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Competence Profiles for Problem Based Learning (PBL)

Guide for Students for Preparing a PBL Competence Profile

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Publication date:
2021

Document Version
Publisher's PDF, also known as Version of record

[Link to publication from Aalborg University](#)

Citation for published version (APA):

Holgaard, J. E., & Kolmos, A. (2021). *Competence Profiles for Problem Based Learning (PBL): Guide for Students for Preparing a PBL Competence Profile*. Aalborg Centre for Problem Based Learning in Engineering, Science and Sustainability under the auspices of UNESCO.

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COMPETENCE PROFILES FOR PROBLEM BASED LEARNING (PBL)

GUIDE FOR STUDENTS FOR PREPARING A PBL COMPETENCE PROFILE

Jette Egelund Holgaard & Anette Kolmos



United Nations
Educational, Scientific and
Cultural Organization



AALBORG UNIVERSITY

Aalborg Centre for Problem Based Learning
in Engineering Science and Sustainability
under the auspices of UNESCO

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ISBN 978-87-93541-29-0

2021 Online Publication

Aalborg Centre for
Problem Based Learning
in Engineering Science and Sustainability
under the auspices of UNESCO

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PREFACE

During the spring of 2021, students at the Technical Faculty of IT and Design and the Faculty of Engineering, AAU are asked to prepare a PBL competence profile in their final period of study. For students who have been in the systematic PBL environment of Aalborg University, this seems at first glance to be rather easy. Every student has been introduced to PBL and gained experience with PBL processes through different projects. However, competences are closely related to practice, and experiences of practice have a strong tacit dimension—we do not experience through conceptual frameworks, we experience through our senses. However, by combining the two – theory and practice – we gain the possibility of making our competences explicit; for ourselves, for teammates, and not least for future employers.

At the Aalborg Centre for Problem Based Learning in Engineering Science and Sustainability under the auspices of UNESCO, we have prepared this guide to support students in the first part of this process. Although your PBL profile is not created specifically for external use, the intention is that it can help you by highlighting appropriate phrases for future job applications, your CV, pitches preparing for job interviews, and not least for presenting yourself in a real-life teamwork setting. In order to make use of your PBL profile in a real-life setting, we collaborate with AAU-Carrier.

This guide is intended to be an introduction for you, as you prepare to create a PBL competence profile. If you are a student at Aalborg University and it is obligatory for you to make a PBL competence profile, you will be additionally supported by a workshop, where together with peers, you can qualify your work with a competence clarification and profile. If you need a to brush up on PBL at the conceptual level, you might consult our PBL overview at ucpbl.net, which among the online resources includes five short videos concerning PBL mind-setting. The videos are on problem design; project design; open problem solving, and process analysis of PBL tracks together with lecture notes (Holgaard & Kolmos, 2021).

We would like to thank the vice-deans at the Faculty of Engineering and Sciences and at the Faculty of IT and Design for their support in this process, as well as the heads of studies at both faculties for their valuable input. Furthermore, we would like to thank our colleagues at the Aalborg Centre for Problem Based Learning for their ongoing contributions. Last but not least, we would like to thank Maiken Winther for making the very first PBL competence profile based on this material and for providing valuable feedback.

We hope that you as a student will find the material helpful in making your PBL competence profile!

Aalborg, February 2021
Jette Egelund Holgaard
Anette Kolmos



1. INTRODUCTION

Studies of PBL progression at Aalborg University (Holgaard & Kolmos, 2019) have shown that after their first term, students find it difficult to conceptualise and articulate their PBL competences.

You might ask why conceptualisation is important at all. In our view, it is important because PBL competences are the generic competences which bring your disciplinary competences into play in a real-life setting. You do not only need to know, you also have to situate your knowledge and apply it to real-life problems. In a PBL environment this is a part of the study and it is recognised that along with generic competences, the synergy of theory and practice in learning is important to increase your employability as a student. In the same way that you need theories, methods, and reflection on your disciplinary subject matters, you likewise need theories, methods, and systematic reflections in relation to your generic PBL competences. In short, the conceptualisation of PBL thereby allows **conscious** and **qualified development** of individual PBL competences.

Furthermore, articulation of PBL competences promotes **visibility** and **synergy** in professional collaborative relationships. If you cannot explain what your competences are in terms of teamwork, it is hard to point to blind spots for further development or highlight your potential to develop others. Likewise, it is difficult to point to optimal team collaborations, if there is no awareness of how the people in the team match in terms of comple-

mentary competences. Finally, yet importantly, how can you convincingly argue for your strength in terms of generic competences in a job interview, if you have a hard time putting the outcome of your PBL experiences into words?

Competence profiles can supplement a CV and provide a richer expression of your competences, highlighting personal strengths and making you prepared to elaborate on your PBL competences by having a clear frame of reference that exemplify your experiences (what you have done) and your competences based on that (what you can do in a professional way). In short, **a PBL competence profile is a presentation of personal strengths when approaching and solving real-life problems.** It highlights competences for working and cooperating in a structured and reflective way when addressing new problems (challenges as well as opportunities). And it all begins with a reflection on one's own experiences with PBL in practice.

This guide has been created to support you, as a student, in **developing your PBL competence profile.** The following sections are designed to support you in:

1. knowing what to look for by introducing you to four competence areas of PBL;
2. clarifying your competences in relation to the four PBL competences areas including a
 - a. brief elaboration of the type of competence
 - b. facilitating questions—what are my skills in this area?
 - c. Examples—what could be highlighted/exemplified;
3. moving from a clarification of competences to a competence profile. Which competences are central to what I want and who I am?
4. Documenting your PBL competence profile: how can I communicate my PBL competences in brief.



2. PBL COMPETENCES IN FOUR AREAS

At Aalborg University, intended learning outcomes (ILOs) to develop PBL competences are integrated in all curricula with the intention to cover four types of PBL competences: problem-oriented, interpersonal, structural, and reflective competences. Although this distinction between the different types of PBL competences are made for an analytical purpose, in real-life, the competences are highly intertwined. However, when analysing real-life experiences, the type of competences makes the analysis more structured as you can use different lenses to look at our PBL experiences depending on the type of relation you are focussing on. In short, when you want to explore your

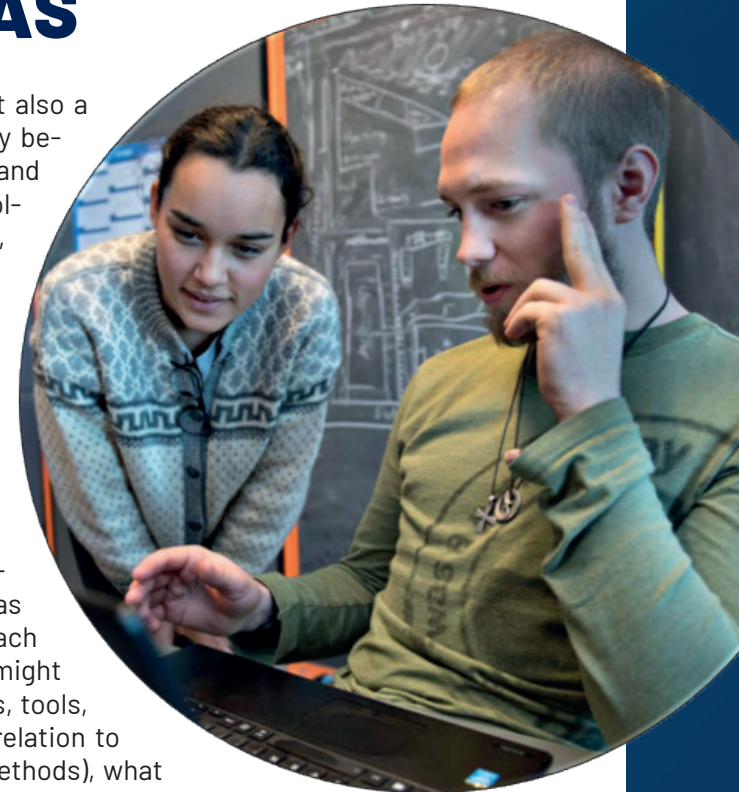
- **Problem-oriented competences**—you should focus on how you approach problems in your PBL practice
- **Structural competences**—you should focus on how you interact with tools and methods to organise your problem-based work
- **Interpersonal competences**—you should focus on how you interact with others when carrying out problem-based working
- **Reflective competences**—you should focus on how you develop your ability to learn by reflective practice

We need all these competences in PBL as problems are always the starting point for the learning process, and as real-life problems are typically so complex we can hardly cope alone without having some kind of structural mechanism to deal with the multi-directional and iterative problem-solving processes. Furthermore, reflective competences are needed to articulate and transfer experiences with the problem based learning process to handle new and comparable situations in an even more qualified way. To work professionally and to develop each of these competences, frames of reference like theories, conceptual frameworks, models, as well as prior experiences help us. Therefore, an overview of PBL competences is not only a combination of diverse competences related to the four different

PBL competence areas, but also a visualisation of the interplay between theories, methods, and practice. Even if PBL is a collaborative way of working, each individual should be aware of their own contributions to the team and competences.

When working with the four areas of competences, you might be inspired by the **overview of PBL aspects** related to the different PBL competence areas presented in Figure 1. For each of these PBL aspects you might ask yourself: what concepts, tools, and methods do I know in relation to this aspect (theories and methods), what have I experienced in my study in relation to this aspect (practice) and how do these two relate to each other? The next question is what is the outcome for me as a person? What have I learnt, and which competences have I gained from this learning process?

These are the overall questions, which can guide you in clarifying your PBL competences. In the following section, we will elaborate on these questions by presenting sub-questions and examples related to each of the competence areas to facilitate you further in this process.



PBL-aspects

12 aspects related to reflective competences:

1. Personal learning objectives
2. Intended learning outcomes (formal)
3. Learning style
4. Resilience
5. Motivation
6. Self-efficacy
7. PBL principles
8. Individual learning theory
9. Social learning theory
10. Process analysis
11. Competence profile
12. Personal learning paths

12 aspects related to problem oriented competences:

1. Problem types
2. Problem identification
3. Problem analysis
4. Problem formulation
5. Problem solving
6. Creativity
7. User involvement
8. Cultural contexts
9. Sustainability
10. Ethics
11. Technology assessment
12. Scenario planning solving

12 aspects related to interpersonal competences:

1. Teambuilding
2. Team culture
3. Team roles
4. Team collaboration
5. Communication-strategies
6. Conflict management
7. Active listening
8. Constructive feedback
9. Decision making processes
10. Diffusion of project results
11. Professional codes of conduct
12. Collaboration with supervisors and external partners

12 aspects related to structural competences:

1. Distributed project management
2. Situational project management
3. Agile management systems
4. Setting objectives
5. Managing time- and activities
6. Delegation of work
7. Collaboration agreements
8. Types of meetings
9. Managing meetings
10. Information gathering structures
11. Knowledge exchange structures
12. Diffusion of project results

Figure 1: PBL aspects related to each of the four PBL competences (Holgaard & Kolmos, 2020)

3. CLARIFYING PBL COMPETENCES

For each of the four PBL competence areas, please find below an outline to explain in short the kind of experiences that each of the areas relates to, thus facilitating questions to further prompt identification of your competences in the particular area as well as examples of how competences can be described.

Please recall that the idea with the use of competence areas is to get as many of your PBL competences 'out in the open'. When summarising you list of PBL competences, getting the categorisation of the competences right is not important.

3.1 Problem-oriented competences

Problem-oriented competences relate to your experiences with identifying, analysing, formulating, and solving genuine problems in an exemplary manner.

Please find below some facilitating questions to clarify your problem-oriented competences:

- What types of problems have you worked with in problem-based project work (concrete/abstract, practical/theoretical, stable/dynamic, etc.)?
- How have you worked with problem solving (specialised/distributed, sequential/iterative, operational/entrepreneurial, etc.)?
- Are your competences primarily gained by working on one type of problem (which one, provide examples) or are your skills broadly suitable for several different problem types (provide examples of the variation)?
- What are your strengths in terms of identifying and analysing a problem, and what have your contributions been in this process?
- How do you think your way of approaching and working with problems will empower you in your future working life?

EXAMPLES OF DESCRIBED

PROBLEM-ORIENTED COMPETENCES

In my studies at AAU, I have worked with different problem types, which have given me competences in problem solving at the component level (e.g. the dimensioning of a turbine blade), product level (e.g. the construction of a gas fired steam superheater), and system level (the simulation and optimisation of resource flows in geothermal energy plants).

I have competences within stakeholder analysis and preparation of business cases in order to establish a nuanced and value-focused understanding of a problem area. This experience has primarily been acquired through projects focussing on the implementation of IT systems in smaller organisations.

I have experience with participatory methods for design and problem solving. For example, I have co-organised creativity workshops with external participants to support them in generating ideas and designing more sustainable products.

3.2 Structural competences

Structural competences relate to your experiences with organising and managing problem-based work—project organisation is central here.

Please find below some facilitating questions to clarify your structural competences:

- How have you organised project work in the teams which you have been a part of?
- What tools, including digital ones, have you used to plan your project work? What competences did you gain from working with these tools?
- Have different problem types prompted different project designs? If so, what competences has this given you in terms of conceptualising your project design?
- What has been your role in project management in the teams you have been in, and what competences has this given you?
 - What experiences has your project work given you in terms of the project manager role, and how will you transfer these experiences to further projects?



EXAMPLES OF DESCRIBED

STRUCTURAL COMPETENCES

In my project work at AAU, I have gained competences in aligning the project organisation to the type and scope of the problem addressed, as well as the project participants. I have experience with project management both in and between groups. As part of my company-oriented course, I also gained insight into the complexity of project management in major international and highly interdisciplinary projects. I therefore have the competence to establish and interact in various project designs.

I have experience with agile management systems, primarily SCRUM, where I have competences in taking on leading roles (SCRUM Master/Product Owner). These competences make me capable of appropriating agile tools as well as a platform for being part of larger project organisations (as framed by e.g. SAFe).

In my project work at AAU, I have acted as project coordinator for several projects, with responsibility for chairing meetings and handling team communication. In connection with this function, I gained the skills to bring digital tools into play, including First Agenda, Trello, and Microsoft's Gantt Chart Software.

3.3 Interpersonal competences

Interpersonal competences relate to your experiences with collaborating in problem-based work. This includes both the relationships between group members (internal relations) and other partners (external relations).

Please find below some facilitating questions to clarify your interpersonal competences:

- What competences have the initiating phases of the projects given you in relation to establishing and defining your team (team building, establishing a team culture, team roles etc.)?
- Think about your experiences with communication and collaboration in your project work. What competences has this collaboration given you in terms of working in teams, across teams, and with external partners?
- Which competences have you gained in working with people from different backgrounds, for instance different disciplines, professions, cultures and which intercultural competences have you gained from this?
- What has been your primary role in team collaboration?
 - Think about your collaboration with external parties during your studies. What competences has this given you when interacting with, and perhaps even being part of, another organisation? How will this affect your skills in future business-to-business relations?



EXAMPLES OF DESCRIBED

INTERPERSONAL COMPETENCES

In my project work, I have worked closely with a group of people for a long period of time, which has made me resilient in relation to internal conflicts. I have gained competences of staying in the conflict, in seeing the conflict as a potential for improvement, being able to separate intention from action, and not least being able to give and receive constructive criticism. I have also gained competences in analysing, mediating, and following up on conflicts. In my approach to conflict management, I fundamentally build on the theoretical position of 'appreciative inquiry'.

As part of my project work, I have worked to develop teams over several terms and with several different academic starting points, just as I have been part of interdisciplinary and multicultural teams. This has given me the competences to collaborate broadly in an organisation across organisational and cultural boundaries.

From my studies, I have experience with several different forms of communication in the dissemination of a problem-oriented project, including pitches, oral presentations, video broadcasting, contributions to scientific articles, contributions to the public debate, and preparation of reports and process analyses—all targetted at different actors. I therefore have a broad set of competences within professional communication, which also allows me to contribute to the design of communication strategies and communication planning.

3.4 Reflective competences

Reflective competences relate to your experiences of reflecting professionally on the learning process itself. This involves reflecting on your own experiences and how these experiences can be analysed and transferred to future learning processes.

Please find below some facilitating questions to clarify your reflective competences:

- Think about your experiences of the preparation of a process analysis. Which concepts/sets of concepts were brought into play to analyse problem design, open problem solving, project design, collaboration, and learning? What competences have you gained in this concern which have optimised your own learning as well as organisational learning?
- Have you incorporated reflection on learning styles into your work to balance your own learning style as well as to make a synergy from learning styles in teams? What competences has this given you?
- What competences have you gained from using different reflective approaches to reveal opportunities for change?
- How have you worked to develop your problem-based competences through your studies (e.g. personal learning goals, strategies, use of theory and method, experiments, evaluations, new goals), and what competences has this given you to facilitate your own and others' competence development?
- What competences do you have in transferring learning outcomes from one situation to another, and do you expect to use these competences in your future educational and professional practice?

EXAMPLES OF DESCRIBED **REFLECTIVE COMPETENCES**

Throughout my studies, I have been involved in preparing several written process analyses which, on an analytical basis and by use of recognised methods, point to possible development opportunities and goals for a team. With this in mind, I have reflected on my own role in the group. This has given me the competence to set learning goals at both the group and individual level.

Through my studies, I have built up the competence to capture and communicate my own learning as well as collaborative learning processes. A selection of highlights including videos and podcasts showing reflection on learning processes in different stages of my study as well as demonstrating progression in my learning process can be found via the following link.

Throughout my studies, I have worked in a problem-based way with the development of my groups' organisational learning skills. Based on Nancy Dixon's theory of organisational learning, I have helped to organise experimental processes to create the integration of knowledge and to increase the focus on collective interpretation processes for coordinated action. This has given me the competences needed to develop organisational learning in teams.

4. COMPETENCE PROFILING

When developing the list of clarified PBL competences, based on section 4, into a PBL Competence profile, the point is to narrow your competences down to those that are central to who YOU are and what YOU want to do. In this process, we suggest that you look at your list and highlight competences from at least five different views, related to conceptual frameworks, practices, performances, preferences, and professional development.

Practice view. In the practise view, you ask: where do I have most experience? Having a large amount of experience is not only about how long or how hard you have worked on a specific activity, it is also about whether you have used your experiences to deal with different situations. For example, a method used in a real-life setting, for instance while working for a company, might bring you to a higher level of experience than if you have used this method continuously within the confines of the university. So the level of experience has both a quantitative and qualitative dimension that is worth reflecting on.

Conceptual view. By using a conceptual lens, you ask: which competences are highly grounded in theory and methods? Knowing about theories and methods means that you have a more generalised frame of reference that can help you when transferring experience gained in one situation to another. It also means that you have a chance to reflect on future practices in a more qualified way and have a broader and more abstract solution space to navigate in, when needed. For example, by knowing different models for project management, you have a broader solution space to combine and even elaborate on project management frameworks in order to design more tailor-made solutions.

Performance view. From a performance perspective, you ask: what do I do best? The performance view adds talent to the picture. Talent is a natural ability that enables you to do something more easily than others and even better compared to externally defined standards. For example, you might be able to point to an activity where you have worked hard to improve, even though it is still difficult for you to accomplish a task to an average level. And on the other hand, you might be able to point to an activity that you caught up on relatively quickly; and even without putting that much effort in you turned out a rather successful piece of work that was above average. In the same way we all have experiences, we all have talents, and these also need to be taken into consideration in profiling your strengths.

Preference view. In the preference view, you ask: what do I like the most? Even the highest degree of conceptual knowledge, experience, and talent will not be exploited to the fullest, if there is a lack of motivation. Preferences are measured, for example, in the learning style test. Such tests do not really state anything about what you are good at, what you have most experience with, or what you are knowledgeable about. They state something about what you would prefer, when placed in a given situation. Preferences do not mean that we should state them and wait for compliance from outside. Preferences mean that we should be aware of competences (typical structural competences) to obtain balance. For example, you might prefer working alone at least a part of the day, and therefore your competence in coordinating and handing over to the team becomes evident.

Development view. Finally, yet importantly, you can ask: how does my list of competences match with who I want to be, professionally speaking? A part of a competence profile is also to clarify future personal learning tracks—in short, pointing towards the next stages of development is a competence in itself.



5. DOCUMENTING YOUR PBL COMPETENCE PROFILE

When you are documenting your PBL competence profile, you need to think about the purpose of making one. You might have a PBL portfolio, where you have collected material about PBL during your study. This portfolio of material will most likely provide valuable data to be considered in your PBL competence profile, but the purpose of the profile is to provide you with a synthesis—an overview. Furthermore, it is also important to remember that the target group for the PBL profile is like that of any other reporting during your study: first and foremost it is for you, and should facilitate support for you in the learning process. Like any other reporting during your study, it should be made appropriate for its future context of use.

As such, the PBL profile is not an addition to your CV to be handed in as an appendix for future job applications. It is however a valuable source of information you can draw on when making your applications, writing your CV, or preparing pitches for job interviews based on the emphases of job adverts. Furthermore, it is valuable when joining new teams as it helps your capacity to present your competence profile in a more comprehensive way. To fulfil these purposes, the documentation has to be easy for:

- **you to update and navigate later on.** In the example on the right of this page, Maiken has highlighted words as focus points for later revisions and screenings for specific purposes.
- **facilitators to relate to.** Besides the need for an overview addressed above, personal information is also needed. Furthermore, in the example Maiken has put in a picture of herself to make the documentation more personalised.

The future integration of material from your PBL profile into your CV, applications, or pitches is the next step and that moves beyond the subjects covered in this guide.

PBL Competence Profile

Maiken Winther

MSc in Geography 2019 from Aalborg University



My studies at Aalborg University have provided me with competences in problem-based learning (PBL) needed to:

Identify **different problem-types** when understanding, managing and handling real life problems. This has provided me with both a comprehensive perspective, and a focused approach to practice. As an example, I have worked with complex redesigns across organizations using a system thinking approach, but also more specifically with changes of specific interdisciplinary work relations.

Obtain a professional **understanding of the context and user needs related to a problem**. For example, I have used actor analysis and participatory design methods to balance and address diverse interests in establishing a more active city environment in Aalborg. By using different methodological approaches to **problem analysis**, adapted to the problem at hand, I have revealed diverse interests, needs and interactions. I have experience with qualitative as well as quantitative methods, and I have also used mixed methods for problem analysis, e.g. by combining interviews and surveys. Thereby, I have created a deeper, more nuanced and value-based understanding of the diverse problems in relation to urban planning.

Carry out problem management professionally, e.g. by structuring workflows and making **project plans** with both a long term and a short time purpose. I have experience in using project management tools such as

GANNT charts and milestone planning in combination with more detailed tools such as week plans and “to-do/doing/done” boards. Furthermore, a stay at a company during one of my projects developed my administrative competences in project management in a real life setting.

Establish, participate in and facilitate **team-based project work** with consideration to personal differences and the importance of continuous development of the team by use of different tools, e.g. analysis of learning styles and team profiles.

Manage conflict by using appreciative inquiry to develop the individual's view of the conflict and by taking into consideration the institutional influences on a conflict. Furthermore, I have experience with mediating conflicts in a team setting.

Communicate professionally in **external relations** by understanding the importance of clarifying and creating synergy of different professional and cultural backgrounds – also in relation to interdisciplinary and non-academic work relations. In an internship at a municipality, I worked to connect different departments and public partners to create a better access to nature.

Reflect on and critically evaluate work processes, and perform collective as well as personal **process-analysis** to guide future competence development. Furthermore, experience from teamwork and internships have provided me with competences to foster interplay between **competence development and organisational strategy**.

6. FINAL REMARKS

In our final remarks, we would like to stress that even though a PBL competence profile is fundamentally your own private document to be used as a platform for highlighting your PBL competences, it is not a case of 'anything goes'. If you want to highlight what you have gained by working in a PBL environment and to offer this as an asset in an organisational context you have to stay focussed on making your PBL competence profile. If you are not focussed, then you will be just as silent or blurry when asked to elaborate on for example your collaboration competence or your project management competences as before. So what makes a good PBL competence profile? Well at least the following five points should be taken into consideration, stating that a PBL competence profile has to:

- **Relate to competences**—this sounds obvious, but what does it actually mean? Well, it means that you should show you have the capability to carry out a function in and across practices and you think that you have the potential to develop this further in new situations. You do not only need to know about something, or be able to apply something, you should also be able to relate it to the context of use. Therefore, you need to include experiences to document this.
- **Relate to PBL**—again it sounds obvious and almost silly to say but based on our experience it is actually easier said than done to keep within the scope of PBL. Sometimes PBL is wrongly considered to be study competences—but knowing how to read a book in the most optimal way does not really indicate anything about your competences in problem based learning and work. Likewise, PBL includes problem design and a contextual scope and thereby calls for integration of different disciplines and subject matters. But this does not make any subject matter

a PBL subject. Therefore, to get your mind tuned in a recap on PBL on a more conceptual level might help (see UCPBL, 2021).

- **Be personal**—because experiences in a PBL environment are grounded in collaboration and it is important to become aware of individual contributions in this process. Every collaboration consists of a number of individuals and a number of competences. In order to make synergy from competences you have to understand both others' competences and contribution, as well as your own. It is also you as an individual student who will have to bring the experiences from previous teams into new team settings. Therefore, the profiling and reflections that are put into making the competence profile personal is actually what provides added value.
- **Create a rich overview**—providing an overview is one thing, creating a rich description of something is another. Combining the two for a rich overview is hard, as the text has to be comprehensive yet short. It has to provide insight into practice but at a glance. Furthermore, you have to be aware of blind spots. Providing your own rich overviews might seem easy for the time being, as you know how everything stated is 'between the lines'. However, after a year you might be surprised about how much you can actually remember of what was put tacitly in between. Therefore, peer feedback is valuable in making your PBL competence profile—if it is understandable for others as outsiders, it will be understandable for you even after memory has faded regarding the thoughts behind the text.
- **Include prospects**—competences are never fixed but always in development. In fact, as human beings are constantly in interaction with the world around them, it is hard to escape from learning all the time. However, systematic and targeted learning is needed if we want to follow a learning path and develop our carriers. Therefore, thinking ahead is a part of making your competence profile in order to bring you further on your personal learning path.



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