

How does phenomenological psychology contribute to current concepts of sustainability in Germany's vocational education system?

A brief historical outline and remarks on current problems

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Abstract

Nowadays education for sustainable development is a key concept in Germany's VET research programmes organized by the BIBB (Federal Institute for Vocational Education and Training) and evaluated by authors of this contribution. The present article casts a glance at the history of this category in Germany's scientific discussions. Roots of actual discourses can be found within cognitive and ecology psychology 100 years ago. Apart from the historic perspective the article makes suggestions how to create lessons fostering reflections on sustainability. These suggestions base upon didactical guidelines discussed in VET in Germany (by Werner Kuhlmeier) and upon concepts of cognitive psychologists on knowledge illusions (by Steven Sloman).

Keywords: sustainable development, didactical guidelines, knowledge illusion

Introduction

Actual contributions in textbooks and journals in Germany focus on two strategies when it comes to creating optimal learning scenarios of sustainability in vocational education and training (VET). One group of contributions delivers general didactic guidelines (see Vollmer & Kuhlmeier, 2014). In these publications the guidelines are often presented as lists. These lists contain recommendations for teachers at school and for seniors at work. Teachers should orientate their teaching in accordance with these guidelines if they want to promote the sustainability-orientated thinking and acting of learners. Seniors should follow the guidelines in order to foster reflections on sustainability at the workplace among colleagues and apprentices.

A second group of articles refers more specifically to learners within the VET system. In these articles, competencies are described that enable skilled workers to act in professional surroundings according to general principles of sustainability (see, e.g., Casper et al., 2018). Different competencies, often presented in forms of systematic models, work together and create a set of sustainability-orientated skills. It is the assumption that in future, after systematic training on sustainability, persons equipped with these skills will work properly according to the general criteria of sustainability.

The concepts how to teach and to learn sustainability in VET mainly came from model programmes initiated and supervised by the German Federal Institute for Vocational Education and Training, often referred to as the BIBB (German abbreviation). The first purpose of the text is to show the historical line from the starting point of environmental psychology and pedagogy at the beginning of the 20th century up to the basic ideas of the BIBB that worked as a conceptual frame for nearly all model programmes of sustainability in VET after the year 2000 (see overview of model projects in Vollmers & Kuhlmeier, 2017). A sketch of the BIBB's basic ideas is given after the historical-orientated section.

The historical-orientated part of the text deals with two sources of modern concepts of sustainability in educational sciences in Germany: phenomenological-orientated environmental psychology and environmental education. The phenomenological method within cognitive learning studies arose as a consequence of disciplinary struggles within the academic psychology

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field in Germany. The origins of environmental psychology were ideas and phenomenological experiments at the beginning of the 20th century in Germany's academic psychology. An excerpt of Karl Bühler's experiments on learning will be presented as an example. Further concepts came from Kurt Lewin and Willy Hellpach. All these concepts emphasise the holistic intentional perception of personal surroundings within processes of consciousness. Moreover, these concepts demonstrated that the perception and the attraction of personal surroundings and of nature are influenced by personal preferences and moral values. These classic concepts anticipated ideas of modern environmental psychology. After 1970, this discipline emerged in Germany's academic world.

The second historical source is nature-orientated pedagogics. Under the influence of the general green movement, environmental education was established as specific academic field after 1970. Thus, ideas of nature-orientated pedagogics of the first decades of the 20th century experienced a renaissance.

The second objective of this text is to emphasise the relevance of phenomenological methods when research and learning on sustainability is the focus. So, the second part of this text deals on the question of how sustainability can be experienced and learned by the individual learner in VET. A reflection on classical methods and concepts, presented in the first part of this text, is helpful. But sustainability in VET goes beyond environmental psychology and pedagogy. To a large extent it cannot be experienced within the working surroundings of individuals. Limitations of personal experiences when ecological decisions are made will be discussed, with a focus on one example of misleading environmental protection by politics, the promotion of so-called biofuel in Germany. At the end, some proposals are made regarding how to handle the complexity of the topic of ecological sustainability within teaching and learning in Germany's VET system.

Historical overview: From phenomenological psychology to environmental education

Psychology and pedagogy are two big columns of educational sciences. The history of the two disciplines has been strongly intertwined over the last hundred years in Germany, both in the academic field at universities and in professional work. The following historical sketch is a strong simplification. The aim is to show that classic phenomenological ideas were integrated into modern environmental psychology and environmental pedagogy. Both sources can be easily integrated into education for sustainable development. The figure below depicts the argumentation line in this text. Boxes in grey, according to the direction of the arrows, will be in focus. The contents of the white boxes are addressed only in brief.

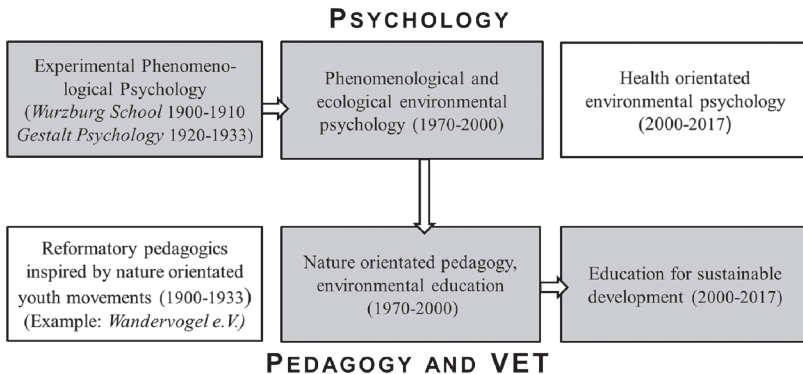


Figure 1. Advanced organiser of contents

Experimental phenomenological psychology of the Würzburg School

The second half of the 19th century was the starting point of the triumph of the natural sciences, which offer a reductionist view on nature. In terms of technical progress, it was a very successful view. Phenomenology in philosophy and

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psychology can be regarded as a countermovement to the methods and concepts of the natural sciences. Edmund Husserl based his phenomenological philosophy of consciousness on arguments against psychology as a natural science. In his book *Logische Untersuchungen* (Husserl, 1900/1901; Eng. Logical Investigations), he described the intentional experience of perception and thinking. Human thinking in everyday life does not follow formal rules of logic or quantitative rules of associations, even though many psychologists supported these two assumptions in their studies at that time. One prominent example was Hermann Ebbinghaus, founder of the empirical exploration of memory. He studied human memory using associations of meaningless syllables (Ebbinghaus, 1885/2011).

Ebbinghaus was one of the pioneers of cognitive psychology in Germany. At the threshold of the 20th century psychology formed as a new discipline of research and academic teaching. Increasingly more chairs of philosophy were converted into chairs of psychology. The newly appointed professors conducted experiments to study perception and thinking. They were cognitive psychologists, the first ones in the history of psychology. Different methods of research of philosophy and psychology pushed institutional struggles between the two disciplines. In 1912 two-thirds of university teachers of philosophy wrote a public note of protest against the gradual transformation of philosophy into psychology. This statement was published in all philosophical journals, and it was sent to all ministries of education and cultural affairs in Germany (Ash, 1984, p. 53). But this intervention did not stop the breakthrough of psychology as new academic discipline.

Controversial issues on the form of experiments in psychology helped to establish new directions of research. Since 1894 Oswald Külpe had been professor of philosophy in Würzburg. He had studied in Leipzig before, where the famous Wilhelm Wundt had been supervisor of his dissertation. But gradually Külpe came to the conclusion that Wundt's experimental techniques in Leipzig were inappropriate for understanding human reasoning (Külpe, 1912). The experimental psychologists in Würzburg were later referred to as being of the Würzburg School of Psychology (Janke & Schneider, 1999). Indeed it was an interdisciplinary research group of philosophers, psychologists and physiologists. Nearly all of them were familiar with Edmund Husserl's writings. They implemented Husserl's concepts into experimental psychology. Karl Bühler's habilitation (Bühler, 1907) was the peak point of the Würzburg School. After his immigration into the USA,

Bühler gained broad scientific recognition with his organon-model of language (Bühler, 1934). In Würzburg, during the first decade of the 20th century, Bühler conducted experiments on learning with his academic colleagues as learners. His theory was influenced by Husserl and can be summed up as an intentional learning theory. It based on the vague and complex experiences of learners in daily life. In this case, daily life means the daily routines of philosophers and psychological researchers at work. This will be demonstrated by the following example of one of his experiments:

Instructor (Karl Bühler): ‘Do you understand the following passage?’

“The idealism after Immanuel Kant has overcome completely the contradiction of the Ding an sich (Eng. object apart)”.

Student (Academic Colleague): ‘Yes (after 14 seconds). At first reflections on philosophers that followed Kant. Then there was a reminiscence of my lecture of the Kritik der reinen Vernunft (Eng. critique of pure reason). Then Hegel’s criticism of Kant’s term of the Ding an sich (Eng. object apart) came to my mind’. (Vollmers, 2014, translation according to Bühler, 1907, p. 306)

In his habilitation, Karl Bühler conducted 600 similar tasks with academic persons being in the role of students. Tasks included philosophical aphorisms (mainly by Friedrich Nietzsche, Paul Heyse and Friedrich Rückert) and questions with regard to the history of German philosophy. Bühler’s method was called systematic experimental introspection. However, introspection has a longer tradition in philosophy and in theology compared to psychology; all variants of introspection focused more or less on the conscious experiences of living persons. Different variants developed different techniques on how to get along with the problem to separate the unique individual experience from the underlying cultural codes and from retrospective rationalisations (Deterding, 2008). Oswald Külpe, head of the Würzburg School during the first decade of the 20th century, claimed that the introduction of introspection at Würzburg had led to a complete new form of cognitive psychology (Galliker, 2016, p. 119 f.).

What is the understanding of learning in such experiments? Six answers can be given to this question (according to Vollmers, 2014):

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- Processes of learning happen within the unity of perception and thinking.
- Learning means to understand complex relations within the area of personal surroundings.
- Learning is the acquisition of something new. But the basis for this are personal knowledge and former individual experiences.
- Learning is an intentional process with focus on certain aspects of the environment.
- Learning is at the same time analytical and synthetic.
- Aspects of the environment are chosen according to the values of individuals. These aspects are mixed up in thinking processes in an idiosyncratic manner.

These six answers form the centre of the phenomenological learning theory following Edmund Husserl's philosophy. Therefore, these conclusions were shared by the majority of phenomenological philosophers and psychologists referring to Husserl later in the 20th century. Husserl emphasised intentionality. In his review on phenomenology psychology, Carl Friedrich Graumann (1999) listed three additional aspects: perceptivity, corporeality and *Lebenswelt* (Eng. everyday life). So, every individual has a unique view on environmental aspects. This view originates from his daily life routines. It is the human body as a whole that fulfils daily tasks.

Both Karl Bühler and Oswald Külpe left Würzburg in 1909. With the departure their specific experimental approach to studying cognitive processes disappeared as well. But after more than 100 years the phenomenological approach of the Würzburg School is still relevant in different branches of psychology. The anniversary textbook of Janke and Schneider (1999) has proven this, although the book does not mention environmental psychology to a large extent. Modern environmental psychology discovered classical phenomenological psychology in the form of Gestalt psychology. The different schools of Gestalt psychology achieved their peak at the universities of Frankfurt and Berlin in the 1920s. But Gestalt psychology has more than one link to the phenomenological tradition of the Würzburg School. There were diverse continuities, theoretical ones, methodical ones and personal ones (Galliker et al., 2007). Theoretical links are common basic assumptions, for example holism as a principle. It refers to the experience of nature and surroundings within the human mind (see Ash, 1995

for holism in German psychology). Methodical similarities show in the concepts and practices of experiments. Both schools emphasised the high epistemological relevance of the verbal statements of persons during and after experiments (for the phenomenological approach in experiments in psychology see Kebeck & Sader, 1984). Personal relations between the two schools existed as well. Max Wertheimer, one of the heads of Gestalt psychology, wrote his dissertation under the supervision of Oswald Külpe (see details in King & Wertheimer, 2005, p. 55f.).

Transformation of phenomenological psychology into ecological psychology

Modern environmental psychology has its cultural origin in the general environmental movement that gained gradually stronger public influence during the decade 1970 to 1980. At that time academic psychologists reflected on the question how academic psychology could contribute to this movement. Environmental psychology, also called ecological psychology, was founded as a new discipline of academic psychology at that time. On the one hand the advocates remembered classical German psychologists with phenomenological and ecological orientation. On the other hand, they adopted ideas of American authors. German environmental psychologist Rudolf Miller summed up these two branches in his article (Miller, 1986). The following passages refer to him.

Among the classical German psychologists that inspired the new psychological discipline two persons stand out: Kurt Lewin and Willy Hellpach. In the 1920s Kurt Lewin was a member of the Berlin branch of Gestalt psychology. He called his phenomenological theory Field Theory. It is a theory that designs the relation of a person and its environment from the perspective of the acting person. Depending on the perspective Lewin's theory was interpreted as theory of perception, of action or of motivation. Even sociological links were constructed by succeeding generations of scientists (see different scientific interpretations in detail in Lück, 2001). Lewin's theory is a phenomenological one. According to Lewin a person's acting within the environment is determined by personal values of different aspects of the environment. This is proven by different directions

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of attention and by different forms of efforts of individuals. In the language of modern epistemology Lewin's approach focused on the perspective of the first person in contrast to the third-person-perspective of natural sciences. The person acting attributes different values to different aspects of the environment. The values are not quantitative. Lewin used the notion valence. The person moves within a field of elements. Each element works as an attraction or a repulsion. Often Lewin's theory is referred to as motivation theory. Instead Lewin himself preferred to speak of a space theory of human life. It is the personal space around the body as a whole that determines human thinking, learning and acting.

The second classical author was Willy Hellpach. In contrast to Kurt Lewin he cannot be assigned to a distinct psychological school. Hellpach became famous as politician elected in the Weimar Republic during the 1920s. The general public was familiar with Hellpach's writings on social-psychology topics but not with his early works (Hellpach's personal, scientific and political biography is presented in Kaune, 2006). Modern environmental psychologists considered Hellpach to be the founder of German environmental psychology. One of his books was already published in 1911. The title was: *Die geopsychischen Erscheinungen. Wetter, Klima und Landschaft in ihrem Einfluß auf das Seelenleben dargestellt.* (Eng. The geo-psychic phenomena. Weather, climate and landscape and their impact on psychic life.) This book met with phenomenological views on human surroundings. Nature and human experiences of it were not designed by stimuli or by measurements. According to Hellpach all human environments consist of three global sectors:

- Nature (Ground, Weather, Climate, Landscape),
- Social and human environment (Cooperations),
- Cultural Environment (Art, Media).

Individuals experience each of the three sectors in a holistic manner. They construct distinguished relations with the sectors and show specific forms of interaction with each of them. When human beings get in contact with these sectors, different forms of expectations, emotions and actions evolve. Retrospectively Hellpach's viewpoint of nature and social surroundings comes surprisingly close to the famous idea of 'Behaviour Settings' of the American sociologists Roger Barker (1968). Barker was one prominent Anglo-American author that inspired

the environmental psychologists in Germany in the 1970s and 1980s. Two other Anglo-American psychologists cited often by Germany's environmental psychologists were William Ittelson (his book *Introduction to Environmental Psychology* was published in 1974) and James Gibson. His book, *The Ecological Approach to Visual Perception*, was published in 1979, but his ecological approach in visual perception research can be traced back to his dissertation in 1928.

Apart from classical phenomenology in Germany and apart from American psychologists with ecological orientation there was a third source of the new discipline environmental psychology in Psychology. The general environmental movement discussed the damages of nature as the result of uncontrolled human interventions into nature and of negative repercussions on humans. Decisions under uncertainty during interventions into complex social and ecological systems were studied and made famous to the general public in the 1980s by Dietrich Dörner (1989). He favoured computer-simulations of complex natural and social systems to study interventions and forms of decision-making of humans. Despite the orientation on computer-modelling his results had a large impact on environmental psychologists. Dörner's experiments revealed misleading strategies of persons trying to conduct complex social and ecological systems.

The concepts of German and American psychologists have been a theoretical background in order to outline research programmes of modern environmental psychology in Germany during the years 1980 to 2000. Fietkau (1999) summed up four guiding principles for empirical research in environmental psychology:

- Person-environment-relation is created and experienced by individuals in holistic forms. From outside (viewpoint of research) this is a dynamic interaction.
- For humans the environment usually does not consist of single stimuli or objects. There are perceived areas of living (for example: town centres, recreation areas, pedestrian zones).
- Different areas of living are emotionally charged by humans using symbolic values (for example: native town, area of well-being, area of danger).
- Empirical research on person-environment-relations has to consider these three basic assumptions in order to use appropriate research designs.

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Fietkau's principles are in complete accordance with the assumptions of phenomenological approaches of Bühler, Lewin and Hellpach presented above. The Würzburg School and the Gestalt psychologists as well conducted qualitative experiments. Verbal descriptions of attitudes, experiences and thinking played an important role in these forms of empirical research (Kebeck & Sader, 1984). Indeed, Fietkau did not argue in favour of qualitative methods, but he discarded laboratory experiments. In his opinion empirical research in environmental psychology has to be conducted within natural settings and has to consider personal emotions and perceptions.

1994 was the year of the formal establishment of environmental psychology within Germany's academic psychology. The section environmental psychology was formed within the Germany Society of Psychology. Leading persons of this section wrote in programmatic papers (see Hunecke, 2001; Lantermann & Linneweber, 2006) that the role of this discipline is to cooperate in interdisciplinary research projects dealing with environmental protection and sustainability. In these projects environmental psychologists should analyse the human factor using key psychological concepts as perceptions, emotions, attitudes or motives. Moreover, a large branch of environmental psychology has integrated into medicine, clinical psychology and public health research. This branch analyses the healing power of different aspects of nature (Gebhard et al., 2016). In international environmental psychology the health branch seems to be the dominant one (see review of research in Hartig et al., 2014).

Environmental Education

Environmental Education started as an academic discipline in Germany during the 1970s as well. There were substantial similarities to environmental psychology. Both disciplines emphasised a holistic experience of nature. Both disciplines aimed at protection of nature. But historical roots were different. In contrast to the classic experiments in cognitive psychology presented in the previous chapter, the sources of environmental education were outside German universities.

Advocates of environmental pedagogy saw sources of their discipline in diverse trends of Reformpädagogik (Eng. reformatory pedagogics or progressive

education) between the years 1900 to 1933 in Germany, especially those that defined themselves to be nature orientated youth movements. For example, the youth movement Wandervogel e.V., founded in 1896 in Berlin, can be considered to be one of the earliest forms of environmental education in Germany. Joint walking in the nature and joint experiencing of nature, mainly of forests, were basic activities and ideas. The Wandervogel movement was not unique at that time in Germany (characteristics of the Wandervogel movement were described by Giesecke, 1981, p. 17f.). Different movements had different ideals of youth and human life. But nearly all of them had in common to perceive nature as a space of shared experiences of groups. Members of the group should stand up for each other. And they should educate each other. Today especially concepts of environmental education with focus on *Erlebnispädagogik* (Eng. experiential pedagogy) define nature orientated youth movements such as Wandervogel to be pioneers (Fischer & Lehmann, 2009, p. 32f.). *Erlebnispädagogik* means to be in nature for a longer period of time, guided by educators, in order to have a holistic experience and to recognise nature as a complex ecosystem.

Compared to environmental psychology at that decade the discussions within environmental education in the years 1970 to 1990 were less focused on research methods and research designs. Instead publications treated political matters and environmental education was designed as a form of political education. Protection of nature was regarded at the same time as a personal and a political goal. The individual should recognise the value of nature for humans in general. Moreover, the individual should reflect on political and economic tendencies working against the protection of nature. Typical learning goals in order to protect nature were carefully usage of energy and knowing of ecological resources in daily life.

Kahlert (2005) argued that the experience of nature is not sufficient if environmental education is the intention of learning processes. He summed up three learning objectives for individuals within political orientated environmental education:

1. To come to living-age appropriate judgements on ecological risks (that means evaluation of the quality of different natural areas and of political necessities to act);

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2. To recognise, to understand and to evaluate the context of measures taken to improve the quality of environment (that are prerequisites of ecological actions);
3. To consider possible (intentional and non-intentional) consequences of actions to improve quality of the environment (so one has to make calculations of consequences of ecological actions).

Ecological education means to increase the knowledge of students to consider consequences of human interventions. It also means the ability to evaluate these consequences in an appropriate ecological manner. The latter marks the transition to ideas of sustainability in education.

Education for sustainable development in VET in Germany

In Germany the BIBB functions as a big regulatory institution in the background of all strategies, techniques and achievements concerning the implementation of sustainability into Germany's VET system. The implementation of structural innovations into Germany's VET system, such as sustainability, usually is carried out by the BIBB at two levels: new definitions of regulatory instruments of vocational trainings in the dual system on the one hand and model projects combined with scientific research on the other hand. Since 2005 the BIBB has initiated diverse Model projects concerning sustainability. Authors of this paper have already given an overview of the BIBB's relevant initiatives since 2005 in the last conference proceedings (Vollmers & Kuhlmeier, 2017). So we go on without any description of these model projects. Instead we cast a glance at their prehistory.

After the year 2000 Konrad Kutt, as member of the BIBB's scientific staff, was given the task to design a concept that should guide research on sustainability. It should be addressed in two forms: as a new qualification requirement of skilled workers and as a general didactic principle. Kutt collected diverse ideas from environmental and political education and linked them with aspects of the triangle of sustainability discussed in publications of economists (von Hauff & Kleine, 2009). Ideas of sustainability could be traced back into the 18th century in Europe (Grober, 2010). But they had been linked to economical processes in

general, not to work requirements of individuals. Before the year 2000 this term had been scarcely used in Germany's VET system.

The BIBB's first ideas on sustainability as a new principle of learning and teaching in Germany's VET system

After 2000 Konrad Kutt organised a series of round-table-discussions with experts from different scientific disciplines and published some papers containing results of these discussions. Kutt's concept how to integrate sustainability systematically into Germany's VET system can be traced back to the year 2001. In his first paper Kutt (2001) stuck to general goals of environmental education. In his opinion these goals are necessary but not sufficient. If one wants to support principles of sustainability in VET one has to go further. According to him sustainability functions as a 'global political-strategic reference-point and must integrate economic, ecological and social goals. Worldwide justice as global orientation has to be addressed at' (Kutt, 2001, p. 50). Therefore, sustainable concepts of VET must focus on:

- Ethical and moral aspects of private, professional and economical actions,
- Intergenerational justice,
- Succeeding arrangements of future global social and economic developments.

Three years later he published an expertise paper (Kutt, 2004). He discussed the blurriness of the concept of sustainability, especially with reference to the definition of professional qualifications in VET. He saw three aspects as main obstacles preventing the successful implementation of sustainability in VET:

- 'There is uncertainty and indistinctness because of increasing complexity. Future development cannot be predicted. That means qualification requirements in professional labour cannot be predicted.
- There are conflicting goals when it comes to the organisation of sustainable development. Actions are influenced by values; objective indicators are not visible. Essential parts of social determined sustainability are ambiguity and conflict.

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- Interests of actors are social as well. Their orientation is individual and collective acquis and advantages. Sustainable development starts from conflicting interests' (Translation according to Kutt, 2004, p. 1).

Thus professional knowledge of sustainability is more than domain specific knowledge. Apart from the professional dimension it contains a political and a global future dimension. Because of the wideness and combination of the dimensions, there will be a big risk of failure in learning. The following section expounds one famous example in this respect. It treats the topic of sustainability with focus on misleading ecological innovations within the area of car fuel. After this example it will be discussed how education of sustainability in VET should be organised in order to prevent such misleading actions in the near future.

The false hope of biofuel – One example of sustainability as a broken promise

As part of the promotion of renewable energy Germany's Government supported, in concordance with the European Union, the introduction of biofuel. Biofuel is fuel from plants (mainly palm trees, soy and rape). In the first years of the 21st century the view prevailed in environmental politics that biofuel was more sustainable compared to fossil petrol. In 2003 the European Parliament and European Council adopted the directive No. 2003/30. It was called the biofuel-directive (European Union, 2003). The member states made the commitment to define state specific basis quotes of biofuel as part of the total consumption of fuel. In 2009 the former biofuel-directive was replaced by the much stricter directive No. 2009/28. Its title was 'Directive of Renewable Energy' (European Union, 2009) and it is still valid in the EU. The directive claimed that each member state of the EU should reach the proportion of 10 percent of renewable energy within the total energy consumption. In 2016 the European Commission has made the proposition of a new directive that scheduled a much bigger rate of renewal energy. Right now this directive is under review within political and scientific discussions (DNR, 2017).

During the first decade of the 21st century Germany was in the role of a pioneer concerning the introduction of renewable energy in the European Union. Since 1998, when the coalition of social democrats and greens took over government in

Germany, there have been a lot of legislative initiatives to foster green energy. Since 1998 within the automobile traffic Germany's diverse governments have fostered diesel powered car construction and diesel fuel. Concerning biofuel, of which the biggest amount should be diesel fuel, the so called Biokraftstoffquotengesetz (Eng. Bio-fuels-quota-act, Deutsche Bundesregierung, 2006) was the most relevant one. After some changes of this law in 2008 the Mineral oil industry in Germany was obliged to secure until the year 2020 the rate of 5 percent bio diesel and of 4 percent Ethanol within the offered fuel in total. Moreover, since 2000 all over Europe farmers have received diverse Government subsidies in order to cultivate energy crops instead of food or animal feeding stuff (Meyer et al., 2007, pp. 123f.). In Germany this has led to an enormous growth of the cultivation of rape, from which is obtained bio diesel, to its peak point in 2007. During the last 10 years the cultivation of rape has remained nearly constant (Statistisches Bundesamt, 2017).

Since its starting point Governmental support of bio diesel has been a controversial issue in Germany. Most of the environmental associations opposed to this support. For example, Greenpeace demands the abolishment of the addition of biofuel to fuel (Greenpeace, 2008, p. 5). In 2013 Swiss sociologist Jean Ziegler demands to stop fostering biofuel within the European Union (Ziegler, 2013) because biofuel damages nature and human beings.

In 2015 German journalist Kathrin Hartman published her book 'Aus kontrolliertem Raubbau' (Eng. From controlled overexploitation, Hartman, 2015). Hartman has travelled worldwide in order to study the global effects of monocultures of energy plants. These plants are not only destined for biofuel, nutrition and cosmetics contain it as well. The monocultures are different in different regions in the world. The plants are soy and rape in Germany and in the USA. But in Indonesia and South America plants of palm oil dominate. Hartmann sums up the global effects of such monocultures as follows:

1. Poisoning of ground and water, because pollutants on the ground were not removed by animals. They lost their former habitats.
2. Dying of species, because these species find not enough food as a result of the use of pesticides. For example, in Germany bees are dying, in Indonesia Orangutans are suffering the same fate.

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3. Expulsion of inhabitants in order to plant palm trees within big areas, because the enterprises behave ruthlessly. This happens mainly in Asia and in South America.
4. Concentration of financial capital in private companies planting palm trees; Companies pay dumping salaries to former inhabitants that are in the role of workers now. This happens mainly in Asia and South America.

Under aspects of sustainability, from a worldwide prospective, if one considers all economical and biological consequences, promotion of biofuel is misleading. Moreover, this example demonstrates that different professions are touched. In VET the devastating consequences of monocultures are of relevance for car mechanics, for trade occupations, for agricultural vocations and for nutrition professionals. The problem is how make such global effects tangible for individual learners, for apprentices and skilled workers alike. The following section (3.3) discusses two different strategies: didactical reduction and creation of sensitivity towards personal lack of knowledge.

Teaching and learning of sustainability in VET – Two different strategies

A lot of philosophers, psychologists and educational scientists emphasised the important role of direct personal experience in human learning. The direct interaction between individual and surroundings is decisive in order to acquire knowledge and skills. What cannot be experienced cannot be understood properly by the individual. But sustainability cannot be experienced by individuals completely because it incorporates global and future consequences. To make sustainability tangible during learning scenarios in VET is a paradoxical task to a certain extent.

There are two basic strategies how to handle complexity in teaching and learning scenarios. One strategy is to reduce the complexity of topics. This strategy is called didactical reduction and a lot of teachers are familiar with it. The other strategy comes from cognitive psychology. It aims to make learners sensitive for their personal extent of ignorance in complex conditions. In the following the two

strategies will be presented in brief. Both strategies have in common the focus on personal experiences of learners.

Werner Kuhlmeier (2008) discussed how to make sustainability tangible during learning scenarios in technical VET, with special focus on agriculture and building jobs. He argued for the reduction of complexity by illustrating complex global relations within simple demonstration experiments and within tasks of moral dilemmas. Demonstration experiments can support experience of natural surroundings. For example, the task to plant an area on the soil will give learners the experience on the links between plants, soil and fertilisation. For example, the task to decide what kind of wood to purchase for carpentry work will give learners the experience of a dilemma situation between sustainability and financial profit. According to Kuhlmeier (2008) these two examples of reducing complexity enhance four aspects within learners in VET:

- To perceive (German *Wahrnehmen*): To experience directly abstract global relations of nature or of society that are relevant concerning sustainability.
- To know (German *Wissen*): To acquire knowledge how products are manufactured, in sustainable form or not.
- To motivate (German *Wollen*) and to evaluate (German *Bewerten*): To develop personal moral standards for regular decisions at work that balance environment protection an economic profit.
- To operate (German *Wirken*): To experience self-efficacy by being able to act in a sustainable way.

The second strategy, to sensitise people for their extent of ignorance about details of complex situations or subjects, is supported by American cognitive psychologist Steven Sloman. Together with his colleague Philip Fernbach (Sloman & Fernbach, 2017) he has pointed out that a lot of people make decisions and evaluations in daily life with an enormous ignorance about facts. For a modern democracy it is scary that a lot of people are not conscious of their lack of knowledge within a lot of domains of public interest. Sloman and Fernbach have studied the knowledge of individuals in experiments using various topics, for example technical devices, scientific facts, law plans and political decisions. He did not study sustainability in economics or in professional aspects, but his general recommendations how to enable individuals to make smarter decisions within complex surroundings could

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be applied on sustainability. Steven Sloman favours communicative learning scenarios that demand verbal descriptions from learners. Thus, they learn what they do know of topics and what they do not know. Questions of others, teachers or colleagues, help them to discover their blind spots. Moreover, learners should develop their personal decision rules at work and in private life when they deal with complex topics. If they internalise their strategies and these strategies proved to be successful learning will be sustainable in a psychological manner.

Conclusions: Main aspects of the phenomenological approach within learning scenarios of sustainability in VET

General didactical guidelines and models of competencies are the overall results of model projects of sustainability in VET in Germany (see introduction). Both contributions are creditable if the aim is to implement sustainability into a VET system. They can be written in general regulatory tools (for example, in curricula). But didactic guidelines and competence models should not be the starting point of learning-scenarios if one takes into consideration fundamental principles of phenomenological and cognitive psychology. Instead the starting point should be the individual experience of person-surroundings-relations at work. Learning scenarios must be designed open and exploratory. Instructions of teachers must support reflections of individual experiences. The instructions of Karl Bühler could work as a model. Moreover, learners must be guided to reflect on real interventions, if they are seniors at work. If they are apprentices, they could discuss consequences of possible future interventions. Evaluation of interventions is one central point of environmental education.

Usually individuals at work have created habits or routines in order to make decisions. That helps them to deal with complexity. Dietrich Dörner and Steven Sloman demonstrated the disastrous consequences of inappropriate habits of decision making in complex systems. Therefore, learning scenarios must encourage learners to explore their habits at work, with special reference to the question, if they support sustainability or do the opposite.

Individuals cooperate in groups, organisations and enterprises. Professional work can be found in all three levels. Therefore, larger forms of decision making and interventions into surroundings should be discussed in VET. One example is the biofuel. It is an example of inter-professional learning. It demonstrates the sociological, political and economic aspects of sustainability.

Phenomenological and cognitive psychology have emphasised that learning is first of all a matter of very individual experiences. Subjective experiences do not deliver complete knowledge of topics. But personal experience does form future actions of humans. In the words of Ernst von Glasersfeld: 'What we make of experience constitutes the only world we consciously live in' (von Glasersfeld, 1995, p. 1).

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