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ABSTRACT

Innovative teaching concepts such as problem-based learning (PBL) can make a difference in an academic setting, particularly when dealing with diversity, and support the successful completion of students’ studies. Introducing new approaches to teaching requires the professionalization of the teaching staff and the development of new tools. As a view from the field, this contribution describes the steps taken at TH Köln - University of Applied Sciences to introduce PBL and discusses empirical and practical aspects of a university-wide implementation. It offers lessons learned from the practical application of PBL theories in a real-life setting.

Keywords: problem based learning, learning university, educational mission, teaching and learning culture

Problem-Based Learning at a “Learning University”¹: a view from the field

Innovative teaching concepts such as problem-based learning (PBL) can make a difference in an academic setting, particularly when dealing with diversity, and support the successful completion of students’ studies. Introducing new approaches to teaching requires the professionalization of the teaching staff and the development of new tools. Higher education institutions need to ask themselves: Which competences do academic teachers² need to support students in their learning process? Which changes in professional practice does PBL demand? How can programs and modules be created and further developed to promote high-quality teaching at all levels? Is PBL an equally useful teach-

ing and learning concept for all disciplines and contexts? Based on findings that confirm a robust positive effect of PBL on the skills of students (e.g., Dochy et al., 2003), initially TH Köln introduced university-wide educational measures that focused on developing the individual teaching competences of the academic teachers in PBL and other teaching approaches such as project-oriented learning (POL) and inquiry-based learning (IBL). This approach was subsequently revised through regular monitoring activities, as it became clear that successful teaching should be understood not (only) as an individual achievement at course level, but also as part of a collective achievement of the university’s faculty body in study programs and curricula. The adapted approach has become an integral part of the teaching and learning culture of the university.

This paper is to be understood as a report from the field and describes the steps taken at TH Köln to introduce PBL among other teaching concepts. It discusses empirical and practical aspects driving its implementation in a real-life setting and tries to shed light on the question of whether the consequent practical application of learning approaches like PBL support the learning process of students with diverse educational backgrounds. It intends to kindle a much-needed discussion surrounding the practical application of

¹ The concept of a “learning university” was coined in the process of introducing innovative teaching at TH Köln. A “learning university” takes the perspective of the students into consideration, in order to continuously work towards excellent teaching. It has to be willing to adapt to new societal missions and a constantly changing student body (Heuchemer & Szczyrba, 2011).

² Such as professors, lecturers, and all other staff involved in academic teaching. For the sake of brevity, they will be referred to as academic teachers / academic staff in this paper.

PBL theories. The experience at TH Köln shows that the shift from teaching to learning (Brown & Atkins, 1990) is a central prerequisite for change.

The article is structured into five sections. The first section examines the connection between PBL and the teaching and learning cultures at universities. The second section describes the development of an innovative institutional teaching strategy at TH Köln, driving it towards excellence in teaching. Section 3 describes the steps taken at TH Köln to implement this new teaching strategy. The changes that resulted in the teaching and learning culture at TH Köln are illustrated in section 4 with two case studies from the field: (1) a module that changed from a mass lecture to a PBL course, and (2) an analysis of the written teaching portfolios by newly appointed professors at TH Köln, which describe their experiences with PBL in their own teaching practice after their first year. Section 5 analyzes the findings and experiences made at TH Köln and describes the lessons learned that may serve as best practice for other universities.

PBL and its influence on universities’ teaching and learning cultures

Klegeris and Hurren (2011), Capon and Kuhn (2004), Bilgin et al. (2015) as well as Ghufuron and Ermawati (2018) all conclude that PBL not only conveys knowledge, but simultaneously develops transfer and problem-solving skills. According to Scholkmann (2016), PBL is among the best-known teaching concepts that places human experience at the center of learning³. In this context, the complexity due in higher education learning is based on three dimensions (Scholkmann, 2016, p. 7):

- with respect to time, by linking the learning situation to previous knowledge or the learner’s own experiences,
- with respect to inter- or transdisciplinary concepts, by describing a problem that involves several disciplines, and
- with respect to naturalism, by selecting a dilemmatic phenomenon for which there is no simple technical or morally unambiguous solution.

These three dimensions influence teaching and learning at different levels. They may, therefore, impact the design of teaching concepts. At the micro level, academic teachers

³ Other such forms of teaching, according to Scholkmann, include project-oriented learning and inquiry-based learning—both of which are also being implemented at TH Köln (see chapter 4.2).

can employ individual measures to link the content of their respective courses to the students’ previous knowledge, assign interdisciplinary tasks, and enrich these with dilemmas (e.g., Hagen, 2014). At the meso level, the departments can commit to project- or problem-based learning as an expression of their expertise or their community of practice (see, for example, civil engineering in Junge, 2006). At the macro level, a university can—as is the case described here—favor and broadly facilitate teaching approaches such as PBL by coordinating its teaching strategy, study program criteria, and indicators, making innovative teaching approaches feasible and plausible.

One of PBL’s targets is to strengthen the students’ personal responsibility. This makes the acquisition of knowledge more sustainable and improves the students’ communicative and social skills. The academic teachers support the students by coaching and facilitating teamwork, creative problem solving, and other PBL-related strategies set in situations that resemble those typical of their future professional field. This allows students to successfully develop relevant competences for their future professional lives. To that effect, the professors often function as role models for their students in their respective discipline or field (Szczyrba & Wiemer, 2011). In addition to learning through problem-solving, observing their teachers apply their knowledge and competence in simulated situations instead of passively listening to a monological lecture offers the students an excellent opportunity to witness and understand underlying processes and to subsequently apply the gained knowledge themselves. Hence, the relationship to their academic teachers influences the students’ learning significantly (Szczyrba, 2009).

The macro level: developing an innovative institutional teaching strategy

TH Köln offers a diverse spectrum of disciplines, with more than 90 bachelor and master courses that span from the applied natural sciences to the social sciences. At the same time, it should be noted that the heterogeneity of students at universities in North Rhine-Westphalia (NRW) is higher than the national German average. Universities in NRW are therefore called upon to embrace diversity in educational biography, migration background, and culture of both of its academic teaching staff and students. Study programs and courses at higher education institutions in NRW must take diversity into account when choosing the right approach to teaching.

TH Köln’s educational mission is to prepare its students to be successful and responsible professionals in a dynamic and globalized world (employability), while also enabling them to

take an active part in shaping a free and open society (global citizenship). Therefore, in addition to providing scientific and professional qualifications, the study programs aim to promote the competences of its students in communication and critical thinking in interdisciplinary and intercultural contexts in order for them to fulfill their roles as responsible global citizens. This goal is driven by the ambition to facilitate the transfer of knowledge and scientific expertise into society. The qualifications that are thus provided by TH Köln’s study programs are based on the academic concept of competence as formulated by the German Rector’s Conference (HRK) in its communication on competence orientation in study and teaching (Schaper, 2012). Accordingly, graduates of TH Köln⁴:

- have extensive specialized knowledge, which enables them to work scientifically and act responsibly in their professional contexts;
- demonstrate high levels of competence and are able to identify, formulate, critically question, solve, and communicate problems employing scientific methods, even in novel, complex situations;
- reflect upon and address social challenges;
- develop contributions to future challenges in their areas of expertise and help shape social innovation;
- organize projects independently;
- communicate and work in a constructive manner across disciplinary boundaries;
- are tolerant and open-minded; and
- are prepared for their role in a globalized society by having benefited from an international approach to research and teaching.

Based on these conditions, TH Köln has developed an approach to “Excellent Teaching” in concert with the faculty and student body since 2009. Academic teachers work on an understanding of teaching and learning on par with their students (Szczyrba & Heuchemer, 2017) and encourage them to engage and participate in the further development of the study programs.

4 Strategic guidelines for Teaching and Studies of TH Köln: www.th-koeln.de/mam/downloads/deutsch/hochschule/profil/lehre/strategische_leitlinien_zu_lehre_und_studium.pdf

The mission statement on “Excellent Teaching”, originally formulated in the Higher Education Development Plan 2030,⁵ is further elaborated in TH Köln’s “Strategic Guidelines for Teaching and Studies.”⁶ These guidelines comprise three elements:

1. The teaching strategy of TH Köln: The teaching strategy is the underlying institutional concept for teaching and studying at the university. It delineates the curricular design of study programs and their respective teaching, learning, and evaluation requirements. As mentioned above, it was elaborated through a university-wide dialogue.
2. The criteria applicable to all study programs within TH Köln⁷: They outline the concept of “Excellent Teaching” cultivated at TH Köln and sharpen the teaching profile of the university. At the same time, these criteria help faculties to (further) develop their study programs.
3. An Academic Balanced Scorecard (ASC) related to the teaching strategy: The ASC covers the diverse possibilities of implementation of the teaching strategy and connects them via a network of indicators and target values. In this way, the ASC enables a holistic view of the implementation of the teaching strategy at TH Köln and helps derive adequate refinement measures.

The micro level: implementing PBL in a traditional teaching environment

In 2012—in the framework of a university-wide study course structure reform—project-based teaching began being promoted at TH Köln through the project “ProfiL² – projects for inspired teaching and learning.”⁸ The term “projects” in the name of the initiative refers to the hypothesis that learning approaches such as PBL and IBL can be implemented through project-based courses in a targeted and flexible manner, depending on the respective disciplines or study programs and their previous affinity for these forms

5 www.th-koeln.de/mam/downloads/deutsch/hochschule/profil/hochschulentwicklungswillungsplan2030.pdf

6 see footnote 4

7 Employability, global citizenship, competence orientation, science, diversity, internationalization, digitalization, democratization, interdisciplinarity, transfer

8 ProfiL² was funded through the Framework of the Joint Program of the Federal Government and the Länder for better study conditions and more quality in teaching until 2016.

of learning. The successful use of projects in teaching that contain elements of both PBL and IBL has been shown, for example, in engineering (Hagen, 2014; Schreiner & Tiltmann, 2015).

As part of the university’s new teaching strategy, and in accordance with Scholkmann (see chapter 1; Scholkmann, 2016), the university integrated real problems from (major) societal challenges into its learning approach. This means that students learn through the engagement with projects that deal with real-world problems and discuss scenarios that mirror situations that they will likely face in their future professional lives. In addition to arousing the students’ curiosity and interest, this approach teaches them to be skeptical of quick solutions, trains their decision-making skills, and stimulates sustainable learning processes. By means of crisis simulation (Oevermann, 2005), the students develop ideas on how to transfer their (own) insights and (self-developed) products into practice with the aim of improving them. In this way, students develop a scientific habitus that extends beyond their student years into their role as productive and engaged members of society. Through targeted counselling and open-learning approaches, the individual differences between students can be harnessed as tools to foster personal and team-oriented learning processes. PBL challenges the students to not only employ their favorite strategies for learning, but to move beyond and familiarize themselves with other possible approaches to learning.

As the academic staff’s knowledge about innovative teaching approaches increased, they recognized on the one hand how much these teaching methods can help to successfully integrate all the students—no matter their educational background—and unleash the potential of their diversity. On the other hand, they realized that the institutional structures (examination regulations, schedules, and teaching council regulations) were not conducive to innovative teaching concepts such as PBL. Neither time flexibility in the distribution of workloads per semester nor the merging of different disciplinary courses into one interdisciplinary module are self-evident in a traditional teaching context. A broad adaption of new teaching concepts is thus not feasible on short notice as long as formal structures still need to be adapted at the institution. The much higher time commitment and increasing supervision efforts that PBL entails need to be taken into consideration if academic teachers are to be motivated to engage with this teaching method.

In retrospect, the ProfIL² project has brought about the following structures and measures at TH Köln:

- All BA study programs are given a project-based structure, providing students with a glimpse of the reality of their future vocational fields. This can arouse

curiosity and interest among students right from the start and lead to sustainable learning processes (Demirel & Dagyar, 2016; Klegeris & Hurren, 2011; Ruiz-Gallardo et al., 2010).

- Within the framework of PBL and IBL concepts, students independently develop transferable knowledge and, in this context, develop subject-specific learning and working strategies. They grasp the boundaries of their respective subjects and can thus contribute to interdisciplinary contexts (Klegeris & Hurren, 2011; Capon & Kuhn, 2004; Bilgin et al., 2015; Ghuftron & Ermawati, 2018).

- The academic teaching staff integrate counselling services into everyday campus life and tailor them to different student and learning needs.

- Further education in university teaching for all academic teaching staff includes the implementation of PBL and IBL in project-based courses, focusing particularly on counselling and support for the highly heterogeneous student body. This strengthens the role of academic teachers as facilitators, who give the active and largely independent students more space—in harmony with the PBL approach.

An important factor for the success of the ProfIL² project and the implementation of PBL at TH Köln is the Center for Academic Development (CAD), which highly influences the teaching and learning culture of TH Köln. Financed initially through a program for teaching excellence,⁹ the CAD was set up in 2010. The center carries out educational research and offers workshops, support for teaching projects, networking opportunities, and a coaching program for newly appointed professors at TH Köln. The participation in the latter became obligatory in 2012 and has since been an integral part of TH Köln. It comprises workshops, individual coaching, and peer-to-peer classroom visits, as well as the composition of a written teaching portfolio—all of this with the support of the CAD’s educational development experts. The coaching program facilitates student-centered teaching as a practiced, learning-related approach to diversity, enabling a variety of learning paths and allowing academic teachers to initiate such paths that support students in their competence development (Kreber, 2014). One of the main starting points of the coaching program is that—to a large extent—the aforementioned diversity of the students at TH Köln cannot be

⁹ TH Köln was awarded a grant in the program “Excellent Teaching” funded by the Stifterverband and the Standing Conference of the Ministers of Education and Cultural Affairs of the German federal Länder in 2010.

considered in conventional course formats such as lectures due to limited opportunities for interaction (Szczyrba, van Treeck, & Gerber, 2012).

Figure 1 summarizes TH Köln’s most important activities that have significantly improved teaching at TH Köln and introduced PBL.

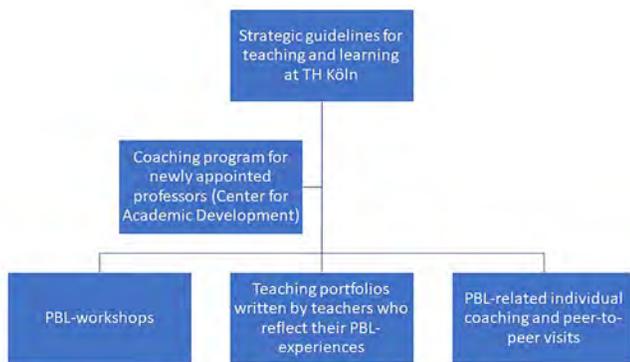


Figure 1: Measures implemented at TH Köln to introduce PBL

Case studies at TH Köln

In what follows, two case studies are discussed that demonstrate how PBL can find its way into the learning and teaching culture at a university.

Case study 1 – Advantages of PBL over mass lectures

Large mass lectures are typically an integral part of higher education teaching curricula. Frontal instruction makes it difficult to take into account the three dimensions of PBL and related learning approaches according to Scholkmann (see above). Nevertheless, there are academic teachers who have successfully adapted their teaching practices by applying teaching and learning concepts like PBL, drawing inspiration from coaching and information offered by the university as well as from the university’s structural reform of its study programs towards a more project-friendly approach. In the case study described below, a module was transformed from a mass lecture to a PBL course, driven particularly by the desire to foster intensive and advanced interactions with students.

Until the winter semester 2012-13, a mass lecture was held for first-semester students in a technical subject at TH Köln. Each semester, approximately 100 students enrolled in the course, which was divided into three parts: Lecture – Exercise – Practical Work. Although the professor was particularly keen on promoting active participation of students, this seemed possible only to a very limited extent, especially

during lectures. At the same time, the learning success of the students was moderate, with a failure rate of 45% to 65% in the written examination. As the examination results showed, most of the students did not exceed the cognitive taxonomy level 1 (knowledge) according to Bloom (1972). In order to enable the students to reach higher taxonomy levels, the lecturer turned to the CAD experts for help. Closely advised by the experts, he revised his teaching concept based on Reis’ thesis, which postulates that advanced performance by the students can be achieved through social inclusion and transparent performance goals (Reis, 2011). To this end, the lecturer divided the students into eleven groups of 8-9 students and applied a teaching approach that combined PBL with the jigsaw method.¹⁰ As a consequence, the failure rate was reduced to a mere 10%; the average grade rose significantly, from 4.4 to 3.3 (1 being the highest grade and 5 the lowest). Taxonomy levels increased from 1-2 to 3.¹¹

The student evaluation of the PBL module (31 completed forms) showed that students appreciated the fact that points were awarded for group work and that lectures and internships counted towards their overall assessment (27 entries). A good learning atmosphere (openness, friendliness, encouragement, feedback) as well as the teacher’s accessibility and commitment were also rated positively (18 to 19 entries). The group’s size was mostly regarded as conducive to learning (17 entries).

Negative ratings mentioned a rather low level of knowledge transfer and shortcomings in organization and procedures (17 and 15 entries). Eighteen students saw no improvement through PBL compared to conventional lectures for the problem-based learning setting. These students felt that time (contact time and self-study) was not used effectively.

Open-ended questions yielded responses such as “lectures are necessary for basic knowledge,” “bad lectures—I have learned nothing,” “PBL is bad,” or “the classical way of lecturing would make more sense.” These students blamed the teacher because they were not able to learn appropriately. These results can prompt the interpretation that students would learn more effectively if they were simply being provided content instead of engaging in their own research. However, as argued by Biggs and Tang (2011), learning

10 The Jigsaw method is a form of collaborative learning developed and tested by the American social psychologist E. Aronson in 1978 (for more detailed information see: Aronson et al., 1978). This method is intended to improve the cohesion and the results of a learning group by intertwining three pedagogical principles: cooperation, interdependence, and learning through teaching.

11 The professor went on to publish an article describing his experiences in this case study (Hagen, 2014) and was awarded a prize for excellent teaching by the TH Köln (https://www.th-koeln.de/hochschule/gute-lehre-herausragend-umgesetzt---zwei-lehrkonzepte-erhalten-den-lehrpreis-der-fachhochschule-koeln-2014_11265.php).

progress depends on the students’ activity, no matter how challenging or ineffective the students themselves perceive the teaching concept to be. While the numbers show that the method is successful, it seems that some students have not yet adapted to PBL group work and still favor lecture formats (Hagen & Szczyrba, 2016). Klegeris and Hurren (2011) were also able to determine the positive results of PBL in lectures with large numbers of students.

Case study 2 – PBL in teaching portfolios

Institutions of higher education are capable of innovation particularly through their newly appointed professors (Heiner, 2012). Hence, through the obligatory coaching program at TH Köln described above, the teaching, consulting, and examination activities of the (still new) academic staff are reflected upon, revised, or changed. The composition of a written teaching portfolio, in which professors describe their experiences with PBL in their own teaching practice after their first year, plays an important role in this process.

New professors usually have a very high level of well-structured expert knowledge in their field; however, most of them lag behind when it comes to academic teaching competences because they have typically not yet acquired sufficient experience in higher education teaching, nor received training in this area before being appointed (Heiner, 2012). The coaching program therefore addresses individual and institutional prerequisites for the work as an academic teacher, defines teaching-related objectives, and translates them into an action plan for individual academic teachers to develop teaching competences based on state-of-the-art research from the field of academic teaching. Through their participation in the coaching program, the newly appointed professors are made aware of the challenges in higher education teaching in general and at their new university in particular.

The teaching portfolio is an integral tool in the context of the coaching program. It allows the new professors to explore and scrutinize their own thoughts about conception, planning, implementation of teaching, and methodological decisions with regard to PBL and/or other teaching/learning concepts. Ghufuron and Ermawrati (2018) and Ruiz-Gallardo et al. (2010) have found that conception, planning, and structuring is an important part of a successful implementation of PBL. The Center of Academic Development carefully accompanies the process of producing each teaching portfolio and subsequently analyzes it.¹² Within the framework of the coaching program, eighty teaching portfolios completed between September 2012 and February 2019 were analyzed and categorized as based on either POL, PBL, or IBL using the MAXQDA software (see table 1).

Category	No. of teaching portfolios	Notable outcomes
POL implemented	45	Strong need of students for guidelines and support; students voluntarily invested additional time & energy
IBL implemented	21	Very positive feedback of the students
PBL implemented	11	Ideal for ensuring in-depth learning
No evidence of POL, IBL, or PBL	14	n/a

Table 1: Analysis of n=80 teaching portfolios of newly appointed professors from 9/2012-2/2019

Forty-five teaching portfolios—representing the majority of the newly appointed professors—showed that project-oriented learning (POL) was integrated into the teaching approach. The professors noticed a strong need among the students for more detailed guidelines regarding the exact steps to be taken in the project and time management, for milestones, and short supervision intervals. POL was positively evaluated; the professors reported that some students voluntarily invested additional time and energy to expand and improve their projects. Since the projects were close to real-life situations, they were influenced by the rapidly changing needs in our society. This allowed the students to develop novel methods that offered new solutions (e.g., Völler, 2020). Students, on the other hand, were reportedly concerned that the projects they were tasked within the course were too large and demanding. A major hurdle seems to have been that they had to wait until the end of the project to resolve uncertainties and ask questions.

Twenty-one professors—the second largest group—applied inquiry-based learning (IBL) in their teaching. They reported that their students applied typical scientific methods such as the development of (research) questions and criteria for qualitative research as well as data collection and

¹² The findings of this analysis are detailed in Gerber (2018).

evaluation procedures. The students provided very positive feedback and reported that they learned how to shed light on practical challenges by developing scientific questions.

Eleven professors applied forms of PBL as a teaching method, representing the smallest group among all collected samples. In their teaching portfolios, these professors described problem-oriented tasks that guided students in identifying problems, based on a previously defined procedure. The students then had to briefly present their results. The teaching portfolios also described independently selected project tasks that were carried out in the spirit of problem-oriented learning. Credit points were awarded for project-relevant team-building measures, outlining and naming the project task, as well as for the implementation and documentation. In this, individual academic teachers drew from their own experience with problem-oriented structuring of courses. PBL was reported as being ideal for competence-oriented teaching and well-suited for ensuring in-depth learning. As concerns the impact of this type of teaching approach, the professors stated that in the specific teaching situation where problem-based teaching and learning was employed, the concept of teaching went beyond mere knowledge or information transfer. Instead, the focus was more on developing student competences by referring to concrete problems and situations.

Analysis and lessons learned

As is to be expected, traditional forms of teaching and examination regulations cannot be changed overnight (Szczyrba, van Treeck, & Heuchemer, 2012). Consistent changes in the teaching approaches, such as the transition from the traditional mass lecture to PBL in small groups, appear to only gradually find their way into the institution’s everyday life. Similarly, the opportunity to benefit from the coaching by the team of the Center for Academic Development and the associated changes in learning behavior and examination are still met with hesitation. Ghufron and Ermawati (2018) note that the workload of academic teachers in PBL modules is significantly higher. Designing a single PBL module may require academic teachers to spend up to 60 working days on development and documentation, as well as on coaching by an educational development expert. In the same context, students—despite showing increased motivation and activity as well as an associated sense of achievement—also face challenges with regard to time management, as they are simultaneously required to deliver high-level performances in other modules.

Nevertheless, important steps have been taken at TH Köln. The experiences gathered show that it is essential to develop balanced and complex study programs that support learning. In the context of the new university-wide macro-level strategy for “Excellent Teaching,” the case studies concentrated on changes on the micro level (individual academic teachers and teaching portfolios). While both the micro and macro levels are important, the meso level (curriculum development) is where the most crucial changes in the learning and teaching culture have to take place. The academic teachers of each discipline collectively need to take ownership of the approach of “Excellent Teaching” in order to make sustainable change possible. Accordingly, the Center for Academic Development has been offering curriculum workshops since 2016.

Figure 2 shows the measures on the micro and macro levels and the meso level that connects individual and institutional goals.

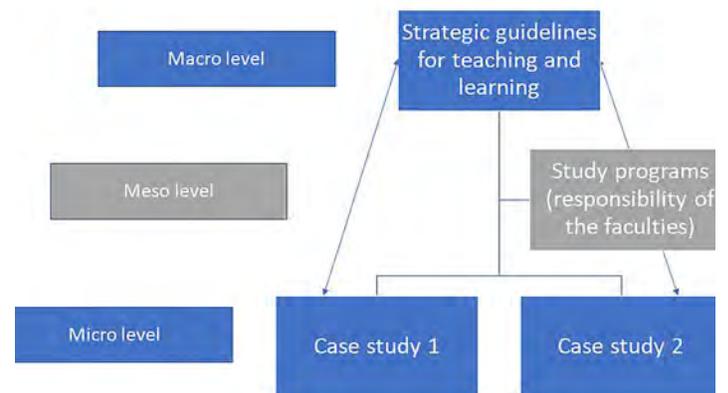


Figure 2: Different levels of implementation of PBL at TH Köln

Curriculum development must be carried out along analytical and conceptual lines and within a team of academic teachers, program managers, and other stakeholders involved (Schaper, 2012). In this, the university management plays a central role in the sustainable initiation of competence-oriented teaching and learning concepts such as PBL, in close cooperation with the faculties. The university management as a strategic decision-maker and facilitator must provide suitable structures in order for teaching concepts such as PBL not to be hindered by the existing formal framework, such as examination and teaching council regulations. Another important driver for a successful implementation of PBL in higher education seems to be a designated coordinating body at the university. At TH Köln, all the different elements and activities presented in this paper are directly

linked to the Center for Academic Development as a catalyst of the change in the university’s teaching strategy and new educational demands related to it.

Finally, it is crucial to involve all stakeholders in the development of a teaching strategy, since a purely top-down approach is likely to fail or not be taken up. In the case of TH Köln, a university-wide dialogue was launched to discuss and define the role the university should assume as a teaching institution. As a result, the concerned parties agreed upon a series of interdisciplinary teaching guidelines promoting teaching approaches that place human experience at the center of learning. Notably, the coaching program for academic teachers new to TH Köln as part of the teaching strategy contributed to this process, as it familiarizes academic teachers with the PBL approach and made them aware of the opportunities and advantages of this method, like the improved interaction between teacher and students.

Conclusions – A university that keeps on learning

The shift in perspective from teaching to learning is a central element of change if student-centered teaching is to be established in a sustainable way and made compatible with existing conditions (Mansbrügge & Wildt, 2010). This transformation needs to be achieved with the help of an institutional teaching strategy (macro level), in individual teaching performances (micro level), but most importantly among teaching staff collectively (meso level). The university-wide implementation of teaching concepts such as PBL is an expression of the efficiency of the university system and speaks to flexibility of TH Köln and, most importantly, to its willingness to learn and improve based on the experiences of its academic teaching staff and students.

In summary, if teaching concepts such as PBL and the associated credits, types of exams, and module sizes remain the responsibility of individual teachers, the desired university-wide change in teaching will not be achieved. Students will perceive PBL modules as “islands” in their overall study courses and will not base their study strategies on them. The university can only achieve its institutional goal of competency-based higher education if all courses of the different disciplines are systematically incorporated into the respective curricula. These curricula need to follow overall strategic guidelines for teaching and need to be co-designed by all academic teachers involved in the respective study program while also integrating students’ views. Examinations and credits must be aligned with these new curricula.

In 2017, TH Köln was awarded the Genius-Loci prize¹³ for its efforts to provide adequate freedom for teaching innovations and their interdisciplinary educational guidelines that are normatively binding for all academic teaching staff. There is still much to be learned, but today, good teaching enjoys a high status at TH Köln and remains the subject of a lively discussion. Learning approaches like PBL—alongside other related learning approaches—require more efforts from all those involved, but students and teachers can come to appreciate that these are certainly worthwhile.

References

- Aronson, E., Stephan, C., Sikes, J., Blaney, N., & Snapp, M. (1978). *The jigsaw classroom*. CA Sage Publication.
- Biggs, J., & Tang, C. (2011). *Teaching for quality learning at University* (4th ed.). Oxford University Press.
- Bilgin, I., Karakuyu, Y., & Ay, Y. (2015). The effects of project based learning on undergraduate students’ achievement and self-efficacy beliefs towards science teaching. *Eurasia Journal of Mathematics, Science & Technology Education*, 11(3), 469–477.
- Bloom, B. S. (Ed.). (1972). *Taxonomie von Lernzielen im kognitiven Bereich*. Beltz.
- Brown, G., & Atkins, M. (1990). *Effective teaching in higher education*. Routledge.
- Capon, N., & Kuhn, D. (2004). What’s so good about problem-based learning? *Cognition and Instruction*, 22(1), 61–79.
- Demirel, M., & Dagyar, M. (2016). Effects of problem-based learning on attitude: A metaanalysis study. *Eurasia Journal of Mathematics, Science & Technology Education*, 12(8), 2115–2137.
- Dochy, F., Segers, M., Van de Bossche, P., & Gijbels, D. (2003). Effects of problem-based learning: A meta-analysis. *Learning and Instruction*, 13(5), 533–568.
- Gerber, J. (2018). Lehrportfolios als Gegenstand hochschuldidaktischer Forschung. In B. Szczyrba & N. Schaper (Eds.), *Forschungsformate zur evidenzbasierten Fundierung hochschuldidaktischen Handelns* (pp. 201–212). https://cos.bibl.th-koeln.de/frontdoor/deliver/index/docId/675/file/FIHB_Band_1.pdf
- Ghufron, M. A., & Ermawati, S. (2018). The strengths and weaknesses of cooperative learning and problembased learning in EFL writing class: Teachers and students’ perspectives. *International Journal of Instruction*, 11(4), 657–672.
- Hagen, M. (2014). Willkommen in der Werkstofftechnik! Problembasiertes Lernen (PBL) im Fach Werkstofftechnik mit Erstsemestern. In B. Berendt, A. Fleischmann, N.

- Schaper, B. Szczyrba & J. Wildt (Eds.), Neues Handbuch Hochschullehre (C 1.7). DUZ Medienhaus.
- Hagen, M., & Szczyrba, B. (2016). Werkstofftechnik für Erstsemester im PBL-Design - konsequent kompetenzorientiert. ZFHE, 11(3), 123–137. <https://zfhe.at/index.php/zfhe/article/view/900>
- Heiner, M. (2012). Referenzpunkte für die Modellierung der Kompetenzentwicklung in der Lehre – Impulse für die hochschuldidaktische Weiterbildung. In R. Egger, & M. Merkt (Eds.), Lernwelt Universität. Entwicklung von Lehrkompetenz in der Hochschullehre (pp. 167-192). Springer VS.
- Heuchemer, S., & Szczyrba, B. (2011). Studierendenorientierte Lehre – Von der lehrenden zur lernenden Hochschule. In W. Benz, J. Kohler & K. Landfried (Eds.), Handbuch Qualität in Studium und Lehre (E 2.6). DUZ Medienhaus.
- Junge, H. (2006). Best Practice: Das Projektbüro. Innovative Lehre im Bauingenieurwesen. In B. Berendt, A. Fleischmann, N. Schaper, B. Szczyrba & J. Wildt (Eds.), Neues Handbuch Hochschullehre (E 4.1). DUZ Medienhaus.
- Klegeris, A., & Hurren, H. (2011). Impact of problem-based learning in a large classroom setting: Student perception and problem-solving skills. *Advances in Physiology Education*, 35(4), 408–415.
- Kreber, C. (2014). Reviving the ancient virtues in the scholarship of teaching, with a slight critical twist. *Higher Education Research & Development*, 34(3), 568–580. <http://dx.doi.org/10.1080/07294360.2014.973384>
- Mansbrügge, A., & Wildt, J. (2010). LehreN: "Impuls zur wissenschaftlichen Lehre" – ein innovatives Weiterbildungsformat. ZFHE, 5(4), 233–250. <https://zfhe.at/index.php/zfhe/article/view/28>
- Oevermann, U. (2005). Wissenschaft als Beruf. Die Professionalisierung wissenschaftlichen Handelns und die gegenwärtige Universitätsentwicklung. *Die Hochschule: Journal für Wissenschaft und Bildung*, 14(1), 15–51. https://www.hof.uni-halle.de/journal/texte/05_1/Oevermann_Wissenschaft_als_Beruf.pdf
- Reis, O. (2011). Sinn und Umsetzung der Kompetenzorientierung. Lehre 'von hinten' denken. In P. Becker (Eds.), Studienreform in der Theologie. Eine Bestandsaufnahme (pp. 108–127). LIT.
- Ruiz-Gallardo, J.R., Castano, S. Gomez-Alday, J. J., & Valdés, A. (2010). Assessing student workload in Problem Based Learning: Relationships among teaching method, student workload and achievement. A case study in Natural Sciences. *Teaching and Teacher Education*, 27(3), 619–627.
- Schaper, N. (2012). Fachgutachten zur Kompetenzorientierung in Studium und Lehre. Hochschulrektorenkonferenz. http://www.hrk-nexus.de/fileadmin/redaktion/hrk-nexus/07-Downloads/07-02-Publikationen/fachgutachten_kompetenzorientierung.pdf
- Scholkmann, A. (2016). Forschend-entdeckendes Lernen: (Wieder-)Entdeckung eines didaktischen Prinzips. In B. Berendt, A. Fleischmann, N. Schaper, B. Szczyrba & J. Wildt (Eds.), Neues Handbuch Hochschullehre (A 3.17). DUZ Medienhaus.
- Schreiner, A., & Tiltmann, T. (2015). IXtrinsisch – Lernen im Gegenstromverfahren. In B. Berendt, A. Fleischmann, N. Schaper, B. Szczyrba & J. Wildt (Eds.), Neues Handbuch Hochschullehre (E 4.8). DUZ Medienhaus.
- Szczyrba, B. (2009). "Das Auge kann sich selbst nicht sehen." Selbstevaluation mit dem Lehrportfolio. In A. Richter & M. Lent (Eds.), Qualitätsentwicklung in Studium und Lehre. (pp. 158–169). wbv.
- Szczyrba, B., & Heuchemer, S. (2017). Educational Diversity – ein gutes Studium braucht Augenhöhe. *RdJB – Recht der Jugend und des Bildungswesens*, 1, 54–59.
- Szczyrba, B., van Treeck, T., & Gerber, J. (2012). Lehr- und lernrelevante Diversität an der Fachhochschule Köln. https://epb.bibl.th-koeln.de/frontdoor/deliver/index/docId/616/file/Forschungsbericht_Educational+Diversity_inklAnh%c3%a4nge.pdf
- Szczyrba, B., van Treeck, T., & Heuchemer, S. (2012). Forschungsstrategien im Change Management: Hochschulische Selbstbeobachtung im Wandel von Studium und Lehre. In B. Berendt, A. Fleischmann, N. Schaper, B. Szczyrba, & J. Wildt (Eds.), Neues Handbuch Hochschullehre (I 4.3). DUZ Medienhaus.
- Szczyrba, B., & Wiemer, M. (2011). Lehrinnovationen durch doppelten Perspektivwechsel. Fachkulturell tradierte Lehrpraktiken und Hochschuldidaktik im Kontakt. In I. Jahnke & J. Wildt (Eds.), Fachbezogene und fachübergreifende Hochschuldidaktik (pp. 101–110). wbv.
- Völler, M. (2020). Nachhaltiges kompetenzorientiertes Lernen und positive Emotionalität in der Projektwoche „Internationale Märkte“ am iwvKöln. In Y.-B. Böhler, S. Heuchemer, & B. Szczyrba (Eds.), Hochschuldidaktik erforscht wissenschaftliche Perspektiven auf Lehren und Lernen. Profilbildung und Wertefragen in der Hochschulentwicklung IV. (pp. 103–123). https://cos.bibl.th-koeln.de/frontdoor/deliver/index/docId/828/file/FIHB_Band_5.pdf

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