

Article

“Norm-Oriented Interpretation Learning” and Resource Use: The Concept of “Open-Didactic Exploration” as a Contribution to Raising Awareness of a Responsible Resource Use

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Received: 14 October 2013; in revised form: 17 December 2013 / Accepted: 7 January 2014 / Published: 17 January 2014

Abstract: It is widely accepted that environmental awareness is essential, yet does not inevitably lead to responsible use of resources. Additional factors on the individual level include the meaning constructed by the term “resources” and the individual and social norms that influence the relevant behavior. Current didactic concepts do not take into account such aspects. Therefore, this article uses a didactic-psychological approach for designing an educational concept for raising awareness for a responsible use of natural resources. Combining insights of environmental psychology and of constructivist didactics, a general principal of “norm-oriented interpretation learning” is outlined to enrich the didactic debate on responsible and efficient resource use. Based on the presentation of a qualifying module for resource efficiency consultants as a practical example of resource education, a new didactical approach, namely “open-didactic exploration” (short form: ODE) is introduced. The article discusses the theory-based elements of ODE and illustrates a step by step process for designing educational materials. This adds to the theoretical debate about a didactic design for resource oriented education. Furthermore, this method can be directly used by practitioners developing education and training material (e.g., teachers, trainers in vocational education). The Wuppertal Institute developed and applied

this method in numerous projects. The conclusion and outlook discusses future expectations and scope of the introduced ODE method as a contribution to foster “norm-oriented interpretation learning”, suggesting perspectives for further development.

Keywords: environmental psychology; resources; norms; interpretation learning; didactics; open-didactic exploration; construction; education material; simulation game; ResourceCulture

1. Introduction

Numerous studies predict a significant increase in the global consumption of both biotic and abiotic resources in the next decades. This can only be avoided by fundamental changes in our perpetual growth-based economic model. Such changes require political measures, a paradigm shift in the product-services system, changes in supply-chain management and in consumer behavior (e.g., [1,2]). A shift of our resource intensive prosperity models from one billion people in Western countries to a further eight billion people in developing countries until 2050 would very likely go beyond the limits of numerous ecosystems around the world (e.g., [3,4]). The amount of natural resources used for the production of goods and services is constantly increasing. The current extraction of primary resources reaches nearly 60 billion tons per year globally—nearly 50% more than 30 years ago (not including the so called “unused extractions” worth 95–130 billion tons in 2000). In economic terms, projections show that by 2030 the world gross domestic product (GDP) will have grown by 130%. This growth will indeed use more resources, causing raw material extraction to double within 20 years [3–5]. These numbers lead to the widely accepted consensus that human societies need to develop much more sustainably. However, the design of substantive changes is tied to challenges on different levels (e.g., [6–10]).

The need for dematerialization results mainly from the perception of a limited environmental space [5,11]. Therefore, the aim is an absolute decoupling of resource use from social prosperity. In addition, a sustainable use of resources in the sense of resource efficiency and conservation is necessary [8,12,13]. The idea of MIPS (Material Input Per Service unit, see [14–19]) can be seen as a generic measure to help decoupling material resource use from economic growth and human well-being [14].

Apart from the demand for an efficient use of resources, the question arises of how resources are dealt with in general. The existing “culture” in regard to resources, or “resource culture”, is sustainably inconspicuous [20,21]. Designing the change towards a sustainable resource culture (see also Section 3) and associated resource competencies (see [21]) is one of the subjects of transition research. Transition research studies complex socio-technical change processes in respect to the challenges of sustainable development. In the application fields of energy, transport/mobility and food, which have been subject to research, so far underlying patterns and dynamics of change processes have been identified [22]. Based on the findings of systems and governance research, transition research essentially explains change as an interplay of development on three functional levels: “landscape”, “regime” and “niche” [23]. Transition is understood as a profound change of the “regime” of a specific system. The regime describes the existing dominant structure of a social (sub)system, its culture and prevailing

attitude. Factors of successful transition are, besides others, the alteration of values and norms, leading to the dispersion of new perceptions and behavioral patterns. Here, norms are understood as rules for action that are derived from someone's personal opinions and beliefs influencing his/her overall attitude (see [24], p. 32). Every norm is linked to a value, which should be realized (see [24], p. 35).

Such a process can be triggered by the combination and interplay of numerous different developments [25–27]. Educational processes play an important role [28] in activating and accompanying the particular transition processes. The German Advisory Council on Global Change suggests “transformation research” as a new field for research, in which knowledge and understanding of transformation processes is a central theme [6]. The aim is to accelerate the dissemination of innovations and wide integration of systemic approaches ([6], p. 375). “Transformation education” provides society with findings of transformation research in a processed form. This is done by conveying knowledge about environmental problems that require transformation and transports goals, values and visions (compare [6], p. 399). So, the “transformative education” develops an appreciation for behavioral options and solution approaches, such as building knowledge for climate friendly mobility behavior, sustainable food consumption or for cross-generation responsibility (compare [6], p. 399).

All educational areas are called upon to promote education for resource efficiency and resource conservation (in short: “resource education”) as a significant aspect of education for sustainable development [21,29]. Responsible stakeholders require suitable didactic tools for implementing a successful “resource education”. So far, there are no such didactic tools available. How can education take place in a setting that not only transfers knowledge but simultaneously enables the respective person to implement this newly learned knowledge in resource conservation behavior patterns?

The following sections present the problem (Section 2) and illustrate the method of “open-didactic exploration” (short: ODE) using a practical example of resource education (Section 3). With these practical implications in mind, the theoretical background of the method is easier to grasp (Section 4). Finally, Section 5 discusses a potential contribution for education material based on the method ODE to “norm-oriented interpretation learning”.

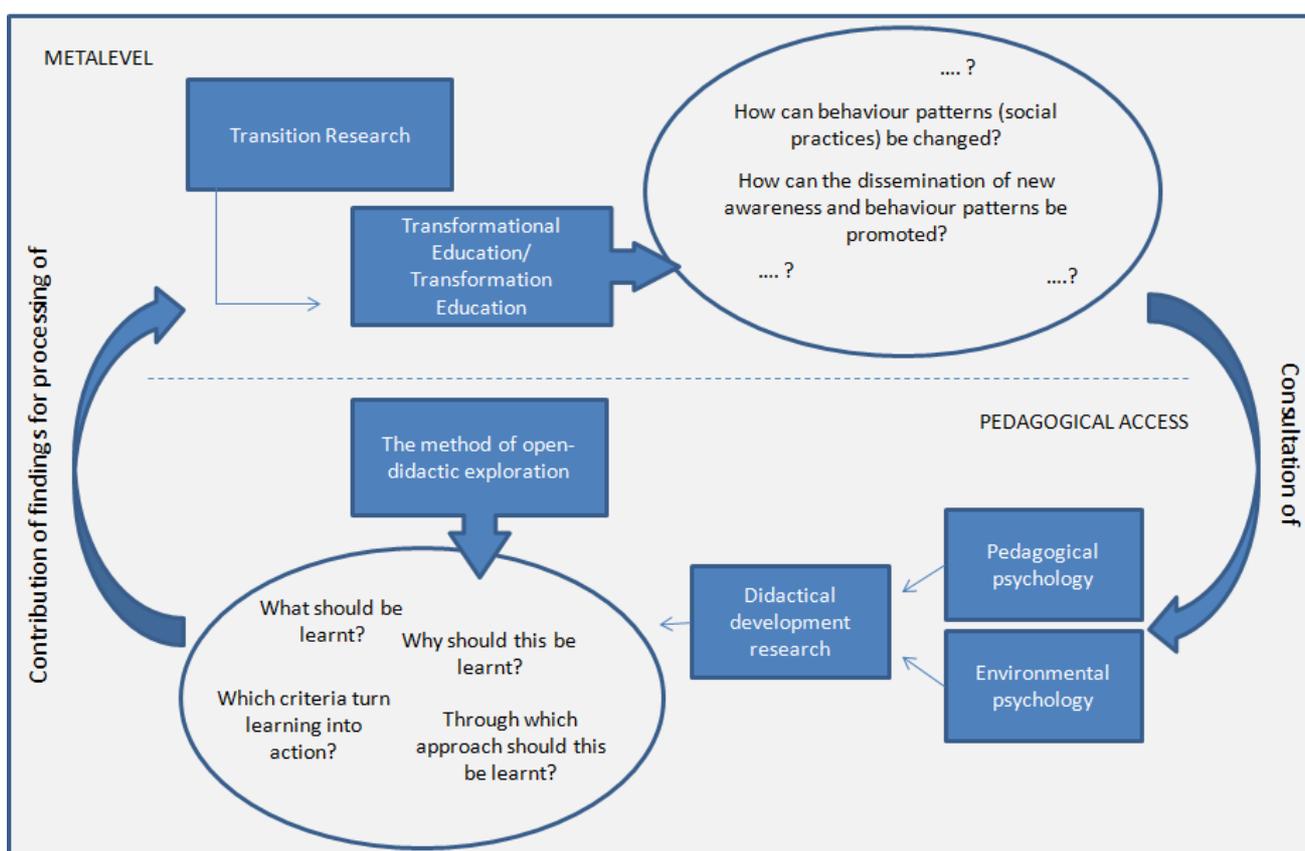
2. Towards “Open-Didactic Exploration”—Interdisciplinary Approach

Previous research has shown that a sophisticated awareness of environmental issues is necessary but is not a sufficient condition for ecological behavior (e.g., [30]). Knowledge and awareness are often given, yet the educational process fails in the application of respective knowledge to adequate environmental behavior. Besides that, indifference and complacency can play an important role. “Education for sustainable development” and the vocational education for sustainable development [28,31,32] are now invoked to address the resulting research desire. A crucial point is the question of how individual behavior patterns with non-sustainable behavioral roots can be addressed and changed as well as disseminated (transfer). So far, existing concepts of education for sustainability only focus on identifying and describing necessary competencies without taking into account the non-linear relation between knowledge and behavior (see [33–36]).

By addressing this question, a model of interdisciplinary access was generated (see Figure 1). Environmental psychology offers a long tradition in studying the relationship between knowledge and behavior. Promising indications for the roles of norms in decision-making processes are found here but

are scarcely used by practitioners in education (e.g., [37]). A possible reason for this is a lack of “translation” to pedagogical categories and lack of illustration of classic didactical questions (e.g., concerning subject-specific teaching methods, adequate learning surrounding, *etc.*). In exchange, the research on pedagogical psychology holds cognitive-psychology insights in store that are based on educational research. These inform how learning happens and therefore also how the old can be unlearned and the new can be learned [38,39]. Didactical Development Research in turn contributes to the design of appropriate educational materials to address behavioral patterns. This research refers back to the experience with course materials and recommendations for teaching and should be categorized as fundamental research to ease the transfer from theory into practice ([40], p. 47; [41]). These disciplines appear promising for a substantial progress on the question of development and change of behavioral patterns from a pedagogical perspective.

Figure 1. Connection between Transformational Education/Transformation Education and advisory scientific disciplines for the derivation of the method “open-didactic exploration” ODE (source: own illustration).



These insights call for a substantive theoretically based didactical approach for designing educational materials for the previously mentioned purpose. The following paragraphs present a project, which applied such didactical approach (the method ODE) in order to foster “norm-oriented interpretation learning”. In the course of the project “ResourceCulture”, a qualification module was developed in cooperation with/for practitioners in the field of professional training.

3. The Project “ResourceCulture” as a Practical Example of “Resource Education”

3.1. Overview

The project “ResourceCulture—Analysis of innovation for resource efficiency and trust cultures in small and medium-sized enterprises (SMEs) was a contribution for sustainable development” was a collaborative project funded by the German Ministry of Education and Research. Starting point of this project was the assumption that SMEs that orient themselves towards resource efficiency strategies are characterized by a specific culture of cooperation and trust. The project dealt with the analysis of such enterprises and the strategic question how innovations in resource efficiency and corporate trust cultures influence each other (see [21,42,43]). The project aim was to develop options for a sustainable growth strategy for SMEs promoting a “resource culture”. The term “resource culture” refers to an expanded resource definition: looking not only at material resources but also immaterial resources (primarily trust as part of a corporate culture), which are needed for innovations in resource efficiency. Which “culture” is practiced in regard to resources and how does this need to change in order to enable sustainable business [20]?

Selected findings of the project were didactically processed in a “qualification module ResourceCulture” [44,45]. Target group of the qualification module are professional trainers who educate consultants in resource efficiency issues and who want to extend their range in a holistic direction towards “resource culture”.

During the project “ResourceCulture”, the method of “open-didactic exploration” was used by and with professional trainers and their target group. They aimed at developing a qualification module for educating resource efficiency consultants towards “ResourceCulture consultants”. This qualification module “ResourceCulture” includes relevant findings from different theories—both in its didactical structure and development (integrating the target group in the development process, *etc.*).

The aim of the qualification module “ResourceCulture” was to develop a set of education materials (see Table 1, Columns 1–3) while considering certain quality criteria (see Table 1, Columns 4–6).

3.2. Development of the Concept

In the project ResourceCulture, quantitative and qualitative methods of social research were applied prior to the development of the qualification module. Besides a literature based discourse construction and an evaluation of the findings through an expert workshop, a quantitative questionnaire of 188 managing directors of SMEs and 124 consultants in the field of resource efficiency was conducted [46]. Complementing this, 17 companies that had received consultation services in resource and material efficiency were questioned as part of the empirical field research. For each company, the managing director, one representative of resource efficiency in the company, one trusted person (workers council if existent) as well as one consultant took part in a qualitative interview [47]. These findings influenced the development of the qualification model ResourceCulture significantly. The results of the questionnaires and interviews also gave insights into the underlying interpretations of the terms resource efficiency and trust ([48], see Table 1, Column 4).

Table 1. Didactical framework for the application of the method “open-didactic exploration” (process steps) and the employed theoretical foundation of norm-oriented interpretation learning (quality criteria), (source: own illustration).

Completed education materials						
Process steps			Quality criteria for all process steps			
No.	Step-by-step process of the ODE Method	Steps of didactic analysis (1)–(7)	Employed instrument and method	Approach based on interpretation patterns (1)–(10)	Construct forms (1)–(6) and respective construction methods	Intervention possibilities derived from the integrated norm-activation and competency model
1	Development of the concept	Meaning of present (1); Meaning of future (2); Exemplary meaning (3)	Field research (qualitative/quantitative methods), workshops with professional experts and representatives of the target group (instructors and learners) as well as multiplication institutions (e.g., academies, train-the-trainer providers, universities, schools)	Considering: Perspective (1); Plausibility (2); Latency (3); Reduction of complexity (4); Continuity (5); Persistence (6); Consistency (7); Societal mediatedness (8); Relative flexibility (9); Systematic-hierarchical order (10)	Encouraging: Perception (1); Deconstruction (2); Reconstruction (3); Co-construction (4); Self-construction (5); Reflection (6); Perturbation	Considering: Information about system characteristics; Information about consequences of action and behavioral alternatives; Competency training for the application of behavioral alternatives; Mediation of ecological values; Stabilization of the influence of personal norms through self-commitment
2	Reconditioning of background information	Structure of content (4); Verifiability (5)	Literature research and analysis, consultation of experts from the didactic and respectively required professional field			
3	Development of didactic materials	Accessibility (6); Teaching/Learning process structure (7)	Literature research, workshops (experts from different disciplines)			
4	Testing, evaluation, revision	Adaption/specification (1)–(7)	Piloting workshop, observation, questionnaires	Adaption/specification (1)–(10)	Adaption/specification (1)–(6)	Adaption/specification

To develop the concept, a strategy and instrument workshop was conducted together with two agencies in the field of resource efficiency [Effizienzagentur NRW (Efficiency Agency North Rhine-Westphalia), VDI/VDE Innovation + Technik GmbH (VDI/VDE Innovation + Technology Ltd.)] which provide services for SMEs as well as offers in further education for consultants and trainers. On this occasion, current and future meanings of the topic resource culture for consultants was discussed (see Table 1, Column 2). In an exemplary manner, the aspect of trust cultures in companies was singled out. With this example, consultants reflected suggestions and ideas for strategies to deal with conflict situations in companies. Based on the results and the suggestions of the target groups, four action areas (competency fields) were determined that were to be worked on in the qualification modules on “activating motivation and drivers of innovation”, “enabling participation”, “building trust in change processes”, “consulting/supporting/moderating in change processes” and “choosing suitable instruments and tools” [44]. In order to identify required competencies for consultants in these fields (see Table 1, Column 6), a qualitatively oriented content analysis was used in the sense of a “narrative review” [36]. The analysis determined personal, social and cognitive-methodological as well as professional competencies, which make up the “desired profile” of a “ResourceCulture consultant” (see [44,45]).

3.3. Reconditioning of Background Information

The selected content was analyzed in terms of its specific content structure. High complexity and emotionality was identified especially in the competency fields “enabling participation” and “building trust in change processes” because basic questions of justice and trust are touched upon. The competency field “activating motivation and drivers for innovation” was understood as having particular didactic challenges (see Table 1, Column 2). In this competency field, it was important to provide the learner in part with psychologically grounded reason for specific motive levels in a way that reduced complexity sufficiently (see Table 1, Column 4).

3.4. Development of Didactic Materials

The development of the qualification material was discussed with the project partners (practitioners) in terms of content and methodology. For this, train-the-trainer providers and consultants were considered as experts. In the development of materials, attention was paid especially to an action orientation and methods for experiential learning. In order to offer as many access points to the learning subject as possible (see Table 1, Column 4), qualification materials were gathered in a modular system that allows a choice depending on pre-knowledge, preferred access point and methodical preferences.

Hereafter, the material “simulation game ResourceCulture—fish pond” (the material is available free of charge (see [49]) is employed to illustrate the open-didactic exploration (ODE) method (see Section 4).

The starting point for this exercise was to develop material for the competency field “activating motivation and drivers for innovation” to address the tragedy of the commons of natural resources based on individual motivations. This was to highlight the motivating factors for non-sustainable behavior and resource squandering often observed by consultants in businesses (see Table 1, Column 5). For this the method “simulation game” was chosen.

The material takes the following issue as the starting point: ResourceCulture consultants in businesses emphasize the value of resources and advocate for a more efficient use. In order to do so successfully, a basic precondition is the ability to understand the current global use of resources from a social-psychological perspective. Additionally, awareness of the link to action shaping norms (e.g., “short-term profit maximization”) is needed. The simulation game “fish pond” was adapted for the context of ResourceCulture. It allows for a basic understanding that resources need to be managed sustainably in order to maximize their long-term use. At the same time, it emphasizes that humans often act in a contradicting manner and uncovers the reasons why (see Table 1, Column 5). Based on this knowledge, consultants can argue the case of efficient resource use more thoroughly and gain a better understanding on how to classify the underlying reasons and motivations for sustainable management in companies.

To get qualified, the participants had to fish in an imaginary fish pond that maintained its fish stock under certain circumstances. If too much fish was removed, participants could sanction each other or coordinate deals for fishing behavior. The catches remained hidden. For this qualification material “simulation game ResourceCulture: fish pond”, the competencies to be promoted by the material were taken from the “desired profile” (see [44,45]). The overall goal was to be able to understand the underlying system characteristics and the strategic structure as well as applying them to real situations. Additionally, the participants were sensitized to reflecting one owns behavior, influenced by personal and social norms. The role of these moral aspects and interrelations with the system (participant and ecosystem) needed to be identified. It was important to put the learner in a position where he/she had to explain the core of the tragedy of the commons problem and find solutions. Focusing on this specific problem allowed for awareness-raising of normative aspects in respect to sustainability and resources. In the sense of a “resource culture”, not only material resources (fish) were significant but also immaterial resources (social collaboration, trust, justice). The discrepancy between the individual gain and a more community-serving behavior could be experienced directly.

Many intervention possibilities ([37], pp. 75–76) were used in the game (see Table 1, Column 6). The participants worked on accessing the information of the fish pond system characteristics and experienced the different types of fishery along with their consequences. Together with others, the participant understood how resource conservation fishery can be adequately applied and which knowledge and competencies are necessary for this task.

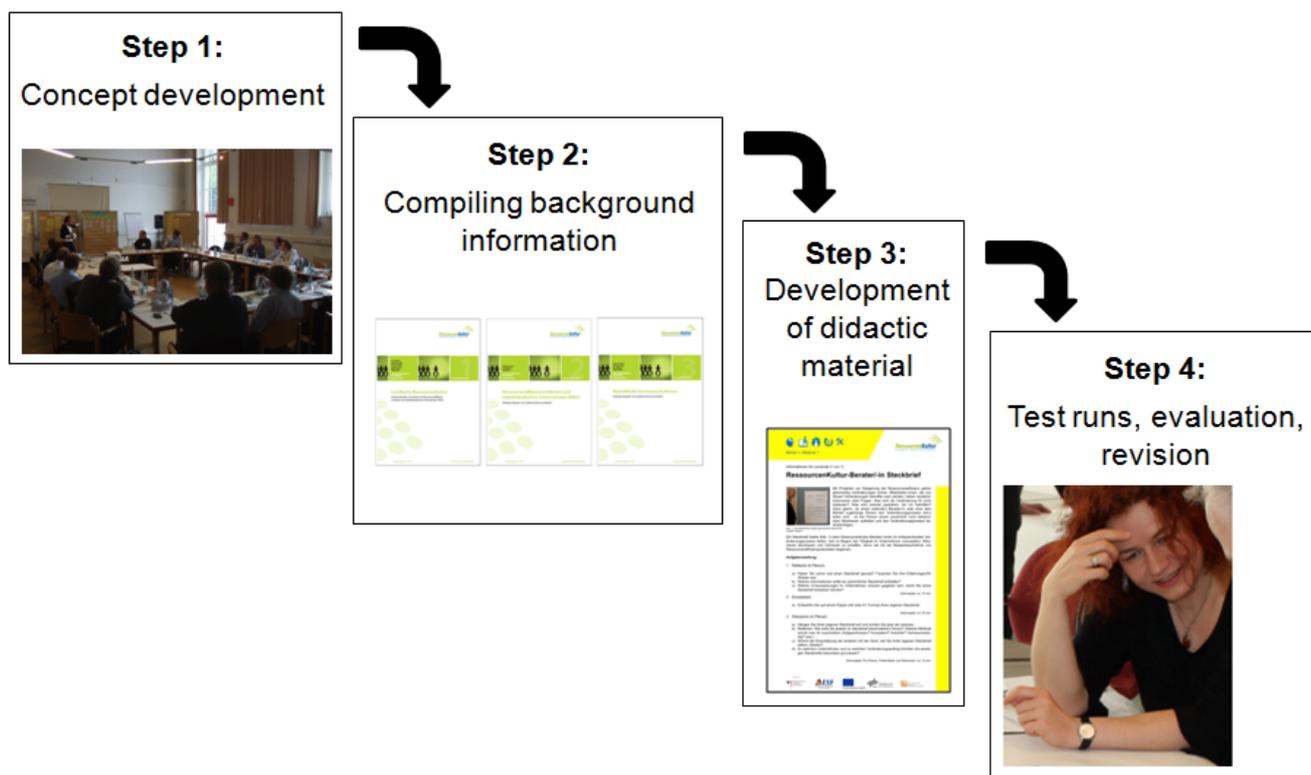
Usually, the imaginary fish pond was overfished and the game ended early. This was experienced as perturbation by the participants (see Table 1, Column 5). Here, the activation of the following construct forms was viable, yet not predictable from a constructivist point of view (see Table 1, Column 5): the subsequent reflection phase allowed for second order observation (reflection) and a group exchange on action-shaping norms in the exercise (co-construction). The individual responsibility for the outcome of the exercise can be understood (perception) and led to relativizing previous knowledge (re-construction) as well as a definition of the individual identity (self-construction). This connection can lead to a critical questioning of interpretation patterns and the setting in of interpretation learning.

3.5. Testing, Evaluation and Revision

During two workshops, selected education materials from the qualification module were piloted with trainers and consultants for resource efficiency. Also, a short evaluation was done using questionnaires ($n = 14$). The testing recorded structural and content orientation of the material in particular. The evaluation resulted in little need for adaptation because the target group was involved early on in the process (see section on “concept development”). The evaluation emphasized the challenges of providing consultants with a broad spectrum of offers with individually suitable aspiration levels. This held true also for the offered method in which some participants already experienced the role play as very challenging and others felt rather sub-challenged. During the revision of the materials, this circumstance was taken into account. For each module, three respective materials with increasing stages of methodological aspiration level and thus higher complexity in construct formulas were developed. An effectiveness analysis of the materials remains to be done.

The practical example showed that the ODE method is well suited for the aim of providing consultants with didactically processed content for the promotion of a resource culture (see Figure 2). This method serves as the theoretical foundation for the corresponding process. Besides the project “ResourceCulture”, the ODE method has been applied in numerous projects, for example, in the project “Encouraging Sustainability” [50].

Figure 2. Development of educational material in the project ResourceCulture following the ODE method (source: own illustration).



4. Development of Educational Material for Norm-Oriented Interpretation Learning—The Method of “Open-Didactic Exploration” (ODE)

4.1. The Underlying Didactic Understanding

There is no specific teaching methodology based on action theory that is currently used for the development of educational materials for sustainability in general and for resource efficiency and conservation in particular (see [29,30]). For the development of education and qualification formats, “education for sustainable development” borrows from the general education discourse (for example, the constructivism debate) and uses didactic approaches of environmental education (e.g., [35]). However, a crucial step is missing here so far: since sustainability is a normative keynote, it demands a far-reaching and precise didactic approach to suitably address behavior patterns.

For the development of the ODE method, a classic understanding of didactics is assumed. Didactics is therefore the “science of teaching and learning that incorporates all aspects of decision making, reasoning, preconditions and processes in the context of educational instruction” ([51], p. 11). Results of this professional didactical process are, for example, educational materials that can be used in different learning contexts [formal, non-formal (see [52]), informal], as it is illustrated in Section 3.

As illustrated earlier, a cognitive-psychological access to the teaching/learning subject matter is seen as productive for the development of educational material, which is why the ODE method is developed further. Siebert [53] understands didactics as “translation between *factual logic* of content and the *psychological logic* of the learner” (translated from [53], p. 2, including emphasis in italics). This perspective of a teaching process design allows for an increased incorporation quality of ODE with the insights of pedagogical psychology research as will be shown later.

4.2. What should be Learnt and Why?

In order to address behavioral patterns, the respective content has to be selected first. Especially KLAFKI (e.g., [54]) demonstrated how the factual logic of content can be approached. The trainer’s basic task is to select relevant learning content and adapt it to knowledge and competencies of his/her target group. His approach of “didactic analysis” is still relevant today and recommends seven criteria to analyze (potential) learning content ([54], p. 135). These criteria (see first column) have different didactic implication that are summarized in Table 2 (see also Sections 3.2 and 3.3).

Fundamentally, an immeasurable choice of content presents itself for learning. KLAFKI [55] defines content suitable for didactic analysis by the approach of “epoch-typical key problems”. The approach focuses on identifying key problems of the respective present situation. Such key problems are socially relevant on a global scale. They are closely linked to relevant future problems and are relevant for each individual in our society (see [55]). These key problems have to be transmitted into learning goals for instruction [55]. For this process, education for sustainable development has a similar approach that is less sophisticated in its complexity. Similar to that, DE HAAN [56] uses occurring “environmental syndromes” as content providers [56].

The keynote of sustainability and the topic of resource efficiency and conservation can be described as an epoch-typical key problem of our times (as shown in the introduction and realized in the practical example “ResourceCulture”).

Table 2. Steps of the didactic analysis after KLAFKI (translated from [54], p. 135) and their general didactic implication for the selection and development of learning content (source: own illustration).

Steps of the didactic analysis (1)–(7)	Didactic implications for the selection and development of learning content (in general)
Meaning for present	Designing learning content that fits into the everyday reality of the learner; meaning of the learning goal for the learner needs to be reflected
Meaning for future	Selecting and designing learning content so that the future meaning of the topic and its consequences is clear to learners
Exemplary meaning	Selecting and designing learning content so that the specific teaching/learning situation could apply to a general situation that affects the learner
Structure of content	Identifying the structure of the selected content and providing it to the learner in a way that he/she can understand
Verifiability	Selecting and designing learning content in a way that is verifiable by the learner using epoch-typical key problems
Accessibility	Analysing special cases, phenomena or trials that can be used to make the learning content interesting, accessible and comprehensible for the learner
Instruction-learning-process structure	Selecting suitable methods for the respective learning content

All seven criteria of didactical content analysis include, from a cognition psychology point of view, important hints on motivating factors for learning processes. Therefore, they play a significant role in the foundation for the design of the ODE method.

4.3. How to Learn?

Once content is chosen, the methodology of presenting the learning content needs to be defined (see Sections 3.2–3.4). At this stage, assumptions have to be made on how learners will process the presented learning content; thus, how learning and unlearning of behavioral patterns occur. With this, a differentiated observation of the term “behavioral patterns” is required in the sense of interpretation of instruction-learning on a theoretical level (how and from what elements are patterns formed, *etc.*).

Current education for sustainable development mainly refers to the didactic principles that are founded on constructivism based didactics among other elements (“Enabling-Didactic”, [57]). Constructivist based didactics define learning as a self-referencing, autopoietic process that cannot be directly influenced ([58], p. 32). Assuming that reality of humans is subjectively constructed, learning is implicitly constructivist too. Thus, certain constructs cannot be transferred directly as trainers cannot force their personal view onto learners (see [59], p. 95). The trainer can only enable learners to learn and take up new issues; he/she creates respective structures enabling a learning process and leads the way in these processes guiding the learner (see [59], p. 96). The individual understands the world through “constructs”. Siebert [53] summarizes: “Our sensory perception, our thinking, feeling and remembering mirror not the outside world but reproduce our own reality. These constructs are not true or false but more or less variable meaning they function, they have proven themselves and enable survival and successful action.” (translated from [53], p. 20).

In practice, the constructivist approach has been promising from a cognition psychology perspective, and unraveling of the term behavioral patterns for didactical processing will therefore be continued here.

In a certain sense, constructs can therefore be understood as interpretation of what is perceived from the outside world. The subjective surroundings and daily routines consist of such interpretations and congregate to interpretation patterns. Patterns in turn are structures (Siebert: “scripts”) that determine our reality perception. Whether a learner thinks economically, rather makes others responsible and thinks in materialistic terms depends on his/her interpretation patterns ([53], p. 110). The approach of interpretation patterns in the constructivism based didactic sees 10 characteristics of interpretation patterns ([53], pp. 109–110). These characteristics can be studied in respect to their didactic implications (see Table 3).

Table 3. Ten elements of interpretation terminology (translated from [53], pp. 109–110 (original emphasis), (see [60]) and possible didactic implication on a general level (source: own illustration).

Elements of interpretation patterns	Didactic implications (general level)
<i>Perspective</i> = Individual interpretation of reality from their <i>specific</i> viewpoint in their insight-shaping interests	Target group oriented, principle of reflection, multiple access points and formulas for the subject of learning, identification of interpretation patterns at hand through reflection, ...
<i>Plausibility</i> = Interpretations need to be transparent and enable “routine action”	Reduction of complexity, behavior oriented, situation oriented, ...
<i>Latency</i> = Interpretations are not constantly conscious, patterns build a deep structure of consciousness	Principle of reflection, perturbation for awareness building, ...
<i>Reduction of complexity</i> = In order to enable action in everyday life, the confusion and complexity of reality needs to be simplified	Reduction of complexity, ...
<i>Continuity</i> = Interpretations are formed through personal life history and indicate a “certain stability and inertia”	Participation, principle of reflection, consideration of critical life events, lifestyle, ...
<i>Persistency of previous experiences</i> = The normative orientation built during childhood has a strong “shaping effect”	Principle of reflection, perturbation for awareness building of individual norms, creative methods for reflection and socialisation, ...
<i>Consistency</i> = Interpretation patterns have inherent connections with each other, at least we are trying to have a coherent world view	Principle of reflection, perturbation for awareness building, ...
<i>Social mediatedness</i> = Interpretation patterns have a social, collective foundation, they are embedded in a “social consciousness”	Principle of reflection, perturbation for awareness building of social norms, ...
<i>Relative flexibility</i> = Persistence and flexibility are conflicting concepts, interpretation patterns are usually only flexible in a certain “drift zone”	Principle of reflection, consideration of critical life events, lifestyle, ...
<i>Systematic-hierarchical order</i> = Interpretation patterns can be sorted into a hierarchy according to their underlying psychological roots	Principle of reflection, perturbation for awareness building, ...

Behavior patterns are therefore determined by their underlying interpretation patterns. These interpretation patterns are formed through construction of reality and respective “interpretation assignment” by the perceiving subject. Besides other factors, “social mediatedness” is an essential and powerful influence (see also section “Conclusion and Outlook”). One has to consider that human learning processes and human behavior are deeply embedded in cultural contexts as well. People are guided as much by what others around them say and do as by the ‘rules of the game’ (see [61]). So, it is important to understand the role of the socio-cultural framework defined as a system of shared beliefs, values, and behaviors that members of a society commonly use in order to deal with their world as well as with one another. It is transmitted from generation to generation through imitation and learning—and it interacts with the formal framework of educational institutions. The socio-cultural framework and its influence on human behavior in different contexts are discussed by many authors (see [62–70]).

The socio-cultural framework can be regarded as path dependent and rather inert. It constitutes the foundation of any culture and its respective conception of the world. One could also say that any socio-cultural framework is the “software” of a society or of a culture area (a group of societies sharing the same or nearly the same culture) and the frame within which social actions (e.g., learning) are taking place. The social-cultural factors of values, attitudes, and beliefs can influence human behavior as motivation or barrier depending on the context of action. They give orientation and aims in life saying what is socially desirable and undesirable. They are the guiding principles of one’s life and therewith they have much influence on one’s way of living and learning.

However, not all values and beliefs of an individual are culturally biased. An individual may have personal values differing from what appears normal in societal mainstream practices, influenced by personal experiences and traits or moral norms. Examples in the field of sustainable consumption show that green consumers hold pro-environmental behaviors, pro-social values, and aspects of altruism, biospheric or eco-centric values (see [71,72]).

The reference point of pedagogical intervention is therefore the constructive action of the subject and its interaction with others as such; the latter, however, being very difficult to influence.

How can the best possible conditions for addressing interpretation patterns and “interpretation learning” ([53], p. 109) be created? Interpretation patterns are formed usually through techniques of “understanding” the world. It is therefore didactical to choose content and method in a way that is invigorating for the education and processing of constructs. Such “construct forms” are ([59], pp. 98–99):

- Perception: sensitizing of perception of the world, processes and interrelations;
- De-construction: relativizing or deconstruction of constructs;
- Re-construction: creation of qualitative more valuable knowledge through integration of information in existing cognitive structures and networks of theoretical knowledge with practical experience;
- Co-construction: cooperative construction of reality;
- Self-construction: construction and extension of identity;
- Reflection: observation, order, developing awareness of constructivism.

Interpretation patterns are mainly changed by the creation of “perturbation”, *i.e.*, through perceived disruptions in the person-environment relationship ([33], p. 23; [41]). Instruction and learning situations,

in which the learner is led to a point at which the viability of his/her construct/interpretation in a certain area becomes questionable (perturbation), allow for potential reframing and/or a correction of interpretation patterns ([33], p. 23). “Perturbation” can be a situation of understanding or cognition which can lead to a change in existing interpretation patterns.

“Co-construction” plays a key role. Situated constructs result from negotiation of meaning with others [73]. Environmental problems can be defined using social assessment criteria, thus, they are closely linked to social construction (see [74], p. 124). Construction co-evolves with interaction in social structure of dependencies (see also [75]), based on the fact that the actors have different backgrounds with different “frames” (see [76], p. 280, based on [77,78]).

Which construct form occurs with whom and in which stadium of the learning process, whether perturbation is reached *etc.* cannot be determined. The reason for this is that the understanding of the world happens within a subjective and highly individual process [58], even though it is closely linked to its social context and interaction with others.

4.4. Which Approach Enables Learning Processes?

Once content and theoretical aspects have been dealt with, the question arises how this learning content can be presented in an adequate way. An unlimited number of different didactical methods are available for the design of a learning situation. Their effectiveness is sometimes more, sometimes less well proven through pedagogical intervention research. With the construction forms in mind, those methods assuming a wide spectrum of different action and social forms [51] appear to be most suitable because they offer different learning accesses. Additionally, the results so far suggest that enabling concrete action of the learner as far as possible is required in order to increase the likelihood of perturbation. Therefore, methods are preferred ([53]: “construction methods”) that enable the following:

- Making complexity of reality understandable;
- Experiencing action and its consequences (experimental character);
- Collecting practical knowledge;
- Facilitation of “perturbation”;
- Making one’s own behavior patterns and those of others transparent (without embarrassment);
- Making individual and social norms subject of discussion and exploration;
- Co-developing possibilities to shape the world and experimenting with options for action.

Methods enabling a learner to implement a real or intellectual action with experimental character, such as simulation game or dilemma discussion, provide the possibility of repetition and reflection in the sense of “construction of meaning from experience” ([79], p. 8). This can lead to collection of practical knowledge and developing competencies or experimenting with them. Examples for methods with such an experimental character (experimental setting), situated between the two extremes of “intellectual experiment” and “real experiment”, are role plays, simulation games (see Section 3.4), dilemma discussions, laboratory experiments, or company theatre events (see, e.g., [80]). Learners themselves can develop possibilities to shape the world or/and experiment with different options for action. These can then be reflected collectively in a social context. In this sense, the cyclical process of action-knowledge-action is traversed. Trainers need to know about existing competencies of their

learners in order to choose a suitable set of methods. There are even offers of highly sophisticated methods such as simulation games for, e.g., pupils.

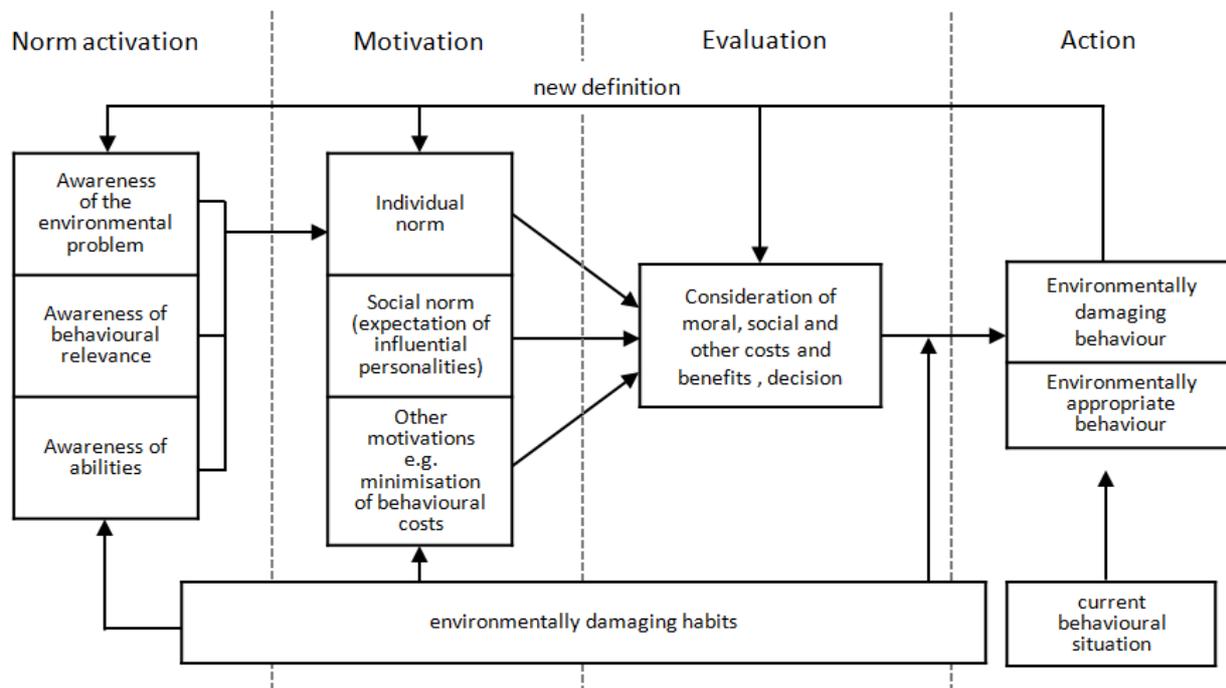
Learning situations and their respective methods need to be analyzed (see [53], p. 316) according to their ability to enable “situated cognitions”. However, such “situated cognitions” can hinder a successful transfer of results; this needs to be taken into account for learning processes, which are designed as situations for applying knowledge. Therefore, it is important to develop the transfer of results in other situations of application (see [59], p. 109).

4.5. What Are the Criteria to Turn Knowledge into Action?

Education for resource conservation and efficiency as components of education for sustainable development is bound to the fact that conveying normative-ecological topics carries specific challenges with it. A central problem was identified earlier: conveying ecological values and attitudes is currently in the foreground of teaching but does not lead to changes in behavior (e.g., [81–84]). This is the reason why it is recommended to complement education for sustainable development with an action-theory foundation that considers for example findings of environment-psychological intervention research concerning norms and makes them didactically accessible. The relationship between knowledge and action should therefore be factored into the design of education materials from the beginning. Through focusing on processes that lead to ecological/sustainable actions (or not), it is possible to develop a more differentiated perspective on the non-linear relationship between knowledge and behavior, as has been demonstrated.

Cognitive-psychologically relevant findings of behavior determining factors in the field of environment traditionally originate from environmental psychology. However, only few models have so far been processed for application in pedagogical work. One model for which such pedagogical interpretation has been attempted, is the “norm-activation model” [37,85]. In this model (see Figure 3), cognitive processes, that precede environmentally damaging or environmentally friendly behavior, undergo different phases (which can be also tracked within the phases of the material “simulation game ResourceCulture—fish pond”, see Section 3.4).

First, in the course of a norm activation, the individual becomes aware of an environmentally relevant problem and connects it with his/her own behavior. At this point, the influence of his/her own behavior on the problem is also evaluated (consequences of action). Additionally, the individual is closely linked to social costs of action (not necessarily of judicial nature). In the evaluation phase, an individual juxtaposes the perception of the environmentally relevant problem, estimation of his/her behavioral alternatives, based on an evaluation of own abilities to make a difference, with motivation. The latter consists of personal and social norms as well as anticipated expectations of peers (“significant others”). The individual assesses options within this cost-benefit analysis and makes a decision for a certain behavior ([37], pp. 72–73). Additionally, the individual maturing processes and moral development level need to be taken into account. Young adolescents, for example, can be more dependent on certain views of their peer group than adults, which show a sophisticated set of social and environmental norms (see, e.g., developmental stages of moral competence [86,87], p. 127).

Figure 3. Norm-activation model (translated from [37], p. 73).

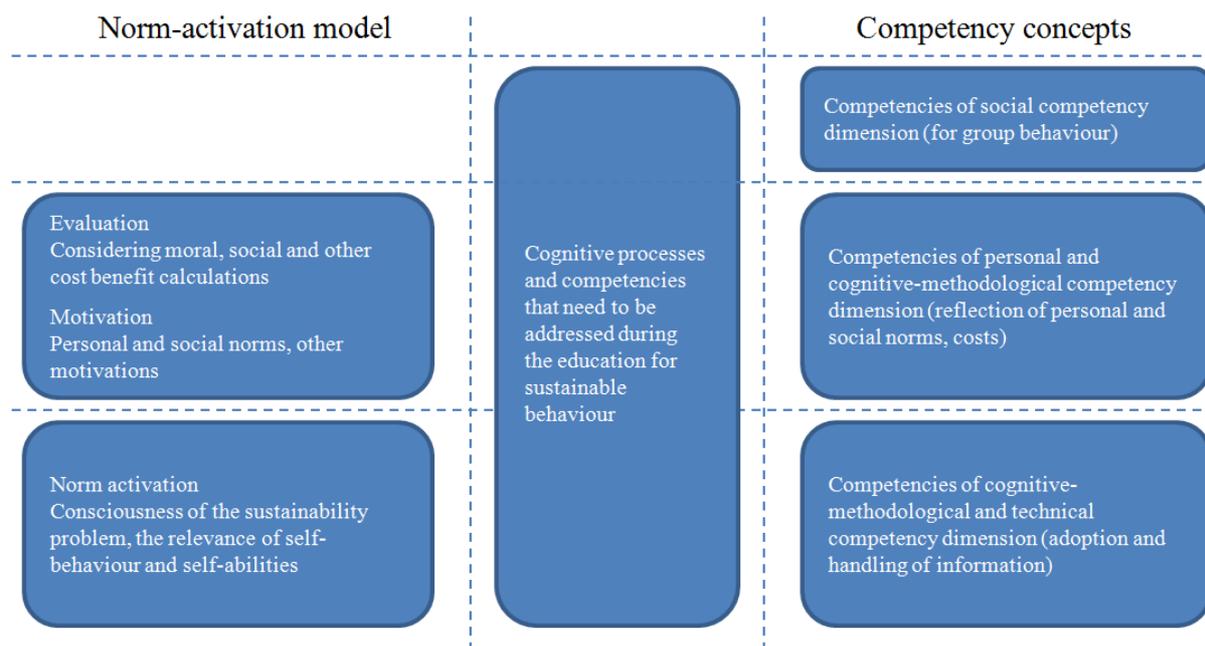
Matthies [37] herself identifies first pedagogically relevant indications on which intervention possibilities yield from the perspective of the norm-activation model for practitioners. Besides measures the author sees at the socio-political level (structural enabling to use behavioral alternatives, campaigns for influencing social norms and other possibilities to lower behavioural cost), she presents measures that can be translated directly onto the didactical level. Instructors should make information on the characteristics of ecological system and the consequences of un-ecological behavior available and accessible. Also, consultation on alternative ecological behavior and capacity building for using these alternatives (development of competencies) should be promoted. Strengthening ecological norms through self-commitment should complement this ([37], pp. 75–76).

Matthies' indication to promote competencies was taken up by Stengel *et al.* [85]. By placing the competency idea *within* the framework of Matthies [37], they enabled a better application of the model for educational work [85]. Competencies are therein not only an element that influences decision-making (“awareness of own abilities”) but are crucial for passing through the phases of decision-making themselves (compare Figure 4). While Stengel *et al.* [85] limit themselves to social, reflexive and methodological competencies, more can be integrated into the model based on meta-analysis, especially personal and professional competencies [36].

The added value of this view is primarily to consider specific relevant competencies in the development of education material that can counteract remaining at only abstract levels of competency (compare [88]). This is the reason the integrated norm-activation and competency model forms the basis of the ODE method. Consistently, it is complemented with an adequate understanding of competencies oriented at the definition that has reached almost a consensus in the education political area. Weinert [89] describes competencies as “the cognitive abilities for problem solving available to or learnable by individuals as well as the connected motivational, voluntary and social willingness and ability to be able to successfully and responsibly use problem solving in variable situations.”

(translated from [89], pp. 27–28). According to Weinert [89], competencies are cognitive abilities that can be trained. It may be assumed that they support or even enable the implementation of cognitive operations such as learning. Weinert [89] emphasizes the meaning of motivational and voluntary abilities indicating inner psychological processes which express available competencies (performance) or contribute to the acquisition of new competencies and their development. Similar to Matthies [37], the author highlights the insufficiency of conveying only knowledge and values related to sustainability and resource conservation/efficiency. Rather, actual competence development (ability) requires additional consolidation of voluntary and motivational abilities and willingness (desire). Insights of environmental psychological research into the consequences of personal and social norms moreover suggest that explicit discussion of these aspects during the teaching/learning processes is necessary. Learners are able to reflect the viability of their own constructs and can become aware of them [58]. Self-awareness and self-reflection can be seen as overall target; the learners should recognize recurring behavioral patterns in order to develop knowledge for orientation, which can be used as basis for self-reliant behavior (see [24], pp. 11–12). A learning target can be derived from this.

Figure 4. Integration of competencies within the norm-activation model (extended, based on [85], p. 37, translated), (source: own illustration).



4.6. Summary: Theoretical Foundation of “Norm-Oriented Interpretation Learning”

The previously outlined theoretical foundations address questions on how behavior patterns can be addressed and which criteria may be applied to change these. Additionally, the didactical implications were analyzed respectively.

Summing up the content so far (see Table 4), the concept is theoretically positioned in the constructivist instruction/learning paradigm (e.g., [51,58,90]). Complementing this, didactic principles of the interpretation patterns approach are employed (e.g., [53,60]). Stemming from this, assumptions can be derived on how interpretation patterns that determine behavior patterns are learned and un-learned. Didactical implications refer specifically to addressing types of constructs and, thereby,

raising awareness for interpretations. This can be reached through construction methods such as perturbation and/or reflection, resulting in a possible change of interpretations (interpretation learning). The design of teaching/learning processes should be oriented towards action and participation. This allows learners to acquire knowledge via real action which can lead to change of interpretations. Based on these findings, the target followed in our approach can be described as “norm-oriented interpretation learning”.

On a practical level, didactical analysis and the approach of epoch-typical key problems by Klafki [55] is employed to choose and design learning content. At this point, the competencies serve as description of output-oriented learning goals.

Table 4. Theoretical foundation of norm-oriented interpretation learning (“elements” and “didactical questions” based on [51], p. 11, translated), (source: own illustration).

Dimension	Didactical questions	Working steps	Elements of norm-oriented interpretation learning
Ends dimension (content)	What should be learned?	Selection and processing of potential learning content	Didactical content analysis
	Why should it be learned?	Identifying a learning goal and respectively required competencies	Epoch-typical key problems, competencies
Dimensions of the learning paradigm	How is learning designed?	Founding on teaching/learning theory and suitable didactic concepts and principles	Interpretation patterns approach, constructs formulas
Means dimension (method)	Through which approach can it be learned?	Selection of suitable method	Construct methods
Action theory dimension	Which criteria lead to turning knowledge into actions?	Using insights of environmental psychological intervention research and respective didactical interventions	Integrated norm-activation and competency model

4.7. Derived Research Method: “Open-Didactic Exploration”

The underlying theoretical foundation has repercussions not only on the didactic design of education material but also on the overall process of their development. Based on insights of pedagogical psychology and environmental psychology, the method of “open-didactic exploration” (ODE) was developed. Its elements are derived from didactic development research and as follows:

“Open”

- Openness exists in relation to selected content—basically all content of any type can be developed with the ODE method for education materials. The approach and illustration are selected in a discourse with experts, project partners or other target groups depending on the project format;

- The method is principally open in regard to the kind of lesson and communication format with which the content is presented. Construction methods and media that encourage construction are preferred;
- Openness is also reflected in application of results: learning modules and educational materials, media formats (e.g., exhibits, online illustrations, CD-ROM) are realizable. Results can flexibly be linked to topical foci in education, experiments, lessons and/or communication of instructors and learners (modular system).

“Didactic”

- Interpretation of the world is didactically encouraged and supported by applying techniques of didactical analysis. In doing so, the didactic processing of content is built on the foundation of interdisciplinary insights;
- The target group of educational materials is incorporated as early as the start phase of didactical processing—already during selection of content—in order to be able to address different life realities as well as thoughts and behavior patterns.

“Exploration”

- The learner discovers the world for him/herself using constructs that are imposed with interpretation, which can be condensed to form interpretation patterns. These interpretation patterns are the foundation for behavior and in turn behavior patterns. Norms play a central role here. Educational materials incorporate this status by using construction methods and by raising awareness for such constructs. This enables learners to make “second-order observations” (meta-level) and to assess the viability of his/her subjective construct for example within a simulation game. This makes demands on learners and supports the development of competencies;
- Interpretation patterns are individual yet socially shaped. Where possible, different points of access to specific learning content are offered. For example, qualification modules are developed to enable learners to choose their own suitable access point so they can individually discover the learning content (modular system) according to interest and degree of previous knowledge.

ODE is a method for step by step development of education materials. These aim at enabling the learner to creatively discover different aspects of a problem, supporting competency development and encouraging “norm-oriented interpretation learning”. The access point of ODE is integrative and symbiotic [40,41].

Primarily, assumptions of the interpretation patterns’ approach influence the ODE method. Learners are considered experts of their own interests guiding their insights (perspectives). Their interpretations are based on previous experiences (persistence of earlier experiences) and have a social foundation (social mediatedness). Therefore, participatory processes are significant to develop education materials to be relevant for the target group. Not new to didactic development research is cooperation (and linked participation) between researchers as the developers of education material and for example the instructor as participants of trainings and/or the hosts of the training events ([91], pp. 29–32). The

dissemination of innovation in the form of innovative instruction and learning material requires cooperation of scientists and practitioners. Further, a top-down approach should be averted because this would mean disregarding the expertise held by instructors on, e.g., context factors and their influence ([41], p. 89). Gräsel [41] relates this to “symbiotic strategies”, the success of which has been verified (compare [41], p. 90; [92,93]). For example, this strategy is implemented in the form of networks or learning communities consisting of schools or teachers and representatives from science or administrators ([41], p. 91 and p. 96; [94,95])—just like the ODE method intends.

A cooperative strategy considerably improves transfer into different educational sectors (German educational system). Transfer depends primarily on the intensity of cooperation between participating institutions and persons, the kind of innovation climate that can be assumed in the institutions and in how far individual actors are supported in their thematic work [96,97]. Secondly, the faculty needs to have interest and sufficient capacity in the innovation topic [98,99]. Lastly, a collective vision for the governance and evaluation processes is important for successful transfer (compare [100]).

Table 1 gives an overview of how this theoretical foundation and the derived method are represented in a didactic framework. The method consists of four process steps with respective quality criteria. The instruments and methodologies are employed in accordance to specific context and are exemplary. The process steps should not always be regarded as selective and might run parallel to each other as well as in repetitive loops.

5. Conclusions and Outlook

The purpose of the didactic framework, introduced in this article, is to provide suggestions grounded in action-theory on how to design products to be applied in formal education processes (materials, modules, other formats). The framework serves as a precise orientation for typical elements of designing lessons, such as means and ends dimensions of their didactic preparation ([51]; p. 11). However, the framework goes beyond this especially through the foundation of its didactic elements in action-theory.

Looking at the categorization of “practical models”, “category models” and “working models”, suggested by research on development of didactic materials [101], our pedagogical framework to initiate norm-oriented interpretation learning is considered a “working model”. Such working models allow: “scientifically ensured possibilities for practitioners and can be considered as offerings in this sense. They are not yet so clearly defined as to be applicable only in a specific situation or result from the same, but they are also not so abstract that translation to fit a certain situation is impossible or difficult” (translated from [101], p. 79). “Practitioners” (e.g., trainers in the field of vocational education, teachers in the field of primary and secondary or higher education) carry much weight in the ODE method and collaborate closely with researchers, as they know best the needs and skills of their target groups. The ODE method shows a set of basic elements that need to be taken into account when developing learning material. Researchers are less in the role of knowledge creators or providers but are also “participants of a pedagogical designing public” (translated from [101,102]). The term “pedagogical designing public” describes the results of an exchange between all relevant actors, in this case: science, educational institutions, possibly administrations and politics [102].

This approach bears certain challenges that could impair quality criteria of scientific work: Lack of resources (time, staff, money), low motivation of a target group, low predictability of results and evaluation processes as well as effectiveness of the developed products, that may have to be adapted to the specific case. These conditions demand increased attention from researchers, a suitable time and work plan and necessary professional competencies and other skills. Success depends on shared goals and content, creating suitable framework conditions (e.g., structural embedding) and maintaining their own autonomy ([41], p. 99).

Considering the interpretation patterns approach, from a constructivist perspective it follows that individual and social norms are constructs tied to interpretations and in turn are part of interpretation patterns. Accordingly, they can also be addressed through construction methods. Competence development through a suitable method is means and ends within this context, aiming to change interpretation and, thereby, also behavior patterns. The constructivist perspective also clearly emphasizes the limited predictability of learning successes, in this case interpretation learning. Preconditions for this are the learner's ability and willingness to reflect his/her own interpretation patterns (compare [60]). Humans, in principal, are able to test the viability of their thinking and acting and to reconsider the underlying patterns in terms of "usefulness in life" and "future relevance" ([53], p. 77). The vision of sustainability and new challenges associated with it increasingly give reason to do so, as they no longer let existing interpretation patterns appear "viable"/useful (compare [53], p. 111). Interpretation patterns thereby forfeit a part of their "function of potential for justification" (compare [60], p. 72). Besides initiating reflection processes to increase awareness for one's own individual interpretations and interpretation patterns, alternative interpretations can be offered in education materials, that encourage learners to test different kinds of thinking and interpretations (*cf.* [103], p. 157). It is possible that alternative interpretations at first remain in an inactive state following a pedagogical intervention ("sleeper-effect", compare [53], p. 112): "Primarily, one has to imagine education processes in a way that reservoirs (new interpretations of world and self-image) form *next to* conventional knowledge and conservative interpretations. This is not an either-or, but a parallelism (...)" (translated from [103], p. 179, original emphasis). This also means that the evaluation of learning successes and the effectiveness tests of education materials may have limited reach, depending on the format.

Especially, insights on the role of social norms and social mediatedness of some characteristics of interpretation patterns (impact of earlier experiences and collective foundation of patterns, [60]) point to the fact that opening the didactic framework to social science perspectives might be fruitful. Thus, complementing insights from (environmental) psychology, the framework could become even more interdisciplinary.

Looking at the integrated norm-activation and competency model [37,85], the pedagogical goal is to empower learners to act according to their personal norms, even if social norms do not support or contradict such behavior. This idea is based on a pedagogical conception of mankind, in which education is understood as self-enlightenment ([53], p. 7 and p. 77) and in which human responsibility can grow out of the capacity to act rational. Accordingly, reflection and methods for awareness building are an integral part of education, even though they should not be employed in the sense of "convincing pedagogy" ([60], p. 149). Reusser [91] sums up how this is a necessary process that can be long-winded: "Since it is not easy to modify or discard deeply embedded and collectively

internalized convictions, thought routines and social practices, problems and resistance (reaction, defence, conflict, inert knowledge) should be expected. In order to change the “grammar of lessons” at a system level, endurance and a suitable culture of further vocational training is needed” (translated from [91], p. 27). Stemming from the fact, that behavior changes are not only achieved through understanding but also through social pressure or financial incentives [88,104], other intervention possibilities should be considered parallel to education. According to Matthies ([37], pp. 75–76), this includes supporting structural changes to act differently, campaigns for influencing social norms and lowering behavioral costs (e.g., development of public transport, driving is “out”, lowering costs for tickets, see [104,105]). In this context, unconscious processes and routines need to be addressed, that often appear resistant even against one’s better judgment and insight. Addressing routines could for instance be achieved through “experimental action”. Allowing new experiences in doing opens new behavioral possibilities. This is especially the case, when the learner is addressed on an emotional level as well (“Thinking-Feeling-Behaviour program”, [106]. In this sense, running through the cyclical process from action to knowledge and back is significant.

Besides such interventions simultaneous to education, options are yet to be identified that can be integrated or combined with the ODE method. Further developing the approach of collaboration between researcher and practitioner within ODE, concepts such as “user-driven innovation” become interesting [107]. Here, users are part of the production system by experimenting with sustainable products and evaluating them, thereby influencing their development. Everyday behaviors of users are the starting points in order to examine the reasons for non-sustainable or sustainable behavior. Similarly, it is conceivable that perturbations ([108]; [53], p. 23) could be initiated through so called “transformational products” [109]. For example, it was shown that visualizing individual water use during a shower, realized in an appealing design in the form of a “shower calendar”, led to more resource conservation behavior in the test groups [110]. The significance of addressing users’ psychological needs is relevant here: “feeling competent”, “being in control”, “being encouraged to have fun” (compare [5,109]). Looking towards such experimental settings requires an evaluation of how far formal learning contexts in the sense of the ODE method can be combined with informal learning contexts along the lines of, e.g., a “Living Lab” setting.

From the perspective of transition research, the ODE method contributes important suggestions and practical examples on how behavior patterns are formed and how they can be addressed. The method, therefore, contributes to transformative education ([6], p. 399; see [111]). As we have argued above (see Section 4.3 on How to Learn), interpretation patterns are socially mediated in the sense that as patterns they reflect similarly *shared* beliefs in a societal group and can belong to certain *social practices*. All learning processes are situated in the social context of action and, therefore, in the larger theoretical background of ODE we refer to transition theory (see [112]), Giddens’ (1984, see [113]) structuration theory and theories of social practice (see, e.g., [114,115]). These theories describe a fundamental interdependence between individual action and social structures, which both enable and constrain action. At the same time, social structure is not an entity on its own but only exists through (re)production in such situated actions.

Social practices, as a routine kind of action of how everyday activities are performed, according to Shove *et al.* (2012, see [115]) consist of the elements *meaning*, *material* and *competence*. Meaning comprises mental activities, emotions and motivational knowledge. This element is, thus, directly

linked to the idea of interpretation patterns, addressed by the ODE method. The concept of structuration and practice theories (see [112]) therefore offer an attractive link between individual learning processes and the social environment by differentiating between *practice as performance* (individual activities) and *practice as entity* (recognizable, socially shared forms of doing things, see, e.g., [114,115]). At the individual level, elements of practices are represented at the level of individual actors (compare: mental structures addressed by ODE) and at the level of *practice as entity* it becomes clear that these are nevertheless socially constructed in interactive processes.

Linking the idea of social practices to transition analysis (see, e.g., [112,116]), it can be said that shared beliefs and interpretative rules are condensed to form practices aligned with socio-technical regimes, thus, regimes consist of interrelated practices (see [117]). As such, they are not always easily changed by individuals, comprise power relations and show the persistence of regimes—nevertheless, practice theories emphasize the possibility to also act different from existing rules and conceptualize change of practices through action. The ODE concept accordingly addresses and strengthens competencies for every person to advocate their own convictions, also against shared rules or expectations of significant others.

Through changing one element of practice, a change in such practice can occur (see [115]). We assume that changing meaning (e.g., through building resource awareness) is a most relevant way to change practices involving high levels of resource consumption (see [104]) and can be supported bottom-up through educational means like ODE.

Conflicts of Interest

The authors declare no conflict of interest.

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