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Student Diversity in a Problem-Based Learning Setting

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Series Preface

The publication entitled 'Student Diversity in a Problem-Based Learning Setting' has been prepared for inclusion in the Research of Higher Education Practices Series, developed by the Higher Education Research Unit in the Department for Culture and Learning at Aalborg University. Our intention with the series is to produce timely synthesis of research on Higher education topics of national and international importance.

This booklet provides a synthesis of research findings specifically on ow to handle Problem-Based Learning (PBL) setting taking into consideration the diversity among students. It includes theoretical perspectives on how to understand the complexity of student diversity when working with PBL approaches in Higher Education, and recommendations on how work with PBL as a framework in order to raise learning potential in diverse student groups.

In this series we are aware that suggestions or guidelines for practice need to be responsive to specific educational settings and contexts. The booklet is therefore presented in a way that readers can consider the suggestions for their own practices and find suggestions for further reading and investigations.

Kathrin Otrel-Cass & Lone Krogh
Series editors

"It completely changed my classroom practice too, I now play the video with the sound off and speak to them [students] my stories". One theme identified was that teachers felt less need to provide highly detailed information to their students and that the video production resulted in them concentrating on providing key points and then facilitating support to the students finding detailed information themselves.

From a paper presented to the AAU Visual Pedagogies Conference, 2018.

Introduction

Why a booklet on student diversity in a problem-based learning setting?

This booklet addresses student diversity as a specific challenge that many higher educational planners and educators face when working with problem-based learning-approaches (PBL) to teaching classes and supervising group work.

The purpose of the booklet is to:

1 Present theoretical perspectives that may help educators understand how diversity can be both a driver and a barrier for learning in PBL-based settings in higher education

2 Provide recommendations and pedagogical tools on how to develop PBL as a framework in teaching and supervision in order to raise learning potential in diverse student groups

It builds on an applied research project, which studied student diversity in two master's programmes at Aalborg University (AAU): the Master's in Social Work (SW) and the Master's in Learning and Change Processes (LCP). The study was carried out over a period in 2016-2017 and was based on focus group interviews with students and single interviews with educators and programme planners at the two programmes (Engen et al. 2018, Engen et al. 2017). The research project showed that student diversity in the form of different pre-acquisitions,

educational backgrounds, and -experiences often poses a challenge to educators, when it affects the learning environment in the classroom negatively. This type of diversity can also cause frustration and confusion among the students, rather than igniting curiosity and exploration (Engen et al. 2018). Our main claim in this booklet is that the potentials of student diversity for learning can only realised if the students develop skills in handling differences in collaborative problem identification and – solving, and that they can only do so, if they are supported by the educators, supervisors and the whole program set-up in the PBL-courses.

What is student diversity, and why is it an important focus?

The vast growth of student intake within higher education programmes in the wake of discourses of globalisation and cross-national competition has given rise to new educational challenges deriving from student diversity (Arvanitakis 2014, Robinson 2014, Schmidt et al. 2011). Thus, student diversity as an educational challenge has gained increasing interest in higher education research over the latest 10-20 years (Engen et al. 2018). The high intake means that students engage with academic discourse and practice with widely varying backgrounds and experience. At the same time, the high numbers of students make it difficult for educators to take into account the fact that students learn differently (Arvanitakis 2014, Spencer & Jiang 2003, Simons

& Hicks 2006). Newer studies point to the fact that students experience the diversity and heterogeneity in ambiguous ways: as a source for explorative and curious learning processes on the one hand, and as a reason for frustration, power abuse and social processes that inhibits learning and risk taking on the other (Lund & Jensen 2016, Robinson 2014). Across these studies, however, the findings point to the conclusion that the educators' pedagogical scaffolding is the basis for addressing diversity issues in higher education settings.

What is PBL, and why should students work with PBL?

In Denmark and around the world, student diversity issues have given rise to many different initiatives at universities (Arvanitakis 2014, Robinson 2014, Simons & Hicks 2006). The Problem Based Learning (PBL) approach to higher education pedagogy is one take on tackling diversity issues that stands out as particularly strong. For more than three decades, PBL has been seen as a potential contribution to resolving diversity issues resulting from high student numbers and students' different experience backgrounds (Engen et al. 2018, Schmidt et al. 2011, McLean et al. 2006).

In order to explain why we regard it as pedagogically crucial to address student diversity issues within the PBL-framework, we take our point of departure in Aalborg University's (AAU) PBL model. The reason is that the AAU PBL model is traditionally regarded as offering a number of possibilities for developing collaborative and problem-solving skills individually and in groups of students. The explicit goal is to ensure that course content and graduates' skills are relevant to society (with respect to e.g. innovation and problem solving) and to the labour market (employability)(Kjær-Rasmussen & Jensen 2013). At the same time, however, the model incorporates central concepts and pedagogical principles that more or less explicitly seeks to harness the innovative potential in diversity in competence, knowledge, and experience (Lund & Jensen 201Hernandez, Ravn & Valero 2015). In short, the model has five key elements:

1 The *problem formulation*, which is seen as the starting point directing the student's learning process;
2 The *project and its report*, which is the specific learning process by which the problem is formulated, analysed, and solved, followed by a communicative product such as a report or adequate product. This is assumed to result in the student's acquisition of knowledge and skills;
3 *Groups,* which are characterized by autonomy vis-à-vis the problem and the project, by participant control and by the collaboration that results from it;
4 The *project supervisor*, who supports both the project process and the group process in working on the problem;

4   *Courses* as a supplement to project work (AAU 2016).

In short, the pedagogical linchpin of programme design at AAU is group work organised to result in a problem-based project. The problem-based focus means that students contribute with a variety of perspectives and knowledge (theories, methods, scientific disciplines, practices) into an interdisciplinary problem-solving learning process (AAU 2016). Overall, this is regarded as the basis for producing highly reflective, independent and competent students and bachelors or master's graduates (see also Kolmos et al. 2004 and Kolmos et al. 2008).

Student diversity and teaching strategies

The above interdisciplinary focus on pedagogy is especially relevant for graduate programs that enrol students with professional bachelor backgrounds and maybe even professional work experience, as is the case in modern educational systems with focus on life-long learning (Illeris 2017). Our applied research project showed, how adding this kind of student diversity to the educational complexity gives rise to new challenges such as balkanisation between students with different professional backgrounds, and maybe even the creation of hierarchies with more or less explicit borders between students with academic backgrounds

and other types of students (Engen et al. 2018, Engen et al. 2017).

Based on this study, one might argue that the PBL model in its current form is not explicit about its strategies – or otherwise - for addressing potentials and challenges arising from this kind of student diversity in classes and groups. In many ways, we found that the model relies on the educators' existing abilities and competences in respect of harnessing the power of the students' differences in knowledge and experience in order to exploit the potentials of the interdisciplinary work (Engen et al. 2017). Consequently, some of the challenges facing educators concerning student diversity may be left unattended in the PBL-approach (Savin-Baden 2003).

Open-ended learning landscapes with no right or wrong answers

Another problem may be that our and other newer studies point to the fact that students may be used to pedagogies that are more test-oriented and based on "right or wrong" answers to specific issues or problems (Lund & Jensen 2016). In relation to this, the challenge embedded in the PBL-approach is that in the outset, the students are expected to explore a given field with the aim of formulating a relevant problem. More precisely, this means that they are supposed to find lacks and lacunas in the existing knowledge base in a field (problem formulation), and

to bring different disciplines into play in an effort to contribute with the "missing knowledge" (problem solving). Therefore, there are no right or wrong questions or answers, since the students themselves are building knowledge in the process of solving the problem, they formulated themselves. Rather than finding a right or wrong answer, the students go through a process of justifying their choices of methods and theories used for solving the problem. In this open-ended learning landscape, the students need to negotiate their different views on the world, their beliefs, and convictions about what is valid knowledge. A main conclusion from our study (Engen et al. 2017) is that if this negotiation should lead to learning and not only frustration for the students, it is of crucial importance that educators and supervisors support them in recognising how differences in knowledge and (professional) experience can contribute to making their case in a PBL-project - in constructing the problem

Educators and educational planners must understand in detail the workings of individual and collective learning processes in relation to student diversity. This understanding seems to be the first step for educators and planners in order to develop pedagogical strategies to exploit the beneficiary aspects of diversity, and to address the challenges and barriers that diversity compose (Engen et al. 2018, see also Jensen & Lund 2016, Savin-Baden 2003).

Based on the above, the aim of this booklet is twofold:
1 to present theoretical perspectives that may help educators understand how diversity can be both a driver and a barrier for learning in PBL-based settings in higher education
2 to provide recommendations and pedagogical tools on how to develop PBL as a framework in teaching and supervision in order to raise learning potential in diverse student groups.

Experience and diversity
A pragmatic learning perspective on student learning

The pragmatic and experience-based learning perspective represented by e.g. John Dewey (1859-1952) with its understanding of learning as based on the human ability to 'find problems' and 'solve problems' may be of use when working with student diversity in class and group work. In the pragmatic learning perspective, 'problems' are understood in a specific way as 'learning problems' and 'knowledge problems' (Savin-Baden & Major 2014). A learning/knowledge problem arises when the individual in a given situation experiences a discrepancy between what he or she expects to happen (based on previous experience) and what is actually happening – in other words, a break of expectations, an anomaly. This break of expectations can develop into an experience if it occasions the individual to:

1 wonder, interpret, and investigate the discrepancy more closely, i.e. to 'formulate the problem'
2 reflect critically on the problem, reinterpreting the situation and formulating a possible 'solution to the problem' by questioning what is understood as "self-evident" (a 'hypothesis' or problem formulation)
3 test the tentative solution (hypothesis) in action and
4 reflect critically on the new action and become aware of a new meaningfulness in the situation (problem solving) (Dewey 1988: 134).

In this way, the action leads to new understanding of the social and physical world - an experience is created. However, critical reflection and the "wondering process" can be a rather demanding process, as the individual leaves his or her own "safe world" and ventures out onto more uncertain ground (Dewey 1988: 139-140).

Different student experiences and backgrounds as mutual "anomalies"

In light of the above, one may expect a population of students to become either (or both) frustrated and pleased when the composition of the class and the groups encompass a high degree of student diversity. The students' different experience bases can lead to different expectations towards and interpretations of the same practical phenomena or theoretical concepts that they work with, when finding or solving problems in class or in groups. If these differences are explicated in the classroom or in the group work, the students may end up, figuratively speaking, being each other's 'anomalies' or break of expectations, since the students' previous experience will influence what they expect to be the responses on their utterances in class and in the group (Simons & Hicks 2006). If these responses differ from their expectations, there is a break of expectation. This break of expectation may, according to Dewey (1988), occasion learning, if the students are supported to work constructively, exploratively, wonderingly and reflectively with the fact that their class/group mates' views and conceptualisations of the same phenomena are sometimes significantly different from their own. Thus, difference does not only have the potential to end in frustration, but much more to be a source of wonder, curiosity, exploration and, in the longer term, reinterpretation of own knowledge base and new recognition and learning (Lund & Jensen 2016). Moreover, when students, researching problem areas, are supported to draw on different types of knowledge from different subjects and disciplines, they also have the opportunity to explicate and consider their own experiences, to make use of them and act in new ways together with their group mates (Lund & Jensen 2016). This creates a learning potential that increases concurrently with student diversity.

The experiential learning perspective can support program organisers and educators in reflecting on, how pro-active use of student diversity can enhance learning potentials within the interdisciplinary problem-based learning approach.

Student diversity and social interaction in PBL

If we go on from this pragmatic view on diversity within the PBL-framework, it is useful to look upon PBL from a *social interaction* angle that is not specifically addressed by experiential learning theories. To focus on social interaction is relevant, since collective exploring, defining and solving a problem – the problem solving process – seems to be a central part of the challenges and potentials of student diversity for learning within the PBL-framework. The social aspect of learning is encompassed by sociocultural learning theories (Illeris 2015), where the potentials of PBL in itself can be used as a way to harness the learning potentials of student diversity in class and group work (Hirst 2014). A socio-cultural perspective on student interaction in class and group work directed at problem-oriented work understands learning as a process of meaning creation, meaning negotiation and practical, collaborative problem solving.

Learning environments and student diversity

In a sociocultural approach to teaching within the PBL-framework, the educator correspondingly focuses on educational environments as significant for building a learning culture in the classroom and in the individual groups that embraces diversity and differences in experience backgrounds (Krishnan, Gab & Vale 2011, Tangney 2011, Bruner, 1996). The intention of the educational environment should be to support the students in developing a sense of belonging and professional identity (Prince & Hadwin 2013). The sociocultural understanding of individual learning as correlated to (educational) culture contributes to understanding PBL as a means of co-creation of meaning in the process of problem formulation and problem solving. If problem formulation and problem solving is seen as a process of social interaction and negotiation of meaning, the PBL-approach may provide the students with an opportunity to contribute constructively with their diversity of pre-dispositions, social backgrounds, personalities to the creation of collective knowledge (Bruner, 1996).

When looking closer at the function of PBL in this perspective, PBL may be interpreted as a structure in the "collaborative room" in classes and groups, a structure, which provides possibilities of creating individual and collective mean-

ing in a co-creative problem solving process (Degnegaard 2014). In order to develop this thought further, it is relevant to look at the product of the problem solving activities of the students, which in the PBL-pedagogies often will be a *project* and a *project report.*

PBL, diversity, and the *project as a "work"*

The cultural approach to pedagogy as a social activity draws on an understanding of e.g. PBL as a mediating cultural "tool for meaning-making". In this understanding, PBL provides the students with approaches, procedures, methods, and practices that can be regarded as supporting the students to co-create collective meaning by means of a *cultural product*, in this case a PBL-*project*. When focusing on the PBL-project as a cultural product, it can be regarded as a "thing", which in a sociocultural sense is termed a "work". If a PBL-project is regarded as a work, it is a work created by texts, figures, arguments, disciplinary methods etc. that all enable the students to justify their problem, problem formulation and problem solution. Even more important, the work also contains the students' understandings of the specific problem and its solution, that is, the discussions, reflections, interaction, negotiations, and compromises. Finishing this line of thought, the project consists of processes of making the students' differences work together in the product (Hernandez, Ravn & Valero 2015).

In other words: the project production itself may occasion that the students' differences and similarities are externalised (Bruner 1996). Differences are negotiated with the help of the PBL-approaches, procedures, methods and practices, and the process working with the problem creates a space for this negotiation. The negotiation is expressed in the product, which thus can be seen as the students' creation of new meaning.

Learning potentials of student diversity, when PBL is seen as a product

To sum up, many different perspectives can be contained and brought to collective knowledge creation by the problem solving process and its product, and the students' diverse backgrounds and worldviews contribute to both the process and the project.

The student externalisations into a product in the problem solving process give rise to diverse learning outcomes:

• Scaffolding for each other through the negotiation of meaning

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- Creating and sustaining group identity and solidarity
- Making division of labour visible in a group, providing opportunities to acknowledge diversity as a learning potential
- Help individuals to become more aware of their own strengths
- Illustrating collective rather than individual progress
- Creating common and negotiated ways of thinking in a group during the creative process
- Inspiring metacognition about the work (project) and, therefore, learning

Recommendations and tools addressing student diversity and the potentials of PBL

In the following sections, we will provide recommendations and tools for qualified reflection on harnessing students' differences in respect of learning prerequisites and overall preparedness and conditions for learning, and for working pro-actively with student diversity in the problem-based approach to pedagogy. The aim is to:

1 shape the social environment in the class and the groups to foster curiosity and exploration
2 provide structures and work forms in class and in the groups that allow students to benefit from diversity and differences
3 teach students how to collaborate in class and in groups (Engen et al. 2018, Woodward-Kron & Remedios 2007).

Following the experiential and sociocultural learning perspectives, it is of imperative importance that the students are provided with possibilities to work with their differences, and that educators and supervisors provide them with tools and collaboration approaches to do so (Engen et al 2018).
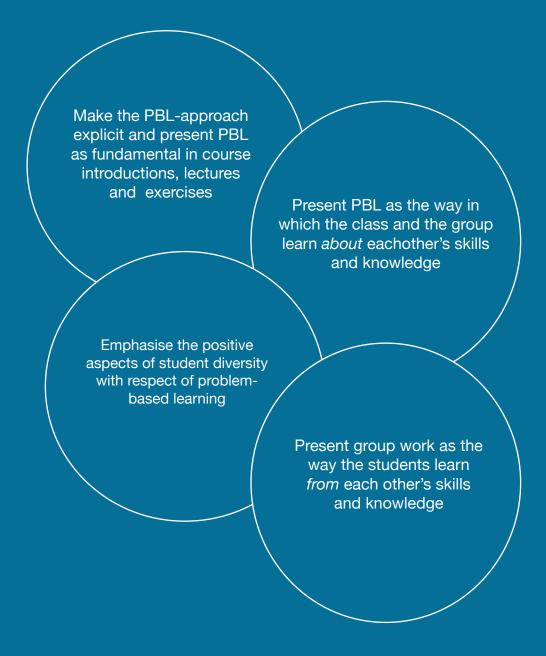
Teaching

Firstly, we recommend that the educators refer to PBL as much as possible when presenting content in class, and in a way that gives words to the pedagogical logics behind PBL and project and

group work in respect of potentials for learning, negotiation of meaning, collaboration and professional development. The students need the educators to explicate the PBL-perspective up front as a basis for the overall pedagogical approach to learning.

It is important that the educators all give words to the positive aspects of diversity among the students, but also that they acknowledge the possible challenges and difficulties in group work. The educators may benefit from watching out for moments where students' prejudice and preunderstandings of each other are challenged or broken down, highlighting the resources embedded in diversity and opportunities to learn from each other. Specific PBL exercises and assignments should be designed to highlight the learning potentials of the students' diverse perspectives on a matter. This can be achieved if the students get an experience producing a product together (either a written assignment or an oral or visual presentation in class) that contains and explicates contributions of each student. During the course or a semester, the student diversity may be addressed by exploring the students' emotional state: are they experiencing a positive learning outcome of diversity, or are they frustrated? In case of frustration, it is important for the educator to reassure the students that when they feel frustration, they may consider it as resulting from diversity, but also as an opportunity to learn something new (referring to the pragmatic learning perspective). In this way, organizers and lecturers can use PBL to create continuity over the semester. It also allows to some extent for the pedagogy underlying the relationship between PBL and group work to be communicated, so that the students are made aware of the potential for academic development and cultivation of affinity within the group as part of the 'learning process'.

Based on the insights from the pragmatic and the sociocultural theories, we recommend articulating the problem orientation as the way that the class learns *about* each other's different knowledge bases, and the group work as a way to learn *from* each other's different knowledge bases.

Suggestions for content reflections:

Make the PBL-approach explicit and present PBL as fundamental in course introductions, lectures and exercises

Present PBL as the way in which the class and the group learn *about* eachother's skills and knowledge

Emphasise the positive aspects of student diversity with respect of problem-based learning

Present group work as the way the students learn *from* each other's skills and knowledge

Assessment

As regards the objective that PBL should be seen as a potential for harnessing the powers of diversity among students, we recommend that assessment should be carried out throughout the entire course or semester, which is expressed in the following concrete suggestions for reflection:

Incorporate plenary discussions and group presentations along the course of the semester/course

In case of group presentations, allocate time for plenary reflection

Use the exercises below to support reflection among the students concerning the potentials of diversity in problem solving processes

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The socio-cultural learning perspective could be helpful for concrete course and semester planning. We recommend (both students and teachers) to use the following exercises as a model for

1   reflection in respect of assessing learning outcomes expressed in students' PBL-projects
2   the students work constructively with their differences
3   the students use the approaches, procedures, methods, and practices of PBL
4   the students incorporate the overall academic content in the project

Practical exercises for students in groups

The following suggestions for exercises should be seen as inspiration for teachers and supervisors to create their own framework for working with a socio-cultural learning perspective in respect of student diversity. The exercises frame how the students can visualise and negotiate meaning in a way that embraces diversity and harness the learning potential of different student backgrounds (Herlau & Teztchner 2006). The exercises are used in the two master's programmes, which we have been studying and are tested in a learning environment with high student diversity.

The first exercise is an inspiration to visualise the potentials and strengths of diversity of competences in a group (Bruner 1996):

Diversity mapping

Individually: 5 minutes

Your profile: how and with what can you contribute to group work?

On PostIts, write as many components of your profile as possible. One component per PostIt.
    Use the following categories:

- Professional experience (work experience, study experience, research experience etc.)
- Personal traits (how are you as a collaborator, how do you handle pressure, conflict, explorative processes etc.)
- Where do you see your strengths in collaborative processes and group work?
- What is you motivation for enrolling in this study programme?

In the group: app. 20 minutes
Share your profiles and describe how you think that your professional and personal strengths can contribute to group work and collaboration.

In the group: 10 minutes:
Use the individual PostIts on a A3-sheet (or bigger if necessary) to visualize the collective competence of the group, using the categories from the first part of the exercise to group the different traits and components of the individual profiles.

The following exercises should be seen as an inspiration for working with formation of groups, so that the foundation for a safe and learning environment in the groups can be laid. In this safe environment, the probability of sharing knowledge and acknowledging differences and diversity increases (Bruner 1996). The environment is created by means of generating a social contract between group members, within which the students have a chance to commit themselves to a project and put into play the diversity mapped in doing this exercise (Herlau & Teztchner 2006).

Working out a collaboration contract

Step 1: preparation exercise "success & failure indicators"
Individual reflection, time frame: 5 minutes.

Success would be, if:

I: _____

The group: _____

The result of the project: _____

Failure would be, if:

I: _____

The group: _____

The result of the project: _____

Guidelines for the individual reflection:

- I myself: what do I personally want (to learn, to achieve) from the group work? How do I want to bring into play my individual competences?
- The group:
    1 What are my overall wishes for the group?
    2 What competences do I want to develop with and within the group work (concerning collaboration, group processes, learning)?
- The result of the project: What level of ambition (high grades, finding practical solutions to problems, learning something new, creating new knowledge or other)?

Group reflection, time frame: 15 minutes:
Present your reflections in the group and discuss the different indicators for success and failure (after Herlau & Tetzchner 2006)

Step 2 'Collaboration contract'

Now think of the upcoming collaboration, and what it requires from you. Discuss how you intend to take advantage of your different individual strengths. Based on this, and on your previous discussions of indicators for success and failure, you will now be asked to agree on a set of "game rules" for your collaboration that all of you can agree on and commit to.

A. Individually (max. 5 min.)**:**
     Note the 3 most important suggestions for a rule for collaboration:

     1. _____

     2. _____

     3. _____

B. In the group: (max. 20 min.)
     Discuss your individual suggestions from exercise A.
     Agree on a set of rules that everybody can agree to commit on 🙂

     Our "game rules":

     _____

     _____

(Adapted from Mortensen 2006)

Generation of subjects for project work
Brainstorming, part 1

Note: It is of crucial importance that one of you control time. In that way the chances that every group member gets a voice increases. Remember that time keeping is a function, not a personal attribute to a group member.

Individually (5 minutes)
- Take a number of PostIt-notes.
- Write suggestions for subjects
- **Procedure: 1 PostIt = 1 suggestion!**

When the first 5 minutes are over, take 5 more minutes doing the following:
Go over your ideas. Consider, which one you think is the best. Then choose 1 suggestion from your "PostIt-pile" put it on a A4-sheet.

In the group (20 minutes):
- Send your A4- sheet to your neighbor. The neighbor adds PostIts with comments and suggestions that builds on and adds to the original suggestion.
- Repeat until the sheet has been around to all group members, mx. 20 minutes.
- Read the comments and suggestions from the other group members and consider what new aspects have been added. Maybe more subjects have been created in the process?

From idea to action
Brainstorming part 2

Now you will have a lot of ideas on your sheets, and you will have experienced how your peers can add to your ideas with their perspectives. In the group, the next step is to select or (narrow down) the idea to a subject that everyone can commit to, and that is manageable for a project. You will have to select, choose from the ideas in order to shape the common idea in the group. You can use the following reflective questions in this process, addressing and testing the different suggestions (app. 20 minutes):

- Is this suggestion relevant for the learning goals?
- Is it realistic to work with this subject within the given time?
- What do you have to do in order to realise the suggestion?
- When can you start?

(Isaksen 1998)

Presentation exercise:
Problem field and problem formulation

Work out a presentation for the class [location, date and time]
You may communicate your presentation by means of powerpoints, prezi, posters, oral presentation - use your imagination…
Presentation time: 10 minutes.
Feedback from the class: 15 minutes
Feedback from lecturer: 5 minutes.

The presentation should contain:

1. A description of the problem field, e.g.
   - How would you characterise the problem field and the problem?
   - What wonderings do you have in relation to the problem field? What puzzles you?
   - What may support and document your perception of the problem field as a problem field? Is it a societally relevant problem and wondering that you have? What documentation of the relevance of the problem field have you found and explored (media agendas, polls, evaluations, reforms, research and science, etc.)?
   - Is your problem field and your wonderings related to the actual content and the learning goals of your study programme?
2. A tentative problem formulation
3. Also, describe a suggestion for a problem based research design, if you have the time

The next exercise is a way to create a shared meaning of the process ahead of the group when working on a project. The exercise intends to scaffold negotiation of the content of the project, and in a way that visualises the components and tasks of the whole process. This creates the space for putting into play and consider each group member's competences and possible contribution into the whole of the project process (Herlau & Teztchner 2006), and in this way harnessing diversity in the group.

Planning: 'Stepping stones'

Time frame: app. 15 minutes (repeat the exercise regularly, when you are further in the project process).

Step 1: Write your goal for the project at the top of a sheet of paper. Divide the paper in two with a vertical line under the goal (see figure below)

Step 2: In the left column, make a list with things needed to be done in order to reach the goal.

Step 3: In the right column, write a realistic solution to each thing that needs to be done.

Goal	
Things needed to be done	Solutions

Figur 1: Task elaboration (Herlau & Tetzchner 2006)

Step 4: Now, write each solution as a concrete task that is possible to carry out as a group member (read, write, refer, investigate, collect data, review literature, search for theory etc.).

Step 5: Considering the time that you have at your disposal, make a realistic sequence of the tasks.

Step 6: On a new sheet of paper turned vertical, you make a timeline. On this timeline, all the tasks are put in an order that is meaningful for you as a group. Indicate, which tasks are done by individuals, by pairs or by the whole group.

Task 1	Task 2	Task 3

Figure 2: Herlau & Tetzchner 2006)

Step 7: You now have a visualised plan for your work with concrete tasks (stepping stones) to be done individually, in pairs or in the group.

(Herlau & Teztchner 2006).

When the students have diverse educational backgrounds, it is also important to provide them with tools to collaborate in groups. The following tool is a way to practice how to use diversity as a strength in group work. The role of red and green leader should be passed on in turns continually in order for all the group members to try to lead, and to co-lead and help the leadership. In this way, the students experience how power is distributed, and that all competences can be of value in leadership and co-leadership.

The leader roles are called red and green leader. Red leader's role is product oriented and strategic, ensuring that decisions are made, that decisions are in line with the goal of the project, and that the direction of the projects is "on track".

Green leader's role is focused on the social climate in the group, is process oriented and occupied with creating space for the group members' different competences are put into play in an engaging way.

Concretely, the roles are played out in the "agenda", which is a set of working habits, described in the last exercise.
(Herlau & Teztchner 2006)

Agenda for meetings

Present: (all names)
Red leader: (name)
Green leader: (name)

Warming up: tell the best joke that you know of!

Select the first/next task from "stepping stones". Based on the task, the group supports red leader to formulate:
Goals for the meeting, which is written on paper and put in the middle of the table

Red leader: what is our status concerning this task? What do we already know? What knowledge is lacking?

Red leader: Based on the discussion and with the help of the group, 'tasks' are formulated on PostIts and put on the paper with the written goal

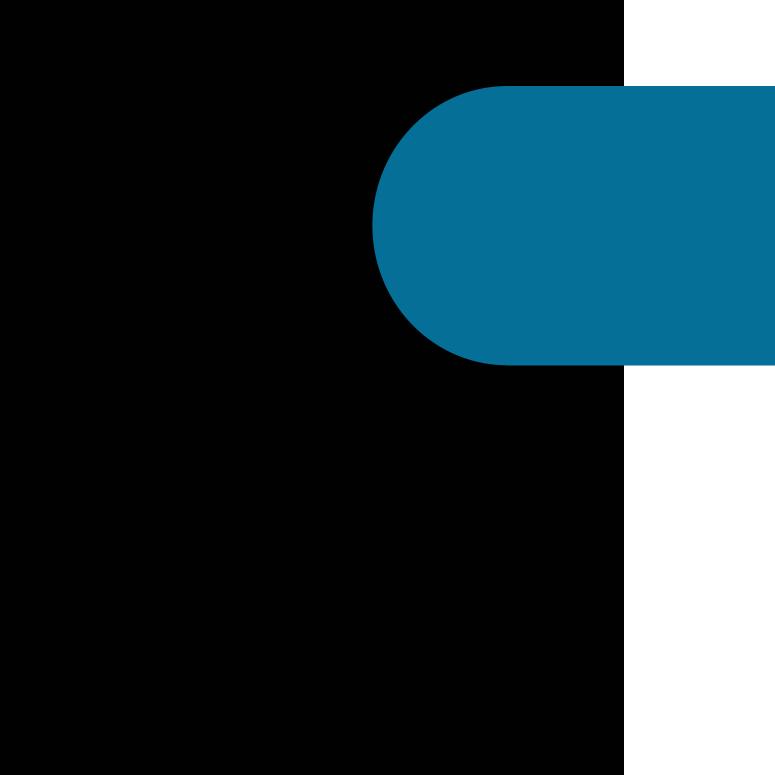Green leader: Delegating tasks: who wants to do what?
Green leader: Makes sure that every group member tales a task (=post-it) from the paper.
Green leader: Goes around each group member and asks about his/her tasks, e.g..: Are you comfortable with your task? How do you understand your task? Do you have the necessary knowledge to work with the task, or do you need inputs from the group in order to get started?

Summing up the meeting: The group gives feedback to the leadership, feedback rules are as follows:

Descriptive	"I saw / heard that…"	(Not assessing)
Directed on function/ role	"Green's role is…"	(Not on the person)
Directed on behaviour	"He interrupted in the middle of…"	(Not on appearance)
It must be given immediately	"We have just discussed…"	(Not long after)
Supportive	"Red was good, when…"	(Non-confrontive)
Specific	"When she mentioned that…"	(Not general)
Delimited	"….	(One subject at a time)
Possible to discuss by all	"Do you think that…"	(Not only individual perception)

(Herlau & Teztchner 2006).

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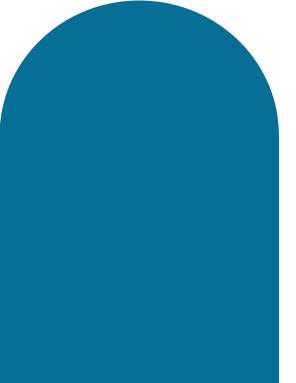
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This booklet presents theoretical perspectives that may help educators understand how student diversity can be both a driver and a barrier for learning in PBL-based settings in higher education. It also provides recommendations and pedagogical tools on how to develop PBL as a framework in teaching and supervision in order to raise learning potential in diverse student groups.

The findings are from a research project, which took place at Aalborg University in 2016-2017, and illustrate how student diversity may poses a challenge to educators, when it affects the learning environment in the classroom negatively, and cause frustration and confusion among the students, rather than igniting curiosity and exploration. The main claim in the booklet is that the potentials of student diversity for learning can be realised if students develop skills in handling differences in collaborative problem identification and -solving.