Approaches to Action Learning in Technical and Vocational Education and Training (TVET)

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Approaches to Action Learning in Technical and Vocational Education and Training (TVET) – Review of Psychological Foundations and Selected Teaching Concepts of Action Learning

Preface

The key role of education and training in national development has been universally recognised. Technical and vocational education and training (TVET) is one of the most productive elements of education. In addition to preparing individuals for the world of work by teaching them the skills and competencies needed for economic competitiveness, TVET also assumes a degree of responsibility for the personal development of its learners, and for their effective participation in society. The meaning and the practice of work in knowledge economies and in globalized networks of production and trade are changing. The need for a highly skilled and productive workforce is shaping economies all over the world. To increase their chances for employability, young people and adults need skills that are flexible and relevant to the demands of today's societies, where individuals must possess a combination of knowledge, practical and social skills and positive attitudes, as well as the ability to think and act independently, creatively and responsibly. If TVET is to meet such diverse expectations, substantial changes are required, and education and training systems should be re-oriented in such a way as to impart a broad range of life skills. Transformation of teaching and learning in TVET is thus needed. Traditional teaching and learning models, which convey a formal, abstract process, are often far removed from the specificities of real world practice. The method of Action Learning, the theoretical bases of which are introduced in this publication, is an approach to work-based learning that was pioneered by Professor Reginald Revans, UK, in the 1960s and has spread around the world. Action Learning provides a tried and true method of accelerating learning that enables people to handle difficult situations more effectively. This approach to learning is considered by some to be one of the most important ideas to have emerged in management and organizational development over the last 40 years.

Action learning advocates questioning and reflection to prompt a deeper level of analysis, to test assumptions, and to explore possibilities. Within a group, work-based problems are discussed and reframed in a learning context. Through sharing experiences and advice, action is suggested and solutions discussed. In this way, learning from shared experience provides innovative solutions and assists individuals and organisations adapt to a rapidly changing world. Subsumed into the learning activities, this method provides enhanced possibilities for personal and professional development of the individual, and can also help improve economic productivity and stimulate economic development.

This paper introduces action-theoretical models and provides an overview of selected teaching concepts of action learning. The UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training (UNESCO-UNEVOC) and InWEnt (Capacity Building International, Germany), two organisations which are concerned with the development of TVET and skills development for employability and citizenship, sincerely hope that this important publication will stimulate the debate on the action learning in TVET and motivate teachers and trainers to use new approaches to teaching and learning in their work.

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Purpose of this publication

Education is decisive for the development of the personality and the participation of the individual in the society. It is an indispensable condition for the ability of a modern and democratic society to face the future. Furthermore, education decides on the innovation and competition ability of the economy. Only those national economies investing in the knowledge of individuals will be able to overcome the transition to the information and media society (cf. Bundesministerium für Bildung und Forschung 2001, p. 5). In the last decades the need for skilled labour has increased significantly; simultaneously a drop in the demand for unqualified employees could be noticed. The cost pressure on companies has grown. Endeavours to reduce the costs without paying the price of quality loss were made. The consequences on the work organisation are logical. The tendency from a strictly vocational-oriented and functional division of labour to one that is orientated towards processes is unmistakeable. The process-oriented work routines stand out due to co-operative activities varying again in type and duration (cf. DIHT 1999, p. 5).

The changes culminate in new demands on future employees and also find expression in conceptions of vocational education; the vocational school has the responsibility to develop vocational flexibility for coping with the changing demands of the world of work and society (cf. KMK 2000, p. 8). According to Wilsdorf, in this context not only the content of learning is important, but also the way it is learnt (Wilsdorf 1991, p. 82 f.).

Therefore, the vocational school has not only the responsibility to teach vocational and general learning contents, but also to enable the learner to think and act independently and responsibly considering the demands of the vocational education. The insight that the modern world of work requires the entire personality already found expression in the pedagogy decades ago. Stein points out the skilled worker who in the future only has to offer his physical strength will not meet the requirements of a modern world of work, because the machine has taken over a lot of his performance (Stein 1965, p. 11).

Consequently, the action concepts of training design are the focus of a very intense didactic debate. Therefore, the purpose of this publication is to summarise important psychological basics of action training and to give teachers advice for the realisation of action learning. Furthermore, chosen methodological concepts for the realisation of action learning are presented, in order to motivate teachers to integrate these concepts into their training.

1 Action-theoretical bases – analysis of action-theoretical models

1.1 The model of action by Leontjew and Hacker

1.1.1 The relation between activity, action and operation

The bases of action orientation evolved from two tendencies of psychology. A very strict examination of the existing concepts shows that it would be appropriate to differentiate between an „acting" and an „action" training (cf. Jank and Meyer 1994, p. 352). The "acting" training refers significantly to the activity theory of the (soviet) materialistic psychology (representatives: among others Galperin, Leontjew, Wygotski). "Action" training mainly concentrates on the cognitive action theory (representatives: among others Piaget, Aebli).

The materialistic psychology leads from the premise that the activity as human life expression can only be understood adequately if, according to Eicker, it is explained by its biological, natural-historical and social origin (cf. Eicker 1983, p. 90). Furthermore, a basis is formed by a view leading from a reflection, i.e. the relation of training contents (objects, phenomena, processes or similar) and its reflection within the human conscience (perceptions, feelings, ideas). Therefore, the connection between human being and environment is established by characteristics of the relation between outer objects and inner insights, action structures, abilities etc., which are materialised by the human being's activity. The psychological activity therefore is the outcome of the transition of the outer material action into the form of reflection, i.e. into the form of perceptions, ideas and terms.

With that, the materialistic psychology strongly emphasises the role of the activity in forming psychological phenomena. Remarkable in this process of reflection is that the outcome is no static figure of the objects of insight, but, according to Gudjons, that the original, sensual content of an object changes itself within the process of insight (cf. Gudjons 1997, p. 42).

As the materialistic psychology provably exerted a decisive influence on the development of action-theoretical basics, the underlying system of terms of this tendency is to be explained initially. As an example, the system of terms by Leontjew is analysed. A key

position in Leontjew's construct of theory is hold by the term "activity" which is an integral, but not additive life unit of the physical, material subject, and of which the real function is the orientation of the subject in the world of objects (cf. Leontjew 1979, p. 83). In other words, the activity is no reaction, but a system with its own structure. In this sense, the human life is an entirety, or more precisely a system of mutually superseding activities with own inner transitions and conversions as well as with an own development (cf. ib., p. 83).

Activities are stimulated by the needs of the subject. They can be material or immaterial. After a need is satisfied it is produced again, if necessary on changed conditions (cf. ib., p. 101). One activity differs from the other in the dissimilarity of their objects. If it is the object (the content of the activity) stimulating and controlling the activity, it can be seen as the true motive of the activity. Therefore, an activity without motive and purpose cannot exist (cf. ib., p. 101 f.). According to Leontjew, a certain need encourages the human being to take up a special activity.

The term "action" is put underneath the term "activity" in Leontjew's system. The action represents the main component of the activity. This component realises the activity and is not subordinated to the need, but to a considered goal. Against this setting, the correlation between the terms goal and action is similar to the one between the terms motive and activity (cf. ib., p. 102).

An activity requires the reaching of a number of definite goals of which some form a strict sequence, i.e. an activity is realised by an entirety of actions subordinated to partial goals. Therefore, the activity of every human being is in the simplest case one single action, or a chain of actions with goals and part goals requiring each other (cf. ib., p. 103 ff.)

Leontjew emphasises that the actions that are to be realised within the activity are stimulated by the motive of the activity and are directed at the goal of the action. A breakdown into the functions that melted together in the motive beforehand takes place. However, the initiation function remains totally with the motive (cf. ib., p. 103).

For Leontjew, activity and action are real and at the same time not identical realities. Thus it can happen that one and the same action realises different activities. Likewise

it can happen that an action transfers from one activity into the other (cf. ib., p. 104).

In the explanation by Leontjew it becomes clear that the goals of an action are developed at random. They are resident in the situation of objects. In this context, the identifying and understanding of the goals are no automatic processes. It is about a process of testing the goals by the action and by filling it with definite objects.

A further important task is to clearly define the goals, which means to identify the conditions in order to reach them. Not the contents of the goals are important, but the conditions and processes to reach them. Leontjew describes the processes for the realisation of the actions as "operations". Therefore, the actions correlate like already explained before with the goals, and operations with the conditions (cf. ib. p. 105 ff.).

Actions and operations are of a different origin. The creation of the action lies in the relation of the exchange of activities. Every operation is the outcome of the change of an action that occurs by its inclusion into another action and its "mechanisation" (cf. ib., p. 107).

It appears to be characteristic that operations sooner or later are mechanised. However, one should not assume that the operations with regard to the action as well as the action with regard to the activity form independent units. A machine that carries out operations that do not realise a purposeful action of a human being can only be out of the human being's control (cf. ib., p. 107 f.).

However, in connection with operation and action it is always to be considered that the human being in his development has influenced a society and has developed in this. Consequently, activity, action and operation can, according to Leontjew, never be considered as isolated from the social relations and from the life of the society, because outside the social relations an activity cannot exist (cf. Leontjew 1979, p. 84).

The activity of every human being depends on his place in society, on the general living conditions and on the individual circumstances under which the activity is arranged.

Therefore, not the outer conditions are motives and purposes of his activity, but the social conditions themselves. In other words, the society itself initiates the activity of the individuals who form the society. The individual human being orientates his activity not towards the society but the society itself is motive and purpose of his activity (cf. ib., p. 84 ff.). Leontjew considers the creation of actions within the activity as being the sole outcome of the transition of the individual human being to live in society. According to Leontjew, their product stimulates the activity of the people involved in the joint work. This product of joint work initially corresponded to the needs of every individual. The technical division of labour that is required by life in society also demands the determining of interim and part outcomes that are achieved in the joint work by the individual. However, these interim or rather part outcomes do not satisfy their needs. They are rather satisfied by the share of the product of their joint activity (cf. ib., p. 102).

The ratio of activity, action and operation is to be illustrated in the following figure. It is fallen back on a diagram of Hacker who can also be put in the tradition of the materialistic psychology.

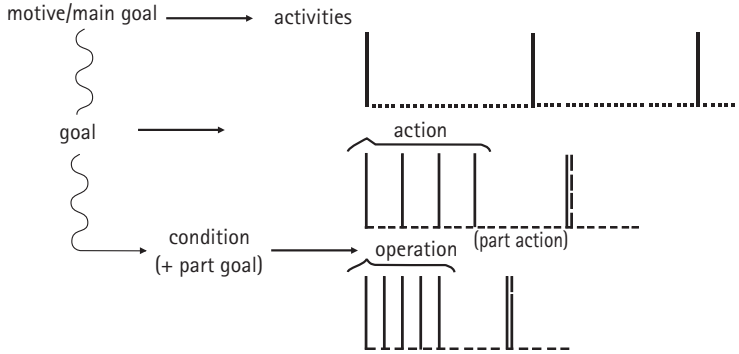


figure: hierarchical structure of an activity after Hacker (cf. Hacker 1998, p. 66)

1.1.2 Components of an action

The human action is characterised by order principles and by the interaction of psychological processes as well as by the orientation to an action goal. According to Hacker, the psychological structure is a conditional order in terms of content because of the dependence on the goals of the working activity. Due to the realisation of the regulation of the goal the activity is a conditional functional order or course

organisation in terms of content (cf. Hacker 1986, p. 109).

The role of the action structure and the included psychological processes consists in the regulation of the activity. According to Hacker, the task is to derive and convert the transferring conditions of the states that have to be gone through on the way from the starting to the end state in consideration of the respective conditions (cf. ib., p. 110).

The structure approach of the psychological action structure by Hacker comprises five components: direct, orientate, design, decide and control. The approach does not constitute a sequence but is about functional groups that mesh in complex actions and proceed meshed (cf. ib., p. 110 ff.). Therefore a strict sequence cannot exist.

Direct

To direct as element of the action comprises the development of goals during an independent activity. The goals are the anticipated outcomes of the action and are caused intentional and by individual effort. Furthermore, they stand out due to an anticipative activity-leading kind of cognitive or memory structures (cf. ib., p. 115). Hacker's approach distinguishes between accepted and independent goals. Therefore, he introduces the term "freedom degrees". Freedom degree denotes the binding nature of the action regarding the action goal, the methods and the instructions of the carrying out. Therefore, a high freedom degree denotes goals that arose from individual decisions. A low freedom degree characterises goals that only arise from the involvement of the acting person in the forming of goals.

Orientate

To orientate as element of the action integrates all processes of getting information. It serves for clearly defining the action situation, the possibilities of the carrying out and the action conditions. If necessary, to orientate also includes the update of action-important knowledge. According to Hacker, those won and regulative effective images are elements of the operative image system (OAS – Operatives Abbildsystem). OAS is a constant action-leading representation of memory, which decide on the success of an action. The OAS comprises three areas: representation of the initial and action situation, representation to the action way and anticipation of the final or rather target state.

The representation to the initial and action situation understands the initial and present states of the action. In the representation of the action way the knowledge necessary for the action is subject of a comparison between target and present and is, if necessary, adapted regarding the action. Action plans are developed including the necessary tools. The anticipation of the final or rather target state tackles the consequences of the action.

Design

To design contains the development of an action way and the selection of tools. The operative image system is further completed. Hacker distinguishes three regulation levels. Those three hierarchical arranged regulation levels comprise:

- movement design/cognitive routines in the sense of skills not anchored in the consciousness,
- action schemes: here it is a matter of goal-referring units of movement stereotypes as well as cognitive routines into variable applicable programmes (cf. ib., p. 159). In this context it seems important that the term of action schemes is not understood in the sense of Aebli's comprehension of terms because, according to Aebli, action schemes are stored as whole in the memory of the individual action elements,
- plans, strategies and heurisms.

Decide

The decision-making plays a key role in the entire action. The development of the goal, the development of the action way and the decision to act are bound to the deciding. The term deciding inevitably requires at least two decision alternatives. The deciding for or against a subjectively available possibility requires the assessing of all possibilities. Assessing is bound to certain criteria. The knowledge available for the assessment of the realisation of the criteria influences the decision. The decisions are categorised by three conditions:
Use of the possibilities with regard to the needs and values of the acting person, estimated time for the realisation, as well as the condition of the realisation.

Control

On the basis of the examined structure elements it becomes clear that the human being is able to control his acting. He is able to develop action goals, collect information about the action situation, design action variations and decide for the

variation that he thinks is right. The human being therefore has an inner model with which he controls the action. In this context it is called action regulation.

Miller, Gallanter and Pribram explain the action regulation by means of the TOTE-units (test, operate, test, exit).

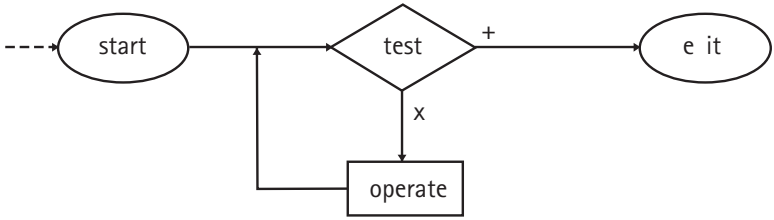


figure: TOTE-units (Hacker 1986, p. 114)

Heart of this model is the closed-loop control circuit. An existing state is compared to the state/goal striven for (test). If there is a contradiction between the existing state and the state that is striven for, it is corrected (operate). The cycle is gone through until the contradiction is overcome. Then the closed-loop control circuit is left (exit). In principle every action can be taken apart into TOTE-units.

Instead of a closed feedback of the TOTE-units Hacker presents an open model. This is the model of the units indication-change-feedback (VVR-units – Vorwegnahme-Veränderung-Rückkoppelung). This model explains how goals change within the activity. In this model, a goal, the final state striven for, is not bound to the beginning of an action, but is a process. During the action, a goal is constantly changed, corrected and clearly defined. Therefore it goes through a development. Complex actions are controlled by a sequence of VVR-units that are nested in one another. These units can not only be effective one after another, but also parallel. Superior units control subordinated units (cf. Hacker 1986, p. 141 ff.).

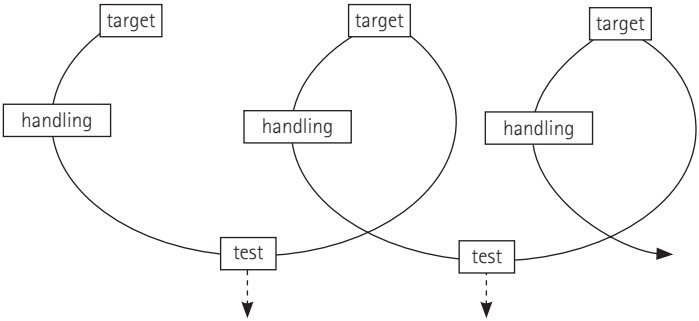


figure: simplified depiction of the VVR-units (Koch and Selka 1991, p. 36)

The components of an action (design, direct, orientate, decide, control) and their combination in Hacker's model are illustrated in the following image.

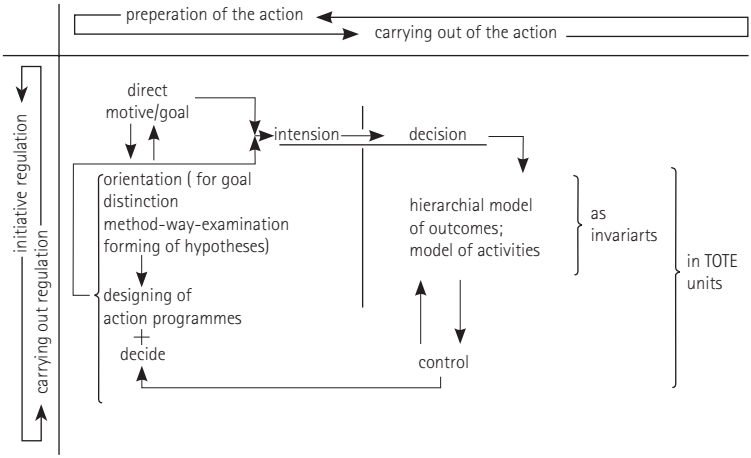


figure: connection of the psychological regulation of action according to Hacker (Hacker 1986, p. 113)

The model ideas concerning the elements of an action or rather an entire action have influenced the concepts of the vocational pedagogy and the special training concepts for decades. The model idea that is borrowed from the psychology was adapted to the vocational education and widened by an intensive research and development activity, so that this idea is made subject of the discussion in numerous publications.

1.2 The model of the action according to Volpert

1.2.1 Definition and basic model of the action

Walter Volpert created an action model that is based on part actions. He established and further developed the model of a hierarchical-sequential action organisation. This action model after Volpert is explained in the following.
Voplert defines "action" as the acting of a human being who tackles with his material environment. Starting point of the action is a goal and the independent reaching of the goal. At first, it is available as target state and is realised by the concrete working process regarding the present state. Planning and feedback processes bind goal and action to each other. The ratio of the acting person and the environment changes in the different parts of the carrying out process. The action can be modified and the action plan corrected as well as revised if deviations from the goal are perceived (cf. Volpert 1999, p. 38 ff.).

Acting person and environment are two important poles of the action that are described as follows:

The acting human being has the willingness and skill to comprehend and reach the goal of an action. Through it, the action leeway is possibly, but never completely limited.

An environment has its own laws and meets the acting person. The environment is neither predictable nor completely easy to be influenced by the acting person (cf. ib., p. 38).

Both poles (acting person and environment) are socially well founded. The acting person is not wholly dependent on the encountering environment that is connected with all relieves and difficulties, but follows complex criteria in order to reach his goal. This pragmatic model describes how the acting is considered as trying to cope with concrete problem situations.

If the goal is reachable and coherent in the way the acting person wants to reach it, the goal is described by the explained approach. This further means that it is striven for reaching the goal efficiently, which is not to be understood as sheer means to an end but as self-responsibility. In this case it exists a principle for the

acting person: in the process of activity he develops a flexible stability and expands this constantly, so that the relation between acting person and environment will be stable and repeatable (cf. ib., p. 39). From this foundation Volpert develops his model of action.

Human actions are abstract and often consist of complex structures. A simple model can illustrate the basic structure of the action. The model contains the goals as well as the planning and feedback processes. It is assumed that the acting person becomes aware of how he can reach his goal and which possibilities he therefore has. The way to the goal is developed with simple ideas and assumptions. The most important elements of the models are: the cyclic unit, the hierarchical structure and the hierarchical-sequential organisation. The simplified model of the cyclic unit is shown in the following.

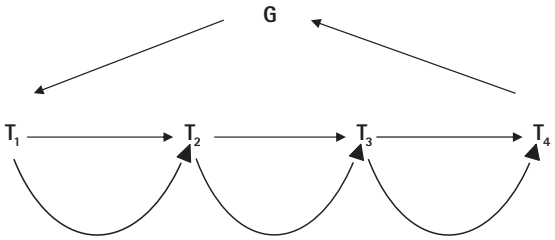


figure: cyclic unit (Volpert 1999, p. 41)

G goal (the action goal)
Tn are the transformations that are necessary for the reaching of the goal
The forms of transformations are divided into:
T1 initial transformation,
T2, T3 conciliatory transformations and
T4 accomplished transformations.

The acting person and the environment are changed within these transformations. The initial transformation (T1) is the first step from the initial state in the hoped direction. In Volpert's model the process of the transformation ends with T4. This is called the act of consumption because the goal has been reached. The conciliatory transformations (T2, T3) are transformations on the way to reaching the goal. After

the accomplished transformation a feedback process is initiated that examines if the acting person reached the goal. In case of having reached the goal the action is completed (cf. ib., p. 40 f.).

The action model explained here comprises two dimensions of acting: at first mental test acting is necessary (straight lines). In a second step, the carrying out of the action takes place, the so-called "working through" of the action plan (bent lines).

1.2.2 Characteristics of the action

In Volpert's model the action is characterised by features. These features are: purposefulness, socialness, concreteness, awareness and feedback.

Every action applies to a goal. From the beginning the acting person has an idea of the goal. From the start, the outcome of the activity is considered to be an anticipated idea of the acting person (cf. Volpert 1983, p. 18). An action is started in order to reach the acting person's goal. It is completed when the goal is reached. Through it the carrying out differentiates the goal. The goal is obvious and of greater importance than the carrying out. With that the carrying out steps back from the goal. It seems to be usual that several ways are possible to reach one and the same goal. Therefore, way and goal have a mutual relation. Although the goal decides on the carrying out, without reflection of the realisation conditions the drawing up of goals is senseless (cf. ib., p. 19), the result of which is that the human action always requires a fundamental way for reaching the goal. The goal has to be viable and action-relevant.

The individual action is always integrated into society. Therefore, the activity of human beings can never be looked at isolated from social relations and society (cf. ib., p. 18). The social development changes the environment and the action conditions. The acting person is influenced in the course of his (individual) development by being socially bound. The triggers of the actions (e.g. tasks) are influenced by the social and technical conditions. During the forming of the goal the adjustment with the social conditions is of importance, i.e. during planning, carrying out and controlling processes social relations are considered.

An action takes place in relation to the "environment". According to Marx, work is characterised as the tackling of the human being with the environment. For Leontjew,

the concreteness of the activity is representational (cf. ib., p. 17). The interaction between human being and his environment is carried out in the interfering and changing activity of the human being and therefore neither in the sheer thinking nor in the passive reacting (cf., ib., p. 17). That is, only intervening and changing activities can achieve interactions between human being and his environment. An action must always contain more than sheer thinking or passive reacting.
The concreteness of the action also implies that it is accompanied by consequences. The concreteness is also obvious in the influence of the organisational culture by the organisation members. Therefore, the human action, for example in a working process, cannot be considered as individual activity. According to Leontjew, the activity of the human individual is part of the system of social relations. It can be concluded that every activity is part of the superior action context without immediate visible intention (cf. ib., p. 17).

Marx distinguishes between the specific human, considered and purposeful action and other purposeful acting. Here, he makes use of the example of the bees.

According to Marx, a spider carries out operations that are similar to those of a weaver and a bee shames many master builders by its construction of the wax cells. But what distinguishes the worst master builder from the best bee is that he has built the cell in his mind before constructing it with wax. The result at the end of the working process was already in the worker's mind from the beginning, i.e. it was mentally available (cf. ib., p. 18).

Purposeful "actions", i.e. without awareness, are not only settled in the human context but can also appear in organisations and technical systems. The acting person has "awareness" if he can give information about the goal. Not every action necessarily has a goal. Some actions are carried out automatically without the discussed meta cognition. Consequently it can be summarised appropriately: acting does not have to be, but can be conscious (cf. Bamberg, Mohr 2006, p. 4).

After the available examinations the purposeful action only is appropriate if a feedback of the result of the action is considered and also compared with the anticipation. The relevant theory approach is the psychological analysis of the stimulus-reaction model (so denoted in the behaviouristic theories).

The principle of feedback is constituted by two elements: comparing processes and modification processes. In the comparing process it is checked if the acting person has reached the goal and in the modification process to what extent the goal is realised by partial actions and the dealing with the environment. If there are differences the activity is continued. Finally, the outcome is examined by a feedback for the goal. Comparing and modification processes are connected with each other. Comparing processes do not only take place during the finishing of the activity, but also during the activity, for example an acting person has to examine the object that has to be dealt with during the working process in order to control his further activity (cf. Volpert. 1983, p. 21).

1.2.3 Action model A

The cyclic unit by Volpert has already been explained. However, the human action has far more complex structures. According to Volpert, every transformation within the cyclic unit has secondary structures. For a detailed examination it can be noted that for every transformation a "part goal" can be given. Every unit is regarded as part of a superior unit. A nested structure over several levels is depicted in the following figure:

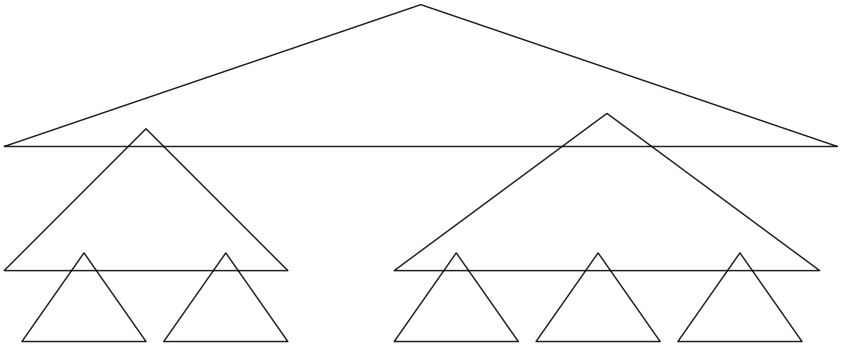


figure: the hierarchical structure after Volpert (Volpert 1999, p. 42)

Volpert distinguishes between "peak unit" and "basic units". The respective levels of the basic units are numbered consequently from top to the bottom. If the model of the hierarchical structure is compared to the cyclic unit, it can be seen that there are no arrows envisaged in the figure. Adding the arrows and the process structure results in the "hierarchic-sequential action organisation" (Volpert 1999, p. 42).

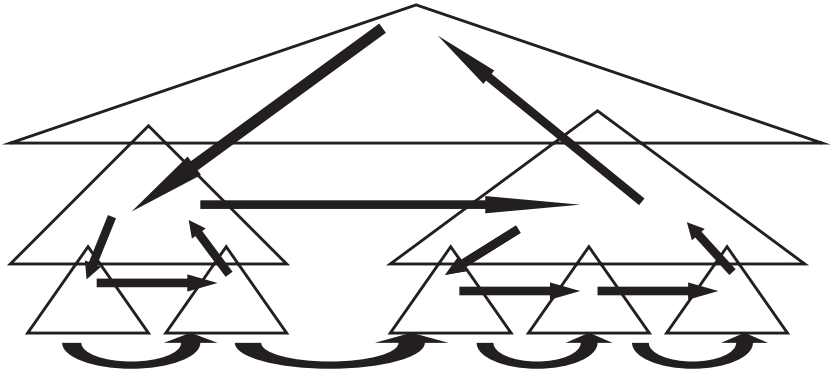


figure: the hierarchic-sequential organisation (Volpert 1999, p.43)

The upper figure represents the combination of both basic principles, the cyclic unit and the hierarchical structure.

The individual levels differ from each other in the reachability of the respective action plan. The higher level always has the higher claim with regard to the goal of the action. According to that, the time to consume the action and to reach the goal of a higher level extends. The highest goal always contains lower partial goals. Thus the probability of failure is increased significantly. So the lowest level estimates a relatively simple way of acting in order to reach the goal, which could consist of psychological actions that can be automated (cf. ib., p. 44).

In this model, simple and everyday life actions are of prime importance. Only very unexpected situations can be integrated. These processes do not explain the flexibility within an action. If this flexibility is connected with the hierarchic-sequential action organisation, the following view is becoming understandable (cf. ib., p. 44 ff.).

Every concrete individual action does not necessarily follow the default processes of the model. Its process and result rather depend on the individual competence of the acting person and the respective action context. Often it will happen that aspects of an action are "dealt with" in one level, but are originally part of another level. Likewise the reachabilities of the successive partial goals do not always have to agree with the same level. It is quite possible that a part goal is differentiated from the preceding level and the subordinated level. However, in difference to the part

goals of other levels it is reachable faster and more directly. This case is not taken into consideration in the figure above (hierarchic-sequential organisation).

It has also to be emphasised that Volpert does not claim that the entire action pyramid is already certain before the action takes places. This would lead to a misunderstanding. The assumption that the action pyramid is already certain before or with the beginning of the action will only be correct in an extreme case. However, there exists a certain forward planning before the real carrying out. The so-called "certain forward planning" means that the respective start units emerge only shortly before the beginning of an action, i.e. only the next steps are planned more exactly in advance. The further the start units are away, the more vague and rougher the plan of the following steps becomes. The strictness of the success criteria and, above all, the restrictions decide on the extent of the needed detailing.

Unexpected incidents do not necessarily have the consequences that the entire action plan is rejected. Rather the new conditions are flexibly integrated into the action plan and the goal is maintained as long as possible. If a part action has not reached its goal, Volpert's action model nevertheless offers the possibility to reach the respective next higher goal in another way. Only if this is not possible the goal is changed or reversed.

In the transformation process the outcome is examined regarding the divergences. Therefore it is analysed if the outcome still agrees with the superior goals. The acting person examines if everything is still in accord with the superior goal. Volpert describes this with "it is on the course" (ib., p. 47). This course is influenced by the goal of the action as well as by the general objectives.

The basic model of the hierarchic-sequential action organisation was presented and discussed. In this place, this explanation should be replenished by the following:

It was pointed out that the acting person can only plan the nearer future more detailed since the entire forward planning can be quite vague. But the everyday life experience has shown that the forward thinking of the acting person is limited. Longer planning, for example at a life plan, is not appropriate since the process of the development of the individual depends on his life conditions. With this way of "planning limits" the forward planning is also limited. Volpert also discusses a further

problem. Sometimes an action has several goals at the same time. This fact is not completely impossible, but rather rare. In this case the action is influenced by a special, material goal as well as by different superior goals.

1.2.3 Action model B

The basic assumptions of the human actions of model B are compatible with model A of the hierarchic-sequential action organisation. They are situation-oriented, clearly define themselves at problems and form their goals within the action. This model provides an explanation of the action process. Action goals are derived from the constellation of the action and the carrying out is constantly designed newly and reversed (cf. ib., p. 69). Consequently, the current conditions of the action are considered and designed flexibly. This steady examination of the compatibility and difference increases the flexibility of the action.

A considerable characteristic of model A is the planning and acting of the acting person, in which action results are included and situational changes can happen. However, this model occasionally cannot bear the reality. In extreme cases the context of acting is totally chaotic or fixed in detail.

Here it is about extremes. In the area between the extremes it is possible to create an order by own acting and to follow own goals. This approach is followed in model B. In order to describe this model, basic assumptions are to be recorded initially.

Firstly, the acting person has to be competent and has to have rich action experiences. Secondly, the competent acting person is transferred into a new situation; when overcoming this situation, he is facing new challenges. Thirdly, the acting person should have relatively complex goals that he follows highly motivated. At the same time there has to be the possibility of following these goals. Fourthly, the situative conditions should permit as well as require all objectives. They have to offer action leeway and at the same time should not let the wished outcome develop as a not-intended by-product but only by the continuous trying of the acting person (cf. ib., p.71 f.).

The criterion of the goal insistence is to be explained very strictly: having chosen a certain way, an appropriate procedure is bound to this against which one is not allowed to violate. A good example for an action in this sense is: "If we take the way

over place A we cannot suddenly jump to place B and continue the voyage from there" (ib., p. 71). Such limits of the process do not necessarily restrict the decision possibilities, since one could have picked A as well as B at the beginning. But the restriction of the action will lead to having to finish the chosen way in the planned sequence.

In model B (with the described characteristics) the acting person chooses because of the "outer" and "inner" conditions between equal possibilities in to order to carry out the action. If a part action is finished the acting person goes back to an earlier time in the action and follows a different action line. In this case the process of the action is fewer detailed. For the "parallel actions", goals and action plans are formed as well as the goal reaching is controlled (cf. ib., p. 72).

In everyday life not always complex goals are followed, since the situation often does not require or permit this. Though this model cannot be applied anymore in this case, it always exists such "jumping" which makes that action and planning processes easier or spares them. Undoubtedly there is also such "goalless" jumping and surely it makes some easier for the acting person, spares every action and planning process that he tries to understand in the model (cf., ib., 1999, p. 74).

Nevertheless, at the same time there are processes of arranged goal pursuance that sometimes are joined with the restrictions of the process. Such action forms are considered as very important and typical. They characterise the essential features of the human action.

Although not every form of behaviour has a considered and complex goal they cannot take place without the binding to should-be characteristics of the action process. In Volpert's definition of action, the goal and orientation were recorded as essential.

Finally, the bases of model B are to be summarised.

The action process cannot always follow a strict structured sequence. The acting person nevertheless follows relatively complex goals by consequent planning.
The model also includes forms of fragmentary acting. To that counts the "witless" repetition of simple movements as sequence of limited work tasks.
Another form of fragmentary acting is described by everyday life actions. In this

situation the action process is spread by outer conditions, for example emotions (cf. ib., p. 75).

1.2.4 Comparison of model A and model B

Fundamental for both models is that both include a top goal and a process of carrying out. In both models the goal reaching is controlled and errors are corrected. A goal-part goal hierarchy exists in both models. The difference between the models is that model B lacks an implication. That is, that the action units on the different levels not always follow a direct chain, but in model B jumps can happen.

Model A of the hierarchic-sequential action organisation brings out the very abstract goal ideas but at the same time lacks the flexibility to respond to moods. Emotional levels and moods also influence model B.

In model A, initially the action is planned. If a part goal is not reached the acting person changes after the carrying out of the action. Model B only needs one top goal. During the carrying out a "witless repetition" (routine) is emphasised and every possible ideas are stressed, i.e. the action process is imposed spontaneously by the acting person, not by the detailed plans that were decided on before. Action-accompanied thinking is found in model B.

1.3 The model of action by Aebli

1.3.1 Activity, action and operation

On the basis of Aebli's works it becomes clear that he distinguishes the action from other activities of the human being due to the higher grade of awareness and purposefulness of the individual when acting.

He explains that acting describes areas of action with a high grade of awareness and purposefulness (cf. Aebli 1993, p. 20). In this context, Aebli understands "doing" in the sense of "purposeful behaviour" (ib., p. 19).

When awareness and purposefulness are the centre of attention, it becomes clear that acting cannot be independent but is connected to thinking and perceiving. Consequently, Aebli pays special attention to this relation.

Acting and thinking form a categorical connection. Aebli unambiguously determines the direction of the connection by saying that thinking emerges from acting (cf. ib., p. 13). He subdivides acting into practical acting and speak-acting (cf. ib., p. 20). In this context he emphasises that the human being has the ability of describing the practical acting by means of language. Therefore, thinking and speaking is understood as inner acting. In this context, a key position is hold by operations. Aebli explains the term operation as follows: an operation is an effective, imagined (inner) action that can be transformed into a sign system. When carrying out operations the acting person directs his attention exclusively towards the arising structure. In other words: an operation is an abstract action (Aebli 1990, p. 209). It becomes clear that Aebli clearly differs from other authors (e.g. Hacker, Volpert) due to his conceptual use of "operations".

The way operations work is explained on the basis of an example in his work "Zwölf Grundformen des Lehrens" (Twelve basic forms of teaching). He falls back up on the example of learning multiplication in elementary school. Starting point for the development of operations is an action. A pupil/student is told to get 20 coke bottles from the cellar. He is able to carry four bottles at once. On the basis of the example of an operation – which is set up by a counting process – the multiplication is introduced. Aebli's example is illustratively explained in the following figure.

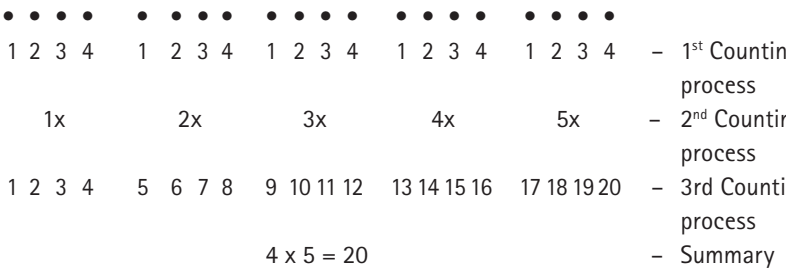


figure: combination structure of multiplication and the setting up of operations by the counting processes (Aebli 1990, p. 212)

The structure of operations follows characteristic steps:

1. setting up an operation (see example multiplication),
2. symbolic coding (the illustrative depiction turns into a symbolic one, see example multiplication),
3. internalisation,
4. automation.

Aebli summarises appropriately: "To do, to understand, to internalise, to automate" (ib., p. 227).

Within Aebli's theoretical structure the relation between thinking and acting was stressed clearly. Because of that, the analysis of the role of perceiving in the context of acting is indispensable as well, as thinking and perceiving cannot be separated from each other. Aebli explains that the elements and the structure of acting require a modality, of which the perception is one of the most fundamental (cf. ib., p. 163). The significance of perception is emphasised within the works of the author. "Without perception no action" (ib., p 163). Due to its key role the perception exerts an influence on all phases of the action.

- Before the action

The perception is the beginning of the action course. During this phase, the facts, the combination of these facts, the necessary conditions for an action process and the place of an action are analysed. This phase culminates in the question: "Where can necessary elements be found and where is the action able to start?" (ib., p. 165 f.)

- When carrying out the action

The perception controls the action. During this phase, questions regarding quantitative and qualitative aspects are asked, e.g. "With what strength and with how many repetitions is an action carried out by the participant?" or "Does a perfect relation between elements exist?" (ib., p. 166)

- After completion of the action

The originator of the product is now in the last phase of perception, which can be appropriately described as "taking hold of the own work" (ib., p. 166). In other words, the originator realises and evaluates his work. A product is created when the

action process is completed. The acting person knows about the goals of his action. Therefore, the acting person in particular has to make a closing evaluation of the action process.

The foundations of acting that are orientated towards activities at the dead object can in many cases also be transferred to social actions. These are orientated towards human beings that are involved in the action. In this context it is insignificant if the acting person is in charge of the activity or just a participant. He has to perceive the conditions of the involved objects as well as of the involved individuals that he has to include in the organisation of the action. Therefore, social actions do not differ from actions orientated towards objects.

1.3.2 Development, internalisation of actions and the structure of action learning

Aebli understands actions as purposeful executions that produce a concrete result. Against the setting of his comprehension of actions he classifies actions into action courses and action schemes. The latter (action schemes) are elements that are stored as a whole in the memory and can be reactivated and applied to new action courses. In this sense, action schemes form the action knowledge respectively the memory for actions. They stand out due to the following features:

- actions schemes are stored as whole units,
- they are reproducible and
- can be transferred to new situations (cf. Aebli. 1990, p. 185).

With regard to the development of action schemes Aebli's theoretical construct shows two ways. Action schemes can be the result of an action carried out in practice as well as the result of a theoretical action idea. Therefore, an action does not inevitably have to be carried out practically.

The author cuts back on his statement by remarking that the effective action is carried out at the concrete object (cf. ib., p. 194). The sheer action idea excludes the real objective support. Therefore, the learner does not only have to imagine the action but also the action object. This action at an imaginary action object gives the learner additional trouble. The perception of the action at a real object often shows the learner if the action was carried out correctly, e.g. a construction collapses or the action grinds to a halt. The theoretical/mental action however does not show an

incorrect action. Because of that, e.g. thought experiments have to be checked by practically carried out action.

For the learning of actions Aebli suggests a phased model. He shows the structure of the action learning on the basis of examples: writing an English newspaper during the English lesson, building an aquarium or terrarium during the natural history lesson, building a hydroelectric power station in the sandpit during the geography or physics lesson (cf. Aebli 1990, p. 196 ff.). Although the pupils/students carry out different projects they follow the same action course, which Aebli describes on the basis of the following four steps:

1. setting the problem,
2. planning the action,
3. carrying out the action,
4. internalising the action.

In the following, the steps of action learning are to be explained in more detail.

Setting the problem

A problem is the starting point for an action. It stimulates the thought process and is directed towards a goal. The realisation and solving of the problem depends on the abilities and experiences of every single person. In the pedagogic/didactic literature including Aebli it is discussed that arousing the interest of the learner for certain problems is of fundamental importance as it introduces the learner to the problem solving process and contributes to a high motivation.

Planning the action

The thought process is initiated and steered in a certain direction by the developed problem. With that, an action is provoked. During the phase of planning the action Aebli works out and suggests the following step sequence:

1. clarifying and justifying the objective and giving reasons,
2. evaluation of the starting point,
3. determining of the individual solution steps,
4. evaluation of the plan (cf. Aebli 1990, p. 198 f.).

Step one is characterised by the questions for the goal, the reason and the relation between the ideas and the objectives. By evaluating the available methods and means the second step is introduced. During this step other people, e.g. experts,

can be included. The third step can be characterised by questions like: "What action steps arise when we plan from the goal?", "Which conditions have to be fulfilled?" or the other way round "How can we get to the goal from the given situation?", "Which are the first steps? Which are the following ones?" (ib., p. 198 f.) The latter estimates the chances for reaching the goal.

Carrying out the action

Aebli suggests a step sequence for carrying out the action just as he did for the planning of the action.

1. making suggestions
2. stating more precisely and giving reasons by the suggesting person
3. evaluation by the class
4. carrying out by a pupil/student or the teacher
5. joint evaluation of the result

All learners take part in the action process although a simple task occasionally only requires the acting of one learner. The teacher plays the role of the observer or that of a participant according to the instructions of the learner. Although the teacher knows all important steps of the action process, he is to grant the learners freedom and to enable them to "experiment". The teacher can possibly support the learners by open questions.

Internalising the action

Like during the previous phases, Aebli makes differentiations during this phase as well. The internalisation of the action is characterised by three individual steps (cf. ib., p. 199 f.):

The first step of the internalisation is described as a retrospective view of the chosen solution path. After completing the work the learners look at the product and all implemented actions are summarised mentally.

The written recording of the most important action steps is the second step of the internalisation. By the pupils'/students' oral presentation of the action process the notes are collected and recorded during the following step. This does not result in a concrete product, but only an overview of the action processes is given.

The third step is the oral description of the action course without any illustrative support.

During the internalisation the learners do not only understand their own actions but also those of the others. By the joint description of the action steps the learner is enabled to comprehend and to carry out the tasks that he did not carry out himself.

1.3.3 Action and term

As it was explained before, according to Aebli, acting and thinking form a unit. In this context the terms are allocated a special role. They are a structure of relations within actions, they are to be objectified from objective conditions or any other aspects of reality, i.e. to be transferred into an almost objective form (cf. Aebli 1993, p. 23).

In contrast to actions they do not have a direct/real benefit, but they have the task to make reality comprehensible. Therefore, they are tools of thinking. "Terms are not only contents of intellectual life. We work with their help. By applying them to new phenomena, the phenomena are comprehended and arrange themselves in our mind" (Aebli 1990, p. 245).

Terms are abstractions of reality; they portray the structures of reality. Terms and actions form a unit. Actions are the origin of the formation of a term. Terms are anchored in the network of action knowledge or are rather a part of the knowledge network. When reconstructing an action scheme, terms are of fundamental importance; they are involved in the reconstruction of hierarchical action schemes that in the end lead to an action again.
The connection between action and term is illustrated in the following figure.

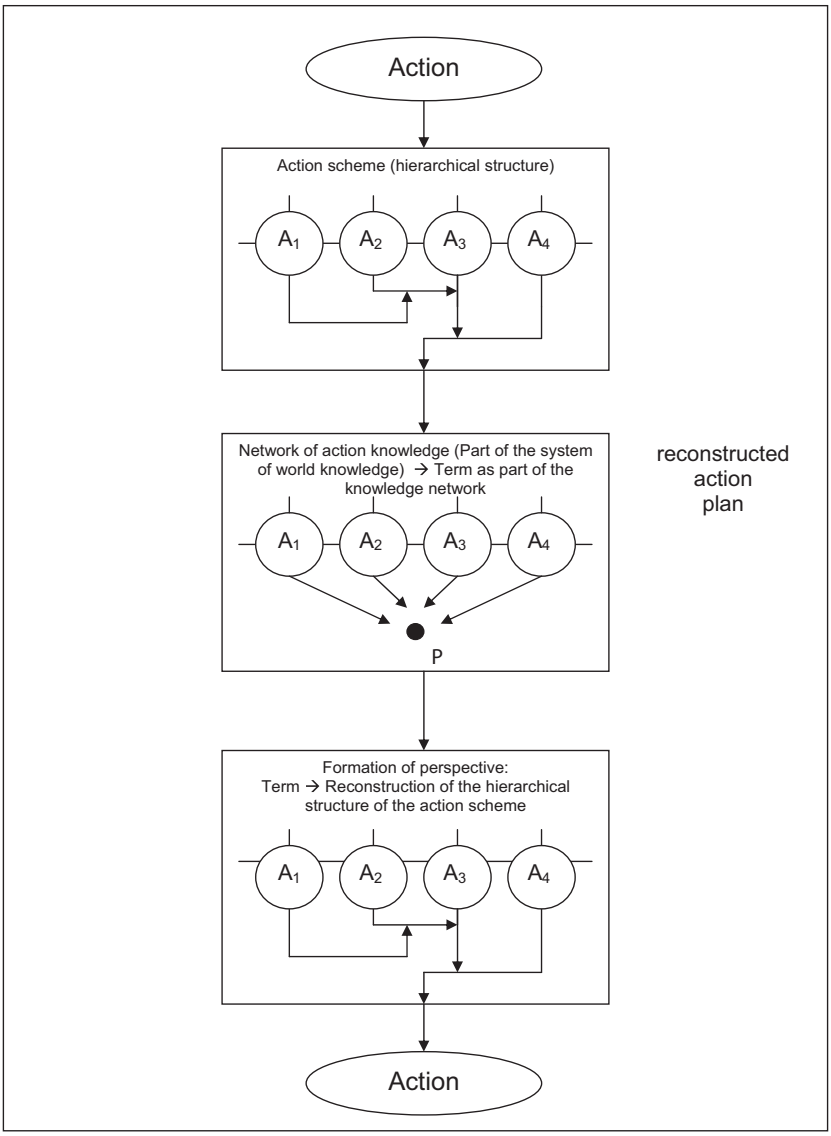


figure: interrelation of action and turm (Aebli 1981, p. 195)

2 Claim of the action training

The differentiation between "acting" training and "action" training – as Jank and Meyer (1994) express it – and the different roots connected with that seem little suitable for the further work, because the consequences for the training cannot be differentiated. Furthermore, this conceptual differentiation could not gain acceptance of teachers of vocational education. Therefore, this differentiation is not made in future.

Additionally to the reasons from the psychological point of view the action orientation of the training is important from the pedagogical point of view as well. The plea from the pedagogical point of view for an action orientation of teaching and learning is, according to Gudjons, the overdue answer to the extensive change within the acquisition of culture (Gudjons 1997, p. 61). Gudjons shows three levels of reasoning for an action design of training:

1. a socialisation-theoretical,

2. an anthropological and learning-psychological and

3. a didactical-methodical level of reasoning.

to 1. The socialisation-theoretical reasons experience action training, especially due to the demographical development and the use of digital media. According to Gudjons, there is a gap of experience between the real world and the consciousness of the pupils/students. Therefore, they show a retarded social and reality experience, but nevertheless they will sit at the control panels of bureaucracy, industry and armament in future (ib., p. 61). Therefore it is necessary to bring the contradicting reality home to the pupils/students and to penetrate pedagogically uncontrolled learning places and experiences of the extracurricular world (cf. ib. p. 61).

Jank and Meyer describe this demand as deceleration of training (cf. Jank und Meyer 1994, p. 345), by which they mean that the schools have to develop a more differentiated school life in future, where pupils/students and teachers gain experiences and are able to try out action possibilities that are neglected outside school. Without action orientation, for Gudjons the school as learning place comes

into question. New media could take over the work of teachers. Therefore, the school can only preserve its claim of importance when it develops cognitive structures by sensuality, experience, activity and action. New information technologies are not to be excluded, however, but integrated into the learning process.

to 2. The anthropological and learning-psychological reasons result from the dialectic person-environment relation where thinking emerges from the activity and reacts on it as action regulation. Training cannot and must not exclusively serve the processing of knowledge, but it is to take the organisation of active, purposeful activities and actions into account.

to 3. The didactical-methodical level proclaims new premises of the didactical training design. The completeness in terms of content is no longer striven for. Examples take the place of the completeness, which is connected to the openness concerning goals, contents and methods of training. Interests and experiences of the students have to be taken into consideration as well.

As necessary conditions for such training the willingness of the teachers as well as the institutional preconditions like interdisciplinary training, breaks and teacher cooperation are particularly emphasised.

Gudjon's reasons for an action training also apply to vocational education, but an argumentation devoting itself especially to vocational education has to include another aspect: the vocational action competence. It could be described as the level of "work process orientation" here.

to 4. The "work process orientation" reflects the paradigm change in vocational education. The development of a vocational action competence is a declared goal of vocational education. Didactics correspond to the leading goal of developing a vocational action competence. The hypothesis that the development of a vocational action competence requires teaching and learning arrangements orientated towards the action form the basis for that. The orientation of vocational education towards actions has become essential at the latest since the establishment of learning fields within the framework curricula of the KMK (Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany). Apart from the legal guidelines, a practical orientation of vocational training and of

an education appropriate to employment requires an action orientation in vocational education. Likewise, a future-oriented vocational education requires an orientation at the action.

The hypothesis that vocational action competence is especially supported by such teaching and learning arrangements, where the learning process is orientated towards actions, form the basis of the action orientation (cf. Bader 2004, p. 1). There are a lot of different ideas and also imprecise terms regarding the question what exactly this orientation towards actions should consist of. The action and epistemological bases were already dealt with. There exist different and partly controversial ideas about the development of the action orientation within learning processes for the support and development of the action competence. Bader worked out seven concepts, positions and variations of understanding that will be explained in the following.

- Action orientation of training in companies towards "complete actions" that include an independent planning, carrying out and controlling / evaluating of vocational work.
- Action orientation of the school lessons in the sense of learning by facts and problems that have or will get equivalence within the experiences of the learners in the foreseeable future.
- Action orientation as a psychologically well-founded structuring of all learning processes – mostly on the basis of cognition-psychological theories, of action regulation theories or of a pragmatic connection of both theories.
- Action orientation as an organisation of learning processes in which the learners get active, if possible by independent acting, at least by active doing, and surely not only by intellectual comprehending of the actions carried out by others.
- Action orientation as learning by concrete actions of which the result is not certain because of solid understanding but of which the result is open.
- Action orientation as a design of learning processes aiming at the ability to take the necessary actions as a result of gained insights in order to change situations in the direction of goals worth striving for with the planned methods.
- Action orientation as a base of curriculum development (cf. Bader 2004, p. 2 ff.).

Action training is an integral and learning-active training where brainwork and manual labour are in a balanced relation. Hortsch characterises the action training on the basis of 12 features, which are summarised in the following.

- Action training is not a method, but a concept for the training design. It is open for design possibilities in accordance with the institutional and organisational conditions.
- The learner as an acting individual is the centre of the training. He extensively determines the learning process individually and organises it actively and reflectively.
- The learning process is mainly self-determined. The teacher steps back from his dominant role, it is his responsibility to initiate learning actions.
- Self-controlled learning is characteristic for the concept.
- The design of learning processes on the basis of action-theoretical reasons requires the development of learning conditions.
- The goal is the development of a vocational action competence including the specialist, methodical and social competence.
- The acting of the learner refers to two levels: the acting with regard to the organised learning process and the acting outside this organised learning process in working and private life.
- The learning process aims equally at the development of cognitive, emotional and psychomotor learning processes. Individual and collective learning activities complement one another. Learning objects appeal to most senses possible.
- The design of the learning process is to be orientated towards the basic structure of human acting (complete action).
- The concept follows the inner logic, therefore it does not orientate itself towards the subject structure, but it is interdisciplinary.
- Exemplary learning objects take the place of a generally structured superficial learning.
- A positive institutional and organisational setting is to be created, which offers the learner room for manoeuvre and enables him to work flexibly (cf. Hortsch 1999, p. 56 f.).

3 Motivation and action training

Motives are initiators of actions and cause goals. Furthermore, they determine the evaluation of the goals striven for and of the action-relevant considerations like e.g. evaluating the chances of realisation. In addition, they have influence on the expectations of success and failure (cf. Schneider und Schmalt 2000, p. 11 ff.).
Motivation is therefore the prerequisite for human acting respectively human activity.

Every individual has needs that are again the origin of motives. Leontjew explains that, in other words, the need initially functions only as a condition, as a prerequisite of the activity. But as soon as the subject starts to act, the transformation of the need begins, so that the need stops being what it virtually was. Leontjew adds that the further the development of the activity proceeds, the more the prerequisite changes into its result. (cf. Leontjew 1979, p. 182). Therefore, needs/motives are "activity stimuli" (ib., p. 182) that go through a transformation process during the action.

The motivation of the learners therefore has a decisive influence on the conception of action training. From the teachers' point of view the motivation is the goal in a narrower sense and the way in a broader sense. Therefore, decisive factors for the motivation with special regard to action training are to be summarised in the following. The summary is mainly based on Hacker's and Skell's results of the research. An important prerequisite for the learners' motivation is a comprehensible and phased representation of learning goals. The learners should develop an idea of what is to be learned (cf. Hacker and Skell 1993, p. 178). They bring differently distinctive motivations in the learning process; therefore, motivation is to be developed during the education process. Prerequisites for a successful learning process are demanding and complete activities that offer a certain motivation potential.

The development of motivation potential requires

- access to the contents and possibilities that are offered by the activity that is to be learned. The significance for the personal development is to be shown,
- learning tasks that arouse needs for knowledge and ability and that are also able to satisfy these needs,
- endeavours which enable the learners to solve the learning tasks and which at the same time support understanding and discovering,
- the development of learning programmes with phases that create a chain or a hierarchy of needs for knowledge and ability in terms of contents. The learner has to be able to satisfy his needs for knowledge and ability during the learning programmes (cf. ib., p. 189 ff.).

Work can be seen as another important source for motivation. It offers considerable motivation potential and can be instrumentalised in this sense within training. The implementation of an experiment offers the possibility to integrate the practical

activity into the training. Even activities that play a role in the later working process can be included on a limited scale.

Contents and demands of activities of the corresponding working process can be very motivating. Activities with diverse and broad demands as well as decision willingness and sense of responsibility motivate the learners in all probability to a more intense effort than monotonous and intellectually trivial activities that are strictly regulated in detail.

Hacker and Skell demonstrate characteristics for activities with a high motivation potential:

- diversity in demands,
- significance of the activities and their results for other individuals,
- task unity or identity in the sense of the realisation of a complete and meaningful work,
- possibilities for independent decisions,
- response about the own activity by other individuals,
- possibility of cooperation and communication (cf. ib., p. 198).

The authors differ between two groups of motivation sources:

1. The diversity and the change in the demands including the intellectual requirement,
2. Activity leeway for independent objectives regarding the proceeding and therefore the possibilities for independent decisions, for the planning of the proceeding and for the acceptance of responsibility. Prerequisite is a sufficient transparency of the work situation and the foreseeing of the demands (cf. ib., p. 200).

The paper therefore offers starting points for the conception of learning processes. The authors themselves talk about "cyclic and hierarchic activities" (ib., p. 201). Direct demands for the design of action learning in vocational education result from Hacker and Skell's explanation:

- sufficient possibilities for an active work are to be created,
- cooperation possibilities are to be provided,
- possibilities for independent objectives and decisions on the basis of decision leeway and consequently the acceptance of responsibility are to be planned,
- a cognitive preparation is to be planned,

- own activity results have to be able to be examined and corrected,
- learning possibilities and learning-dependent transmission possibilities of qualifications to classes of activities have to be given (cf. ib., p. 201).

The summarised aspects of motivation against the setting of action training can be consulted as a basis or as tools for the design of action learning.

4 Selected teaching concepts of action learning

4.1 Project learning

Project learning or also called project method is to give the pupil/student the possibility to organise him- or herself more independently and to contribute actively to the learning process. This instruction procedure aims at the development of self-organising and self-responsibility. The special form of this training enables the pupil/student to not only contribute constructively to the lesson, but also to participate in the planning of the lesson beforehand.
A great advantage also involves the product- and practice-orientated work. It helps the pupil/student to occupy themselves with more than the vocational school and to make progress in transforming knowledge into practice.
The project method is orientated towards problems concerning the teacher. By analysing the problem and stating it more precisely and by finding and simulating action alternatives the method tries to find a solution for the problem/the product. The project doesn't aim at arranging unreal scenarios but at being able to match the practice and to have a usable objective or subjective value.

The project work can take place subject- and vocational field-overlapping. Furthermore, different working methods, forms, and instruments can be used in order to find solution patterns for the problem.

Within the project method, the teacher plays a special role. He or she not only has to have professional competences, but also has to offer his or her help during the planning and decision processes within the project.
Thus, another important aim is the communicating of work-methodical competences and the possibility of communication and action processes within the project groups.

The project method according to Kilpatrick/Dewey

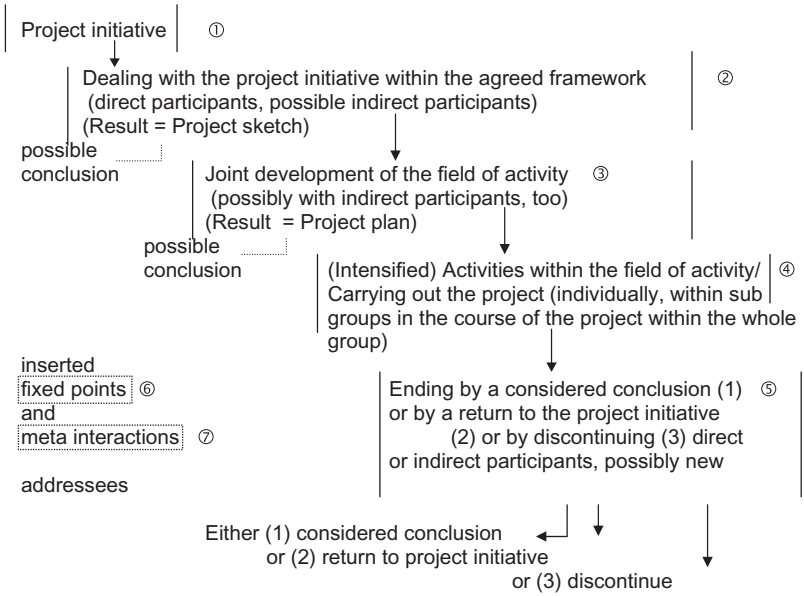
The project method can have the following course:

1. The method begins with finding and receiving an obvious set problem concerning the participants.
2. In a second step the problem is located and stated more precisely.
   - A general instruction goal in form of a problem is given
   - Instruction relevance of the action is partly given in form of a problem, a plan, and an experiment
3. The third phase is characterised by drawing up action and solution bases
   - By making a plan to solve the problems the aim is stated more precisely
4. The simulation phase is to help to test the worked out solution possibilities intellectually and to check them for the implementation of the plan.
5. In the end, the experimental check is the implementation of the worked out project plan.
   - Carrying out the plan as a problem solution or implementing the product, if required balanced realisation under the principle of job-sharing.
   - Implementation and usage of the results.

see FREY, Karl 1991

The following basic pattern of the project method is surely able to make the course even clearer:

„Basic pattern of the project method"



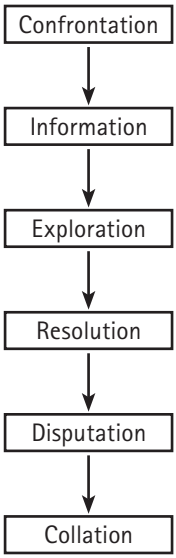
FREY, Karl: Die Projektmethode, 1991

4.2 Case study

The case study or as well case method is a complex instruction procedure in which the priority is the development of a problem solving concept. The problematic situations can mostly be found in practice. The pupils/students have to analyse the problem-solving context independently and to work out solutions in group work.
In the case study different solutions are critically compared and selected after certain criteria.
The case study can be divided into three phases. In the model of F.-J. Kaiser the phases are differentiated again, but in principle this model is also based on the three phases. As a basic condition for a case study the problems have to be discerned, before the phase

of searching for and gaining information begins. The participants are to analyse the problem and to become engrossed in the topic in order to create a basis for further work. The second phase is called the phase of problem solution. The pupils/students are now to search for various solution alternatives and to decide well founded in favour of one solution.
The last phase is characterised by solution critique. Within the group, the different solutions are to be compared, discussed, and compared with similar solutions in practice. The comparison is a help to draw nearer to practice and to carry out realistic evaluations in order to use them for practical planning in the future.

Phase model of the case study according to Kaiser



The case studies are not methodically restricted, however, and the teacher can choose between various variants in order to plan the lesson. The following outline according to Kaiser shows the possibilities:

Variants of the work with case studies (according to Kaiser)

Method	Discerning the problem	Gaining information	Solving the problem	Criticising the solution
Case-Study-Method	Priority: Concealed problems have to be analysed	Information is provided	Solution variants are found out and the decision is made	Solution is compared to the decision in reality
Case-Problem-Method	Problems are explicitly stated	Information is provided	Priority: Solution variants are found out and the decision is made	Solution is compared to the decision in reality
Case-Incident-Method	The case is described fragmentarily	Priority: Information has to be obtained independently	Solution variants are found out. The case is solved.	
Stated-Problem-Method	Problems are provided	Information is provided	Solutions are provided. Alternative solutions are looked for.	Priority: Provided solutions are criticised

4.3 Role play

The role play is another instruction method that focuses on action learning. During the play the participants assume fictitious models of thinking and acting, and experience, discuss and solve a certain problem in a limited time frame. The role play is especially suitable for the experience of action processes.

The role play is planned, organised and carried out within the group. As soon as the problem is discerned, understood and structured, the group has to elect the participants for the game and to fill the corresponding positions. In a next step the group develops a course plan which can help to solve the problem. The participants

outside the acting group take the role of attending observers who can take an „objective" point of view while criticising later on.
After the planning phase the actual role play begins. During the action and communication, solution possibilities are to be found and a solution is to be presented.
Afterwards, a group discussion and an evaluation of the role play is carried out in order to gain further knowledge.
These role plays can vary depending on the scale, i.e. roles can be switched or alternative scenes can be introduced. Furthermore, various aspects can be specially discussed.
A résumé and a potential generalisation of the possible solutions bring the role play to a conclusion. This conclusion is to give the pupils/students a general view of the experienced and to explain the actions.

The role play can also be described as a phase model:

Introduction phase
- Starting point
- Discerning of the problem

Work out phase
- Roles have to be filled with arguments corresponding the points of view
- Collection of material is provided

Discussion phase
- Press conference – statements of the parties having participated in the play are read aloud
- Discussion – a consensus is to be reached

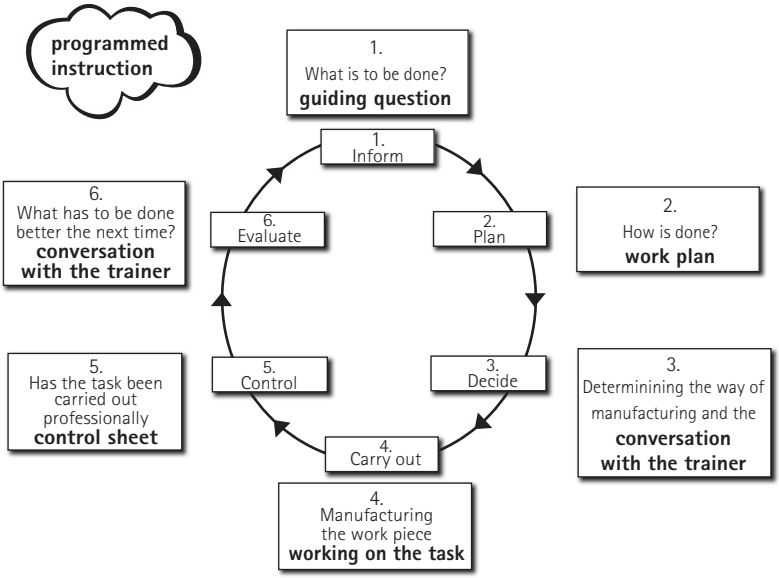
Reflection phase
- Why has X acted like that?

Evaluation phase
- How have opinions been influenced?

4.4 Programmed instruction

The term of programmed instruction characterises an instruction procedure where the pupils/students who have to cope with practical exercises are instructed by written documents – texts. (cf. Rottluff, 1989, p.148)
In the 1970s this method was developed out of the operational practice and improved by the academic discussion.

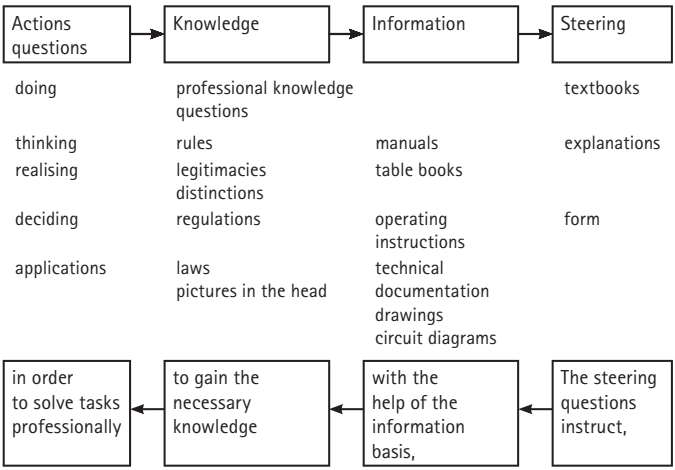
Course



Source: Arnold/Lipsmeier/Ott 1998, p. 40

The programmed instructions are to help to gain an insight into certain training periods and to understand the „rules" of the learning and working processes within theses periods. A programmed instruction normally exists of the steering questions, a work plan, a control sheet, and a guiding principle.
The introduction to the practical tasks are to be strengthened by instructions including so called steering questions. The pupils/students work on complex tasks independently and are instructed by steering questions.

The pupils/students work out the knowledge that is necessary for coping with the tasks independently with the help of provided media and are also instructed by steering questions.
In this way, impulses for the acquisition of knowledge and the planning of work are to be given and the pupils/students are to be prepared for the future work in operational fields.
The programmed instructions give advice with which media the knowledge can be gained and also provide information if necessary. The pupils/students plan their work and the carrying out of their work independently, but are partly supported by a planning raster or other aids.
The pupils/students practise the skills they are to develop with so called exercise aids, deciding to a large extend independently about the extent of the exercises and therefore determining the planning of their working hours independently.
After having finished adequate part tasks the pupils/students initially analyse the course and the results of their work themselves before discussing their analysis with the instructor.
The programmed instruction is to help to carry out the self assessment and the objective assessment of the completed work and to help the pupil/students to get the ability to assess and to develop his or her work correctly.
The teacher is to give the pupils/students a hand in form of steering questions.
The steering questions can be developed after the following pattern:



4.5 Experiment

An experiment is an empirical procedure to gain data and information; it is conducive to verify a hypothesis. During the experiment, the modification of one or several independent variables and its effect as well as the modification of the set-up of the experiment and its effect is examined. Intellectual as well as representational test acting is characteristic for the experiment.

Research and teaching experiment
In principle, experiments can be divided into research experiments and teaching and learning experiments. They differ in their objective.

- Research experiment: Examining unknown connections by quantitative or qualitative processes.
- Teaching and learning experiment: Experimentally comprehending familiar legitimacies and connections for the purpose of communicating. The legitimacies and connections are unknown to the pupil/student, he or she acts in the sense of the research experiment.

Classification of the teaching and learning experiments

Teaching and learning experiments can be classified after the connection between variables and effect:

- experiments for the investigation of cause-effect connections (e.g. scientific experiments)
- experiments for the investigation of end-means connections (e.g. engineering-scientific experiments)

Teaching and learning experiments classified after their didactic function:

- experiments for approaching a certain topic,
- experiments for working out knowledge
- experiments for practising, strengthening, falsifying, and verifying,
- experiments for assessing performance.

Teaching and learning experiments classified after their form of organisation:

- teacher experiment (demonstration)
- Student experiment

- o experiment in individual work
- o experiment in partner work
- o experiment in group work

Teaching and learning experiments classified after their relation to reality respectively their level of abstraction:

- reality experiments (representational)
- experiments with models (represented)
- thought experiments (conceptually abstract)

Teaching and learning experiments classified after the personality dispositions that are to be developed:

- knowledge-oriented experiments
- use-oriented experiments/training experiments

Methodical phases of experiments according to Bader

Reinhard Bader explained the course of the experiments in phases organised as follows:

1. Observing a phenomenon (e.g. components become distorted when loaded)
2. Formulating a question respectively a hypothesis (e.g. What is the connection between the resulting force and the distortion of a component?)
3. Planning of an experiment, i.e. creating an artificial, technical reality complying with certain marginal conditions (e.g. planning of a block and tackle experiment: Determining variables and constants; jig; attaching the load; measuring the sample; increasing the load per time unit; estimating measuring errors)
4. Carrying out an experiment (observing, measuring, recording, evaluating ...)
5. Formulating a statement (a result) respectively supporting or falsifying the initial hypothesis in consideration of the marginal conditions and the accuracy of measurement (e.g. validity of the law of Hooke for a certain material, for a certain area of load)
6. Categorising the sub statements in a full theory (e.g. assumption of an uniaxial stress condition; stress hypothesis)
7. Reflecting the consequences of the statements and of the application possibilities (e.g. agreement of the experimental results with the behaviour of a component in use; possibilities of the arithmetical dimensioning of components)

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UNESCO-UNEVOC International Centre

Our Profile

The UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training was established in Bonn, Germany, in September 2000, based on a Host Country Agreement signed earlier that year between UNESCO and the Government of Germany. The Centre was inaugurated on 8 April 2002.

The Centre seeks to help UNESCO's 192 Member States strengthen and upgrade their systems of technical and vocational education and training, and to promote a greater availability of skills development options so as to implement Article 26 of the Universal Declaration of Human Rights and UNESCO norms and standards concerning technical and vocational education and training.

The Centre undertakes its activities through a world-wide network of 267 UNEVOC Centres in 163 countries. It creates synergies with UNESCO Headquarters, UNESCO Institutes/Centres and Field Offices; and works in close partnership with other international and national agencies in the field of technical and vocational education and training.

Our Vision

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- access for all
- high quality, relevant and effective programmes
- learning opportunities throughout life.

The Centre contributes to increased opportunities for productive work, sustainable livelihoods, personal empowerment and socio-economic development, especially for youth, girls, women and the disadvantaged. Its emphasis is on helping meet the needs of developing countries, countries in transition and those in a post-conflict situation.

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The UNESCO UNEVOC International Centre acts as a key component of UNESCO's international programme on technical and vocational education and training. It also works to support UNESCO's mandate for Education for All and Education for Sustainable Development.

The Centre achieves this through taking action to strengthen and upgrade the world-wide UNEVOC Network (Flagship Programme), with particular reference to:

- Stimulating international and regional cooperation concerning human resource development
- Promoting UNESCO normative instruments and standards
- Promoting best and innovative practices in TVET
- Knowledge sharing
- Mobilizing expertise and resources
- Strengthening partnerships with other relevant agencies

InWEnt – Internationale Weiterbildung und Entwicklung gGmbH Capacity Building International, Germany

InWEnt – Capacity Building International, Germany, stands for the development of human resources and organisations within the framework of development cooperation. InWEnt offers courses that cater to skilled and managerial staff as well as decision makers from business, politics, administrations and civil societies worldwide.

With the education, exchange and dialog programmes for approximately 55,000 persons per year, InWEnt constitutes the largest joint initiative of the German Federal Government, the Länder (German federal states) and the business community. The centre in Bonn and 30 other locations in Germany and abroad employ roughly 850 staff.

The organisation commands a total annual budget of approximately €130 million. The Federal Government is main shareholder and represented by the Federal Ministry for Economic Cooperation and Development (BMZ), which is also the main financial contributor. Approximately 40 percent of the budget is from further commissioning bodies, in particular the Federal Ministry of Education and Research, the Foreign Office (AA), the Federal Ministry of Economics and Technology, and, increasingly, the European Union (EU) as well as various further multilateral organisations. Main cooperation partners are the KfW Bankengruppe (KfW banking group), the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH (German Technical Cooperation) and private business foundations.

InWEnt was created in 2002 through the merger of Carl Duisberg Gesellschaft e.V. (CDG) and the German Foundation for International Development (DSE). In keeping with the tradition of the predecessor organisations, both Länder (German federal states) and German business are shareholders and thus ensure that InWEnt is firmly anchored in society.

Within its business fields, InWEnt amalgamates the decades of expertise and regional experience contributed by CDG and DSE. The methodological repertoire is structured along broad lines, making it possible to customise modules to fit the specific requirements of customers and tasks and provide appropriate solutions. The employment of new media permits the development and implementation of innovative knowledge management methods, the launching of international virtual learning communities and the promotion of multiplier systems.

Joint Publications from InWEnt and UNESCO-UNEVOC

1) Frank Bünning/Zhi-Qun Zhao (eds.), TVET Teacher Education on the Threshold of Internationalisation, 2006

2) Jon Lauglo, Research for TVET Policy Development, 2006

3) Frank Bünning/Alison Shilela, The Bologna Declaration and Emerging Models of TVET Teacher Training in Germany, 2006

4) Frank Bünning, Approaches to Action Learning in Technical and Vocational Education and Training (TVET), 2007

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