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## Problem-Based Assignments as a Trigger for Developing Ethical and Reflective Competencies

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# THE INTERDISCIPLINARY JOURNAL OF PROBLEM-BASED LEARNING

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SPECIAL ISSUE ON COMPETENCY ORIENTATION IN PROBLEM-BASED LEARNING

## Problem-Based Assignments as a Trigger for Developing Ethical and Reflective Competencies

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### Abstract

The following research question serves as the starting point of this research and development project: How, in the context of a didactic design, can problem-based assignments trigger learning activities for the development of ethical and reflective competencies in students in economics courses? This paper focuses on the design of problem-based assignments as a trigger for purposeful learning activities, and, based on the literature, summarizes the principles of problem-based assignment design. A case study on the “city economics” topic outlines the implementation of these principles in a specific economics class context. In the context of a design-based research approach, the development and testing of the design are linked to the creation of design principles comprising many situations. In conclusion, the paper presents its preliminary research results.

*Keywords:* design-based research, problem-based learning, economics education, moral development

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### Starting Points

Problem-based learning (PbL) is a concept with many requirements, as well as various theoretical and practical definitions and designs. Although it is mostly understood as a didactic method, certain authors also view it as a curriculum design philosophy. “Problem-based learning is an approach to structuring the curriculum which involves confronting students with problems from practice which provide a stimulus for learning” (Boud and Feletti, 1997, p. 15). The literature does not provide a standard definition of “problem-based” (Savin-Baden, 2000). Bereiter and Scardamalia (2000, p. 185) differentiate between “PBL” (uppercase) and “pbl” (lowercase). “PBL” refers to a close understanding of, and relates directly to, Barrows’s (1986) McMaster model. Its particularly distinguishing feature is a focus on script-like designed realization forms; for example, “the Seven-Step Method” (Müller, 2007, p. 31) or Hmelo-Silver’s (2004, p. 237) learning cycle. With “pbl,” the learning process’s focus follows a problem statement, and the learning steps, which are comparatively vague or unspecified, can thus have a flexible design. In this paper, “PbL” is used as an umbrella term for both types.

Apart from developing professional competencies, PbL can potentially also enhance problem solving and social and personal competencies. Furthermore, the assumption is that PbL triggers higher motivation in students and promotes the transfer of knowledge into practical action, as well as critical and creative thought processes (Müller, 2007, 37f., p. 49). Based on these considerations, there is reason to suggest that PbL can be a suitable concept for promoting ethical and reflective competencies.

A substantial research strand focuses on the question of the influence of individual design variables on PbL’s learning effectiveness (Müller, 2007, 65ff.). Besides a student’s prior knowledge and teacher support, Van Berkel and Schmidt also identify assignment quality as very important for learning success. Assignment design therefore plays a supporting role in developing a high-quality learning process and achieving learning success. Although assignments proved to be a central PbL factor, there are very few empirical findings on the connection between assignment characteristics and learning success (Arts et al., 2002, p. 470). “Research into what makes a problem a good problem should be an area of primary interest to investigators in this field.” (Van Berkel and Schmidt, 2000, p. 241).

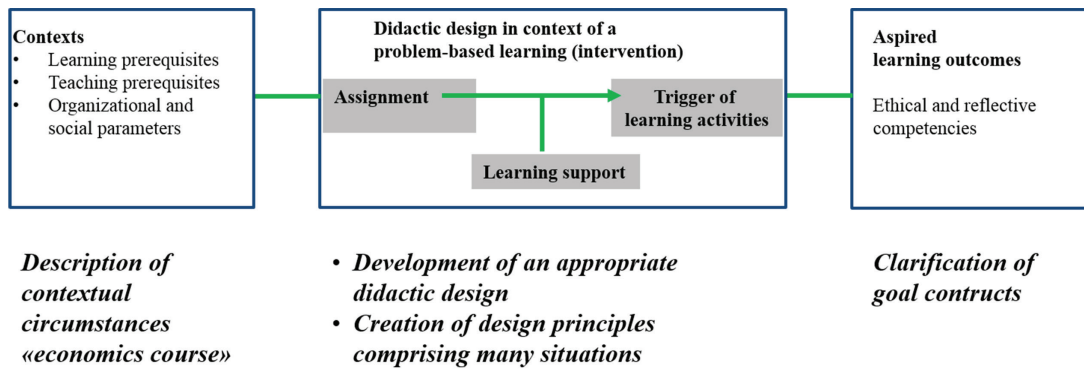


Figure 1. Frame of reference for the analysis and design of problem-based assignments for developing ethical and reflective competencies.

This paper investigates the following central question against this background: How can problem-based assignments in the context of a didactic design trigger learning activities for the development of ethical and reflective competencies in students in economics courses? “Didactic design” is understood in a broad way, i.e., it covers both instructive and exploratory phases of the teaching and learning processes. The frame of reference in Figure 1 outlines the research areas.

The outlined frame of reference clearly shows that assignments substantiate a part of the didactic design. These assignments aim directly at triggering learning activities that contribute to the fulfilling of the aspired learning outcomes. Forms of learning support also complement the triggering of purposeful learning activities. One thus differentiates between personal and material forms, i.e., teacher activities, but also support in the form of media and materials (e.g., textbooks, Internet resources). Contexts consist of the following components: individual contexts—specifically students’ cognitive, social, and motivational prerequisites—as well as teachers’ methodological, cognitive, and affective prerequisites. Further, as contextual circumstances, organizational and social parameters (e.g., the time, space, and social circumstances of an economics class) can affect the development of didactic design. Aspired learning outcomes (here: ethical and reflective competencies), which are defined as more or less precisely formulated competencies, are the reference and destination points of learning. According to this frame of reference, the study explores the following key areas: (1) clarification of goal constructs; (2) description of contextual circumstances; (3) development, testing, and evaluation of problem-based assignments as part of didactic design, and creation of design principles comprising many situations.

This paper is structured as follows:

- Section 2 introduces and explains the methodological research framework of design-based research (DBR).
- Section 3 presents the central principles of problem-based assignment design on the basis of a literature review.
- Section 4 explains the goal constructs, and section 5 describes the contextual circumstances during the testing.
- Section 6 illustrates the principles of designing problem-based assignments, with a specific goal focused on the basis of a case study with a “city economics” topic.
- Section 7 reports on the initial project results, and section 8 concludes with an outline of further research foci.

## Design-Based Research as Methodological Research Framework

This research and development project does not examine the effectiveness of a given didactic intervention with regard to operationalized learning goals. This approach only makes sense if there is a precisely defined didactic objective, as well as a theoretically sound and stable didactic concept for reaching this objective. Neither of the two requirements is fulfilled at the start of this project. Despite numerous research studies, especially on moral education (see Reemtsma-Theis, 1998), the determination of objectives for ethical and reflective actions in economics courses remains unclear, and the issue of effective intervention or appropriate didactic design undefined. Particularly, there was a lack of reliable concepts

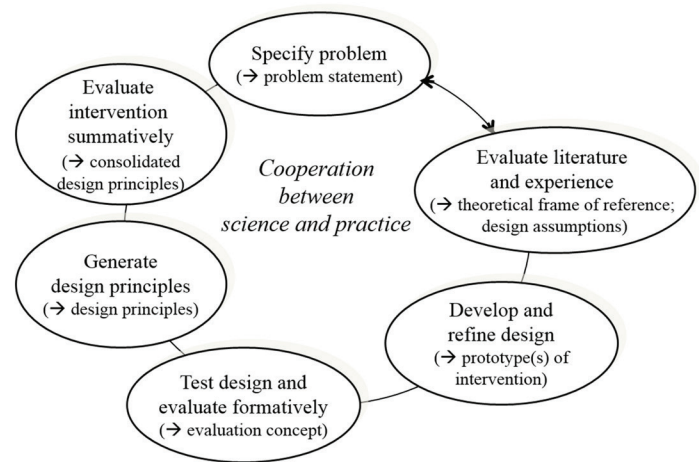
for creating problem-based assignments and developing ethical-reflective competencies. This starting point suggests applying a “design-based research” approach (see Design-Based Research Collective, 2003; McKenney and Reeves, 2012; Euler, 2014).

DBR’s objective is to contribute to the development of “innovative educational environments” (Brown, 1992, p. 141) and simultaneously develop theories with practical relevance. DBR’s premise is not whether an existing intervention is effective, but the manner in which the desirable objective can best be achieved in a given context through an intervention yet to be developed. Consequently, it commences with the search for and identification of significant problems in concrete practical contexts whose solutions demand an innovative approach. In terms of interventions, these solution approaches still need to be developed. The aim is thus to find innovative practical solutions for unsolved problems. Interventions “differ from most educational research, because they do not study what exists; they study what could be” (Schwartz et. al., 2005, 2).

The development of innovative solutions is theory-based; i.e., it is underpinned by available scientific evidence, as well as experienced practitioners’ available everyday theories. More effort is initially spent on theory development to increase the practical relevance and/or the robustness of the intervention before a (if required, comprehensive) theory verification. Experienced practitioners are included in the different phases of the research and developmental process, thereby opening up other approaches to practice research fields, if this is allowed in the context of “distant research.”

On the one hand, DBR strives to achieve concepts or theories that will be useful for current practices. On the other hand, theories are pursued that transcend a learning situation’s application area. DBR does not only pursue an explanation of interventions’ effects in a unique learning environment, but attempts to formulate “prototheories” of learning and/or area-specific theories that fit into a broader context (see also Cobb et al., 2003, 10 et seq.). The theories primarily incorporate design principles tested for a designated application context (see van den Akker, 1999; Reeves, 2006).

The research and development process is realized in iterate cycles of design, testing, analysis, and redesign. Within these cycles, the design is incrementally optimized, and the development processes and principles are simultaneously documented. The interventions should only be summatively evaluated after an advanced refinement, i.e. the development potentials of the interventions should be exhausted before an approach is rejected as lacking usefulness (see Lewis, Perry, and Murata, 2006, p. 8). The following diagram outlines the fundamental application flow of a DBR process, and identifies the targeted results for the individual process phases (Euler,



2014):

Figure 2. Research and development cycles in the design-based research context.

The research question identified in section 1 is the starting point of our research. This study explores the research field of topics chosen for economics courses at Swiss Matura schools, secondary level II, and the principles according to which problem-based assignments should be designed to trigger learning activities that develop ethical and reflective competencies in this target group. As an initial step, this study will evaluate basic theoretical and empirical findings, as well as teachers’ practical experience to record the research-related challenges of the frame of reference. This leads, amongst others, to a clarification of goal constructs and assumptions related to the principles of problem-based assignment design. This also forms the basis for the development, testing, and evaluation of assignment prototypes in concrete teaching contexts of certain chosen topics (here: “city economics”; see iconomix, 2014). The research essentially focuses on the following questions: (1) how do teachers include assignments and apply them in class; (2) to what extent do specific design principles of problem-based assignments trigger intended learning activities. Overall, different assignments are tested and evaluated in different classroom contexts. By comparing these evaluated test activities, we should gain findings on sustainability from many situations, as well as teachers’ application of individual assignment design principles.

## Requirements for a Problem-Based Assignment

This study identifies the central principles of PbL design based on a literature review (Kühner, Euler, and Collenberg, 2016). These design principles should rely on the development of problem-based learning tested for its effectiveness, and changed if necessary. Assignments are understood as “problem-based”

when we cannot find solutions by recalling preceding knowledge, but need to follow original thought processes.

The study evaluated 43 texts in total, of which 15 sources introduced explicit statements on essential PbL principles. These statements consolidate into 12 principles, of which seven have obligatory and five optional characteristics. Obligatory principles are those constituting PbL, and are thus indispensable. Optional principles are those with a strengthening effect that do not necessarily need to exist in every single form of PbL.

The majority of the following principles directly affect assignment design, especially with principles 4, 7, 11, and 12 demanding ongoing planning regarding forms of learning support.

A summary of the obligatory PbL principles follows (the following principles are primarily based on Barrows, 1996; Bransford et al., 2005; Dolmans et al., 2005; Gijbels et al., 2005; Hmelo-Silver & Barrows, 2006; Hmelo-Silver, 2004; Huber & Hader-Popp, 2005; Klausner, 1998; Mandl, 2010; Reusser, 2005; Savery, 2006; Schmidt et al., 2007; Weber, 2004):

Table 1. Obligatory PbL principles.

No.	Obligatory principles of PbL	Explanation
#1	<b>Challenging assignments</b> as starting and reference points of learning	The accomplishment of a challenging assignment constitutes the central reference point of the learning process.
#2	Solving an assignment requires reflection or <b>cognitive activities</b>	The student must activate original thought processes to accomplish the assignment.
#3	Assignments have <b>an appropriate level of complexity</b>	The assignment's structuring and complexity levels correspond with the student's prerequisites.
#4	Assignments enable <b>development of specialized and interdisciplinary competencies</b>	Depending on the learning objective, assignments can remain focused on actual specialized situations, or they can be directed (additionally) toward problem-solving and/or social and personal competencies.
#5	Assignments enable <b>a clear and emotional activating connection with concrete learner experiences</b>	Assignments should be relevant and interesting for students, and provide a bridge between prior experience and authentic real life challenges.
#6	Assignments enable <b>an appropriate level of student-centered education</b>	Depending on context, the accomplishment of an assignment should require a student's highest possible level of self-organization.
#7	Accomplishment of an assignment requires <b>an appropriate level of teacher support</b>	Teacher support is necessary, depending on the existing learning prerequisites. Support can relate to learning processes and outcomes. Support should contribute to a student not grappling with the problem superficially.

A summary of the five optional PbL principles follows:

Table 2. Optional PbL principles.

No.	Optional principles of PbL	Explanation
#8	An assignment invites students to represent <b>positions and arguments</b>	The substantiation of a possible solution is paramount, especially for assignments without a clear correct solution.
#9	An assignment enables <b>multiple perspectives</b> on situations and problem-solving approaches	An assignment enables different views of situations, for example, from the perspective of different actors, disciplines, or theories.
#10	An assignment has a <b>narrative anchor with realistic situational contexts</b>	The acquisition and application of knowledge are understood as situation- and context-relevant. This explains the embedding of knowledge in narratives or situational contexts with reference to reality.
#11	Working on an assignment enables <b>communication and collaboration</b> between learners	The openness of assignment solving suggests an exchange with, or embedding in a collaborative learning process. Certain authors even go as far as explaining embeddedness in group work as an obligatory principle.
#12	Working on an assignment enables the <b>use of digital media</b>	Complex assignments are often abstract, and an exchange within groups can be difficult to realize organizationally. Digital media can, for example, introduce actual situations better, make information resources available, or facilitate exchanges via social networks.

## Clarification of Goal Constructs

Clarification of the goal construct of “ethical and reflective competency” follows in a second theoretical foundation step. Following Euler and Hahn (2014), this competency is divided into knowledge, skills, and attitude dimensions, and, based on the literature, put in concrete terms with the following key activities (see Kühner and Euler, 2016):

On this basis, specific points of reference can be determined for the design of problem-based assignments:

- Value clarification: Assignments support the identification and clarification of values or attitudes that underlie the actions of certain actors.
- Assessing the consequences of value-based decisions: Assignments force the analysis of the potential consequences of an economic action or decision for certain actors.

Table 3. Components of ethical and reflective competencies.

Knowledge	Skills	Attitude
Recognizing and describing values as a basis for decisions and actions regarding an actual economic situation. Assessing the consequences of a personal stance.	Introducing and defending personal values and attitudes in discussions, as well as resolving and clarifying value conflicts in economic issues.	Developing an attitude toward actual economic situations, taking a stance on value issues, and making value-based decisions with regard to economic issues.

- Identification of and reflection on value alternatives: Assignments lead to the identification of alternative actions and reflection on underlying values.
- Making decisions about value-based actions: Assignments encourage decision-making concerning particular value conflict situations.
- Explaining the consequences of decisions: Assignments lead to explanations of the consequences for the concerned persons and thereby substantiate individual decisions.

## Description of Contextual Circumstances

Within the subject context “city economics,” the study developed three didactic designs with the following focus areas: site selection, urban sprawl, and segregation. The study developed problem-based assignments for each focus area and has, to date, tested it twice (the spring of 2015 and 2016) with eight teachers in a total of 14 classes of the secondary level II (gymnasium, canton school, vocational school). In the first focus area, we used an internet-based application that makes city economic connections visible. The development of ethical-reflective competencies is specifically addressed in the context of the second focus area (urban sprawl).

Data on the learning and teaching prerequisites were collected prior to and during the design testing.

**Learning prerequisites:** Tests were conducted in seven different advanced Matura classes (2–4 years) with various specializations (music or modern languages, amongst others). In three of the seven classes, a vocational baccalaureate is the goal. Accordingly, the students’ ages varied from 16 to 26 years. Class sizes varied from 16 to 25 learners.

The students have no specific prior knowledge of the main topic, “city economics.” The topic, nevertheless, is based on basic economic knowledge of price formation or market mechanisms, and therefore students in higher classes have appropriate prior knowledge. The students are familiar with PCs, Internet, and relevant applications.

According to the teachers, the students have very little experience with problem-based assignments. They are, however, accustomed to using written material independently to answer questions or acquire information about new topics. The students have partial difficulty with open-ended questions and expect model solutions. The students are able to have specialized discussions based on structured knowledge, but they seldom reflect critically on the content. They have no experience of discussing values and attitudes. Overall, the performance level is very heterogeneous. The students know the assignment’s chosen situational context, London, and, in principle, find it attractive.

**Teaching prerequisites:** As a rule, teachers are not familiar with the new components of didactic design (topic “city economics”; developing ethical and reflective competencies). It is also assumed that teachers are not experienced moderators of discussions on value issues. Against this background and in addition to the assignments, they also receive suggestions for possible solutions, and a detailed teaching concept as the foundation of their teaching structure. This, along with further references to background material, provides them with suggestions for the thematic deepening and the backgrounds of the learning goals, timelines, and methodological options. In addition to the problem-based assignments, they receive practice exercises, specialized texts on the content, as well as a knowledge test.

## Exemplary Implementation of a Problem-Based Assignment

The design principles of problem-based assignments as outlined in section 3 must be developed in the context of the described contextual circumstances (section 5) in such a manner that they advance the fulfillment of aspired learning outcomes (section 4). Subsequently, the design of a problem-based assignment will, as an example, be outlined for the “urban sprawl” thematic focus area.

The introduction of Nadine, a newly employed young woman looking for an apartment in London, serves as the narrative anchor (PbL-principle #10). There, she will encounter various problems. All problem situations relate to the realistic current context of the city of London (e.g., authentic rental fees, green belt, congestion charge; #10). In the thematic focus area, “urban sprawl,” Nadine encounters the issue of the development of London’s green belts (#1).

The structure of the assignment is such that it initially activates prior knowledge about London, as well as experience of city planning issues (#5). All subsequently required information is made available: In addition to the information sheet on city economic connections, the students receive, for example, a “value set” for the analysis of reasoning (see below). In principle, they are able to complete the assignments on their own (#6). Support from a teacher might be necessary, depending on the learning prerequisites (#7): A description of the terms defining the value positions and attitudes is potentially useful, especially with new topics. Support with the discussion processes during a pro-con debate (#8) is potentially useful.

A subtask addresses the explicit goal constructs of ethical and reflective competencies and follows later in a detailed introduction. A broadened narrative anchor will facilitate the assignment’s introduction (#1):

*In the course of further apartment viewings, the development of green belts keeps on bothering Nadine. "What is the chance of excavators moving in soon?" she wants to know from the landlady, who replies, "This has been a contentious issue for years. Only yesterday a demonstration was held here for the protection of the green belt. The motivation was the ground-breaking for a housing project at the edge of the green belt. The police even had to intervene, because some demonstrators abused the construction manager verbally. – If you ask me, it will still be a longish debate!"*

*Assignment 2a. Place yourself in the position of the demonstrators and note their arguments for or against the development of the green belt in the table below. Subsequently, reconstruct a peaceful discussion between the supporters and the opponents.*

Figure 3. Assignment "Green belt."

This assignment requires cognitive activities (#2) from the students and matches assumptions about them regarding its structuring and complexity levels (#3). This requires them to represent positions and arguments (#8). In addition to the search for arguments, a first assessment of the consequences is done here (goal facets of ethical and reflective competencies in the knowledge dimension, see section 4). Based on their available knowledge of economic consequences, but also by placing themselves in the situation of the concerned parties, the students acquire arguments for various interest groups. Accordingly, the arguments not only result from specialized knowledge, but also from exploring the interests of the concerned groups, like the residents, environmentalists, etc. (#9). The discussion of the arguments and the simulation of a demonstration address specialized goals (knowledge of the consequences for the model parameters), as well as interdisciplinary goals (#4): The discussion of various perspectives, as well as role adoption in the simulated situation, has, for example, the potential to develop empathy and social competencies (#11). Role-playing can specifically address the skills dimensions of the ethical and reflective competencies.

A better structure for reasoning and an approach toward focused reflection demand another task: namely, dividing the students according to their values and arguments (#2). For this form of value declaration (an ethical and reflective goal in the value dimension), the students have access to support to clarify the difference for them. In addition to the example, a "value set" and a table are available for the systematic capturing of the findings (#7). Figure 4 shows a table with suggested solutions in blue text.

This discussion forms the starting point for a further assignment in which the individual students have to decide

for or against the development of the green belt. This demands an explicit decision (#2) and thus, as an interdisciplinary competency, also addresses the students' ability to judge (#4). This assignment corresponds to the ethical and reflective competency attitude dimension identified in section 4.

## Results of the First Test Cycle

The outlined assignment is part of a comprehensive project that explores the initially identified central question: How can problem-based assignments in the context of a didactic design trigger learning activities for the development of ethical and reflective competencies in students in economics courses? In the DBR context, evaluation of didactic design occurs in various phases and with various focus points (McKenney and Reeves, 2012, 136ff.) While the design's internal structure (consistency and feasibility, amongst others) is initially tested during an alpha phase, testing in a manageable context is the focus during the beta phase. The subsequent gamma phase focuses on the exploration of the design efficiency and effectiveness in terms of the aspired goals.

Two evaluation phases have been conducted to date. The assignments outlined in section 6 were tested in six classes with four teachers and a total of 150 students. The evaluation method consisted of participatory observations during the lessons, interviews with teachers, interviews with student focus groups, and an analysis of the student's written answers to the assignments. The evaluation, therefore, focuses on the following questions: (1) How do teachers implement the assignments and apply them in class? (2) Which learning activities do the principles introduced in the problem-based assignments trigger?

### Implementation by the Teachers

The implementation is set up to allow teachers to decide on the embeddedness of the assignment, as well as on the use of additional material. On the one hand, this procedure enables adaptation to a specific classroom context, but, on the other hand, risks only a partial implementation of the design principles and the intrinsic potential not being fully exhausted. This is especially true in those areas that are new and unfamiliar to the teachers.

The evaluation alludes to both aspects of the implementation. The tests thus showed that teachers adjust individual (parts of) assignments to fit the local context, or enrich them creatively with personal ideas and experiences. In contrast, other assignment parts or principles were, contrary to their intentions, not incorporated. The problem statement is thus, for example, partially not used as a frame of reference for a learning activity, but rather as an illustration of a compiled



Assignment 2b. At the previously mentioned demonstration, a reporter interviews one of the demonstrators: “Why do you fight for the preservation of the green belt?”—“Because the green area needs to be conserved for the animal and plant world.” One demonstrator adds: “Respecting nature has huge meaning for the future! The animal and plant worlds are an important element of our ecosystem.”

This case shows that a concrete argument against the development of the green belt (here: conserving the green area for the animal and plant worlds) can be associated with a central value (here: respect for nature). Such arguments and values are represented by different interest groups (here: environmentalists). The following table displays a collection of values:

“value set”				
Social values	Personal values	Economic values	Ecologic values	Aesthetic values
Respect Tolerance Justice/fairness Responsibility/caring	Dignity Health/recreation Freedom Security	Profit Performance Utility Growth Value creation	Sustainability Respect Diversity	Beauty Harmony Balance

Which moral concept forms the basis of the arguments of certain interest groups who fight for the development, or the conservation, of the green belt? Record, with reference to the “value set,” the underlying moral concepts in assignment 2a’s open table column.

Arguments for the development ( = contra green belt)	Underlying moral concepts	Arguments against the development ( = pro green belt)	Underlying moral concepts
<i>Example: City’s residents: Developing the green belt would make additional attractive living space close to the center possible. This would decrease the pressure on rental prices in the center. Apartments in the center would become more affordable. Residents would be able to afford bigger apartments. All residents would thus benefit more.</i>	<i>Example: Economic values: utility Social values: fairness or justice Personal values: freedom</i>	<i>Example: City’s residents: If London’s green belt(s) were to be developed, the population’s recreation space would disappear.</i>	<i>Example: Personal values: health, recreation</i>

Figure 4. Assignment “value clarification.”

subject structure. A pro-con reasoning is not introduced in relation to a problem, but as a knowledge structure or “model solution” in the course. Teachers further report difficulties with guiding ethical discussions that are often reduced to cognitive aspects and only occur superficially. To a certain extent it becomes clear that teachers only partially realize the student-centered approach intended in the design and instead fall back on the classical teacher-centered environment, especially during unfamiliar teaching phases.

### Statements on the Triggers of Learning Activities

As expected, the students did not express themselves uniformly, but one can nevertheless gain stable indications from

the diverse forms of examination. In the first tests, the assignments outlined in section 6 are evaluated as understandable, rather challenging, but only moderately motivational.

Certain principles are critically reviewed. According to the evaluation, certain assignments are only moderately challenging, especially when the problem context is not a point of reference for the learning process, but is used to illustrate the theory (#1). In such cases, limited cognitive activities occur regarding the comprehension of the conveyed theories (#2) and the topic seems too uncomplicated (#3). Furthermore, the students’ analyzed written answers often show that the processing depth of individual assignments remains limited. Many learners find a discussion of ethical questions

difficult, especially when these are not reduced to a cognitive dimension (#4). While some find the relation to the “apartment search in London” context clear and motivational, it has no relation to others’ reference world and they therefore find it abstract (#5). In addition, there were partial reports of monotonous tuition when a methodical approach was repeated too often. The teacher’s behavior, although often perceived as controlling, is, however, not negatively evaluated in this context (#6).

An overarching finding refers to the general approach on how PbL is introduced by the teacher and correspondingly perceived by the students. Given that the students are often used to follow a teacher-centered type of learning, PbL requires them to deal with challenging, complex problems and means a different type of learning. In addition, students may be accustomed to follow a deductive line of reasoning, treating problems not as a trigger for aligning the learning process but as an illustration for better understanding abstract models or theories. Therefore, it seems to be of major importance to guide the students into this comparatively new experience of teaching and learning.

## Interim Conclusion and Further Research Foci

The findings from the first two test and evaluation cycles show that the potential of problem-based assignments only unfolded to a certain extent. To some extent, this confirms the notion of an “under-controlled learning process,” which was pointed out by Müller as a result of his study in a different implementation context: “The students do not study the compiled learning content at all, or only in a very limited manner, and thereby, cognitive processes . . . remain superficial” (Müller, 2007, p. 266; own translation). Currently, it remains an open question whether the limited triggers of learning activity are due to irrelevance of the relevant principles for the learning process, the characteristics and realization of the relevant principles, or to the teachers’ implementation of the assignment in the classroom. Before rejecting a principle for the design of a problem-based assignment, one must first test how teachers can adjust and modify the implementation of relevant assignments.

The tests contain many suggestions for the adjustment of an assignment. It is specifically necessary to decide whether the relationship with the aspired learning objectives remains intact despite the adjustments, and whether the design mainly covers the learning requirements.

In future testing phases, two focus points are in the foreground:

- During development, in addition to the adjustment of assignments, the focus is on the following question: How can the assignments’ potentials be better realized through teachers’ learning support?

- When the gamma phase of the evaluation is reached, not only the application but also the effect of the principles is prominently in the foreground. This puts the following questions in focus: Which learning activities result from the application of specific principles? To what extent are the facets of ethical and reflective competencies addressed or achieved?

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