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Facilitation in a PBL environment

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Aalborg University 2008

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Preface

During the last 40 years, problem based and project based has become a widespread method for teaching and learning in higher education. Especially, in engineering and science education, the combination of both problem based and project based learning has been utilised in a transformation process of courses, programmes and educational systems at department or faculty level.

During the years, much literature has described the change process, variety of models and structures to support a PBL practice. However, there has been less literature to give overview of and to conceptualise the new practice between teachers and students. You can establish structures to support more student-centred learning, but at the same time you need to establish new cultures; otherwise you might risk that academic staff practice according to old learning paradigms in spite of the new structures. On the other hand, you can find engaged staff practicing a student centred approach within traditional educational structures – but at a certain time, a structure to support the student centred learning approach has to be established.

This booklet is about culture and about practice. We have collected theories, models, and tools for reflection, analysis and development of the staff role in PBL. We have chosen to conceptualise this role as facilitation in a PBL environment in order to stress that in a PBL culture, the students are playing an active part and make core decisions on their own. The role of academic staff is to motivate learning processes, to point out possible directions, to help in difficult situations, to empower the students and sometimes to answer students' questions. The difficult part is to find out which strategy is the right one for a given situation.

The content in this booklet has developed during training session of academic staff at Aalborg University and we hope that it can serve as a source of inspiration to others in the field.

September, 2008

Anette Kolmos
Xiangyun Du
Jette Holgaard
Lars Peter Jensen

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1. Introduction

Changes in higher education

The process of globalisation has brought changes in various aspects of human society. Fundamental changes have been witnessed in the process of knowledge creation and dissemination – production of knowledge is getting independent of educational institutions, and different forms of learning can be defined in broader sphere of society (Barnett 1996). In the post modern society, knowledge can no longer be regarded simply as ‘truth’, thus the terminology of didacticism is being questioned and learning has become the focus of attention. Educational institutions, as locus of learning, are not a self-contained world in which students acquire knowledge and apply it outside, but a part of a broader learning system (Wenger, 1998). Thus universities are unavoidably facing the deep transformation of learning theory.

Used to being the key institution in the production and reproduction of high powered and formalized knowledge and high level expertise for the modern society (Barnett 1994), higher education (universities), are undergoing diverse changes in order to provide sufficient learning opportunities. Among all the changes, the shift of the core of education from teaching to learning stands out as one of the most significant. In practice, a drive to student-centred learning arrives: more weight is being placed on the process of learning knowledge than on teaching it (Barnett, 1996, Bowden and Marton, 1998, Jarvis, 1995, 2001, 2003 and Kolmos 2002).

Objective

The objectives of this booklet are to reflect facilitation as a new role of teaching by reflecting experiences and presenting various notions of facilitation with particular reference to a PBL-environment.

Danish context

Parts of this book were originally written in Danish to support a video on project facilitation. We needed an English translation of this Danish book in order to support the English speaking teachers at Aalborg University, as well as to develop material for the new master programme in Problem Based Learning in Engineering and Science at Aalborg University.

However, the English translation has moved far beyond the original Danish version. Translating Danish concepts into English context is rather difficult. What makes it difficult is that English is not just about the English language. Language is developed on the basis of opinions and meanings in a given culture. Anglo-Saxon culture is different from

Danish culture despite a continuous alignment. Different English conceptions have their origins in different contexts.

Supervision

So far, the Danish “vejledning” concept has often been translated to the English “supervision”. However, this may not indicate the exact meaning of the Danish “vejledning”. Supervision may be interpreted as a hierarchy between the supervisor and the student being supervised, so the supervisor may be regarded more or less as the “project leader” directing the students learning process. This is one interpretation of supervision. Another interpretation is related to psychology.

*”Supervision is a contract-based, time-defined, supporting, initiating and professionally-managed process in which **a more experienced colleague aids a less experienced colleague with the integration of professional knowledge and actions**, in such a way that the colleague increases their ability to perform in relation to the subject's methods” (Keiser and Lund, 1986: 27, own translation).*

In this definition, there is still the approach that the supervisor is the master, although there is a tradition that the person who is being supervised is the one defining the agenda for meetings.

Facilitation

As university professors we are masters in our subject field. At the same time, however, we have to be able to organise students’ learning processes in a PBL-environment. PBL is defined by practising a student centred approach with emphasis on students’ motivation and learning experiences. Therefore the concept facilitation is more and more often used as the overall concept for the teacher’s role and function in a PBL-system.

“Facilitation literally means ”easing”. Its art is in drawing out the wisdom already embedded and lying dormant in the psyche of the learner. Facilitators are people with the skills to create conditions within which other human beings can, so far as is possible, select and direct their own learning and development. A facilitator is a ”process guide” who works with a group to assist it to achieve self-defining purpose” The facilitators philosophy informs their approach and its manifested as a concern with the psychological growth of the person.” (Gregory, 2002).

There are also other concepts such as coaching, guiding, advising, tutoring and facilitation. All these concepts have their special context and origin developed together with the cultural practise.

In this book, the word facilitation is chosen as it is this concept that is often used when talking about the teacher’s role in connection with PBL.

It suggests openness towards the student and contains a more balanced power relationship between teacher and student. It signals open space even though there is still the task of guiding, advising and teaching the students to tolerate insecurity and guide them in start-up and closing processes, etc.

Situated facilitation

Another terminology used is “situated” facilitation to stress that facilitation is always situated and to underline that the most important part in this teaching role is to be able to decode the students and use appropriate tools and strategies to improve the students’ learning at that certain time. A series of conditions will determine the project facilitation and it is the intention of this book to give an overview of these. In facilitation numerous factors come into play – factors which can often be hard to put into words, but may be sensed as you meet the students.

In practice, the facilitation of projects and students’ learning is diverse. Professional, educational and personal factors all come into play. In a facilitation situation a closer relationship between teacher and student is often seen compared to more traditional educational methods. When facilitation is combined with problem based project work, a significant change happens in the traditional student’s and teacher’s roles e.g. in considering who is making the agenda, taking initiative and secure the needed discipline.

Project facilitation

In project facilitation, the facilitator still has a role as teacher. This role, however, is far more complex than the traditional lecturer’s role. For this reason many teachers are unsure of how to handle the facilitator’s function in practise. Typically, teachers are uncertain of the degree of control, whether they must ensure a sufficient common professional level and where to draw the line of personal involvement.

There are no unambiguous answers to these questions due to the differences in learning environments, qualification requirements and facilitation situations. However, there is no doubt that a lot of experience and inspiration can be passed on from the learning environments where project facilitation has been practised as a professional and educational discipline for a number of years.

2. Transformation in higher education – from teaching to facilitating

If higher education has to move from a more scholastic view on teaching to a more constructivist approach to learning, student centred and participant directed learning is one of the key issues to be addressed. In this approach, the ability to take control of ones own learning is seen as a qualification in it self and, as stressed in participatory research, a source of motivation. However, student centred learning does not happen by it self; it has to be facilitated. In this chapter we will elaborate on the changing role of teaching and the state of the art of facilitation within a PBL-context. Finally we will discuss the complexity of facilitation in a PBL-environment, whereas the rest of the booklet is about navigating in this complex.

2.1 Changing the role of teaching

Teaching guidelines

The kinds of skills required for good teaching are directly linked to the assumption of effective learning. From a constructivist approach, Rogers' (2002:88) summarizes four shared focus-areas in the contemporary adult learning theories:

- 1) Focus on who is doing the learning;
- 2) Focus on the context;
- 3) Focus on the kind of learning task being undertaken;
- 4) Focus on the processes involved.

In line with this approach of understanding learning and education, Brook (1999) provides some guiding principles of becoming constructivist teachers at higher education:

- 1) Posing problems of emerging relevance to students,
- 2) Structuring learning around primary concepts,
- 3) Seeking and valuing students' points of view,
- 4) Adapting curriculum to address students' suppositions,
- 5) Assessing student learning in the context of teaching.

Student-centred learning

From this perspective, teaching activities in a student-centred learning environment are playing a different role than in the traditional lecture

centred environment. This role in general can be summarized as following (Zimmerman and Lebeau, 2000): teaching activity should emphasize learning by doing and hands-on problem solving. Students should be encouraged to analyze, interpret and predict information and be supported to foster new understandings based on past experiences. Learners should be facilitated with sufficient and appropriate possibilities to communicate with others, which involve purposeful interaction with teachers and fellow students. In addition, teachers should also develop considerate methods to help students relate the theories and their past experiences to the practice, to have regular reflection and evaluation on their learning activities, and to become self-directed learners.

2.2 The PBL context

The facilitator's role is dependent on the educational tradition and cultural frame. In this book, the understanding of the role of university teaching is based on the Problem Based and project organized Learning environment (PBL), in particular, with reference to experiences from Aalborg University, Denmark.

Effectiveness of PBL

In the past decade, PBL has been increasingly used as a strategy for development in the globalized higher education (Kjaersdam, 1994, Savin-Baden, 2000, Barrows, 2000, Graaff and Kolmos, 2003, Kolmos and Graaff, 2007). Sufficient research has evidenced the effectiveness of PBL on student learning in diverse aspects:

- 1) Promoting deep approaches of learning instead of surface approach (Biggs, 2003);
- 2) Improving active learning (Graff and Cowdroy, 1997, Du, 2006a),
- 3) Developing criticality of learners (Savin-Baden, 2003),
- 4) Improving self-directed learning capability (Hmelo and Evensen, 2000, Du, 2006a),
- 5) Increasing the consideration of interdisciplinary knowledge and skills (Kjaersdam, 1994, Graaff and Kolmos, 2003),
- 6) Developing management, collaboration and communication skills (Kolmos 1996, 1999, Du, 2006a),
- 7) Developing professional identity and responsibility development (Hmelo and Evensen, 2000, Kolmos, 2006, Du, 2006a, 2006b),
- 8) Improving the meaningfulness of learning (Savin-Baden, 2000, Du, 2006a).

Institutional benefits

At the institutional level, the shift to PBL will benefit the university/departments in terms of:

- 1) Decreasing drop-out rates and increasing rate of on-time completion of study (Kolmos and Graaff, 2007);

- 2) Supporting development of new competencies for both teaching staff and students (Biggs, 2003, Kolmos and Graaff, 2007),
- 3) Promoting a motivating and friendly learning environment (Du, 2006a), and
- 4) Accentuating institutional profile (Kolmos and Graaff, 2007).

What is PBL?

A great diversity has been observed in terms of the definition and practice of PBL. However, one agreed way of identifying whether one teaching activity can be categorized as PBL practice or not is to view the position of the teacher in the learning process (Savin-Baden, 2003). No matter in which way of transforming towards PBL, pedagogy development remains the one of the essential aspects in the action plan (Kolmos and Graaff, 2007).

PBL in Denmark

In the Danish context, PBL provides special frames based on the Danish educational tradition, which was formed by Grundtvig, on democratic learning and free education. Some of the principles that are important in the Danish PBL-understanding are (Berthelsen et al, 1977)

- Problem orientation
- Interdisciplinary
- Exemplarity
- Participant direction
- Group work

The formation of these learning principles were part of the project work models developed at Roskilde University Centre and Aalborg University which were both founded in the early 1970s.

PBL at McMaster

Many of the same principles were formed by Howard Barrows when he founded the McMaster University in Canada. Principles were formed as:

“A learning method based on the principle of using problems as a starting point for the acquisition and integration of new knowledge.” (Barrows and Tamblyn, 1980).

He emphasises that:

- Problems form the focus and stimulus for learning
- Problems are the vehicle for development of problem solving skills
- New information is acquired through self directed learning
- It should be student-centred
- There should be small student groups
- Teachers are facilitators/guides

There are not any definite learning theories behind the formation of the principles as formed by Illeris or Barrows. On the contrary, it is more like an integration of cognitive, psychological and sociological perspectives within the learning theory.

PBL learning principles

Based on the principles above and a comprehensive understanding of learning Graaff and Kolmos (2003) developed the PBL-model presented in figure 2.1 This model include principles within three dimensions: cognitive learning, collaborative learning and contents.

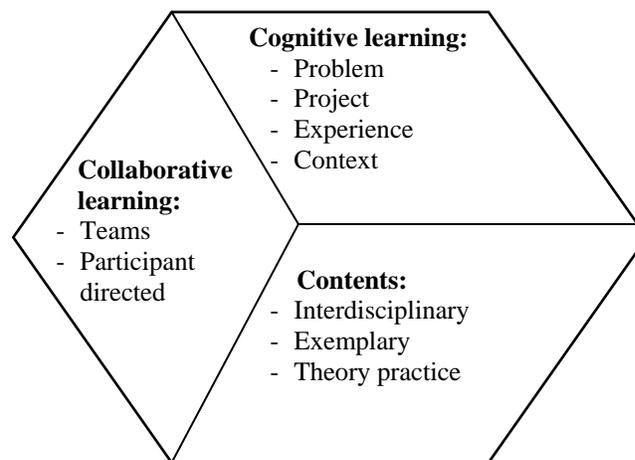


Figure 2.1: The PBL learning principles (Based on the works of Graaff and Kolmos, 2003)

Cognitive learning

The cognitive learning approach means that *learning is organized around problems* and will be *carried out in projects*. It is a central principle for increasing students' motivation. The problem provides a starting point for the learning processes, places learning *in context*, and bases learning on the learner's experience. The fact that learning is also *project based* means that students have to work with a unique task involving complex and situated problem analyses and problem solving strategies.

Contents

The contents approach especially concerns *interdisciplinary learning*, which may span across traditional subject-related boundaries and methods. It is *exemplary practice* in the sense that the learning outcome is exemplary to the overall objectives, and the content supports the relation between *theory* and *practice*. The learning process involves an analytical approach as theory is used in the analysis of real life problems and both theoretical and empirical problem solving methods.

Collaborative learning

The social or collaborative approach is team-based learning. The *team learning* aspect underpins the learning process as a social act, where learning takes place through dialogue and communication. Furthermore, the students are not only learning from each other, but they also learn to share knowledge and organize the process of collaborative learning. The social approach also covers the concept of *participant-directed learning*, which indicates a collective ownership of the learning process and, especially, the formulation of the problem.

Motivation as key factor

There is no doubt that the increase of students' motivation is a considerable argument behind the fact that PBL-models work worldwide. Self-directed learning, or in the Scandinavian version participant-directed learning, is a substantial source of motivation. The abilities to influence teaching processes, ask the questions and bring together known comprehensible contexts are all motivating factors.

The PBL-model at Aalborg University is characterised by open problem based learning and student controlled project work. Therefore, it is not a question of ensuring that students use specific knowledge, but rather a question of guiding them to give reasons for and make central choices in the learning process within the outlined professional frames.

2.3 Effective facilitation in PBL – state of art

The effective facilitator

What constitute an effective facilitation role in a PBL setting? In general, Savin-Baden (2003) mentions two challenges for teaching staff in PBL:

- 1) to be a facilitator who is aware of how they teach, why they teach that way and how their teaching is perceived by students,
- 2) to equip the students to take control of their own learning.

These two challenges have been well researched in different disciplines within medical education. Many scholars write about the role and responsibilities of the tutor/facilitator in a PBL setting. Since the beginning of the employment of PBL in educational setting, Barrows and Tamblyn (1980) have proposed that the role of teaching is facilitating students learning rather than conveying knowledge. Instead of telling students what they should learn and in what sequence they should learn, the tutor should help students determine on their own what they need to know and how to learn. By stating that 'A faculty person who is a good tutor can successfully tutor in any area', Barrow and Tamblyn (1980) highly weigh the role of facilitation in teaching activities in PBL.

Critical reflection

Margetson (1994) suggests that the tutor facilitates or activates the group by questioning, probing and encouraging critical reflection, suggestion and challenging in helpful ways where necessary to ensure that the students progress satisfactorily through the problem. Through their examination, De Grave *et al* (1998) confirmed the suggested four factors for the role of tutors in PBL: elaboration, directing the learning process, integration of knowledge and stimulating interaction and individual accountability.

Scaffolding

In their later work, by using the metaphor of ‘scaffold student learning’, the same writers (De Grave *et al* 1999) propose a model of supporting student learning which constitutes elements of knowledge and interaction and dialogue.

Stress learning processes

Based on the experiences from the University of Maastricht, they also suggest that more effective teaching take place when teachers (tutors) stress the learning process more than the content acquisition. Findings from the above mentioned quantitative studies have been echoed by qualitative research. For example, based on discourse analysis, Gilkison (2003) indicates the importance of tutors’ roles of “raising students’ awareness” and “facilitating the group processes” in a PBL setting.

Students’ expectations

In medical education, several studies on students’ perspective on effective facilitation within a PBL environment have been carried out. These investigations show that the expectation to the facilitators’ skills is rather multidimensional, including both facilitative skills and knowledge expertise. Based on their survey study, Kaufman and Homes (1996) find that students appreciate the facilitative and collaborative style of tutors who have:

1. skills in group facilitation,
2. friendly and approachable personality; and
3. capability of giving clinical insight or anecdotes and pointing out clinical relevance to the cases.

These findings are echoed by the qualitative studies. For example, Caplow *et al* (1997) identify three roles for effective tutors from the students’ point of view:

- 1) facilitative expertise - the tutor’s knowledge and ability to facilitate group work;
- 2) knowledge expertise - the basic science or medical craft knowledge possessed by tutors; and

- 3) clinical reasoning expertise – tutor knowledge of medical problem-solving and critical reasoning skills.

Steinert (2004) find that students highly emphasize group atmosphere and facilitation skills. Students' comments on effectiveness of teaching indicate the importance of clinical relevance, critical thinking and the integration of basic and clinical sciences. A recent study by Kassab *et al* (2006) shows that students value the effectiveness of teaching from those who respect students' options, establish good communications with students and understand their feelings and advise students on how to learn. These studies on students' perspectives on the role of teaching in PBL have been found useful for staff development, as students needs and interests can be revealed and identified from the way they evaluate teaching (Das *et al*, 2002, Steinert, 2004).

Reflection and action

Studies on the role of teaching in PBL in engineering education have been carried out as well, though not sufficient in number (Kolmos *et al* 2004). Based on Kolb's (1984) experiential learning model and Schon's (1983) theory of reflection, Hansen (2000) has developed a model of facilitation at engineering studies in PBL environment. Hansen suggests ways of which a facilitator can help the students get through respectively the comprehension and transformation dimensions in order to improve group dynamics.

The facilitators should also take initiative to create a learning environment based on reflections and experimentations. In practice, some guidelines are suggested to teaching staff for them to play the positive role of facilitation (Hansen and Jensen, 2004):

- 1) focus on improving the students' communication,
- 2) address project management and use facilitative questions to start reflection,
- 3) introduce communication diagrams, and
- 4) participate in the structuring of the project.

Process skills

Based on teaching experiences and qualitative research evidence, Kofoed *et al* (2004) suggest that the project facilitators' support is necessary and it is important to create a reflective learning culture. Therefore, facilitators should be qualified in both the subject area and in helping students develop process skills like communication, management and group dynamics.

Contextual diversity

The contextualization of the role of teaching in PBL has been reflected by several researchers (Neville, 1999, Hansen, 2000, Kolmos *et al* 2001, Du, 2006a). From different perspectives, these writers stress flexibility, diversity and contextualization of facilitation in PBL settings.

Neville (1999) discusses about the relation of facilitation to disciplines and departmental affiliation. Hansen (2000) reports differences in facilitating individual students and groups of students. Kolmos (1997) summarizes the context-dependency of facilitation by referring to the variety in PBL practices, types of projects and level in the educational system. It is concluded that the most difficult part in facilitation is to be able to “read” or “decode” students’ knowledge and practice in order to contribute to their learning process. Du (2006a) finds that students’ have different expectations to the teaching staff, depending on project status, stage in the educational system and discipline. As a conclusion of her study on facilitation in PBL, Savin-Baden (2003) argues that to enable students to achieve according to their maximum potential, facilitators require a flexible approach, which is context dependent and responsive to the needs of a diverse range of students.

Open definition

Savin-Baden (2003) summarizes the openness in the definition of effective facilitation in a PBL environment. She states that being an effective facilitator is more than just asking open-ended questions and to ensure that the team works effectively and that team member’s learning needs are met. The facilitator also has to promote a team culture, be challenging, help the students to manage the tasks and process and enable them to move from critical thinking to critique. As she wrote,

The facilitator, therefore, has a role in not only being honest about her own agenda within the team, but also a responsibility to help the team to examine what counts as acceptable behaviour and perspectives and how notions of difference can be assimilated in the team effectively. It is, in many ways, easier to avoid engagement with complex issues that are perhaps seen as more disruptive than it is to help students learn to manage them within the team. Facilitators need to be aware of such complexities so that they do not silence some and privilege others. Thus effective facilitation demands not only that we acknowledge and manage diversity, but also that we learn to trust the judgments and intuition of ourselves, our colleagues and our students. (Savin-Baden 2003: 50-51).

Complexity

In summary, there is a general lack of agreement considering the requirement as well as the assessment of teaching skills for university teachers (at a European level especially) (Graaff, 2004). And it has been a difficult task to provide precise answers to the question of effectiveness of facilitation in PBL. Savin-Baden (2003) argues that facilitators are affected by both the learners and the learning contexts, which makes it difficult to define what is ‘good’ or ‘better’ facilitation. It is more important to explore the impact of tutors’ personal and pedagogical stances to facilitation than to merely generalize their behaviour and outcomes. Facilitation in a PBL

environment demands not only awareness, skills, strategies, but also engagement and personal development processes.

2.4 The complexity of facilitating PBL

Facilitation is connected to a high degree of, what Polanyi (1966) would call, tacit knowledge. Even the most experienced facilitators have a hard time expressing how and why they arrange, practise and appropriate their facilitation in different settings. We will argue that this is because the process of facilitation is extremely complex.

A facilitation model

In facilitation, psychological, cognitive and institutional factors are closely intertwined, and at the same time the learning process and learning outcome is not predefined and the power to arrange the process is highly distributed. Figure 2.2 illustrates the level of complexity of facilitation in a PBL environment.

Chaos-management?

The facilitator has to appropriate their practise to a mix of student identities (at least in a group setting), to support their organizational learning and to secure a progress from idea to solution. Furthermore, the facilitator has to work within a given educational framework, where the predefined teaching philosophy might be more or less in agreement with personal opinions, and the regulations, resources and physical environment might either hinder or support the facilitation process. Facilitating is a kind of chaos-management at micro level – without actually being in a traditional management position.

The question is – what can you do if you want to develop your facilitation skills without being in a trial and error position? What we suggest is that it might be helpful to have some tools and guidelines at hand.

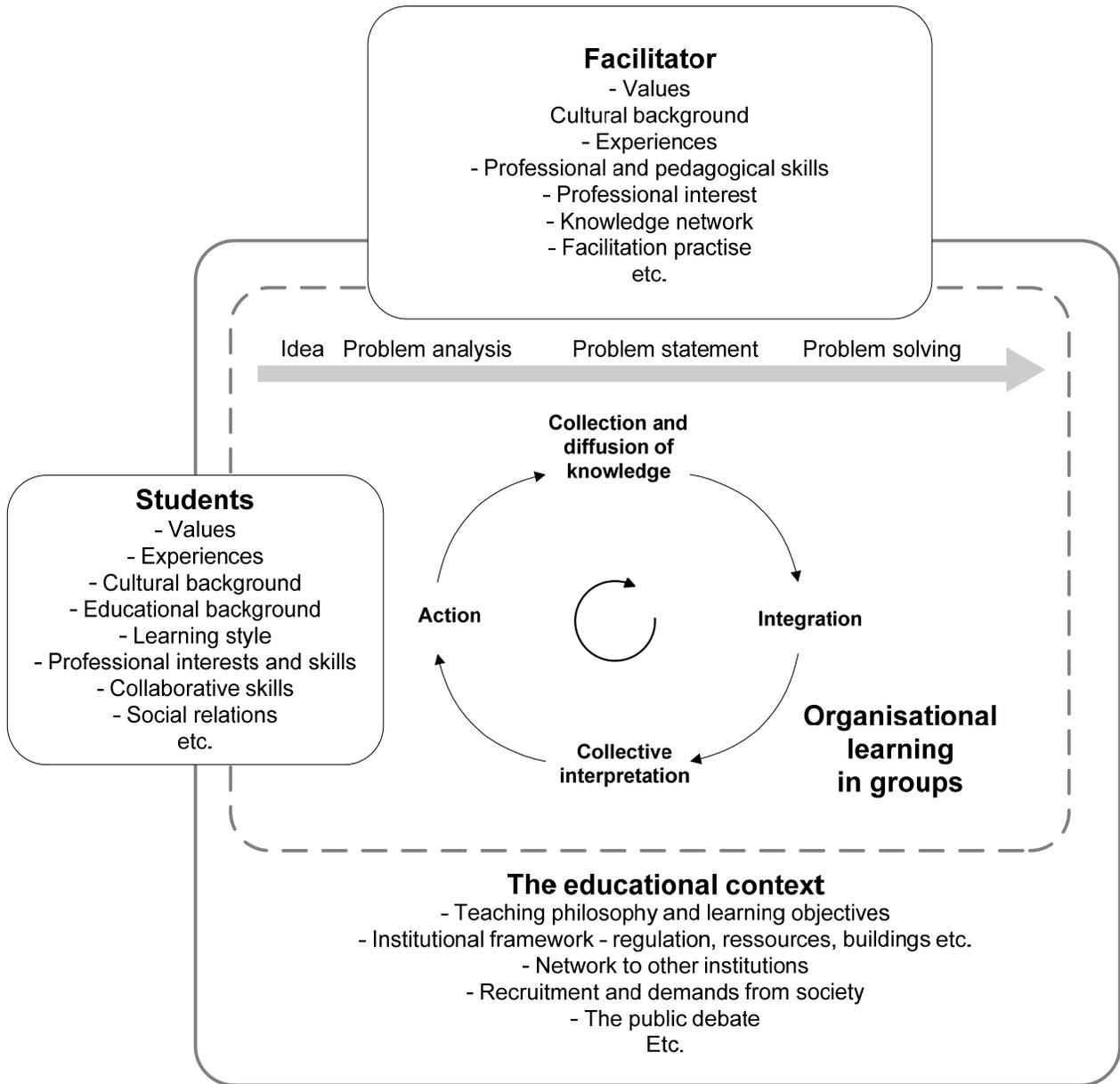


Figure 2.2: The complexity of facilitation.

3. Facilitation and PBL

In this chapter we will present the PBL framework for facilitation including an introduction to the PBL-curriculum (3.1), Teamwork (3.2) Different project types (3.3), typical phases in the project (3.4) and facilitator tasks (3.5).

3.1 The PBL curriculum

PBL on different levels

PBL can be practised in a single course, but many teachers running isolated PBL activities find that there are a lot of obstacles, in connection with schedules, demands for assessment, acknowledgment from leaders, etc. As a PBL system may contradict traditional systems, it is important to have educational models in mind.

Curriculum cohesion

Models can and will look different as they must be adapted to culture. However, cohesion is important between all elements in a curriculum: the objectives, the selection of content, the learning methods, the exam/assessment and not at least the teacher's and student's expectations. Change in one of these factors will influence the others.

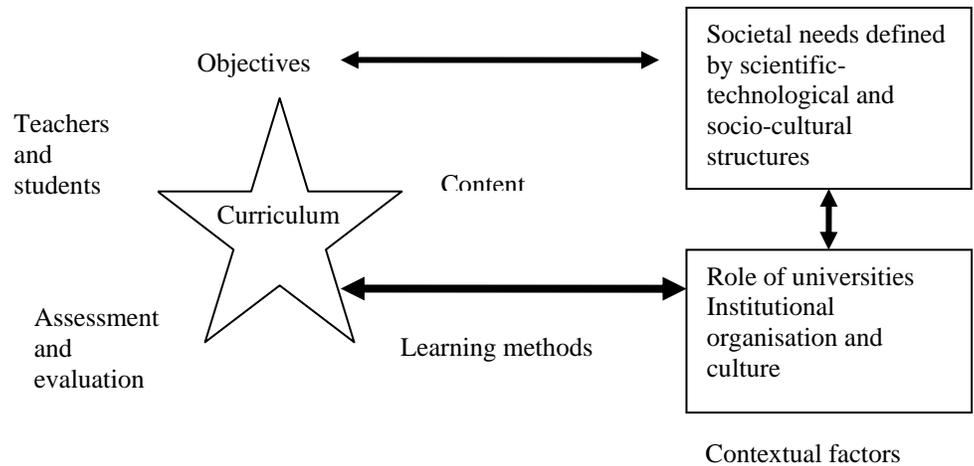


Figure 3.1: System approach to curriculum development

Objectives

The goals and objectives have to respond to public society and employers. Normally, in a PBL-system there are additional objectives to address skills as cooperation, project management, methodology and interdisciplinary as well as practice related analysis and solutions.

<i>Content</i>	Principles for selecting content should be provided in order to avoid an overloaded curriculum. In a PBL curriculum there are other criteria for selection of content such as the problems addressed in the projects, as they determine the choice of scientific methods. Thereby, the facilitator has to align the project proposals to the content specified in the criteria.
<i>Learning methods</i>	The choice of learning methods should correspond to the goals and objectives and take the students' experiences and interests as well as choice of learning media into consideration. In a PBL curriculum there are a lot of choices to be made, e.g. size of the group, type of projects, length and scope of projects, the relationship between traditional lectures, seminars and projects and the degree of students' self-determination, etc.
<i>Assessment / Evaluation</i>	The choice of assessment methods should correspond to the goals and learning methods and also secure quality improvement. In a PBL environment, the assessment method has to correspond to the team setting including common goals and distributed workload in the project. However, at the same time an individual judgement often has to be made. Evaluation for quality assurance in a PBL system has to be built on the same ideology as the rest of the system, e.g. involvement of students in both formative and summative evaluations.
<i>Teachers and students</i>	Staff's and students' former experiences, expectations and attitudes to learning should also be considered. In a PBL-system it is important to give room for the interests, experiences, ideas and identity work and motivation of students as well as teachers.
<i>Contextual factors</i>	The curriculum system interplays with institutional culture and organisation and there ought to be an alignment in the same way as there is an alignment among the factors in the curriculum development model.

3.2 Teamwork

Teams consist of individuals and for a facilitator coming from outside, it can be very hard to look through what is happening among the team members. Knowing some of the theories of group dynamics might help in understanding the communication and collaboration pattern among the team members.

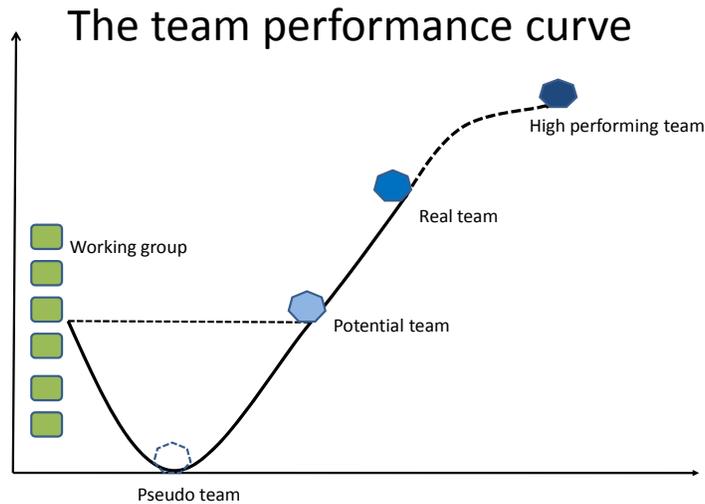


Figure 3.2: The team performance curve (Katzenbach and Schmidt, 1993)

Katzenbach and Schmidt (1993) have developed a team performance curve with five types of teams, see figure 3.2.

Working group

The start is the working groups consisting of individuals. They do not share a common goal, but do primarily interact with each other to share common information, experiences and help each other in the learning process. These groups might be regarded as some kind of study groups where the members have individual goals and thereby they are not working on a common project.

Pseudo team

The second type is the pseudo team. They should be working on a common goal/common project, but they do not really try to achieve any goals. These types of teams are weak groups. Maybe they do not know how to collaborate, maybe they got stocked by personal conflicts or they do not have interest in joining forces. In education you find many of these types of teams – the members are confused, and they need guidance in how to proceed.

Potential team

The third type of team is the potential team of which there are many in education. These teams try to collaborate, try to set up clear goals and clear sharing of work – however, there is still a long way to go. For such teams guidance and facilitation is also needed for the team to reflect their own practice in order to optimize their performance.

Real team

The fourth type of team is a real team – defined as a small number of people with complementary skills and who are equally committed to

common goals and working approaches. In education it is typically project groups in the late semesters that have learned how to collaborate and create a supportive social environment.

High performance team

The project groups in the late semesters can also represent the fifth type: the high-performance team. They have all the good characteristics from the real team – but they do more. They are committed at a personal level and invest time and energy in doing things at the best level.

The question is how to facilitate student team to improve their performance and their common goals. Many student team run into problems at a personal level due to different levels of ambitions, personal conflicts, different interests, difficulties in keeping appointments and deadlines, unequal amount of workload, lack of knowledge in project management, etc. There are no easy solutions; however, it should be a point on the agenda for new and not so experienced teams to discuss potentials and experiments for improvement.

Team developing phases

For each team there are phases to go through. Lenn er-Axelson and Thylefors (1993) have described five phases:

1. The initial phase characterised by uncertainty, vague norms and roles and some power struggles.
2. Honeymoon phase with “nice” communication, unity, generosity and idealization.
3. Integration phase with crystallization of roles, creation of sub-groups, deeper communication and a “we”-feeling.
4. Phase of conflicts where the power has to be divided, alliances created and where there is a need for management.
5. Maturity is the last phase where teams hopefully will reach, with clear goals and roles, mutual respect, clear communication of facts and feelings, constructive criticism and consensus.

Forming, storming, norming, performing

In the literature, there are many overlapping ways of characterizing team phases. Another typology is the forming, storming, norming and performing phases (Jaques, 2000), which are build on the same elements as in the previous phases but in another order. Jaques (2000) combines these phases with types of needs, see figure 3.3.

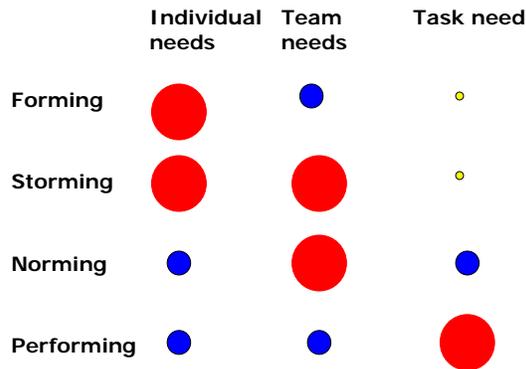


Figure 3.3: Relative influence of individual, group and task needs on group member's behavior at different stages of group development (Jaques, 2000).

Different needs

David Jaques (2000) emphasizes that there are different needs for individuals, teams and tasks during the team process. In the beginning individuals have the need to create their own identity in a new team – why am I here? What are my contributions? How do I interact with the other team members? During the period of storming where the groups has the first conflict concerning different interests and maybe also work patterns, it is important to create a common ground for the team moving the focus from individual needs to group needs. The performing phase is oriented towards the tasks and it is in this phase, the students should forget about themselves and their own needs, and focus on the problem at hand and how to solve it collectively.

Communication diagram

One very “easy” tool, for improving the communication internally in a team but also with a facilitator, is the communication diagram.

The communication diagram illustrates who is speaking to whom after counting in a period of a half to one hour of observation. After the communication has been counted the team can start to analyze the pattern in several ways, e.g. national background, gender, roles and functions and also extravert and introvert team members. There are many possibilities, and the fact that the communication pattern has been “counted” gives a more solid ground for reflection.

Communication diagram

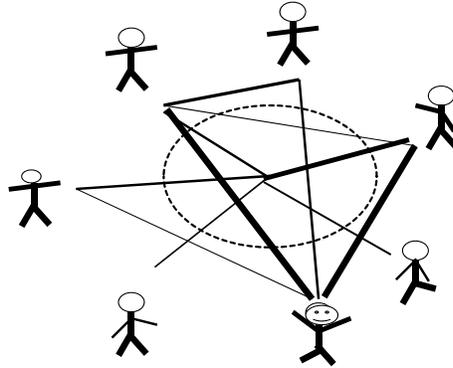


Figure 3.4: Communication diagram

3.3 Project types

There are different types of projects and each one has a different need for facilitation. There is no standardised designation for the project types within educational institutions, but again the specific professional learning objective determines the type of project facilitation. There is a distinction between three types of projects: case based projects, discipline based projects and problem based projects (Kolmos, 1996).

Case/task based project

The case/task based project is characterised by considerable planning and control by the teachers / supervisors. In this notion of case based project, the problem, disciplines and methods are chosen beforehand, see figure 3.5.

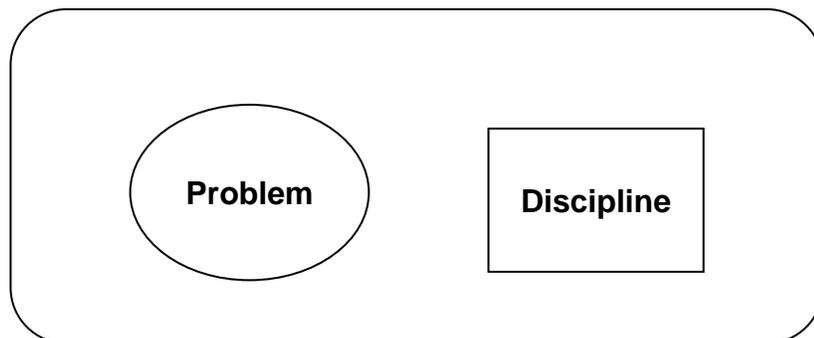


Figure 3.5: The problem and the discipline are chosen before hand in the task based project.

Metaphorically speaking you could think of a football game. You know where the football ground is and you know the basic rules. So you prepared to play by the rules at the ground provided for you.

The discipline project

In the discipline based project, the disciplines and methods are chosen beforehand and the students have a free choice of problem within the frame of the pre-described disciplines and methods, see figure 3.6.

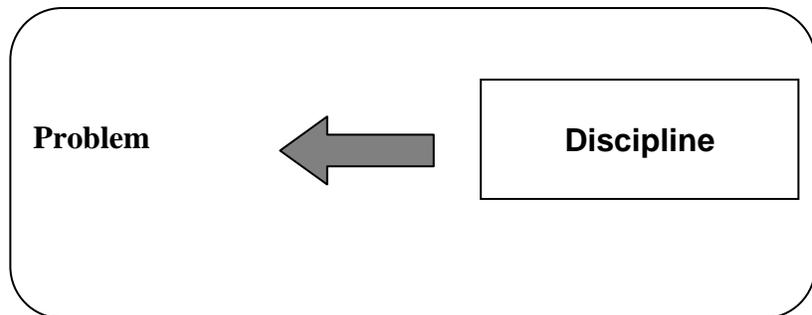


Figure 3.6: The discipline and methods are chosen before hand and within this frame the students define the problem to be addressed.

Again we use the analogy to the football game. This time you know where to find the football ground and you know the basic rules, but you also know that you most like will not win the game, if you do not know how to appropriate your play to the opponent you are facing.

Discipline based projects leave less latitude for the students' project choice. The starting point for the project work is that it must relate to a professional field offered by a certain course. It means less options and priorities for the students, and also exact professional and methodological goals and demands in relation to the project work. In this context the facilitator has a more active role in managing the learning process and the selection of learning material.

The problem based project

The problem based project is different from the two former types of problem orientation as the problem is the starting point. This means that the problem will determine the choice of disciplines and methods see figure 3.7. This is a real problem based learning process where the students have to start with a problem, analyse the problem, find fundamental solutions to the problem, choose the right solution and outline strategies for implementation. Teachers may have to think about ideas for the project and indicate initiating problems, but the analysis and documentation of the problem should be done by the students.

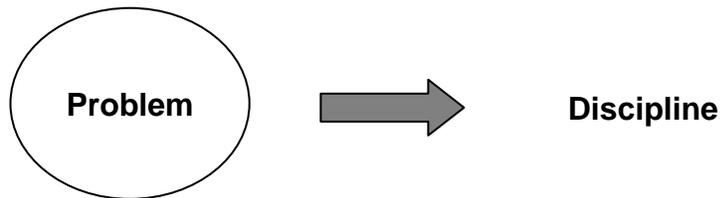


Figure 3.7: The problem will determinate the choice of disciplines and methods in a problem based project.

Metaphorically we are now dealing with a situation where the students do not know whether football is in fact the right game to play – maybe chess would fit the purpose of playing even better. The needs therefore have to be outlined and together with the possibilities to fulfil these needs – and maybe new creative ideas come up and a new kind of game is developed.

As the students structure the analysis and solution, they have the opportunity to demonstrate the use of knowledge from lectures and courses and the facilitator might challenge the students to provide additional knowledge if needed. This project type involves a high degree of responsibility for the students' own learning process, but also some uncertainty. The level of responsibility and uncertainty expressed by students also has to be reflected in the act of facilitation.

The type of project has a tremendous impact on the facilitator's role and the relation between traditional courses and projects. Experience shows that a close cohesion between course offer and project work motivates the students' learning of the course material. On the other hand, experiences also show that the students are more motivated for project work in open projects, because they have the opportunity to influence the choice of problem to be addressed, and the theories and methods to cope with the particular problem.

3.4 Phases in the project

Pre- and after-supervision

Norwegian didactics have been very systematic in their illumination of the facilitator's functions by stressing peer supervision among colleagues as well as project facilitation and facilitation in general. Especially in relation to peer supervision, Lauvås, Lycke and Handal (1996) operate with the concepts of pre-supervision and after-supervision which

underlines the importance of planning before and evaluating after the supervision sessions.

We often meet the impression that facilitation is something you just do on the basis of the students' work papers. However, preparation of facilitation is extensive as the response to the work papers must be adjusted to the students' professional level and relate to the overall objectives of the project. Prior to facilitation it is important to ask oneself what could be the next goal for the students in order to support the progression in the project work.

A progression perspective

Hiim and Hippe (1998) work with a relation-didactical access. In relation to project facilitation they operate with different phases which must be seen in relation to each other. The phases follow the course of the project work closely and include:

- Mapping of the participants' qualifications
- Determination of project frames
- Presentation of the problem / goal
- Clarification of project content
- Work process / learning process
- Evaluation of the project work

Again the preparation phase is underlined.

A social perspective

Inglar (1999) follows up by emphasising the phases of facilitation:

1. The contact phase: social contact, get-to-know one another and uncover expectations between the parties
2. The contract phase: wording of expectations and agreements and types of dialogue and response.
3. The preparation phase: planning of all didactic elements, including the students' qualifications, frames, goals, contents, process, evaluation and relations (according to Hiim and Hippe's phases). The plan covers the whole period, but may be adjusted continuously.
4. The implementation phase: professional character of the meeting; pre-facilitation/planning of each meeting, implementation of the activity, further strategies and after-facilitation e.g. an evaluation of the students' progression (according to Lauvås, Lycke and Handal).

5. the evaluation phase: evaluation of each meeting is related to the after-facilitation, but with more focus on the pedagogical evaluation.
6. the end phase: each meeting is ended with, what has been learnt, what has been done and what can be done differently next time.

From visions to details

It is not imperative which phase you choose. It is important to be aware of the different phases and suit the facilitation to the actual phase in the project course. In a start-up phase, the students will need a facilitator who inspires, is full of ideas and opens up possibilities while the end phase is about ensuring logic, consistency and consequence in the final project presentation.

3.4 Facilitation tasks

Facilitation is situated

Facilitation is diverse. What went well in one student group is not necessarily a success in another group. Facilitation is situated and therefore dependent on various factors and relations. As a facilitator, it may be difficult to access what went well and what went wrong. An emotional reaction from the students may very well be irritation and fatigue because they have to rethink and rewrite parts of the project. It is complicated to decode the students. Their immediate reaction to the facilitation does not necessarily correspond with their recognition of the professional outcome three weeks later.

Interpersonal relations

Normally, facilitation runs without problems between students and their facilitator(s). At the beginning of the course the parties adapt as the students quickly read the facilitator's professional codes of learning, temperament and tone of language and likewise the facilitator reads the project group and the individual group members.

As in all interpersonal relations the first meeting between facilitator and students is very important and has a great impact on the rest of the course. The students will expect to meet a facilitator with professional as well as personal qualifications. It is important to harmonise the mutual expectations and requirements with regard to professional, process oriented and social relationships. This harmonisation of expectations continues throughout the course.

Multidimensional tasks

There are several tasks to take care of as a facilitator. The very first classifications of project facilitation written in the late seventies and early eighties mainly provide a description of work functions. These are

typically described in diverse study regulations where they are worded as a line of specific tasks and procedures (Kolmos, 1996). The descriptions vary from study to study due to contextual differences, but in summary aspects of planning, organisation, implementation and evaluation of the project work are addressed.

Statements on tasks

In these early attempts to define the functions of facilitation you find very specific statements regarding the tasks of a project facilitator. The following is an example of such a statement:

Planning and organisation:

- Participation in meetings for the gathered facilitator group of the semester.
- Interpretation of the semester goal and preparation of topics and project proposals
- Planning of semester introduction, guest lecturers, special courses etc.
- Input to the time schedule and timetable for the semester.

During the semester:

- Participation in the main group's meetings.
- Preparation and participation in staff meetings for teacher groups.
- Preparation, implementation and evaluation of facilitation meetings with the students.
- Contact with companies etc.

Evaluation:

- Planning and running the exams.
- Participation in total semester evaluation.

Professions and people

Exceeding the specification of the work functions there has been a continuing discussion whether the facilitator should relate only to the professional aspects of the project work, or if the facilitator should also relate to the organisational, process oriented and interpersonal aspects. Over the years there has been a tendency to provide facilitation of pure professional character, but group cooperation should also be facilitated – especially when new students has to be socialised into the PBL environment.

4. Types in practice

– a framework for decoding student needs

In real life each group is unique and if you ask the group facilitators, they are also quite different from person to person and project to project. However, facilitator types can be useful tools; like different jackets we can put on and off when appropriate or suddenly find our self in.

Furthermore, an important quality of a facilitator is his or her ability to facilitate an awareness of the individual within the group, the role each person is playing as a team member and the role the facilitator is playing as well. This can be facilitated by using categorisations or even tests as a foundation for introspection and/or collective interpretation and reflection.

In this chapter we will introduce you to:

- different frameworks for reflecting ones facilitator types,
- a personality type indicator (MBTI),
- an indicator of learning style (ILS) and,
- an overview of different team roles.

There are many alternatives to these characterizations; however the ones presented is chosen as they provide different reflections on the personal and interpersonal dynamics in a PBL environment.

Authorisation

However, it has to be taken into consideration that you have to have or consult somebody with an authorization to test by the MBTI or Belbins team model, and furthermore there is a fee for each tests given. However the personality types and roles can be presented for students for self reflection. The ILS is on the other hand free of charge.

4.1 Facilitator types

Facilitation invites many different roles and forms of involvement in the students' project and learning processes. The facilitator's different roles may be described in relation to the degree of participation in the students' project course.

Levels of involvement

Holten-Andersen characterises three typical roles (Holten-Andersen et al., 1983):

1. the facilitator acts like a group member;
2. dialogue based facilitation; and
3. the facilitator acts as a consultant

The facilitator as group member

If the facilitator takes the role of a group member, the facilitator takes over the responsibility of the project. The facilitator participates as an active group member and is, for example, actively involved in choosing theory, methods and literature, together with the structuring and editing of the project. This type of facilitator ends up being strongly dominant in the project work, endangering that the students are deprived of the responsibility of their own learning, with no space left for the students to try out their own ideas. Facilitators who participate as group members tend to give the answers instead of posing questions. The facilitator also tends to be the “project owner” instead of the students.

Dialogue based facilitation

The dialogue based facilitator keeps a certain distance to the group. This facilitator stands on the sideline, ready to give a kick, if necessary, but also ready to pull back if the group is able to work by itself. This role gives space for the students to take initiative and try their own ideas and at the same time the facilitator provide guidance. The facilitator will point out the possible directions in which the students can seek answers, and there is no doubt that the students are the “project owners”.

Consultancy

A facilitator in a consultant role is passive at the beginning and is only active when the group asks for facilitation. The danger is that the students get stuck and for a period of time do not have the general view which is necessary to call on the facilitator. The consultant will give the facilitation the group what it asks for and sees undoubtedly the students as “project owners”.

4 types of facilitation

Tofteskov has described four types of facilitation: product; process; laissez-faire; and control (Tofteskov, 1996), which to some degree overlap the roles described above. The concepts of product and process facilitation have especially been recognised by staff.

Product facilitation

Product facilitation might be a more traditionally master-apprentice relationship characterised by the facilitators' ownership towards the final project report. The facilitator drives the students out of their own ambition and is not satisfied before the group has reached this goal. Product facilitation is directed to the project report and the facilitator gives lots of direct solutions and tip-offs to the students' professional problems. The facilitation tends to answer questions instead of giving choices, as was the case for the consultant role. The facilitator reads the working papers through several times which resemble a reviewing-process. In this type of facilitation, it might be difficult to make a shift in role to the examination because the facilitator must judge himself. In this way, the facilitator has become a "member of the group" and indeed a very dominant one.

Process facilitation

In process facilitation, the students' current learning process and ideas are emphasised. The goal is to support progression in students' learning. This does not necessarily mean that they reach an optimum result. The philosophy in process facilitation is that the students learn as much of their faults and mistakes as of a flawless project report. When the facilitation aims at the process, it can both include professional and collaborative processes. As a facilitator you will practise dialogue based facilitation by asking questions and give possible solutions and you will make the students reflect on their professional and organisational processes.

Laissez-faire facilitation

Laissez-faire facilitation is the more indifferent and superficial type of facilitation. It is found in two versions. The facilitator may believe that the implementation of the project depends on the students' inclination – which you should not interfere too much and only praise. The other laissez-faire facilitation covers lack of involvement where the facilitator would rather mind his own business and hence only gives superficial response to the work of the project group.

Control facilitation

Control facilitation is characterised by the students being examined during the whole project period. The facilitator controls if there is depth behind every written word, whether every group member contributes to the process and if there are differences in the students' skills. This kind of facilitation may seem scary to the students and they may choose to limit the facilitator's insight into the work of the group.

Interplay of facilitation types

The above-mentioned types of facilitation are described as ideal types. In reality, it looks somewhat different as there will often be a mix in the specific facilitation situation. It is possible to mix elements from product

and process facilitation and to some extent still have some control. The types can also be used in different phases of the course. Process facilitation is often used at the beginning of a course while product facilitation is practised at the end.

Bitsch Olsen and Pedersen (1999) have coupled the four facilitation types with a further two dimensions: problem oriented and professional oriented facilitation. These two concepts are not in contrast to each other, but have different focus.

*Problem oriented
facilitation*

Problem oriented facilitation takes its starting point in the problems of the project. It supports the students in wording and analysing the project's problems and gets an overview over choices of method. The use of methods is a central element in facilitation, covering a critical reflection on the advantages and disadvantages of using the chosen methods and adjustment of methods to other contexts. The interdisciplinary aspect is also central in problem oriented facilitation as the problem is controls the choice of theory and method. This type of facilitation is closely related to the problem based project described in section 3.3.

*Professional oriented
facilitation*

On the contrary, professional oriented facilitation is centred about the specific scientific field. It is about combining the professional areas of interest and curiosity with scientific skills in order to formulate theoretical perspectives and develop methodological frameworks. This type of facilitation is closely related to the discipline project (see section 3.3).

These two dimensions are closely connected and in a facilitation situation, regardless of the project type, there will be a need for both. As problems may lead along unknown ways and require new types of methods and cross-disciplinary couplings, problem oriented facilitation will reach much further than the professional oriented facilitation. However, there will always be a need for the professional oriented facilitation.

Overview of types

Bitsch Olsen og Pedersen (1999) developed the following table, where the problem oriented and the professional oriented facilitation are related to Tofteskov's four types of facilitation..

<p>Product facilitation Result oriented</p>	<p>Problem oriented facilitation Stimulates analysis and conclusions. Provides suggestions to problem presentation, analysis and conclusion etc. Looks for the “red thread”.</p>	<p>Professional oriented facilitation Leads the project towards certain scientific questions in the interests of the facilitator. That is “research based facilitation” where focus is on the facilitator’s research.</p>
<p>Process oriented facilitation Course oriented</p>	<p>Stimulates independency and choice of analysis. Poses questions to problem presentation and the problem field.</p>	<p>Stimulates critical and self-directed use of theory and method in the research of the group.</p>
<p>Laissez-faire facilitation Conflict shyness or uninvolved</p>	<p>Everything is official as long as the group works with the project. The conflict shy facilitator accepts all papers while the uninvolved might just stay away.</p>	<p>Everything is official as long as the group does as the facilitator directs them to do. The facilitator tells stories about their own research.</p>
<p>Control facilitation Directed at exam and checks for capacity</p>	<p>Sets deadlines and controls regularly that the group’s work is proceeding. Very active at the end of the project work.</p>	<p>Discipline/study regulation based facilitation Ensures that the group has a deep understanding of theory. Very active at the end of the project..</p>

Bitsch Olsen and Pedersen (1999:126, own translation)

Different roles are needed

There is no ideal role to suit facilitation as it will depend on the group and the course of the project. The competence of the facilitator is to master several types of facilitation and be able to choose the form that stimulates progression in the learning of the students. The difficult part is to decode students’ needs and adjust the facilitation accordingly.

As a facilitator you do not decide yourself which role you take on and it might be necessary to practise all three roles within the same project course. For instance an integrated project group with lots of self-confidence starts out with the perception that they can manage on their own and they push the facilitator out into a consultancy role. If the group later on gets stuck they do not necessarily want the facilitator to solve their problem but it may be ideal if the facilitator redefines his role to the dialogue based facilitator or even acts as a group member for a while. The situation may also be the opposite where there is a need for the facilitator at the beginning of the project period, while later on the facilitator is pushed into the consultant role as the group gets more resourceful.

Personality matters

However, the choice of facilitator's role is not only dependent on the relation to the group but also the facilitator's identity, temperament and experience come into play when the role is formed and practised. Young facilitators often have difficulties at the beginning, partly in leaving the responsibility for the project to the students, and partly by acting as authority. Other facilitators find it difficult to leave one's own ideas and perceptions in favour of the views of the group. Finally, there might be facilitators who leave far too much responsibility to the project groups, because they solely take on a consultancy role. The ideal is to be able to use all roles as required in relation to the professional as well as the social process of the students.

Finally, it is important to underline that in the facilitator's role you must never enter a dialogue with the students on an equal level. The facilitator's role also includes the function as judge or executioner and that has, of course, decisive consequences for the interaction between the facilitator and the students.

4.2 MBTI on personality

Personal communication is an important aspect of facilitation. There is no doubt that personality comes into play in facilitation and is far more visible than in the ordinary course and class education.

Body language and tone

When the "tough words" are said with "happy eyes" and in a tone of "teasing" they have another meaning and effect than if the body language directly supports the "toughness". And if you express the "tough words" with a soft voice and politeness, you may risk that the real message never gets through to the group. In intercultural relations one on the other hand has to be very careful with humour.

As individuals both students and staff are different, not only in regard to learning and communication styles, but also in the fundamental value orientation. The individual type indicator is a way to understand identity and personality.

The MBTI

Myers-Briggs Type Indicator (MBTI) is just one tool to reflect on personality. The MBTI-model is a further development of Jung's personality types. Simplified it builds on four basic dimensions (Briggs Myers and Myers, 1980). Here the dimensions are only briefly described and presented in figure 4.1.

E Extraversion	Attitude to the surrounding world	Introversion I
S Sensing	Perceptive function	Intuition N
T Thinking	Judgemental function	Feeling F
J Judging	Lifestyle	Perceiving P

Figure 4.1: Four dimensions in the MBTI

Extraversion/Introversion

The first dimension is attitude towards the outside world and the question about where the individual finds the energy – the extroverted versus the introverted. Extroverted types find their energy in the outside world. They need contact to the surroundings, to speak a lot and are often recognised through speaking and discussion. They are social types, fast, active and enterprising. Introverted types, on the other hand, get their energy from the inner world. They speak after they have thought and therefore present very well thought out arguments. They are reflecting types who perhaps prefer to arrange their thoughts on paper before discussing them. They need to withdraw and practise more private and reserved social relations. They are not so fast and enterprising because they need to reflect before they act.

Sensing/ Intuition

The second dimension is the perceptive function which describes the way a person perceives information. It is distinguished between sensing versus intuition. Sensing is based on experience and reflects the specific, details, facts and practical use. Intuition is based on theory and covers the abstract, patterns, meanings, ideas and possibilities.

Thinking/feeling

The third dimension is the judgemental function and describes the way a person makes decisions. This is about thinking versus emotions. Thinking symbolises rationality, analysis, objectivity, distance and justice. Feeling does not symbolise the feelings a persons have, but the way a person tend to appraise based on subjective and personal values, empathy and social orientation.

Judging/ perceiving

The fourth dimension is about lifestyle, and is about judging versus perceiving. Judging is an expression of a structural approach to the surrounding world, and symbolises systematic behaviour, planning, order, control and being in due time. Perceiving is an expression of spontaneity, flexibility, open and unplanned decisions and the tendency to finish tasks at the last minute.

MBTI-preferences

The MBTI-model measures the preferences of the individual by using these type indicators and the person ends up with four preferences. An MBTI-preference corresponds to the preference of right-handed persons who prefer to use their right hand to write and draw, but can, of course, learn to use their left hand though it takes more training. The dimensions in the type indicator must be understood in the same way. An introverted person can, for example, learn the competences which are natural to an extroverted person, but rests better in his or hers own preferences. The preferences may be combined in 16 different ways which state the MBTI-types with their specific characteristics (Borbye, 1996 and Lawrence, 1996).

Experience from Aalborg

The MBTI-model has, amongst others, been used at the Faculties of Engineering and Science at Aalborg University, in relation to first year students, PhD students and assisting professors. In all contexts the model has been met with approval as it gives a frame of understanding different approaches to communication and learning. The extroverted and intuitive facilitator might suddenly understand why some students slip off the facilitation – perhaps these students are introverted and sensing (Kolmos and Kofoed, 2001).

The MBTI was successfully used in a test with 60 students in Electronics. The students were happy with the tool as it helped them to understand themselves and each other. They did not use the results every day, but they were kept in mind and at an interview afterwards all students were able to remember their own type code and all the technical details about it. Most project groups had an overview of the MBTI types on the wall and they used it frequently to understand controversies in the group. Furthermore, they used it for personal development.

In a project group with several dominant introverted members, it was used to acknowledge the need for developing their extroverted side. They deliberately gave work tasks to the introverted types in the group to give them channels to communicate, e.g. to keep the logbook and keep in touch with the facilitator etc. These tasks would normally be carried out by the extroverted members.

Another group did not find it necessary to use the MBTI-tool. The majority of the group members had identical type codes (ESTJ and ESTP) and only two members fell outside. But these two members had tremendous help from the MBTI-model as it gave them a useful frame of

reference when reflecting on their experiences of group work. One of them was very introverted and had always known, but suddenly it was “accepted and that was a great relief”. The other was characterised by a very strong intuition and had difficulties being understood in the group. The MBTI-model gave these members the possibility to make these differences explicit and enabled the group to discuss dominance within the group.

The usability of MBTI

The MBTI-model has proved to be an excellent tool in relation to project facilitation and group work, but until now it has only found use within limited parts of the project-oriented learning environments. If it is to be an effective educational tool in the future, the model must be used widely by facilitators and students in order to make it a natural part of the educational culture.

4.3 ILS on learning styles

Learning style tests is a rather effective instrument to explicate the learning preference in a way which makes self-reflection and improvement of learning capabilities possible. According to Biggs (2001) it is important to distinguish between learning styles and approaches to learning. Learning style is a concept derived from psychology. It normally refers to the preference of individuals’ way of operating in one way compared to another, so in that sense learning style tests points to the preferable ways of perceiving and processing information.

What is a learning style?

According to Felder and Brent (2005) learning styles can be defined as characteristic cognitive, affective, and psychological behaviors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment. However, learning styles do not include the ability to learn. Abilities refer to how well you are doing things – and there might not always be a correlation between style and ability (Biggs, 2003).

Deep and surface learning

The field of research considering learning style tests is profound and divers. Recognized educational researchers as Säljö, Martons, Entwistle and Ramsden have considered cognitive learning styles in a sociological and phenomenological view by referring to surface, strategic and deep learning (Schmeck, 1988; Sternberg and Zhang, 2001). In their interpretation learning styles do not include the learning approach. The approach to learning is based on a systemic view of learning as an interactive relation between teacher, learner, content/task and methods. The deep approach to learning encompasses that the student is trying to achieve a level of understanding, whereas the surface learning approach

is equivalent to memorizing. The researchers who developed these approaches did not interpret the differences as individual factors but as contextual factors.

Limitations

So learning style tests indicates less about the students' differences in approaches to studying, the intellectual development and different responses to specific classroom environments and instructional practices, as indicated by Felder and Brent (2005). With these reservations, the learning style tests must only be seen as a supplement for analyzing the implications of teaching and learning.

ILS

At the faculties of Engineering, Science and Medicine, Aalborg University, Felder's ILS (Indicator of Learning Style) is used to raise awareness of students learning styles.

Sensors/Intuitors

Like the MBTI, the ILS adopts the complementing irrational types, that are sensing and intuition, and the notations are directly inherited from Jung, although today this can lead to misinterpretation. As the ILS is developed to tell how information is perceived and processed and not how it is judged, the rational functions are not included.

Sensors draw on sights, sounds and physical sensation or as expressed by Jung (1964) objective stimuli. They prefer concrete data, experimentation and factual instructions (Felder and Silverman, 1988), and furthermore observations (Felder, 1993) and procedures (Felder, 1996). For problem solving they prefer standard methods, as they like repetition and dislike complications (Felder and Silverman, 1988). Sensors are patient with details – they are careful but may be slow (Felder, 1993).

Intuitors draws on insights and hunches (Felder and Silverman, 1988), memories, interpretations and ideas (Felder, 1993), and thereby they interpret the potentials and inner meaning of things. Intuitors prefer principles and theoretical insights to solve problems, they are bored with details and often quick but careless. Furthermore they like innovation and welcome complications as they are seen as challenges (Felder and Silverman, 1988). In this way, the sensor-intuitive dimension stresses the preferred type of information (Felder, 1993).

Active/Reflective

Furthermore Felder and Silverman adopt the complementary elements active and reflective defined by Kolb (1984), which is related to the Jungian concepts extroversion and introversion.

Active or extraverted learners process information by physical activity or discussion and they relate the perceived information to the external world (Felder and Silvermann, 1988). They learn by trying things out or

working with others (Felder, 1996). Reflective or introverted learners process information through introspection and they work best by themselves or in pairs (Felder and Silvermann, 1988). They learn by thinking things through (Felder, 1996).

In this way the active-reflective dimension stresses the preferred way to process information, and not the preferred type of information (Felder, 1993). This is the why the sensor-intuitive and the active-reflective dimension is independent, all thought they both deal with preferences related to the internal and external world.

Visual/Verbal

The third dimension, visual and verbal, comprises whether a person prefers information presented by icons or linguistic codes and thereby this dimension emphasize which modality that is most effectively perceived (Felder, 1993). Felder and Spurlin (2005) relates the visual/verbal dimensions to the visual-auditory-kinesthetic formulation of modality theory, neurolinguistic programming and cognitive studies of information processing.

In Felder and Silverman's work (1988) this dimension was named as the visual/auditory dimension, but in 1995 the notion auditory was changed to verbal to include both spoken and written words (Felder, 2002, Felder and Henriques, 1995)

Visual learners prefer demonstration, pictures and diagrams (Felder & Silvermann, 1988), graphs and schematics (Felder, 1993). The verbal learner prefers written and spoken explanations (Felder, 1996), sounds and mathematical formulas (Felder, 1993).

Sequential/Global

The fourth dimension, sequential and global, emphasizes how students progress towards understanding (Felder, 1993). This dimension is the hardest of the four to place in a theoretical context, as it is mainly based on experiences with cognition processes related to particular intelligent children. However, Felder and Silverman (1988) indirectly refers to Kolb (1984) by indicating that the sequential learner may be strong in convergent thinking and on the other hand the global learner may be strong in divergent thinking. Furthermore, Felder and Spurlin (2005) point to several analogs to this dimension, e.g. whether the student has a left (sequential) or right (global) brain dominance.

The sequential learner understands in continual steps and solves problems by linear reasoning processes. Thereby they can apply material when they understand it partially or superficially (Felder and Silvermann, 1988). They prefer an orderly and incremental instruction (Felder, 1996).

The global learner process information in a system-oriented manner and makes progress in large leaps (Felder, 1996). They take in information in seemingly unconnected fragments (Felder, 1993). Global learners seem lost but suddenly they “get it” and to such a degree that they are able to apply it in solving practical problems– and they may not be able to explain how they learned it (Felder and Silverman, 1988).

Overview of the ILS

In sum, four complementary sets of concepts are present in the ILS; active versus reflexive, sensors versus intuitors, visual versus verbal and sequential versus global, see figure 4.2.

Complementary learning styles	
Sensing <ul style="list-style-type: none"> • Draws on physical sensation • Practical and observing • Prefer the concrete: facts and data • Prefer repetition 	Intuitive <ul style="list-style-type: none"> • Draws on insight • Imaginative and interpretive • Prefer the abstract: theory and modeling • Prefer variation
Visual <ul style="list-style-type: none"> • 'Show me how' • Prefer pictures and diagrams 	Verbal <ul style="list-style-type: none"> • 'Explain me how' • Prefer written and spoken explanations
Active <ul style="list-style-type: none"> • 'Lets try it out' • Process information by physical activity • Learn by working with others 	Reflective <ul style="list-style-type: none"> • 'Lets think it through' • Process information introspectively • Learn by working alone or in pairs
Sequential <ul style="list-style-type: none"> • Understands in continual and incremental steps • Linear reasoning process • Convergent thinking and analysis 	Global <ul style="list-style-type: none"> • Understand in large leaps • Tacit reasoning process • System thinking and synthesis

Figure 4.2: Overview of the different learning styles

Usability of the ILS

At the Faculties of Engineering, Science and Medicine at Aalborg University the ILS has been used to test students and make them reflect on the way they react to teaching and team communication. In this concern we see the ILS as a strong tool to increase awareness of different learning styles.

4.4 Team roles

The notion of team roles

A set of team roles is a framework from which each individual can test his or her strength and weaknesses within a group setting. According to Belbin (1993) a team role is a specific behavior, which make an effective contribution to team performance. Belbin has defined nine team roles, where the pattern of role balance has shown to have crucial effect on a team. In the following the nine roles are shortly described based on Belbin (1993).

The ‘plants’

The plant is the first out of three roles associated with thinking types. The idea-makers, the entrepreneurs or in Belbin's words the ‘plants’ are regarded as the creative persons in the group when it comes to idea generation. The idea-makers are crucial in solving complex problems, as they love the challenge of new thinking. However, sometimes the idea-makers have a hard time, when the initiating phase in the project is over, and they might lose interest and be quite offended when the other group members do not find their “new” ideas so interesting in the end of the project.

Monitor evaluator

The monitor evaluator is the next ‘thinking’ role. The monitor evaluator has an analytical eye on everything. He or she values precision and therefore likes to think everything through before going into action. He or she likes objectivity and dislike emotional judgments. The monitor evaluator is important in a team to make well-considered solutions. However, he or she might have a hard time leaving the analytical phase in the project, and might express that by keeping criticizing and questioning the decision made.

Specialist

The specialist is the last ‘thinking’ role. He or she is often single-minded, and likes to go into detail with a specific area on which the specialist is totally dedicated. He or she thereby provide knowledge and skills in rare supply, and might be highly respected in that concern. However, the specialist seems to dwell to a degree where it might not contribute to the team goals, and there is a risk that the specialist overlooks or even disrespects the importance of seeing the ‘big picture’.

Shaper

The shaper is the first out of three ‘active’ roles, as the shaper is the one pushing for action. He or she has a drive to see things happen. Not too

much talk – let us take action. The shaper is willing to take the obstacles to get moving, and even be quite provocative towards people who want to reconsider before acting. Like the coordinator, shapers often see themselves as leaders and might be confident that without them pushing to the others nothing would happen.

The implementer

The implementer is the next role associated with action, and he or she prefers that the project is all ready shaped and it is time to implement the plans. He or she is the one looking at the time schedule all the time. The implementer is also the one actually turning ideas into practical actions, and he or she is very disciplined, reliable and efficient in doing so. However, the implementer seems to be inflexible if unforeseen problems arise and it is not possible to stick to the plan.

The completer

The completer is the final role associated with action and getting things done. The completer however, might surprise everybody as he takes over at the last phase of the project getting everything in place and quality checked. The completer is focused on not making mistakes and therefore he or she goes through every detail to secure that everything is as it should. The completer is the one hating that the misspelling in the first line, second word, at page four has been overlooked. Furthermore, he or she is anxious to get everything right in due time, and might be reluctant to delegate the responsibility for quality control to others.

Resource investigators

The resource investigator is the first of three roles associated with social interaction. He or she is extrovert and finds energy in contact with other people. Resource investigators are important in projects that profits from interviews and dialogue with business or public organizations. However, the resource investigator tends to make many contacts and might lose interest after the initial enthusiasm has passed. Thereby he or she is not that good at establishing partnerships and maintaining long term relationships.

Coordinator

The coordinator in the next “social” role, and in a project group within a education system he or she is often the confident and mature person, maybe older than the others and more experienced. The coordinator is a typical chair person, the one raising issues for discussion in a group, the one promoting decision making and the one taking initiative to delegate the work tasks. However, the coordinator likes to take leadership, and this might be problematic in an educational environment where individual leadership is not legitimized.

The team worker

The team worker is the last of the three social types. He or she is corporative, mild and diplomatic. The team worker is important in a team to reduce unproductive conflicts and establish and main a good

psychological working environment. However, the team worker does not like to see the team in conflict even though the conflict is productive, and the search for consensus and continuously 'calming the water' can result in the lowest determination which might not always be the best solution.

*The usability of
team roles*

Only facilitators with a Belbin authorisation can make Belbin tests, and furthermore resources to pay the fee on each test have to be provided. However, most students at Aalborg University, Faculties of Engineering, Science and Medicine is presented for the Belbin team roles to raise awareness of the different skills needed in group work. Sometimes, students seem to value the 'plant' and the 'specialist' on a higher level than e.g. the 'team worker' and the 'completer'. However, getting an understanding of the strength and weaknesses of the different roles and the synergy between them has a positive influence on the team-spirit and the mutual respect among group members.

5. Keys to effective facilitation

There are different factors that might influence the act of facilitation. In this section, we will exemplify some of the commonly observed factors and discuss how they will impact on facilitation and how these factors can be addressed.

5.1 Clarify the mutual expectations

Collaboration contract

One of the few Danes who have done research related to the contract and the contract phase is Nørgård Dahl (2002). He characterises the start-up phase by 1) uncovering the mutual expectations between students and facilitator and 2) preparing a contract. This procedure ensures that the students' expectations towards facilitation are heard and discussed together with the facilitator's expectations to the students. The contract is a way to make expectations explicit – once these are written down it is much easier to have an ongoing discussion to improve the interplay of students and facilitator.

It is important to be explicit and to balance the mutual and this should happen early in the process to clarify the premises for collaboration. In some educational contexts the facilitation contract briefly describes the professional and process oriented expectations as well as practical issues as meeting frequency, deadlines etc (Nørgård, 2002).

Students' agendas

In practice most facilitation meetings are run by means of an agenda. A draft agenda is normally made by the students and is adjusted together with the facilitator at the start of the meeting. In principle, no meetings are held without written material from the group. However, in the start-up-phase the basis for facilitation might just be an agenda and a few key words concerning the topics to discuss.

Working papers

Later on, the facilitator will expect a written presentation or work papers before the meeting. At this point it is important to know, as a facilitator, how thorough the work papers are prepared when they are presented. If it is the first draft it would be wrong to give a detailed criticism as if it was a final contribution to the project. On the other hand, most facilitators give a more detailed criticism on presentations which have been worked through several times by the whole group. At the end of a project the students experience increasing time pressure and stress level and as a facilitator you know that this means shorter time for mutual discussion of the group members' work. In the final phase the group will be more

sensitive to extensive criticism from the facilitator. At this point the facilitator will normally balance his closing criticism in relation to the project deadline.

Some facilitators want to be presented to the whole project material prior to the formal deadline and evaluation. On the contrary, other facilitators do not want to be presented to the whole material which resembles the project to be assessed right after facilitation. It is a question of temperament and trust between facilitator and project group. Most importantly, the premises for the final part of the facilitation process have to be agreed at the beginning of the project course.

Criticism not approval

As a facilitator you may face a dilemma if you are presented with a report which seems to be incomplete, but from the students' side is seen as complete. The dilemma arises if the facilitator is not aware of the status of the presentation and therefore does not give the necessary criticism. The project group is left with the well-founded apprehension that the presentation did not meet considerable criticism and hence is "approved" by the facilitator. This problem arises especially in project groups with students who have professional or language weaknesses and hence difficulties producing written contributions at the expected level.

Single or group work

As facilitator you would expect that the weaker group members' work is subject to a thorough finishing in the group, but that is far from certain. The other group members may have difficulties giving the necessary criticism because it will obviously be more extensive than towards the other group members. Maybe the group members do not have the necessary resources or tools to remedy the problem or they do not believe that it helps. Instead they hope that the facilitator will notice the problem and provide the necessary help. It is a problem which often arises in facilitation, but is rarely mentioned to the facilitator. The group, however, expects that the facilitator will notice the problem and mention it.

5.2 Communicate effectively

Another angle on facilitation is communication. It is an art to create a dialogue which results in a mutual understanding of the problem, limitations and possibilities in the project and the collective learning processes.

The professional dialogue

Hansen (2002) has developed the concept of professional dialogue based on Schön (1983)'s description of 'the reflective practitioner'. The aim of the professional dialogue in this frame of understanding is to facilitate

students to reflect on the professional content as well as organisational processes. A mutual professional dialogue may be promoted in different ways.

Reframing understanding

One of the specific methods is to reframe the understanding of each others contributions to the dialogue. This means that contributions and questions from the students are repeated by the facilitator. The other way around, the students have to provide an explicit formulation of the way they have understood the facilitator's comments.

Facilitating examples

Another specific method is about answering the students' questions with examples. The examples used must not include direct answers, but encourage the students to extract principles which may solve the present problem. It may prove very difficult for the students to extract and transfer the principles from the given picture to the specific problem, but at this point you may also contribute to the process by reframing. To help the students towards an understanding of how the principles and methods can be used to address a new professional problem is an important facilitator task. The students' ability to "transfer" is trained, e.g. use knowledge and methods from one problem to another.

Relate to typical problems

A comprehensive professional dialogue may also reflect the line of problems which inevitably will arise in the students' project work. The following situations are good examples of this:

- Collaborative problems: Conflicts inevitably arise and is often maintained, because students are unable to enter into a professional dialogue with each other as they cover up their uncertainties.
- Transfer problems: The students have problems with the transfer of knowledge from one field to another. Knowledge is often learned in relation to a certain situation or problem hence it may prove difficult to transfer the use to other fields. This is also the reason why students may find it difficult to relate knowledge from courses and lectures to the project work.
- Abstraction problems: The students find it difficult to go from the specific problem to the abstract theoretical level.

Questioning techniques

Techniques that can be used for asking questions are:

- Summarise what the students say – and ask if this is what they mean?
- ask open-ended questions- use why, how, what, where, who and when
- keep a dynamic list of questions
- give continuous feedback

Even though the dialogue should be the axis of rotation in every project, it is a new approach to the understanding of facilitation. Communication between the parties is not synonymous with a comprehensive professional dialogue where the facilitator develops an understanding of the students' way of thinking and starting point. However, the intention to create understanding should be the aim of any facilitation situation.

5.3 Team facilitation

Group differences

Professionally, project groups differ. In some groups the work is very independent and the facilitation is more like a discussion than guidance. In other groups the response must be repeated several times and the same problems may be discussed more than once. There is a distinctive difference in professional level among the groups which implicates a different basis for choice of facilitation strategies. In weak and dependant groups there is of course a need for many meetings, more control and an extensive response to content and organization. But it is also important to be aware of groups which seem to be self-confident with large professional strength and cooperation competence. Sometimes students cover up their uncertainties and they do not regard the facilitator as a person they can trust and talk to about their troubles. No matter where the groups are professionally and how much project experience they have, the project work is aimed at the common goal of meeting the overall professional learning objectives.

The students' project experience is an important starting point for the planning and execution of the content and form of the project facilitation. If the students have only limited experience with project work or the students are at the beginning of a new education there is of course a need for a more thorough facilitation than the more experienced and professional students. For less experienced students, there will typically be a need for a fundamental introduction to project work and project management. Furthermore, the reasons for cooperation, the level of responsibility and the different roles must be clarified within the group and between the group and the facilitator at the beginning of the project.

The collaborative pattern

The collaborative pattern in a group may often seem inscrutable to the facilitator among other things because the question of cooperation will often not be addressed during facilitation – neither from the students nor from the facilitator. Still, it plays a decisive role in the professional recognition process (Keldorff, 2002).

Project work implies that the students have a basic believe in each others' competencies and therefore believe that they can provide each other with meaningful professional feedback. The learning environment in the project group must provide a space for knowledge acquirement, reflection and learning which also works when the facilitator is not present. The common space of knowledge and recognition is built up through daily cooperation in the group.

The integrated team

The students may have developed very different types of cooperation. The ideal type is the integrated team work where the students equally cooperate and share everything, e.g. working 2 and 2 on the different chapters with one person moving on to work on another chapter after a while. Unfortunately, it is very common that the students practice a more instrumental cooperation where they each work on their own chapter. For experienced PBL-students this might not be a problem but instead a way to increase effectiveness. However, for newcomers to PBL, it is important that they experience a closer cooperation with peers in order to understand the very deep nature of cognitive cooperation.

Students with less PBL experience may find it difficult to understand that the professional outcome of the group process exceeds what single student can reach by himself. Usually, this recognition is already clear after the first PBL process: One has acquired more knowledge, more depth and a higher level of understanding.

Reading the pattern

If a facilitator is to get a picture of the collaborative pattern in a group, the group must account for the present or future organisation of work. But the professional performance and product of the group work will also indicate how the students organise their work and this may be reflected in the facilitation by illustrating the link between organisation and outcome.

Normally, the collaborative pattern of the project group becomes obvious in the final project report. Well-functioning and integrated cooperation results in a homogeneous presentation while an instrumental and divided cooperation pattern often ends up in a project report with independent

and limited chapters. The presentation is normally a precise indication of the organisation of the group and is useful to direct the facilitation process.

Group size

The number of students in a group is important when looking at ways of communication, internally in the group as well as in the dialogue between students and facilitator. It is, of course, easier to ensure a dialogue with everyone in a small group. Normally, the facilitator's chance to get to know each student in a larger project group is limited and you do not have the same opportunity to get a picture of each group member's skills. On the other hand, small groups – e.g. 2 members – give limited grounds for the professional and social interaction which is an important part of the learning process. Small groups also tend to develop a strong sense of tacit knowledge, which unfortunately may obstruct the presentation of the project work.

Large project groups complicate the organisation of the work and demand a tightened set of rules for the group work and the meetings. The students may choose to organise the meetings with a chairman and note taker etc. They may also agree to change seats during the semester. In this way, they break the speaking habits which inevitably arise during the dialogue between the group members and the facilitator.

Comment on project management

Many teachers from Engineering do not feel confident in facilitating group processes. However, it is not so mysterious – both non experienced as well as experienced students may progress their work in a more efficient manner if they get some response.

Lots of students do not expect their facilitator to commend their project management and how they plan, organise and share the work. However, it might be very easy to respond to this part of the process and to ask questions within the professional content, e.g.:

- What is the time schedule?
- What are the plans and activities?
- How have they planned to set up sub groups?
- How will they deal with chapter experts?
- How do they respond?
- Etc.

Let students sum up on meetings

A commonly used technique is to let the students sum up the meeting: what are the three main points from today's meeting? If time allows there could be a round on the individual student's points – this often starts a discussion partly on their internal understanding of what has been said and partly on the understanding of what the facilitator said.

In a PBL-system there has to be a function of introducing the core principles of PBL-learning systems as a part of the facilitation process or through courses. In any case, elements of group processes should be on the agenda for facilitator meetings.

Group Portfolios

A powerful tool to address and reflect on the process of team- and project work is a group portfolio, where the group analyses the process of working together, planning and doing their project. The portfolio might also address the co-operation between group and facilitator and the collaborative pattern in the group. The following might help the students to write the portfolio.

WHY write a group portfolio?

The reasoning of writing the portfolio is that students will be able to improve and enhance their skills in handling problem-based project-organized group work.

HOW to do it?

Writing a group portfolio can be divided into 4 phases: Description, assessment, analysis and synthesis, each of which is shortly described below.

*Description:
What did we do?*

It is important to describe the groups work processes as exactly and as detailed as possible. The areas mentioned above should be included but other areas which you have found to be important may also be included. It is important to complete the factual description before you start to assess and analyse.

*Assessment:
How did it go?*

Having described what happened, the students should assess how it went. In other words: What went well? What did not go so well? It is important to motivate the students to be honest and outright not only about the good experiences but also about the not-so-good experiences – only by realising that some things did not go well can you improve your performance.

*Analysis:
Why did it happen?*

Following the assessment the group should analyse their work processes and reveal the underlying factors which have influenced these processes. In other words: Why did things go the way they did – why they went well or not-so-well? The reflection is embedded in the WHY questions.

*Synthesis:
What to do next*

If the group's self-assessment and analysis is to improve students' skills within the problem-based project-organised group work, it is necessary to synthesise the good and bad experiences and present them as 'good advices'. A useful way of formulating such advice is in the form of a *start-stop-continue*-list, i.e. a list with statements as follows:

- In the next semester we will **start** to do <good action> which we did not do in this semester
- In the next semester we will **stop** doing <bad experience> which we did in this semester
- In the next semester we will **continue** doing <good experience> which we also did in this semester

It is a good idea when writing the group portfolio that one of the areas is completed at a time, i.e. for example start with a description of the project planning process, then assess and analyse the related experiences, and finally make a synthesis by preparing good advices for project planning. The good advices should be very concrete and operational in order to stimulate actual improvements in future projects.

*An example of
newcomers' portfolio*

The group portfolio is extremely powerful for newcomers in a PBL environment, where it is recommended to use at least the first two semesters.

The following is copied from a second semester group portfolio, from a group with 7 members studying Informatics (Jensen, 2005):

'Assignments: There were many different working qualities in the group. Some were good at programming and others were good at usability testing and so on. We made a group role test, which told us what each of us were good at, we took it again at the end of the project, to see if we had evolved. We divided the assignment between us, after wishes, knowledge, ability, mental energy and time. In case there were assignments no one wanted, we looked more at the quality and abilities of each member and decided who should take it.'

5.4 The individual within the group

As a facilitator you must pay attention to the fact that some group members speak in very specific terms while others will express themselves in more abstract ways (Kolmos and Kofoed, 2001). The students may also have difficulties in understanding each others way of

thinking and acting. The facilitator should contribute to this recognition and facilitate the group accordingly.

There is clearly a need for more focus on the individual in PBL-facilitation. In the earlier mentioned concepts of facilitation the students are seen as a group and no differentiation is made between them. The single group member requires to be seen by the facilitator as an individual and to receive personal response.

Personal talks

Hansen (2002) has, on the basis of the professional dialogue, developed specific methods which put focus on facilitation of the individual in the group. As an example he operates with personal talks on the basis of learning logbooks written by the students throughout the project period. The logbooks include an ongoing reflection on specific learning objectives, professional problems, learning problems or problems concerning students' self-organisation. This is a type of diary which would belong to each student.

During facilitation, the students, which Hansen (2002) worked with, gave the learning logbook to the facilitator who afterwards gave a written or oral response. It is a resource demanding method, but at times it can be productive for both the facilitator and the students as they become closer and have a mutual reflection on the learning processes in the project work. The individual talks and learning logbooks may therefore improve the collaboration between the facilitator and the group.

Individual Portfolios

As discuss earlier in this chapter, group portfolios (in a PBL environment) helps both the unskilled groups to reflect and improve their team work process and the facilitator to understand what happens and reflect that in the facilitation of the group. In a similar way an individual portfolio, where each student in a group write and reflect on their own individual skills as a 'project worker', can serve as an effective tool to develop student skills and appropriate facilitation.

Using individual portfolios in course

Besides the experiment provided by Hansen (2001), the idea of making students prepare an individual portfolio, to reflect on their individual learning within a group, has only been facilitated in a course setting (Jensen, 2008):

In order to prepare Danish students to take in foreign newcomers, a new course named Professional Procedures in a Globalized World (PTW) was established in the autumn semester 2007 (1st semester master level) with the purpose: To resume students focus on team work by introducing professional procedures on project management and teambuilding/work in a Globalized world.

Individual portfolios in written examinations

To provoke new reflections on the students past experience's with the subjects, each student had to write a personal portfolio or learning journal documenting their experiences and ability to reflect upon them. These documents were also used for written examination of the course (pass/no pass).

An example of content

Quote about Project management: (see Jensen, 2008)

'Before undertaking Adizes test, I considered what I expected from the test results at first. I concluded that I would have a stronger preference towards the administrator and entrepreneur roles. I have always been very structural oriented with all my work. I often write down plans for solving tasks at hand. This helps me get the bigger picture beforehand. I am most satisfied when most details are discussed and evaluated before the real work begins. Chapter 5 will also show that this applies to my learning abilities as well.

Regarding the actual project management, I prefer when tasks are properly organized among group members, since the individual responsibilities are clarified. By this I mean, when everyone has a task assigned, they get a responsibility for getting that particular task done before a deadline. The administrative role is not only how I prefer to lead, but also helps me cope with different every-day tasks. This aspect will be further elaborated in chapter 6. Regarding the entrepreneur role, I also have a willingness to explore new possibilities and I think long-termed when developing strategies for different solutions.

After the test, I realized I was more of an integrator than the entrepreneur. I still scored highest in having the administrative role.

But this actually comes as no surprise to me, since I endeavour to heighten the social life in the group and try to be aware of the relations

between the group members. Conflicts can be very destructive for the team work and should be solved when discovered.'

Quotes like this show that a student can benefit a lot from reflecting on his or hers skills and the facilitator reading this will be much more aware of each students personal skills, opening the possibility of a much more personal facilitation in order to improve the individual students skills and learning.

5.5 Cultural differences

Recent years have witnessed a growing internationalization of engineering educational programs, partly because international study programs are continuously being established to attract foreign students, partly because staff members increasingly are recruited from foreign countries.

International programs

The increased mobility of both students and teaching staff poses double challenges to engineering institutions: A growth in the number of international programs and an increase of the cultural diversity in the educational setting. Both of these challenges necessitate intercultural awareness and strategies for educators and students alike, foreigners as well as locals.

The challenges are particularly pronounced in a Problem Based and Project Based Learning environment (PBL), because in this learning environment, process skills, such as project management, communication and collaboration skills are demanded in addition to technical knowledge. Furthermore, when studying in International Programs students are expected to develop such process competencies in a multicultural setting. Therefore, specific strategies are needed, both from an individual and an institutional point of view, to improve teaching and learning in culturally diverse PBL based educational environments.

Internationalization at Aalborg University

Since the beginning of the new century an increasing number of international Master programs in engineering and science have been established at the Faculties of Engineering, Science and Medicine, Aalborg University, and the number of foreign students enrolled with the Faculty has increased from 511 in 2000 to 922 in 2005 (<http://tal.aau.dk/studerende/internationalisering/bestand>).

These international programs provide 2-year-long master degree education. The study form is based on the same PBL principles and

methods as used in the Danish study programs. Meanwhile, a growing number of foreign staff members have been employed, who are involved in teaching activities (mainly in international master programs and in some few bachelor degree programs) as well as in research work in different fields. With the participation of students and staff from different countries in the world, the learning environment at AAU is becoming increasingly multicultural. This means that many teaching staff and students in master programs have a chance to teach and study in an intercultural PBL team project.

*Challenges of
cultural diversity*

The increase of cultural diversity poses challenges to teaching staff and students alike, foreigners as well as Danes. Foreign staff and students, on arrival to AAU, often go through a difficult time before they are able to understand, benefit from and contribute to the PBL environment. Danes, on the other hand, often have difficulties understanding, communicating with and benefiting from the new perspectives which the foreigners bring to the educational setting.

*Barriers of
international programs*

The barriers identified in teaching and learning can be summarized in the following:

- Difficulties for foreign students to work in project groups, partly due to their unfamiliarity with project work and partly due to different understandings of team work. It is difficult for multicultural groups to reach agreement on timing, planning, and handling relationships and conflicts in project organization and management.
- A general lack of collaboration between Danish and foreign students. The Danish students, most of whom are familiar with the PBL method from years of study at AAU, often show reluctance to work together with foreign students, who are inexperienced in working within a PBL environment.
- Mismatch of expectations between teaching staff and students. This effect is especially visible between Danish staff and foreign students, and between Danish students and foreign staff. For example, Danish teaching staff expects foreign students to be active and independent in the learning process, while foreign students tend to expect more transfer of knowledge from Danish teaching staff.

Reflection on teaching experiences

Based on our teaching experiences and research over the past years, a range of cultural factors have been attributed to explain these barriers. The main factors are listed in the following.

1) *Language problems*

Language remains the first problematic issue confronting group work in an international context. The use of a second language (English) brings about lots of difficulties in both daily communication and professional discussion. However, different strategies have been developed to solve this problem, when students get more familiar with each other.



Photo 5.1: Group of international students

Photo 5.1 shows how a group of international students work together in their project room. They use blackboard as assistance in their discussion in order to avoid unnecessary misunderstanding in communication since the English language is not the first language for any of them. Everybody writes down their thoughts on the blackboard to explain how they understand and suggest things.

2) *Socio-economic factors*

Socio-economic background factors, such as ethnicity, race, religion, gender, age, etc., also influence people's ways of thinking and communicating. The main cultural differences are reflected in the behavioural patterns (what are good or bad manners), values on timing and efficiency (punctuality), ways of conducting meetings, handling disagreement and reaching agreement, perceptions on the role of teaching (authority vs. facilitation), attitudes towards learning (process-oriented vs. outcome-focused). Peer evaluation appeared to be much more difficult to be appreciated in an intercultural group than in the Danish group context. Foreign students tend to get confused by the supervisors' facilitating questions when they expect precise instruction. Sometimes they are not sure whether they should follow the supervisors' suggestions and whether they offend the supervisors if they do not follow.

3) *Educational traditions*

Differences in educational traditions and systems, for example in terms of the perception of learning, study form, teacher-student relationship,

examination methods etc, have influence people's behaviour in the educational setting. Many foreign students and staff, who come from study environments based on a philosophy of knowledge transfer, find it difficult to understand the philosophy of PBL which highlights problem-solving, critical thinking, active and self-directed learning, self management and collaborative learning. It demands time and experiences for newcomers to understand the idea of learning with problem orientation and project organization, which means that nobody knows the exact answer until the project is finished, and students need to take the responsibility to manage their own learning instead of passively receiving instruction from authority.

4) Collaborative learning

It can also be difficult for newcomers to understand that group work can be an efficient way of learning. In the Danish context, it is closely related to the social and political culture of democracy as well as the constructive approach. For example, the creation of knowledge can come from everybody's participation and information sharing). In some cultures where competition is highly encouraged and individual achievement is greatly valued in the assessment, group work does not have a cultural meaning in an educational context. Due to these differences, many foreign students have different perceptions on the group-based assessment, compared with Danish students who are familiar with group work since primary school. When reflecting on their experiences of group-based exams (the report and oral defence), many foreign students had negative opinions: a) they (in the same group) made different efforts but got the same marks in the exam, b) they worked harder and did a better job but got lower mark than other groups due to the subjective criteria (differences among examiners), c) their individual achievement is not visible, and d) they could not see the benefit of collaborative learning if their future workplace seem to value individual capabilities.

Strategies and suggestions

In order to diminish the barriers in teaching and learning in international engineering programs at AAU, different activities have been developed since 2002. These activities include courses and seminars for students, such as PBL course which aims to help foreign students develop process competencies and intercultural competencies in a PBL environment, and workshops and pedagogical training for teaching staff. It has been functioning effectively in terms of helping students getting accustomed to the new study environment and shortening the time that has to be used for this transformation.

International groups

In some study programs, Danish students are greatly encouraged to work together with foreign students in a shared project team. However, the experiences so far are not very positive. Very often the group including Danish and foreign students have a happy beginning but exhausting end. For the Danish students, foreign students do not have the same project management skills as them; therefore, they have to spend lots of energy teaching foreign students how to do things. On the other hand, foreign students often feel that they have to adapt themselves to learn the Danish ways of doing things, because Danish students tend to take things for granted and teach foreign students how to do projects in the established ways. Sometimes foreign students tend to think that Danish students do not have the solid technical knowledge which is basic in engineering work. After one project trial, Danish students would choose to work in Danish group to make things easier.

Introductions

Relevant activities such as workshop and courses have also been provided to new teaching staff including both Danish and foreigners to help them understand the philosophy of PBL and develop their teaching skills in relation to PBL. We have observed that many foreign staff can see the advantages of PBL and try to contribute to it. However, there is also some foreign staff, who after staying in AAU for a period of time, still believe that students would not be able to learn sufficient technical knowledge in a PBL system.

Facilitating intercultural communication

As teaching staff and educational researchers, we ourselves have experienced a learning process through the past years' work in international study programs. At the early stage of our work emphasis was on how to integrate foreign students, who were regarded as the 'problem' since they had difficulties getting used to the new learning environment. Accordingly, the objectives of the PBL course and other activities were mainly focused on how to help foreign students adapt to the established PBL environment at AAU.

More recent experience, however, has shown that intercultural issues in engineering education are more complex than first assumed. It is not enough to focus only on foreign students, other important aspects in the intercultural communication in teaching and learning call for attention as well. For example, foreign teaching staff is confronted with similar challenges in recognising PBL as an effective way of teaching and learning and getting used to the teacher-student relationship. Danish staff and Danish students tend to expect foreign students to be sufficiently 'good' in managing project work, using the same criteria of judgment as is used for Danish students.

Adjusting to PBL

In AAU and Denmark, PBL have found a stable ground due to the unique history that encourages group work, critical thinking, collaboration, a learning culture with low power gap and close link between industry and university. However, it is difficult to expect newcomers who come from different backgrounds to adapt to this system over a short period of time. Therefore, as the following figure 5.1 shows, it is necessary to establish a new platform and a new learning culture which can benefit all participants.

Interplay of factors

We suggest that all these factors should be kept in mind during preparing and conducting teaching activities in intercultural learning contexts. In order to benefit students from different cultural and educational backgrounds, the facilitation of the PBL environment should not just be based on the established practices from the Danish programs. Despite the fact that some diversity is more due to individual differences and could not be simply explained by cultural differences, cultural concern remains an essential factor in the international programs. It is important for all the participants in the intercultural PBL environment to have the awareness of cultural differences, and to be willing to develop strategies in order to handle different cultural or individual issues in teaching and learning, and lastly to develop intercultural competencies together.

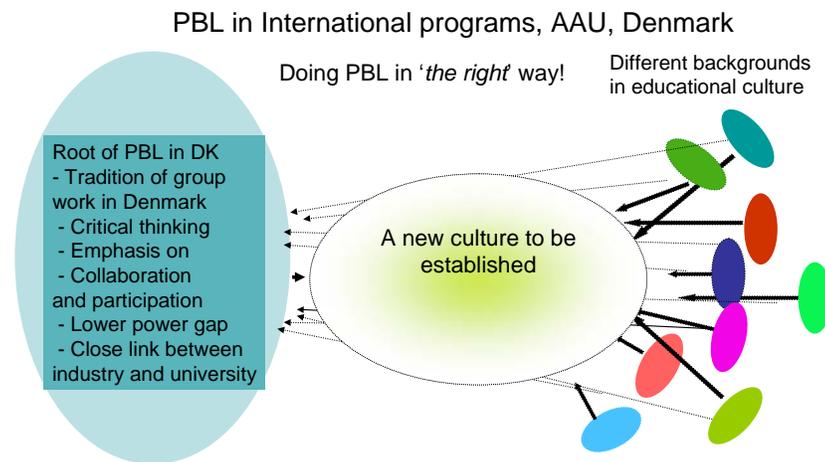


Figure 5.1: Establishing a new learning culture in an intercultural PBL setting

5.6 Assessment

In a PBL environment there is a lot of informal formative assessment (evaluation) throughout the process, e.g. each time facilitators respond to students' work and each day when students are discussing their own work. However, there is also a summative assessment or examination, to legitimise that the demanded skills are obtained.

The hidden curriculum

The form and content of the assessment is part of the hidden curriculum which exists in the problem and project based system like in all other educational systems. Usually the teachers do not think much about this aspect, but there is no doubt that the students seek to read the facilitator's criteria for a good project. Therefore, it is important to discuss the goal of teaching, the project goal, the students' goals and the facilitator's goals together with the criteria in the examination to avoid a hidden assessment.

Individual or group

Assessment shared project work should, in principle, lead to a shared grade, but in many places the legal framework dictates that the group members are graded individually. In the Danish system there are individual oral exams where the students have to defend their project. As examiners, both the facilitator and an external expert are present. It is the oral exam that officially counts for judgement.

As a facilitator you may be in a dilemma because you have an insight into the group work during the preparation of the project. If during the facilitation you have noticed weak students in the group you cannot mention this to the external examiner unless it is directly readable in the final project exam. On the other hand you might say that a facilitator who has such a presumption must be obliged to test the weak student's knowledge level in connection with the assessment.

One of the other important principles of project work is that learning happens through cooperation between the students in the group. Excellent collaboration means that you are able to give each other meaningful professional feedback through discussion and dialogue. Some groups can even change drafts and work on each other's contributions to the project. However, study regulations might demand for a specific assessment method.

Project assessment

Project assessment can happen as formative or summative assessment, where the group presents and discuss their project and the facilitator

functions as chairman and/or examiner.

Regulatory limitations

In Denmark the group was previously able to present, discuss and be assessed in a group setting. However in 2006 it was banned by law to make summative assessment of students in a group setting. From that point project presentations and discussions with the group can only be used as informal formative evaluation in a Danish context. This is done under the notion of 'status seminars'.

Project presentation

Formative assessment – status seminars

The students start with introducing a draft agenda and each group member makes a short oral presentation. The choice of topic of the oral presentations varies. It may be a summary on essential results from the project, elaborating on additional fields of theory or a presentation of results from empirical studies and tests made after the project. In excess of the professional aim, the oral presentation is also a guarantee that all group members get the opportunity to train his or hers presentation skills. The oral presentation is normally commented on by the facilitator with regard to content as well as form.

Discussion

The oral presentations as well as the working papers form the basis for discussion. The facilitator leads this part of the evaluation and how it is practised varies dependent on the group's presentation skills, the quality of the working papers and the strategy of the facilitator. In some cases this part of the evaluation is used for a critical and detailed exposition, especially if there are weak and faulty sections.

In other cases – when the project is well-prepared – the problem presentation, theories and analysis of the project are basis for discussing new perspectives and relate the project to other contexts.

Peer and self assessment

Formative assessment of the project work may assume many other forms. For example you can integrate peer-evaluation or self-evaluation in a systematic way. At occasions Aalborg University practises a system where each project group receives feedback from an opponent or peer group. An optimum use of this system requires that the role of the peer group is clearly defined.

Testing

Summative assessment – the exam

The practise of summative assessments varies due to cultural differences at the different educational establishments. At some institutions the students draw questions and answer them individually (this goes for all Danish institutions). At other educational institutions the examiner poses

more elaborating and in-depth questions to each group member during a discussion phase.

4) Marking

The marking is normally reserved for the facilitator and the examiner to mark students' efforts. After marking it is important to schedule time to inform the students about the considerations and the arguments behind the grade. This may start new reflections which might improve students learning and skills.

6. Final remarks

In this booklet we have collected theories, models, and tools for reflection, analysis and development of the staff role in PBL. However, the area of facilitation is not yet exhausted. In the next edition of this booklet, more focus will be given to interpersonal communication, facilitation of intercultural groups, facilitating for creativity and innovation and different assessment methods.

Request for feedback

With this version we have taken the first step to support facilitators in a PBL environment. To do our best we need your feedback, so please comment on this booklet in every aspect you might find important in order to improve the next version. To give feedback, please send an email jeh@plan.aau.dk.

The importance of pedagogical training

In every case we would like, as a final comment, to stress the importance of pedagogical training and peer-assessment. A book like this can support but never replace the personal advices and situated training which we hope is provided for you as a facilitator.

In every case:

***Facilitation is not easy,
but it is challenging, exiting and powerful!!***

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