Cognition: "I understand" (U)

Motivation: "I am interested" (I)

"I can participate actively" (P)

These data provide the basis for a differentiated analysis of the interrelation of subjective experience, behavior and influence of the learning environment.

5. Results

5.1 Product data

As criteria for successful learning we chose two measures: One was a standard test to assess learning, composed by teachers. This test requires the reproduction of knowledge acquired during the learning process. We expected, that both classes would score similarly in this test. An advantage of the experimental class was not expected, because Self-organized learning does not focus particularly on knowledge

[6] For the analysis of video data see PFEIFFER 1998, BRÄUER 1999, GLOMBIG 1999, WUTTKE 1999

reproduction. Nevertheless, it must be guaranteed, that the experimental class is able to pass this test as well as the control class, because such tests are one part of their final exam. To assess problem solving competence, students were given two problem descriptions, to which they had to produce a written solution. These solutions were analyzed concerning their completeness and quality (see chapter 3).

Concerning the test to assess knowledge reproduction we could confirm our assumption: no difference between experimental and control class could be found (Fig. 5) - in both classes students were quite successful.

	SoLe (n=21)		TraLe (n=14)		t	p
	M	(S)	M	(S)		
Knowledge materials administration	6.86	2.06	6.64	2.62	.271	.788

Fig. 5: Knowledge Differences between experimental (SoLe = Self-organized learning) and control class (TraLe = traditional learning) in materials administration (t-test).

But if we take into account that the control class started with a considerably higher pre-knowledge (mean = 5.21 compared with 3.21 in the experimental class) this can nevertheless be seen as quite a success for the experimental class (see Fig. 6).

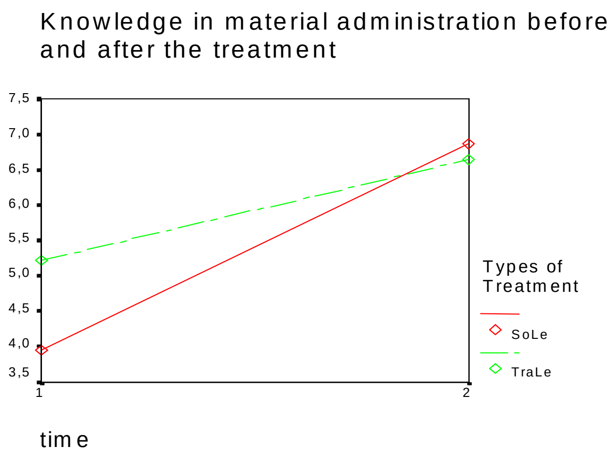


Fig. 6: Knowledge in materials administration before and after the treatment. SoLe = experimental class, TraLe = control class.

If we analyze problem solving competence we find a definite advantage in favor of the experimental class.

Materials administration	SoLe		TraLe		t	P/ω^2
	M	(S)	M	(S)		
Formal/ quantitative categories						
Analysis of given situation	9	3,86	9	4.35	.000	1.000
Definition of goals	1.29	1.95	.86	1.03	.199	.752
Measures	1.71	1.49	.86	.95	1.907	.065/0.07
Control	1.81	1.47	0.50	0.46	3.45	0.20
AIT	6.8533	3.5361	4.6707	3.1044	1.876	.070/0.07
Qualitative categories						
Declarative knowledge	3.43	0.75	2.79	0.80	2.42	0.21
Knowledge network	3.57	1.83	2.50	1.34	1.874	0.70/0.07
Logic	3.00	1.30	2.07	1.27	2.086	.045
Potential success	2.67	1.32	1.71	.99	2.300	0.28

Fig. 7: Categories of problem solving competence. SoLe = experimental class, TraLe = control class. ω^2 is a measure for practical significance. 7 % (and more) are generally seen as being acceptable (BREDENKAMP 1972, 49).

The students, who learnt Self-organized, deliver *more complete solutions* (formal categories) and a *better quality of solutions* (qualitative categories). A (statistically or practically) significant difference in favor of Self-organized learning can be found in the categories 'measures', 'control', 'AIT', 'declarative knowledge', 'knowledge networks', 'logic' and 'potential success'. These results indicate, that our open learning environment supports successful learning and problem solving.

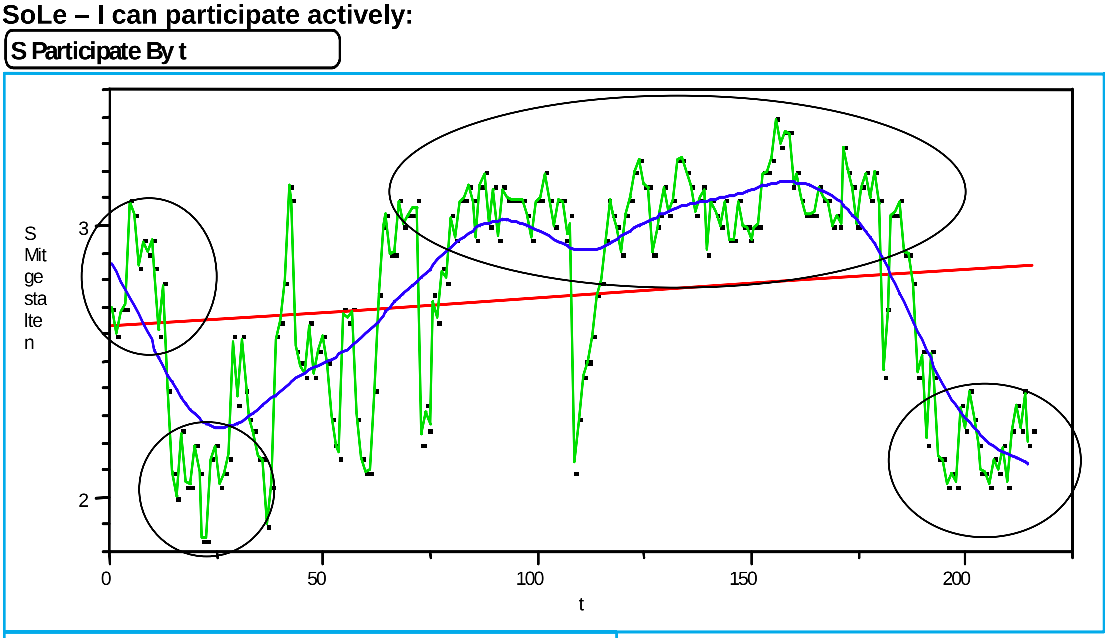
The following results are concentrated on the second focus of our study: to find out how the effects shown above can be described in detail and how they might be explained.

5.2 Process data

As mentioned above, we recorded in five-minute-intervals five cognitive, emotional and motivational state variables (see Fig. 4). With these data, time series can be created, that represent individual or aggregated processes (class level). On the one hand, aggregation leads to a certain loss of information, on the other hand, it can be helpful as a first step to detect general processes.

The time series indicate, that the processes in the experimental class (Self-organized learning) were in some categories more favorable than those in the control class (class level). The following graphic shows (as an example) the series of the item "I can participate actively":

SoLe – I can participate actively:



TraLe – I can participate actively:

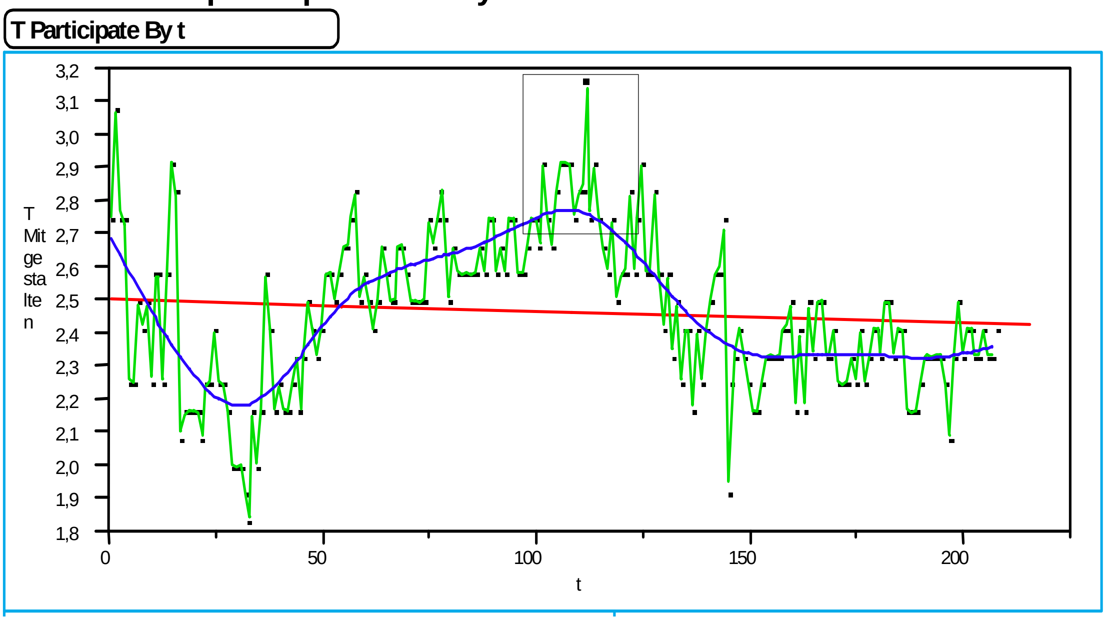


Fig. 8: Aggregated time series of the item "I can participate actively" in the experimental class (above) and control class (below).

In the *experimental class* we can clearly observe the phases of the didactic design. In the first phase (left circle), students have the feeling that they can participate actively. This was a period of time, when they had to reflect about the previous working period by themselves. After this, we find a certain decrease in the realization of possible participation, because the teacher provided feedback and recollected the previous working process (circle below). Then there is again a period of time, when students experienced active participation. This is a new period of Self-organized learning or problem solving (ellipse). The decrease towards the end (right circle) can be explained by the didactic design as well: the groups presented their results of the previous problem solving process. During this time, other students' participation possibilities were restricted.[7]

The maximum in the *control class* is, apart from two exemptions, constantly below 3.0, whereas the experimental class reaches a *mean* of 3.1 during the second phase of Self-organized problem solving (ellipse). Maximum values are 3.4. In the control class we notice a peak around t = 113. This period has to be analyzed with the help of our video data, concerning contents and methods, that might have led to such a peak. In general, such time series provide hints for potentially interesting phases in learning processes. These have to be analyzed in a second step with the help of video data.

Apart from descriptive analysis we compared the means of the two classes (Fig. 9).

	Mean SoLe	mean TraLe	Std.dev. SoLe	Std.dev. TraLe
Others take me seriously	2,7157	2,7921	0,1675	0,1517
I feel good	2,6687	2,8141 *	0,1907	0,1984
I understand	3,0424	2,9267	0,1643	0,1766
I am interested	2,8377 *	2,5849	0,1980	0,1809
I can participate actively	2,7463 *	2,4655	0,4078	0,2362

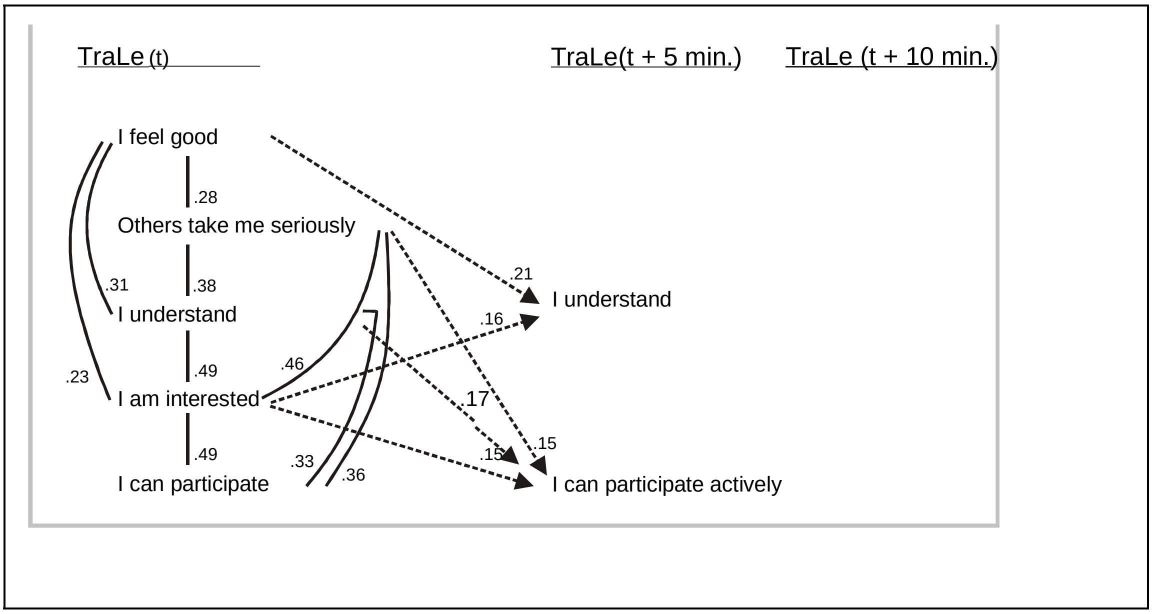
Fig. 9: means and standard deviations of aggregated time series in the experimental (SoLe) and control class (TraLe). * = significant on the level α = 5%).

These results show, that students, who learnt Self-organized, were convinced to have more possibilities to participate actively, and they were significantly more interested. The understanding of the learning content was slightly higher in this class as well. However, the emotional items show a slight advantage in favor of the class that

[7] We also analyzed time series of subgroups or individuals. These give additional information about learning processes. For example, we found, that the class, that learnt Self-organized was very heterogeneous. Apparently some students can cope better with such a way of learning than others do. Teachers should be aware of this and offer individual help (see WUTTKE 1999).

learnt traditionally. This is probably due to the complexity and uncertainty of the learning situation in the Self-organized class. Some students might have difficulties in coping. If subgroups of this class are analyzed this can be confirmed – there is a significant difference concerning emotional variables between two subgroups of the experimental class (WUTTKE 1999). Similar differences between these subgroups can be detected concerning motivational variables and the use of learning strategies (WUTTKE 1999).

To get more information about the learning processes in the two classes, we analyzed if and how these process variables are connected. For that purpose, cross-correlations of the time series have to be computed (SEMBILL/ WOLF/ WUTTKE/ SANTJER/ SCHUMACHER 1998). We analyzed synchronous and asynchronous (with a time lag of 5 and 10 minutes) cross-correlations between the variables. Especially asynchronous cross-correlations are interesting, because only those allow statements about how one variable affects or influences the other.



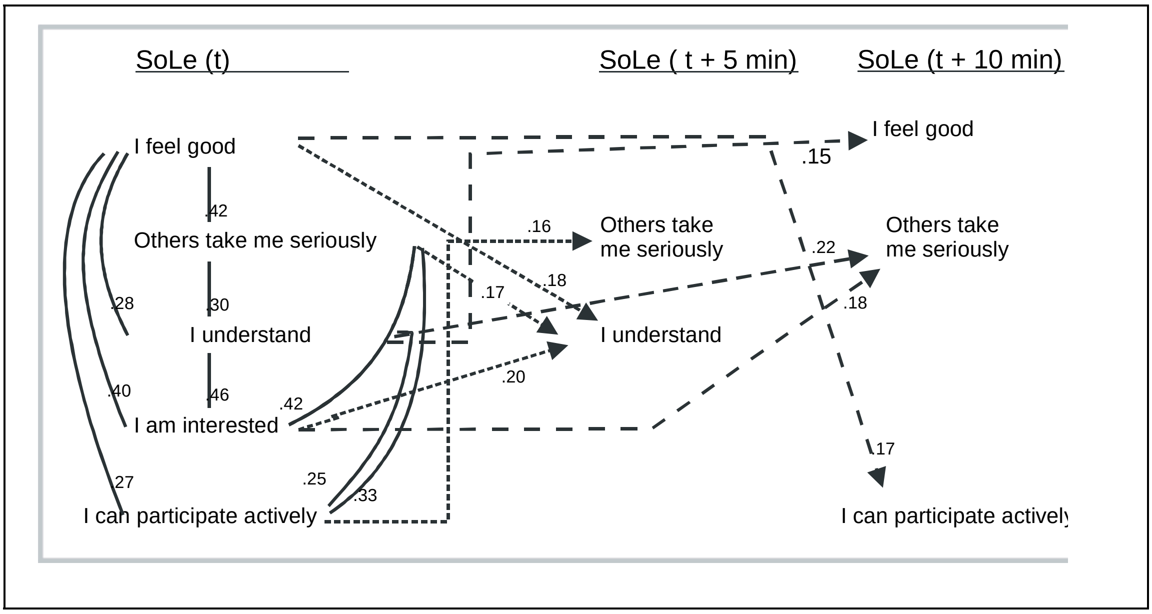


Fig. 10: Cross-correlations between the process data in the control class (above) and the experimental class (below)

In both classes all five items are closely connected (t; synchronous correlation). This result indicates, that cognitive, emotional and motivational processes during the learning process cannot be seen as being separate.

In both classes we find an influence of the emotional item "I feel good" and the motivational item "I am interested" (both in t) on the item "I understand" (t + 5 min.). In the experimental class there is an additional influence of "others take me seriously" (emotional item) on the understanding of the learning contents. These seem to be basic processes, that are fairly independent of a specific teaching method: if students feel good, if they are interested and integrated in their learning group (others take me seriously), learning and understanding will be enhanced.

Apart from these basic processes, we find rather different cross-correlations in the two classes. A remarkable result is, that the processes in the experimental class seem to be more lasting than in the control class and that more variables are connected over a longer period of time. This is a positive result if students feel good, are interested and well integrated in their peer-group. But it can be fatal, if emotional and motivational variables are negative. Therefore, before implementing Self-organized learning, teachers should know about the possibility of such processes. They should be able to identify students who have problems in coping with Self-organized learning and to offer adequate help.

The next step was to analyze the correlation between our process data (5 variables) and the criteria of success. We could not find any significant *direct* connection. But it is possible to show an indirect influence of the five process items on problem solving competence via students' motivation and their learning strategies (for detail see WUTTKE 1999; WUTTKE 2000).

6. Concluding Comments

In view of changing qualification profiles for adolescents entering professional life, we tried to implement a learning environment in which students learn Self-organized. The learning environment was based on complex, authentic problems.

The first focus of the study was to show, that Self-organized learning supports successful learning. The data indicate, that a Self-organized learning process can enhance problem solving without neglecting students knowledge of necessary facts. With the analysis of our process data (second focus) new insights are possible: When time series of the two classes are compared, it can be shown, that Self-organized learners can participate more actively and are therefore more interested in the contents. We could also show, that in both classes cognitive, emotional and motivational processes are closely connected. In both classes students have a higher understanding of the learning content when they are feeling good, are interested and well integrated in their learning group. The difference between the two classes can be seen in the closer connection of the variables in the experimental class and in the fact, that the correlations can be found over a longer period of time. This result can be positive or rather dangerous, depending on how students are able to cope with a Self-organized learning environment.

In general, Self-organized learning can be seen as a powerful and constructive way to reach higher qualification and to deepen students' interest in and understanding of learning contents. But even if the arrangement is successful in general, some students seem to have difficulties in coping with complexity and uncertainty. The conclusion cannot be to go back to traditional teaching. But these results must lead to didactical consequences, e.g.:

- Teachers must be able to identify students, who have difficulties with such a learning arrangement.

- Furthermore, they should be able to help students to acquire necessary tools to learn Self-organized (e.g. learning strategies, problem solving strategies).

In addition, these consequences must lead to new ways of teacher education (or further education), because presently teachers might neither be able to identify such problems nor to help with adequate tools to cope with them.

7. References

BARROW, D. A. (1993): The Use of Portfolios to Assess Student Learning. A Florida College's Experiment In a General Chemistry Class. In: JCST, December 1992/ January 1993, pp. 148-153.

BEREITER, C./ SCARDEMALIA, M. (1989): Intentional learning as a goal of instruction. In: RESNICK, L.B. (ed.): Knowing, learning and instruction: Essays in honour of Robert Glaser. (Lawrence Erlbaum) Hillsdale, N.J., 361-392.

BRÄUER, H. (1999): Emotional-motivationale Wirkungen von sozialen Interaktionsprozessen in Lern-Gruppen. Evaluierung eines Kategoriensystems zur Erfassung von Motiven und emotional-motivational wirkenden sozialen Interaktionen. Diplomarbeit.

BREDENKAMP, J. (1972): Der Signifikanztest in der psychologischen Forschung. (Akademische Verlagsgesellschaft) Frankfurt a. M.

BROWN, J.S. / COLLINS, A. / DUGUID, P. (1989): Situated cognition and the culture of learning. In: Educational Researcher, 18, 1, pp. 32-42.

COGNITION AND TECHNOLOGY GROUP AT VANDERBILT (1997): The Jasper Project: Lessons in curriculum instruction, assessment, and professional development. (Erlbaum) Hillsdale, N.J.

DE CORTE, E. (1995): Designing Powerful Teaching-Learning Environments. Conductive to the Acquisition of Cognitive Skills. In: OLECHOWSKI, R./ KHAN-SVIK, G. (Hrsg.): Experimental Research on Teaching and Learning. (Peter Lang) Frankfurt/M., Berlin, Bern, New York, Paris, Wien, pp. 67- 82.

DÖRNER, D. (1976): Problemlösen als Informationsverarbeitung. (Kohlhammer) Stuttgart.

DÖRNER, D. (1983): Kognitive Prozesse und die Organisation des Handelns. In: HACKER, W./ VOLPERT, W./ von CRANACH, M. (Hrsg.): Kognitive und motivationale Aspekte der Handlung. (Huber) Bern, Stuttgart, Wien, S. 26-37.

GLOMBIG, A. (1999): Zusammenhang zwischen emotionaler Befindlichkeit und sozialen Interaktionsprozessen – eine emprische Untersuchung von Lerngruppen in einer kaufmännischen Berufsschule. Diplomarbeit.

PFEIFFER, Christiane (1998): Lerninhalte und Lernziele in einem selbstorganisationsoffenen Lehr-Lern-Arrangement - Einfluß der Realisierung auf Lernprozeß und Lernerfolg. Diplomarbeit.

RESNICK, (1987): Learning in school and out. In: Educational researcher, 16 (9), pp. 13-20.

SEMBILL, D. (1992a): Problemlösefähigkeit, Handlungskompetenz und emotionale Befindlichkeit. Zielgrößen Forschenden Lernens. (Hogrefe) Göttingen, Toronto, Zürich.

SEMBILL, D. (1992b): Handlungs- und Emotionsstrukturen. Operationalisierungen, Rekonstruktionen und Ergebnisse. Dokumentationsband zur Monographie: Problemlösefähigkeit, Handlungskompetenz und emotionale Befindlichkeit. Zielgrößen Forschenden Lernens. Göttingen/ Mannheim.

SEMBILL, D. (1995): Research Learning: How to get Top Students. In: Olechowski, R./ Khan-Svik, G. (Eds.): Experimental Research on Teaching and Learning. (Peter Lang) Frankfurt et al. pp. 129-146.

SEMBILL, D./ WOLF, K. D./ WUTTKE, E./ SANTJER, I./ SCHUMACHER, L. (1998): Prozeßanalysen Selbstorganisierten Lernens. In: BECK, K./ DUBS, R. (Hrsg.): Kompetenzerwerb in der

Berufserziehung – Kognitive, motivationale und moralische Dimensionen kaufmännischer Qualifizierungsprozesse. Zeitschrift für Berufs- und Wirtschaftspädagogik, Beiheft Nr. 14. (Steiner Verlag) Stuttgart.

SEMBILL, D./ WOLF, K.D./ WUTTKE, E./ SCHUMACHER, L. (2000): Self-organized Learning in Vocational Education. Foundation, Implementation and Evaluation. (forthcoming).

WOLF, K.D. (1995): The implementation of an open learning environment under World Wide Web. In: MAURER, H. (Ed.): Multimedia and Hypermedia, 1995. Proceedings of ED-MEDIA 1995, Graz. (AACE) Charlottesville, pp. 689-694.

WOLF, K.D. (1996): Gestaltung und Einsatz einer selbstorganisationsoffenen Lehr-Lern-Umgebung unter World Wide Web. In: HRON, A. (ed.): Vortragsreihe "Multimediales Lernen" am DIFF Tübingen November 1995 - März 1996. Tübingen, DIFF.

WOLF, K.D. (1999): Erfahrungspunkte - Prozessfeedback in einer WWW-basierten Lernumgebung. In: Zentralstelle für Weiterbildung der TU Braunschweig (Hrsg.): Elektronische Medien in der wissenschaftlichen Weiterbildung. Möglichkeiten, Erfahrungen, Anstöße. Braunschweig: Technische Universität, 150-160.

WOLF, K.D. (2000a): Gestaltung und Einsatz einer internetbasierten Lernumgebung zur Unterstützung selbstorganisierten Lernens (forthcoming).

WUTTKE, E. (1996): Lernen in selbstorganisationsoffener Lernumgebung. Eine empirische Untersuchung bei angehenden Industriekaufleuten. In: VAN BUER, J./ APEL, U. (Hrsg.): Entwicklung der Wirtschaftspädagogik in den osteuropäischen Ländern III - Empirische Berufsbildungsforschung und neue komplexe Lehr-Lern-Prozesse. Studien zur Wirtschafts- und Erwachsenenpädagogik aus der Humboldt-Universität zu Berlin, Bd. 9.3. Berlin, S. 99-119.

WUTTKE, E. (1999): Motivation und Lernstrategien in einer selbstorganisations-offenen Lernumgebung. Eine empirische Untersuchung bei Industriekaufleuten. (Peter Lang) Frankfurt et al.

WUTTKE, E. (2000): Lernstrategien im Lernprozeß. Analysemethode, Strategieeinsatz und Auswirkungen auf den Lernerfolg. In: Zeitschrift für Erziehungswissenschaft, 1, 97-110.

WUTTKE, E./ Santjer, I. (1996): Dokumentation der Auswertung der Problemfälle "Materialwirtschaft" und "allgemeines Problem". Unveröffentlichter Arbeitsbericht. Justus-Liebig-Universität Gießen, Fachgebiet Arbeits-, Berufs- und Wirtschaftspädagogik. Gießen.

YOUNG, M. F., KULIKOWICH, J. M., & BARAB, S. A. (1997). THE UNIT OF ANALYSIS FOR SITUATED ASSESSMENT. INSTRUCTIONAL SCIENCE, 25, 133-150.

Bisher erschienen

Heft Nr. 1
Lüdecke-Plümer, S., Zirkel, A. & Beck, K. (1997). *Vocational Training and Moral Judgement – Are There Gender-Specific Traits Among Apprentices in Commercial Business?*

Heft Nr. 2
Minnameier, G., Heinrichs, K., Parche-Kawik, K. & Beck, K. (1997). *Homogeneity of Moral Judgement? - Apprentices Solving Business Conflicts.*

Heft Nr. 3
Lüdecke-Plümer, S. (1997). *Bedingungen der Entwicklung des moralischen Urteils bei angehenden Versicherungskaufleuten.*

Heft Nr. 4
Heinrichs, K. (1997). *Die „Schlüsselqualifikation" moralische Urteilsfähigkeit – Ihre Entwicklung und Ausprägung bei kaufmännischen Auszubildenden.*

Heft Nr. 5
Beck, K. (1997). *The Segmentation of Moral Judgment of Adolescent Students in Germany – Findings and Problems.*

Heft Nr. 6
Heinrichs, K. (1997). *Betriebsbezogene moralische Urteile von Auszubildenden im Versicherungswesen – Persönlichkeitsspezifisch oder situationsspezifisch?*

Heft Nr. 7
Sczesny, Ch. (1997). *Das Lösungsverhalten bei wirtschaftskundlichen Aufgaben – Visuelle und physiologische Begleitprozesse situierter kognitiver Leistungen.*

Heft Nr. 8
Beck, K., Bienengräber, Th., Heinrichs, K., Lang, B., Lüdecke-Plümer, S., Minnameier, G., Parche-Kawik, K. & Zirkel, A. (1997). *Die moralische Urteils- und Handlungskompetenz von kaufmännischen Lehrlingen – Entwicklungsbedingungen und ihre pädagogische Gestaltung.*

Heft Nr. 9
Beck, K. (1997). *The Development of Moral Reasoning During Vocational Education.*

Heft Nr. 10
Sczesny, Ch., Lüdecke-Plümer, S. (1998). *Ökonomische Bildung Jugendlicher auf dem Prüfstand: Diagnose und Defizite.*

Heft Nr. 11
Lüdecke-Plümer, S., Sczesny, Ch. (1998). *Ökonomische Bildung im internationalen Vergleich.*

Heft Nr. 12
Beck, K., Bienengräber T., Parche-Kawik, K. (1998). *Entwicklungsbedingungen kaufmännischer Berufsmoral – Betrieb und Berufsschule als Sozialisationsmilieu für die Urteilskompetenz.*

Heft Nr. 13
Beck, K. (1998). *Wirtschaftserziehung und Moralerziehung – ein Widerspruch in sich? Zur Kritik der Kohlbergschen Moralentwicklungstheorie*.

Heft Nr. 14
Beck, K. (1998). *Moralerziehung in der Berufsausbildung?*

Heft Nr. 15
Beck, K. (1998). *Ethische Differenzierung als Grundlage, Aufgabe und Movens Lebenslangen Lernens.*

Heft Nr. 16
Parche-Kawik, K. (1998). *Wirtschaftsethik und Berufsmoral – Die Auseinandersetzung um das Leitbild für den modernen Kaufmann im Lichte empirischer Befunde.*

Heft Nr. 17
Hillen, S./ Berendes, K./ Breuer, K. (1998): *Systemdynamische Modellbildung als Werkzeug zur Visualisierung, Modellierung und Diagnose von Wissensstrukturen.*

Heft Nr. 18
Breuer, K./ Höhn, K. (1998*): Die Implementation eines Qualitätsförderungssystems für be-rufliche Abschlußprüfungen – Eine Interventionsstudie am Beispiel des neu geordneten Ausbildungsberufs Versicherungskaufmann/ Versicherungskauffrau.*

Heft Nr. 19
Beck, K. (1998): *Die Entwicklung moralischer Urteilskompetenz in der kaufmännischen Erstausbildung – Zur Analyse der Segmentierungshypothese.*
Minnameier, K. (1998): *Homogenität versus Heterogenität des moralischen Denkens – Wie urteilen Auszubildende im Rahmen betrieblicher Kontexte?*
Zirkel, A. (1998): *Kaufmännische Berufsausbildung und moralisches Denken – Erleben weibliche und männliche Auszubildende ihre soziale Umwelt unterschiedlich?*

Heft Nr. 20
Wuttke, E. (1999): *Lernstrategieeinsatz im Lernprozeß und dessen Einfluß auf den Lernerfolg.*

Heft Nr. 21
Beck, K. (1999): *Zur Lage der Lehr-Lern-Forschung - Defizite, Erfolge, Desiderate.*

Heft Nr. 22
Minnameier, G. (1999): *Wie man lernt, komplex zu denken, oder: Was substantielle Lernfortschritte sind und wie man sie erzielt.*

Heft Nr. 23
Beck, K. (1999): Fortschritt in der Erziehungswissenschaft? Anmerkungen zur Gegenwart einer unendlichen Geschichte.

Heft Nr. 24
Bienengräber, Th. (1999): *Die Entwicklung moralischer Urteilskompetenz im Betrieb – zur Bedeutsamkeit einzelner sozialer Bedingungen für die Genese der moralischen Urteilsfähigkeit*.

Heft Nr. 25
Parche-Kawik, K. (1999): *Wahrnehmung sozialer Interaktionsbedingungen am Arbeitsplatz – Unterschiede in den Sichtweisen von Auszubildenden und ihren Ausbildern.*

Heft Nr. 26
Beck, K. (2000): *Die Moral von Kaufleuten – Über Urteilsleistungen und deren Beeinflussung durch Berufsbildung.*

Heft Nr. 27
Bienengräber, Th. (2000): *Zur Frage der Bereichsspezifität in der Wirkung moralischer Entwicklungsbedingungen.*

Heft Nr. 28
Beck, K. (2000): *Alternative Research Approaches: Development Strategies in Educational Technology.*