Investigating Required Group Dynamics and Motivational Strategies for High-Performance Study Teams*

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The objective of this article is to explore what are the group-related dynamics and motivational strategies for becoming a high-performing engineering student team in a university environment applying a problem – and project based learning (PBL) model. It reflects an interest in engineering students' motivation to learn in groups – a poorly researched area within Engineering Education in times of great educational, societal and environmental need for engineers who possess such collaborative skills and competencies. The theoretical framework is constructed by contemporary theories about relational dynamics (liquidating, maintaining or evolving ways of interaction), 6 strategies to support or inhibit motivation in collaborative learning and theories on high-performing teams. Empirically, the study is based on recorded real-time interviews and actions of three selected first-year engineering student teams' collaboration and interaction, with 5 or 6 students in each group. Theoretically, the article concludes that high-performing study teams are characterised by an ability to stay curious and draw learning and nourishment from internal differences, while still keeping an explicit learning focus. Being able to acknowledge and work with unresolved differences is an ability that puts the team on a constant evolving learning curve. Reflecting upon and being able to master 6 specific motivational strategies creates the most supportive and developing framework to do so. From an empirical point of view, we show how this plays out in three specific teams and conclude that our three engineering student teams are on their way to become high-performance teams, displaying qualitatively different versions of what an efficient study team looks like.

Keywords: high-performance team; group dynamics; motivational strategies; engineering students; PBL

1. Introduction

Although engineers might still be perceived as individual technical contributors, the nature of engineering work has changed considerably, requiring much more than the technical domain knowledge attained through university education and by experience. It is widely recognised that 21st-century engineers in a highly complex world with huge societal challenges, such as e.g., UN Sustainability Goals, are expected to possess a set of transversal skills such as teamwork, communication, management, and entrepreneurial skills [1–3]. Indeed, these skills have a high impact on their employability. According to Bray [4], engineers are not laid off due to a lack of domain engineering skills and competences, but they are let go if they cannot work efficiently together with others.

But what does it mean to work efficiently together and how can we support engineering students to train them in these competences? Katzenbach & Smith [5] have contributed with research on team collaboration and what it takes to become not only an efficient team, but a high-performance team in a business setting. High-performance teams understood as teams aiming for big goals and high-quality work with a big impact on whatever area they operate in. According to Katzenbach & Smith [5] high-performance teams grow out of a team-based striving to create common goals for which

they hold themselves mutually accountable, among other things, by daring to take calculated risks and by going into relevant disagreements within the team. They seek to learn and improve at all times, both in order to reach their common goals and also to let individual members strive and prosper. They take risks, and share successes and praise.

From an educational point of view, the interesting questions are: How can we organise learning activities for our study groups to be as passionate and motivated about their learning goals and as deeply committed to one another as is laid out here? What are the dynamics and strategies that bring about these kinds of abilities in study groups? Even from a narrow educational point of view, looking at the ways students could become more motivated about their learning and achieve skills for high-performance is arguably a relevant issue. University management have recognised that retention rates are higher when students are engaged and motivated in their studies and part of an efficient study team [6–8] and students motivated for learning goals simply learn better [9].

However, there is very little, if any, research on *groups and their motivation* to study and learn within the area of Engineering Education (EE). A literature review [10, 11] found 209 papers reporting research on students' motivation and collaboration in groups, none of them within the field of engineering. The literature search was conducted in English

peer-reviewed articles from the year 2000 onwards, within the combined areas of motivation, group work and learning (or any relevant synonym of these), in the appropriate databases of ERIC, Scopus and the Danish Research database. Of the 209 papers that turned up in the search, only 16 papers were really about groups and their motivation and only two looked specifically at motivational strategies, both by the same authors. From an *individual* perspective, it is possible to find a few studies, carried out with the highly influential theory of self-determination as a preferred frame of reference, looking at engineering students' motivational issues from a generic and thus not contextualized perspective [12–15]. A very recent and somewhat larger literature review by Wijnia et al. [16] supports the finding that motivation as such is a poorly investigated area within the higher education institutions. The study focuses specifically on the motivational merits of a specific pedagogical model of learning: problem- and project-based learning (PBL). Wijnia et al. find a total of 1077 studies that have studied the relationship between motivation and PBL. They show that the quality of the studies – in terms of the motivational theory applied – is *"outdated"* and they *"lack nuances"* in their theoretical approach [16, p.10]; they end up concluding that *"despite the surge in interest in investigating the link between PBL and motivation, after over a hundred empirical studies, we still have very little insight into the effects of PBL on students' motivation using contemporary motivation theory. The unclear results emerging from the studies that do use more updated motivational constructs teach us that the link between PBL and motivation is more complex than the founding fathers of PBL and later PBL practitioners assumed. This tells us that if we mean to improve PBL to trigger motivation in students, more and better targeted research will have to be performed"* [16, p. 8].

The lack of research on the motivation to learn in groups is intriguing, given the above-mentioned arguments related to employability, the complexity of current engineering challenges, retention issues and quality of learning, and this paper will aim to seek more knowledge within this field of study.

Therefore, on the basis of these arguments, our research question is *what are the group-related dynamics and motivational strategies of becoming high-performance study teams in a university setting?* We will do this by means of an in-depth empirical analysis of three selected first-year engineering study teams at Aalborg University, who are on their way to becoming high-performance teams. Thereby, we aim to show what high-performance engineering study teams in a PBL environment look like in practice. The first step is to clarify the

theoretical concepts necessary to build a framework of what we understand by a high-performance team, group-related dynamics and motivational strategies. Secondly, we describe why and how we picked the three empirical cases. Thirdly, we present the analysis of the cases and finally, on this background, we discuss the implications for becoming high-performance study teams in a university setting.

2. What is a High-Performance Team and What Does It Take to Get There?

As established above, recognising when a team is doing well and has a high-performance impact is important. Katzenbach & Smith [5] contributed a renowned and highly qualified piece of research on this subject. They identify five different types of teams, of which the first two are not really a team, but either a group of individual people collaborating on a shared issue or a group of individual people who speak as if they are working for the same goal, but are not really united on that goal (see Fig. 1). The third is a potential team, which is a group of individual people who are starting to have a common purpose and goal. They also recognise the need for collective activities and products and acknowledge and accept the collective need for mutual accountability and conflict resolution/negotiation from a shared point of view. That is, they are following the conviction that "we are all in this together".

Only the last two categories – real teams and high-performance teams – can be identified as actual teams from an effectiveness and performance point of view. Katzenbach & Smith identify 5 and 7 characteristics respectively that mark real and high-performance teams. Real teams have a common purpose and goal; they apply collective activities, produce collective products, hold each other mutually accountable and dare to enter into conflicts. High-performance teams, in addition, have an *explicit* focus on continuous learning and mutual trust and respect.

Following these definitions, we will use the concept of team, to imply either a potential, a real or a high-performing team as defined above and reserve the concept of group to imply a more general and all-encompassing understanding of a collaboration between at least three students.

2.1 Real Teams: Common Purpose, Goals and Approach; Accountability and Courage

Real teams *"are equally committed to a common purpose, goals and working approach for which they hold themselves mutually accountable"* [5, p. 9]. Even when people are working on different aspects of a
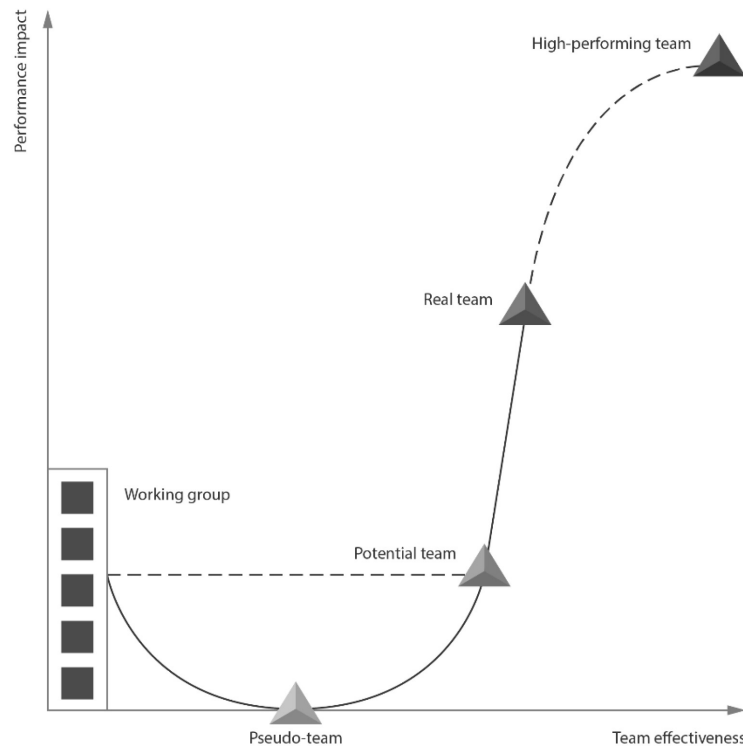
Fig. 1. Five stages of Team Performance. Reproduced and modified from [5, p. 84].

project, real effective teams understand the end goal. They understand the purpose. Making a team consider questions such as "what are we creating?" and "how do we want to make a positive contribution to our team and to our education?" can be profound.

In the face of a performance need, real teams apply collective activities and produce collective products; they share knowledge and hold each other accountable – when they discuss, when they plan and when they carry out the plans. And when they disagree, they dare to enter into conflicts. Real teams debate. This debate is an invaluable exercise to flesh out ideas, concepts and strategies. Debating, challenging and defending ideas creates better ideas. It may feel uncomfortable to argue, but that is why it is so important to create a safe and trusting environment.

2.2 High-Performance Teams: Mutual Trust and Respect Along with a Focus on Explicit Learning

Over time, a real team has the opportunity to become a high-performance team. A defining characteristic of this team is mutual trust and respect. High-performance teams operate in an environment where they have each other's backs covered. Members are deeply committed to each other's personal growth and success. High-performance teams seek to learn and improve at all times, both in order to reach their common goals, and also to let

individual members strive and prosper. They take risks, and share successes and praise. They are quick to reveal missteps. This is important because the earlier mistakes are highlighted, the easier they are to fix, and the faster and more the entire team learns. Operating in a trust-filled environment breaks down barriers and allows people to be more vulnerable.

Ultimately, high-performance teams come to work in a communality culture. This is when team members are not worried about who gets the credit; when they go out of their way to serve each other. When a team has a communality culture, it is not about the single team members, it is about the team owning its work and supporting each other, because they want both the team and the individuals to be successful.

Katzenbach & Smith developed their theories on the basis of case studies within the business world, as such, a different context from the one we are focusing on; see Spliid et al. [16] for a further discussion of this. It is a core concern for students at universities to focus on learning. Another challenge with this approach is the difficulties in operationalising collaboration and continuous learning on a micro level, making it possible to analyse and understand group processes in detail in the university setting. In order to understand how a group works well in a particular learning setting – problem – and project-based learning – we will first intro-

duce a basic model of how to understand social interaction in a group from a developmental point of view. This model has been chosen since it highlights some of the same aspects as Katzenbach *et al.*, while still including the whole spectrum of relational group dynamics. Secondly, we couple this understanding with six motivational strategies that go into detail on how groups facilitate or hinder motivation on a more specific level.

2.3 Relational Dynamics In A Group Setting

According to Mourier et al. [18], there are, basically, three ways of being in a relationship with another person – the liquidating, the maintaining and the evolving kind. It is the quality of the collaboration, especially the contact and the response that determines this outcome. All three kinds of dynamics are present in the group; it is the total relational dynamics of the group between the individual members that makes up the collaborative culture of the group. It can change, both daily and over time, what kind of dynamics prevails. Table 1 illustrates important characteristics of the three types of relational dynamics and a more explicit example of what is required in order for an evolving relational dynamic to take place. The evolving relational dynamics is what supports development and learning.

A situation with a difference of opinion, of perspective, of emotion or the way of handling something is a situation in which it is genuinely possible to detect what kind of relational dynamics is at hand. How a group in a socially shared learning situation respond to differences is seminal to the way they develop and learn – with and from each other and others.

When it comes to liquidating dynamics, the focus is very often on the negative issues: what went wrong, who is to blame and why. Aggressive power struggles and argumentation, with a winner and a loser, carry the day. To ignore responses is a significant part of the liquidating dynamics. Rules and control are put forward instead of personal engagement and responsibility, which is absent. As a consequence, people in the group withdraw, expectations and roles get locked and, over time, aggressions are made silent. A drainage culture with scapegoats is established and the potential to grow, learn and inspire is liquidated [18].

In the maintaining kind of dynamics, there is a basic lack of contact, following the saying that it is better to be silent than to argue. To the extent that things are said, they are said indirectly, clashes are ignored and the desire to say no is suppressed. Not only are responses ignored, responses are altogether avoided and the level of anxiety is high in this kind of dynamic. Self-sacrificing behaviour often occurs and the single individuals pull themselves together and try to fit in, while ignoring or suppressing their own emotions and registrations. People are not willing to risk themselves or prepared to invite changes. A lack of development prevails.

Evolving relational dynamics create a lot of energy and vitality [18]. Where individuals dare to keep their diversity, distinctiveness and integrity conflicts are bound to materialise in the open. There may be conflicts, but with the underlying agenda that everyone involved is expected to move forward together and a deep belief that the other has something to offer, that I do not understand completely here and now. There is no predetermined truth, just an imprecise feeling that something new can be created by curiously identifying and scrutinising differences. Groups like this are often imprinted with high goals, big expectations, huge amounts of individual responsibility and a large involvement in each other. It is you and me together in a coordinated dance marked by vitality, acceptance and initiative. In this way, the high-performance team is reflected in the evolving relational dynamics.

For groups to really thrive and develop, a predominant part of the relational dynamics needs to be within the evolving area. In the following, we will

Table 1. Three basic types of relational dynamics. Translated and modified from [18, p. 86]

	Liquidating	**Maintaining**	**Evolving**	**Example: Evolving**
Norm	Difference is a problem	Difference is equalised	Difference is opportunity	Curiosity/Recognition
Handling	Rules	Pseudo-consensus	Collaboration	Mirror/Contain
Response	Error-focus	None	Engaged	Excited/Positive
Confrontation	Attack/defence	Ignore/suppress	Nurtured	Identify/Acknowledge
Resolution	Backward	Standstill	Forward	How to go ahead?
Responsibility	Avoidance	Sacrifice	Action	Who does what?
Sense of reality	War	Denial	Acceptance	
Mood	Aggression	Anxiety	Vitality	
Motto	Me – not you	You – not me	You and me	

get even more specific and consider six motivational group-based strategies that visualise specific ways of regulating motivation in collaborative learning.

2.4 Group-Based Strategies to Regulate Motivation

As stated in the introduction, especially within the engineering education field, the interest in modern motivational theories has been limited and focused on the motivation of individuals in a generic setting [12, 13] In this study we are looking at groups of engineering students in a specific PBL context and therefore searching for a motivational understanding that both accommodates the group related and the contextual dimensions of motivation. Katznelson et al. [19] define their motivational understanding as an interaction between the single student and the immediate situation and context at hand:

> "We do not consider motivation as something that is or is not. Something somebody just has and others don't have. On the contrary, we understand motivation as a dynamic and changeable size, which must be seen and understood in a concrete context and a specific cultural and historical context (Pless et al. 2015; Jackson 2006; Lemos 2007). . . . [We understand] motivation as something that arises in the encounter between the young people's experiences, interests and motives for participation, what creates meaning for them, and the cultural practices and frameworks that prevail in the contexts in which they participate."
> Katznelson et al., [19, pp. 22–23] translation

Following this understanding that motivation arises from the interaction between people and context we turn to the research of Jarvela et al. [20] who has been studying motivational strategies of groups in a higher educational setting. They have pointed out six important motivational strategies available to groups in higher education in order to regulate their motivation while collaborating. Five of these strategies encourage motivation and one

strategy undermines motivation. They are illustrated in Table 2. Self-handicapping is the strategy that undermines motivation.

Groups encounter different socio-emotional challenges when they collaborate [21], such as challenges related to personal priorities (e.g., different goals), work and communication (e.g., different styles of interaction), teamwork (e.g., differences in commitment), collaboration (e.g., different understanding of task) or external constraints (e.g., different family situations). In other words, differences arise and will call upon the group to regulate them. The six motivational strategies do not articulate the need to nurture confrontation as the evolving type of dynamics discussed above, but apart from that they are based on the same ethos of being curious and positive in the collaboration. Furthermore, the strategies are very specific, aiming at a higher education context. Jarvela and Jarvenoja [21, p. 354] define motivational regulation as follows:

> "Motivational regulation includes thoughts and behaviours through which students act to initiate, maintain, or supplement their willingness to start or to make an effort toward completing academic activities."

The motivation regulation strategies concern both the value base and the goals of the group – social reinforcing and socially shared goal-oriented talk. They also concern the way they inspire each other and structure their work – interest enhancement and task structuring. Finally, they deal with how they might obstruct their performance abilities and how they are able to reflect on the way they work – self-handicapping and efficacy management.

We will use both the three basic relational dynamics and the six motivational strategies to analyse our empirical cases and thereby illustrate

Table 2: Motivation regulation strategies in a socially shared learning situation. Reproduced with modifications from [20, p.127]

Regulation strategy	Definition	Example
Social reinforcing	Students' identification and administration of reinforcements influencing their motivation and shaping their joint behaviour	The students make reciprocal suggestions of how to plan the poster. Kalle suggests an idea and Mari completes with *"why don't we add. . ."*. The other two support the plan.
Socially shared goal-oriented talk	Students using goal-oriented dialogue; thinking about various reasons for persisting in or completing a task	The students discuss which topic to take for the poster-task. *"Let's take the topic "metacognition". That is also a good choice concerning the exam."*
Interest enhancement	Increases aspects of students' intrinsic motivation or situational interest while completing an activity	*"This is a brilliant idea!"* The students express concrete examples to increase joint interest: *"I can describe my example. . ."*
Task structuring	Reducing the possibility of off-task behaviour by structuring a task or environmental conditions	In a situation where students have difficulties making progress . . . one student says *"Let's make a list of the five most important points."*
Self-handicapping	Manufacturing obstructions before or during a task that make performing difficult	*"This text is so complicated. . ."* The other group has a much better poster than we have"
Efficacy management	Students' ability to monitor, evaluate and control their expectations, perceptions of competence, or self-efficacy	*"The task is not easy and this group is not working well"* or *"The discussion today has been productive. We progressed well!"*

what high-performance teams might look like in a higher engineering educational setting.

3. Case Study Approach

To get insight as to how high-performance study teams look in practice, we chose to video-observe eight engineering study groups while collaborating on the same tasks, and then to interview them about the tasks and what motivated them to work towards their learning goals in general. On the basis of these data, we then singled out three teams that right away seemed to be on their way to becoming high-performance teams, and carried out an in-depth analysis of the group dynamics and motivational strategies employed by them. In the following, we describe the choices we made during this process of data collection.

Empirical data has been collected among first-year engineering study groups, because the drop-out rate is generally the highest in the first year; thus, we want to learn what a highly motivated team for learning looks like at this point in time. The empirical data is gathered from two first-year Engineering and Science study programs at Aalborg University in the fall semester of 2017. One is the study of biochemistry, environmental techniques and biology (KMB), and the other is the study of techno-anthropology (TAN). These were chosen because of their availability, and because they each represent very different studies, in a continuum from 'hard' mathematical engineering education to a 'soft' kind of engineering education also concerned with and analysing human behaviour. They also differed in size. The KMB study program included a total of 31 groups and about 200 students and the TAN study program comprised 5 groups and about 35 students. On each study program, four groups were selected for observation, interview and written feedback. The groups either volunteered or were asked to participate in the data gathering events. In this way, we tried to avoid systematically biased groups, and maximised the chances of finding very different group dynamics within the field of engineering and science. With a total data set of eight groups, we were in no way striving to be representative; we merely aimed to open up to a variety of group dynamics.

Three of the group processes are subjects for analysis in this study. According to Flyvbjerg [22], cases can be selected based on their specific characteristics, and these three cases were selected based on their illustration of different kinds of evolving dynamics. They were then analysed through the lens of the theoretical frame developed earlier on. The gender balance in the teams differs; two teams had either one or two females and four males, while one team consisted entirely of 6 males (one student was not present the day the data collection took place).

The task the groups were asked to carry out was to discuss one of four very different, but realistic, stories of motivational problems that occur in a group-based learning environment. The four stories were developed based on three teachers' long-standing experience and were pilot-tested by two groups before being developed into visual communication (teaching) material. These visual assignment stories were used as the context for collecting the empirical data for this research. For example, the groups were observed when engaged in the assignment and videotaped, but without the presence of an observer, to see what was actually going on in the learning situation. Subsequently, the students were asked to note what they perceived as a 'good' study day and, in contrast, what they perceived as a 'poor' study day [23]. In conclusion, they were interviewed about this and about their behaviour and values related to motivation.

In the following, we will analyse the three chosen teams on their way to becoming high-performance study teams to illustrate how they look in a university learning setting. Each analysis is structured according to the six motivational strategies, at the same time investigating to what extent and how they play out as evolving teams. Afterwards, we discuss what high-performance study teams look like and their implications.

4. Empirical Analysis of Three Teams and their Practices towards High-Performance

In the following, the value base and goals of each team are analysed by laying out their social reinforcing strategy and their socially shared goal-oriented talk strategy. Then we look in detail at the way they inspire each other, share knowledge and structure their work by laying out their interest enhancement and task-structuring strategy. Finally, we analyse the way in which they might obstruct their performance abilities and how they are able to reflect on the way they work by laying out their self-handicapping 'strategy' and their efficacy management strategy. While scrutinising the way they collaborate, we will also identify the kind of relational dynamics that materialise in each team in the particular piece of process available.

4.1 Case One: "It should not feel as if we are really working". Having Fun as First Priority

This team is a TAN study team and it consists entirely of 5 males who seem very homogeneous in age and appearance. The team was circled out as

an evolving case due to their obvious vitality and their apparent forward resolutions.

4.1.1 Social Reinforcing – Having Fun

The social glue in this team is based on having fun. When asked about what constitutes a good study day, one of them says with a smile: "*I can't think of a single good study day we've had*" and the rest of the team laugh, indicating that they have had nothing but good study days. Another team member adds to the fun by hinting at a funny incident: "*Seriously, can you remember that day when Gustav had to see the doctor? Oh, my God!*" The mood of the team is in clear concord with the evolving value vitality, to such an extent that it defines the team. They are very committed to each other; they almost seem to be a team in love with the motto being you and me:

> Man 5: . . . "We very much agree on things.
> Man 4: I even want to say, when I was at home [ill] and my whole head was standing still, I was so happy when I saw your messages.
> Man 3: We are such real girlfriends – I mean, if I can come to you and say: 'Oh, my God, this girl, I'm totally fucked; boys what do I do?' – then I'm certainly not afraid to say 'I haven't got a clue what this [regarding the project] is about.'"

This feeling of safety and mutual trust not only creates unity and motivation within the team, but also makes it very easy to share knowledge (see below). The members of the team see themselves as equals. Difference is more experienced towards others, and here they can be quite rude and exclusionary – almost liquidating, as the next quote will illustrate.

4.1.2 Socially Shared Goal Oriented Talk – "Stand Your Ground", Productivity and Fun United

The team discuss the assignment story, in which one group member says very little. The following quote shows an important part of the social value base of the team - standing your ground. It also shows how they lose track of the task and unite as a team – to a certain extent by excluding others. Finally, the quote illustrates how they tend to be esoteric in their language, merely indicating things, yet understood by everyone:

> Man 1: "But he didn't have the guts to say something. That's a little.. Come on.
> Man 5: Actually, there are people like that.
> Man 1: I know. It is just. . . get over yourself. . .
> Man 5: Yeah, yeah. . ..
> Man 2: They shot him down every time he said something.
> Man 1: Yeah, yeah, of course as a group one must unite. . . but anyhow, one also has to stand one's ground. I am not very. . .

> (Here, Man 2 interrupts and starts to talk about group members in other groups at their study)
> Man 2: We also hear from the other groups that X, she is so 'do this, do that'. And if you didn't, she would. . .
> Man 3: I understood from the steering group committee meeting that they talked both about X and Y, she had done nothing. . . . But this [not standing your ground] is not something you should teach each other. I mean, if you let yourself run over every time you say something, then you teach others that this is the way you may be treated."

Socially, the value is *"stand your ground"*. Later in the interview, it turns out that several of the team members have had experiences of feeling somewhat excluded from a group and had reached the conclusion that one has to take responsibility for oneself. Professionally, a core value in the team is 'productivity and fun united'. As one of them put it: *"It should not feel as if we are really working, it should not be a burden"*. Motivational wise, this team holds that motivation should be intrinsic, coming from within or arising from the interplay in the group. Compared to the other teams, they do not talk a lot about their values and goals. From the interview, we learn that they often drift off and talk about *"everything"*, so at this point they already know each other a lot. We also learn that the assignment story did not motivate them much; they took it more as an opportunity to have fun with each other. The lack of going into depth with issues that are not immediately appealing is, as we shall come back to later, something they struggle with.

4.1.3 Interest Enhancement - Only when Interested or Asked

There are no examples in the observation that they enhance their interest in the subject – they tend to talk over each other instead and drift off. In the interview part, they display these abilities better:

> Man 5: ". . . Productivity is when we move on . . . structure a task . . . write down a lot.
> Man 3: We have also had days where we read like crazy . . . this is also kind of getting closer to a goal . . .[and] when we all know what the task is like . . .
> Man 4: . . . I also believe that is has to do with the cosyness . . . after 1–1.5 hours of working . . . we all need 10 minutes, where weird stuff is being said in order to move on."

Here, they build on each other's words and enhance different perspectives. Their responses to each other are engaged and they handle the question collaboratively. As pointed out above, however, there is very little engaged response in the observational part as regards the story they were asked to discuss. Even in the above-quoted discussion, it took the

strength of an outside force (the interviewer) to get the team members to talk about it in the first place.

4.1.4 Task Structuring – "Touch Base"

The ping-pong between cosyness and productivity is deeply engrained in the way they structure their work. There is a constant alignment process going on, they have a very organic way of structuring their work tasks, and they use the concept of *"touching base"* to describe it:

> Man 3: "We make contact with each other all the time, even if we work separately for 1.5 hours . . . all the time we touch base . . . it is a very dynamic way . . . Okay, is what we are doing all of us . . . is that still pointing in the right direction? . . . in reality, are we investigating what we want to?. . .
> Man 4: We use each other constantly . . . 'cause we have the same idea about where we want to go.
> Man 3: Even in the writing process, if I have written a very long piece . . . every time I am in doubt, I just touch base . . . just put it on our mutual table.
> Man 5: Then everyone will join in and say what they think about the subject.
> Man 1: I believe this is one of the reasons why our group works so well."

When a deadline approaches and pressure to produce increases, this vibrating kind of being in touch and having fun meets a hindrance, and it seems they have to gather their forces and oscillate with a higher intensity. One of them points out that this change of intensity and direction *"kind of dulls down the process a little . . . [but] as soon as we surpass that point, then it goes insanely fast."*

4.1.5 Self-Handicapping – Lack of Persistence and Focus when Subjects are not Fun or Appealing

As is obvious from the observation and the quotes above, the team are quick to derail themselves:

> Man 5: "[Quickly tying up the answer to a question] . . . Isn't it just that?
> Man 1: Well, maybe also – kind of make a specific sort of – what is it called. . .
> Man 5: Talk?
> Man 1: Daring to speak 'cause this Noa sounds like he is a total twit.
> Man 4: But Noa is actually the smartest of them.
> Man 5: . . .[B]ut he dares not say anything. If he had talked from the beginning, they would have been finished by now and been given the grade 12.
> Man 2: Who talked about this last Wednesday? . . . [Start talking about something else]"

Here, we see a lack of curiosity to dig deeper, so missed learning opportunities could occur. It is a general strategy of this team when confronted with something different and initially not appreciated

that it is not nurtured – rather it is attacked or suppressed. It could be that this task is an isolated case of lack of motivation and endurance. In the interview, however, the team acknowledge that they struggle with keeping focus and being efficient in general, as we shall see below.

4.1.6 Efficacy Management – Only When Interested or Asked

The quotes shown above in connection with strategies of interest enhancement and task structuring also illustrate the strategy they use when it comes to efficacy management – they are at the same time very good at enhancing, reflecting and interrupting themselves. If the subject at hand does not immediately appeal to them, they do not reflect. Responsibility, in these situations, is avoided rather than activated. As shown above, in the interview, they are perfectly capable of reflecting on their routines when asked, but on their own (during the observation) very little reflection is seen. In the interview, they also do state that they gained a lot of insight into their routines – e.g., the routine of touching base – from being asked to carry out an evaluation of their process (a so-called process analysis). Most of the interview is an inquiry into why they are not efficient, and after the interview the team comment that this was very valuable to them. A short part of this reflection on their lack of efficiency follows:

> Man 5: "You do not feel that you get anything done at all before lunch, because you are so unconcentrated. And after lunch you start to be . . . it is somehow smashed again, you don't bother.
> Man 3: I just do not think that we have started yet.
> Man 1: We talk about all sorts of things, all sorts of weird things."

As concerns efficiency, the team has so far had a maintaining and denying kind of strategy, with standstill and ignorance as resolution to an internal conflict between the wish to be efficient and the resentment towards work being *"a burden"*.

4.1.7 Summing Up – A Vital Team with a Lack of Curiosity Towards Subjects that are Considered a Burden

This team consists of apparently very homogeneous individuals – and what keeps them together is their common interest in and shared experience of having fun and being productive in a cosy way. In this matter, the motto is "you and me", vitality is a key, collaboration the way to deal with interaction, touching base the way to have nurtured confrontations in a forward and action-oriented manner, and accepting the sense of reality.

Their greatest asset is the way this vital, almost organic way of micromanaging differences provides them with excellent opportunities to share knowledge. Their greatest threat is their reluctance and resentment towards issues that go against their own values or interests. They often do not see difference as an opportunity. Externally, towards others, there are several examples of them being liquidating. Internally, there are next to no examples of internal conflicts between the team members. The subject of efficiency is treated in a maintaining kind of manner. Generally, this makes it difficult for them to face their own challenges and specifically, in the case of efficiency, their productivity becomes uneven.

4.2 Case 2: "Hey, Take Care of your Group Member." An Open Mind as First Priority

This team is a TAN study team and it consists of two females and four males. Immediately, it appears to be a less homogeneous team than the above. The team was singled out as an evolving case due to their immediate acceptance and engagement in the assignment story.

4.2.1 Social Reinforcing – Acceptance And Flexibility

This team builds on values about acceptance and flexibility. Difference is seen as – if not opportunity – then at least something which is tolerated and acknowledged. In this team, we find dialogue building on the arguments of others and a shared idea that group members should support and help each other. In other words, this is a highly collaborative team. Both the way they talk and the things they say while discussing their story underlines this. There is a very accepting sense of reality in this team and a laid-back kind of mood, at times adjacent to anxiety, but never aggression. Professionally as well as socially, the values about acceptance and flexibility point in the direction of cherishing different opinions:

> Man 1: "Let us look at the question 'What does it take to handle otherness in a group?' . . . I think it takes. . . [answers the question] . . . and if one can handle this [otherness], then it certainly results in [the group] achieving a lot. . . . One is very welcome to disagree [in this group]. . . we must be able to handle listening to things we do not agree about."

In this team, the individuals differ a lot from each other, both in terms of gender and in terms of their ability to collaborate and the degree of work quality. Team roles are very outspoken as well. Man 1 is the informal leader and chief ideologist. He is the one coining most of the team values and behaviour, and seems to have the most to say.

4.2.2 Socially Shared Goal-Oriented Talk – "Take Care of your Group Member", "Bite the Bullet"

There is a lot of value – and goal-oriented talk in this team. One of the shared social goals is that 'we look out for each other'. It is a team responsibility to take care of individual team members and find ways to ensure that everyone is okay without jeopardising the common goal. The motto is you and me, even if it is by no means an easy task:

> Man 1: "Hey, take care of your group member! [in a response to the way a group member is treated in the story].
>
> Man 2: Yes, maybe they should share, so that one could help him . . . Maybe it is also the wrong task he has got, if he is so quiet, calm and laid back and not taking the job 100% seriously . . .
>
> Man 1: . . . the hard part is also to find that balance [between group and individual needs]. And to identify – where is the problem? Is it private – 'cause that is too difficult – or is it because it is not interesting enough or is it the group that is the problem?"

Professionally, one of the most outspoken goals is self-discipline, to be able to work hard if necessary. As one team member puts it: *"it is not all fun in a project, and sometimes you have to bite the bullet"*.

4.2.3 Interest Enhancement – In Depth and Action-Oriented

The team is good at talking in depth about a subject of interest – even sensitive issues. They have a nurtured way of dealing with confrontations and an action-oriented way of taking responsibility, looking ahead:

> Woman 2: "I have always been the one who sat around, while the others were doing everything. Unless I were the best, and then I would do everything.
>
> Man 1: Fair enough. It also happened – just to mention it – in P0, but I believe it's been fine here [in P1].
>
> Woman 2: Yes, I am not particularly good at group work.
>
> Man 1: Fair enough.
>
> Woman 2: I have a natural tendency to hold back, and stuff like that.
>
> Man 1: Yes, yes. After all, it's back to what you expect.
>
> Woman 2: I was – when I was little, I was extremely shy. Now I am more talkative, but . . .
>
> Man 3: Here is also a thing, where we as a group have to be better at poking at you and asking X – what do you think of this? Because..
>
> Man 1: Just make room to pass on the word.
>
> Man 3: Yes, because if you are not good at speaking up for yourself, then we have to draw it out of you."

The team not only has values about being accepting and tolerating difference – they walk the talk – even if the difficulty of balancing the individual need with the team need is also demonstrated in the quote.

The team does not show curiosity to drill more into the reasons of the inabilities of one team member. They interrupt her, aiming to move on. The engaged response has a limit. Discussion of other subjects shows more engagement.

4.2.4 Task Structuring – Structured Meetings and Focus on the Task

The team are good at immersing themselves in the team work. They approach a subject rigorously, keeping an eye on the task at all times, and solve it without too many impasses. They seem highly motivated throughout the assignment work, at one point discussing how the group in the story could improve their task structuring:

> Man 3: "I don't know if they have group meetings like we do, where they go through the whole purpose, like we do.
> Man 1: I am thinking something like a joint correcting meeting; you often do that and then everyone takes a look at it. This is one of the things we have done, which I find smart.
> Man 2: Exactly, then you are quickly able to catch if things do not fit together or if there is a difference in the level of writing.
> Man 1: . . . it is easier if everyone says it, instead of thinking it. It is smarter if you talk it through."

In their own work, sometimes they have a tendency to "*bite the bullet*" a little hard. Later, we shall show a little bit more about the way they work and plan.

4.2.5 Self-Handicapping – Maintenance of Unequal Roles

The team struggles to find a balance between taking responsibility as a team and letting the individual take responsibility on his or her own. They tend to suppress that conflict – supposedly sometimes at the expense of the team and sometimes at the expense of the individual, but always at the expense of clarity, curiosity and nurtured confrontation. Here we see a passage where one team member is very explicit about her own rather self-destructive behaviour and the informal leader gives a vague, incomprehensible and ignoring kind of answer, trying to stick to the situation, instead of saying how her behaviour affects him.

> Man 3: "Well, it could be that the group sees it as if he does not want to, but he feels that it is not his choice? [referring to Lukas, in the assignment story]
> Woman 2: . . . If I were in a situation like that . . . where I wouldn't really come forward [with me] . . . I [would] push myself further back. If I can't . . . do anything, I just sit and do nothing. . . . I give up.
> Man 1: In theory this is also, I believe all the time – Okay, the idea is fine, but it is hard.. Now, I don't know how, but now we also do know – I don't believe that it is that bad, but I

> would suggest that. If they have not talked a lot about this with Lukas from the start, then it is hard to know when it happens [that the group misunderstands the signals of Lukas] or when it is Lukas that is annoying. Well – well, it is just very easy to misinterpret a specific way of acting and then yourself act like an idiot."

The role and behaviour of woman 2 in the team clearly creates some tension and the team walk a long mile to accommodate her. By not being clear about how they feel about her behaviour, they undermine her equal role in the team and create a precedent that self-destructive behaviour can go unnoticed by everyone in the team. Sacrifice becomes a way of responsibility. In the end, this is not going to create a high-performance team culture.

4.2.6 Efficacy Management – "There Is Nothing We Do Not Talk About"

The team is reflexive minded and competent at discussing their efficacy management. They talk a lot about how they manage their group work. They are also proud of the fact that they are ahead of the other groups. Below they discuss their planning, how they have come this far and the nice feelings that go with that:

> Man 1: ". . . There is room for both, I would say. Both the serious part, but also the break where we just have fun. There have been no days when we have done nothing. We have always done something useful.
> Man 4: We have been very lucky with the way our group has developed. . . .
> Woman 2: We are certainly the group who have reached the furthest by far. . . . Yeah, in that way, there are many milestones ahead that trigger success and I believe we will see a lot of that in the coming month. Like a lot.
> Man 3: . . . It is actually our planning that is very good. We have meetings, when we need to and there is something to talk about. . . . Then we write and read at home. . . . when we have talked everything through, there is room to be social.
> Man 1: It is due to the fact that we talk everything through. You see . . . there is nothing we do not talk about. . . .
> Man 4: So, when you meet this often to discuss things, you are bound to be up to speed.
> Man 1: So when we go home to write – compared to what I have tried before – we know more what the group is after. . . . Expectations are aligned every time we meet in the group."

As indicated above concerning their self-handicapping issues, there might be a limit to the statement *"there is nothing we do not talk about"*, but they certainly go a long way to make that a reality.

4.2.7 Summing Up – A Challenged Team with Capacity to Accept and Handle Internal Differences

This team consists of members with very different assets and capabilities. Collaboratively, they are

challenged, as especially one team member is not initially comfortable with group work and often finds herself in a low value position in a group. At the same time, however, other team members are very comfortable with group work and good at accepting differences. The group dynamic is built on acceptance, open-mindedness and looking after each other. In this matter, the norm points in the direction of 'difference is opportunity', collaboration and the motto of 'you and me' is certainly the way to deal with each other and discipline, to the point that *"biting the bullet"* is the way to structure their work and deal with time issue conflicts.

Their greatest asset is the way they accept that reality is not always as shiny as one would like it to be. Reality comes in many shapes, and this is okay. You tolerate, you accept, you deal with internal conflicts, you plan efficiently and you work hard when necessary. Their greatest threat is that they could tend to give up vitality or suppress the needs of the more capable team members in order to stay 'flexible and open-minded' and thus in the long term create a culture more prone to sacrifice in the team.

4.3 Case 3: "A Version Where Everyone is Excited." Common Ground as First Priority

This team is a KMB study team and it consists of one female and four males. The team was singled out as an evolving case due to their forward resolution and engagement in the assignment story.

4.3.1 Social Reinforcing – "It Has To Work For All Of Us"

The social glue in this team is made up of an array of social values focused around community and treating each other respectfully and helpfully. For example, when a member is searching for a word, someone else suggests one, and when a member speaks his mind, everyone else listens carefully. This is the team with the longest passages of uninterrupted talk. In general, they have an engaged response to each other and handle their interaction collaboratively. The core values are communality and working together. The need for community is not evenly distributed, though, and this gives rise to internal tensions. In these situations, there is a strong urge to include everyone and find common ground, acknowledging that conflicts are *"indeed personally wired"*:

Man 3: ". . . [The best day was a day] at a supervision meeting . . . this was the first time where we had a common goal . . . so good to have a common goal.
Man 2: [My experience of the best day] goes somewhat against the group again . . . at that time I worked much

better alone . . . but I do fully respect your decision [to work jointly in the group].
Woman 1: Well, it has not turned out to be that way [working individually]. . . . Maybe we should deal with that later?
Man 2: No, no, it is fair enough, four against one, then you have to bow . . . I started to study more calculus at home individually instead.
Woman 1: But I feel that you engage more in the group work, up here . . . No? It should also work for you, though. It is no use if you don't benefit.
Man 2: Well, it is. . . sometimes it is not of much use to me.
Man 4: I believe you feel the same way as me – that sometimes it is too much sitting too many people together . . . the times we sat by ourselves and wrote together – that worked very well . . .
Man 3: I like it that you keep trying to find ways to improve this, because it has to work for all of us."

As is visible from this passage, the team is forward-oriented in their resolution and action-oriented in their responsibility. The team adheres to the ideal of nurtured confrontation, with their motto being 'you and me'. Once in a while, they discuss their differences under the heading of *"Wolves hour"*. They have PBL as the underlying accepted norm. They strive to contain differences, even if maybe they do not always see them as an opportunity. As a team, they have a vision of being united. One team member puts it this way: *"I believe it would be great if we could create a version where everyone is excited".*

4.3.2 Socially Shared Goal-Oriented Talk – Common Goals are Seminal

They strive to create a team work, and a result that excites everyone. This is also reflected in their goal-oriented talk. The team uses a lot of energy in discussing common goals and finding out how to go ahead, and it pays off – all of them want to put energy and drive into the project. They *"agree on the problem"* and on *"their level of ambition"*. One of the team members often plays the role of the devil's advocate in this process. Returning to their discussion above:

Man 2: ". . . What I experience, when we do that [work in pairs], is that we have to do it anyway – I mean whether we are sitting as one or two, it still has to go into the document to be tested by the whole group eventually, and then another 3 ideas arise . . . we haven't tried it out [working in pairs] on a big scale though; we will only be doing that in this P1 period. It will be interesting to find out if this works better."

They discuss their internal conflict lines at length and over time with the focus on how to manage. The team does not only say that they are forward- and action-oriented – they walk the talk and are able to contain and discuss differences.

4.3.3 Interest Enhancement – Building on Each Other Going Deeper and Deeper

In their talk, they engage right away and they immerse the conversation more and more, having an eye for what is useful for them as a team. Just a small part of their discussion illustrates this:

> Woman 1: "Should we make a summary? Shouldn't we do that?
> Man 3: Yeah, that could be nice.
> Woman 1: 'Cause this is something that we struggle with too.
> Man 3: Yeah, there is a lot that I can recognise, I think. . . .
> Man 4: The things that really make it a mess for them – those are the factors coming from without – work and family.
> Man 3: Yes, Jep.
> Man 1: And at the same time they expect something which is not do-able anyway.
> Woman 1: . . . they have done wrong exactly the same way [our supervisors] told us about the contract . . . they have not discussed - well, how do we do this? ... that is the important factor – We do it like this, that if anyone does something disorderly, we instigate a 'wolves hour', where we address the issue. . . .
> Man 3: What should they have done differently, specifically speaking . . . what do you think?"

They embrace the whole subject. Ten minutes after they started, they are still discussing it – taking several detours, but still managing to focus on the subject, while being good at including everybody.

4.3.4 Task Structuring – Staying Focused and Aiming for Specifics

They are very good at structuring their work, both by taking notes as illustrated above and by staying on track and not getting distracted. While discussing a technical matter, one team member still keeps his focus on the subject at hand. And they stay on the subject until they get specific:

> Man 1: "[I would suggest] more group meetings.
> Man 2: . . . Well, even if he sits at home, he could create a skype connection.
> Man 3: A really good and specific example. . . . I also believe that the wolves hour . . . where you have to say three good things and three bad things about people [is a good way]."

4.3.5 Self-Handicapping – Smoothing out Differences in Case of Status Clashes

In terms of self-handicapping, they do have something of a fixation/challenge around the value that everyone should be working together and constantly be present. There is an underlying tendency to sometimes smooth out disagreements or be a little aggressive when it comes to individual members:

> Man 1: "I think somehow it makes sense to – e.g., you could call and say: 'I cannot come today, because my daughter is ill, but I know what you should talk about and I would like to add something along these lines'.
> Man 3: Well, but then you also contributed in some way, right?
> Man 1: Yes, you did.
> Woman 1: I don't think so. I think that is a bummer . . .
> Man 1: Yes, that is a bummer. That is really a bummer.
> Woman 1: 'I am not coming today. Here are 3 bullet points. Would you please discuss and also take my opinion into account?' You can't use that for anything."

Man 1 does not 'stand his ground' here, on the contrary, and Woman 1 is not very tentative or curious about this opinion. Overall, the word of Woman 1 seems to carry most weight at times and she is also the one to interrupt the others most often. The suppression of this and similar conflicts will ultimately cut off the contributions of the less valued opinions from the others. Potentially, this will create a biased team learning.

4.3.6 Efficacy Management – We Keep Discussing the Way We Work

As is also visible from the quotes throughout this section, the team is very good at discussing the way they work. In general, they set aside a great deal of time to discuss and reflect on their disagreements, their strong and weak points etc. altogether. One of the team members sums it up neatly:

> Woman 1: ". . . Let's see, if we try to look at this in regard to our own group . . . I actually think we are pretty good at deciding on important decisions in collaboration. When we disagree, we work them through and the flip side of this is that it possibly takes a long time and can be super-frustrating, but this is what we keep doing."

4.3.7 Summing Up – A Democratic and Community-Based Team with a Manageable Level of Disagreement

This team consists of individuals with rather different personalities and a rather homogeneous wish to work collaboratively under joint leadership. The group dynamic is built on community ideals and treating each other respectfully and helpfully. In this matter, the team fits neatly into the evolving team dynamic with a high emphasis on collaboration, with 'you and me' as their motto, and for this team a rather strong underlining of forward-directed resolution and action-oriented responsibility.

Their greatest asset is the way they keep focus, structure their tasks and persist with their discussions until they have reached a level of agreement and detail that secures strong support and very specific action. Their greatest threat is their longing

for a common way of doing things, thereby closing their eyes to their internal differences and a sneaking power imbalance between the team members that is not revealed.

5. Discussion

Leaning on Katzenbach et al., we have so far established that high-performance teamwork translates into deeply committed team members with a common striving to establish and obtain common goals in an accountable and common work approach, at the same time having an open mind to learn from each other and the project in order to reach their goals, in essence, using common resources and differences as vehicles to learn and evolve. With this point of departure, we have analysed three 1st-year study teams, each picked out for being, in their own way, on the road to becoming high-performance study teams. At the onset of the analysis, all three study teams showed signs of being at least potential teams in the sense that they had common purposes, performance goals and a good working approach. By investigating the group-related dynamics and the motivational strategies of each team, we were able to give a more detailed picture of how far they have reached up the team curve (see Fig. 1) and by what dynamics and strategies they got there. An overview of the empirical analysis is presented in Table 3.

One obvious thing to state about the three 1st-year study teams in terms of relational dynamics is that none of them apply fully fleshed evolving relational dynamics *all the time*. What is more, in different ways, they all to a lesser or larger degree struggle with embracing the norm of seeing difference as an opportunity for learning and development. Can it at all be expected that first-year students should be able to form high-performance teams? They are still in their first semester, and it doesn't seem reasonable to expect this from a junior study team. Learning new ways of collaborating, such as problem-based learning, does require time and students have to get to know each other – although our experience as teachers tells us that some teams do in fact stop evolving and experimenting very early on in their collaboration, once they find a working mode that suits their immediate needs. In general, however, it is very rare that all interpersonal communication within any group falls into the evolving mode all the time [18]. Thus, the important aspect here is that enough communication falls within this category that they may maintain direction and will not stalemate into maintenance mode or, worse, the liquidating mode. The goal is not to avoid the dynamics, but to embrace them and navigate them sensibly. In this sense, all the teams are doing well at the specific point in time when we observed them, even if specific goals and student personalities make them appear very different. The real value of these cases is

Table 3. Summing up the empirical analysis.

Attributes No.	Evolving team no. 1	Evolving team no. 2	Evolving team no. 3
Norm	Difference ignored/Attacked	Difference tolerated	Difference accepted
Handling	Collaboration	Collaboration	Collaboration
Response	Engaged → None	Engaged → None	Engaged→ None
Confrontation	Ignored → Attacked	Nurtured → Ignored	Nurtured → Ignored
Resolution	Forward → ?	Forward → Standstill	Forward → Standstill
Responsibility	Action → Avoidance	Action → Sacrifice	Action
Sense of reality	Acceptance → Denial/War?	Acceptance	Acceptance
Mood	Vitality	Vitality → Anxiety	Vitality → Anxiety
Motto	'As long as we have fun we evolve'	'We sometimes have to sacrifice to evolve'	'We can only evolve if everyone is happy'
Strategy No.	**Evolving team no. 1**	**Evolving team no. 2**	**Evolving team no. 3**
Social reinforcing	Fun	Acceptance	Communality
Socially shared goal-oriented talk ***Socially** ***Professionally**	Stand your ground Productivity and fun united	We look out for each other Bite the bullet	We are one Everyone is excited
Interest enhancement	Spurred by vitality	As a rule	Always
Task structuring	Touch base– constant calibration	Obligations before fun	Let's get action-oriented
Self-handicapping	Lack of fun equals lack of depth in learning	Finding a balance between team and individual	Individuality is difficult
Efficacy management	When invited	As a rule	Always

that they display some of the common pitfalls for teams, when aiming to stay in the evolving mode on their way to becoming high-performance teams. They show what is or can be destructive behaviour and what kind of pitfalls and forces different group dynamics can have on the path towards high-performance. In the following, we will go through these pitfalls and discuss their implications and how we as teachers and supervisors can help them stay on track. The evolving motto constructed for each team reveals the pitfalls that the specific team displays. The mottos are primarily deduced from the conflicting material found in each group in relation to their self-handicapping strategies.

5.1 'As Long as we Have Fun we Evolve'

Study team no. 1 is a typical study group consisting of like-minded people aiming to have fun as they study and learn. On the one hand, this team creates a vital environment, giving the individual students a good learning experience and an exceptionally good knowledge-sharing climate. When they work well, they work almost like a united organism and get things done. They are very committed to each other, to the point where everyone else is excluded. We observe them at a point in their group process where there is little sign of disagreement amongst them. It could be that they are still in their 'honeymoon phase' [24] and haven't yet reached the point where differences materialise. It could also be that they have had differences that they managed to work out and now find themselves in a calm period again. We don't know. What we do know, on the other hand, is that they take a rather ignorant and sometimes aggressive stance towards what is different from themselves outside the team and that part of their value base is 'stand your ground'. This tendency to ignore or even attack what is different and tough to understand, while at the same time adhering to a norm of standing your ground, will potentially create tough situations within the team when differences arise here. Either you ignore them or the way you deal with them will have liquidating qualities. In both cases, their lack of curiosity and resolution skills will set limits to what they are able to learn, or at least slow down the learning process considerably. We already see signs of this in their tendency to shy away from the challenges they have with being inefficient and not very productive for part of the time. In this sense, they have too few fruitful confrontations and in the long run they will not really learn how to deal with tough or unwanted situations. Deep learning and change [5] involves a willingness to skate on thin ice and be ready to take risks. It is important to create vitality and joy, but to really become a high-performance team with a big impact you need also to learn the ability to stay

curious about unpleasant things. As a supervisor, the challenge is to help this team develop this ability, keeping an eye out for how they deal with their internal disagreements and other relevant aspects that don't bring them much joy.

5.2 'We Sometimes have to Sacrifice to Evolve'

Study team no. 2, on the contrary, is a study team consisting of very different personalities, genders and experiences, which they juggle on a daily basis. In this sense, they are both forced to deal with much bigger differences, and are also more willing to take on the challenge. And a long way down the road they manage to welcome the differences, set goals and work efficiently towards them. The responsibility in this team is more on the group level than on the individual level, which is contradictory to case one. Their vitality is, however, nowhere near the vitality of team no. 1. What we see is also that sometimes 'the widest shoulders carry the heaviest burden' – implying that inequality in competences amongst the team members causes the more capable team members to take a larger responsibility to make the collaboration work than the one who – by her own account – is less able to contribute to the team work. We also see a willingness in the team to ''bite the bullet'' and put in extra working hours in order to reach a deadline. In themselves, both tendencies are good strategies to overcome very real team and project challenges and ultimately help the team reach their goals. At the same time, however, they entail the risk of installing the strategy of sacrifice as an applicable way of dealing with challenges. The danger in this is that some members habitually shy away from taking care of their own needs and put the needs of others or the needs of the project as the first priority. In the longer run, this might stall or distribute the learning unevenly. It might even break up the team in the end. Groups like this face delicate challenges. Relevant questions for the team members are: What is a fair distribution of responsibility? How much should individual needs get ahead of team needs? How can we make sure that everyone gains what they want from the learning process? Addressing personal differences in terms of the ability to cooperate and deliver is a delicate matter that requires skills, resources and time. The risk for this kind of team is that they face too many delicate challenges and therefore ignore and/or sacrifice either individual or team needs. As a supervisor, the challenge is to help them develop good conflict management skills and emotional intelligence so that they are able to take the delicate discussions and find out how to deal with the big differences in a way that everyone finds useful and respectful.

5.3 'We Can only Evolve if Everyone is Happy'

Study team no. 3 is a team with a very solid anchoring in the values of PBL. Like study team no. 2, it consists of members with mixed gender, though without the big internal differences in competences and experiences. In this sense, they are not as challenged. They aim for a high degree of total agreement amongst the team members and are very committed to collaborating in a way that underlines the general evolving motto of 'you and me'. They are so attentive to this value that they might potentially be in danger of sacrificing productivity in order to have everyone agreeing. This underlines that for a study team to aspire to be a high-performance team they need to be equally deeply dedicated to their goal, keeping them focused and on track, helping them to dare go into the conflict of how to decide whose opinion or needs they should follow. Their simple answer is that, working like a total organism, we follow the best man or woman. This in return demands that the abilities and weaknesses of every member are acknowledged and that the trust and commitment of everyone is high enough to work as a unit. In general, this team strikes a good balance between too many and too few conflicts. They are blessed with some differences and still able to take away learning from them. What this team needs from a supervisor is the support that they are on the right path and that conflicts and differences are a good thing and something that brings them along in a learning process. The more they are able to know and lean up against each other, the more they will be able to work in the interests of their common project.

The three cases are all different in the composition of gender and personalities etc. They portray teams that feel as if you are in a group of friends, in a group of very diverse people or in a group that is somewhere in-between. From these different starting points, they show us different pathways on the road to delivering high-performance and help us convey the message that the road towards becoming a high-performance study team is a road of enough evolving relational dynamics, with an eye to the use of proper motivational strategies, while at the same time watching out for common pitfalls such as the ones laid out here. There are always discrepancies and conflicts in a group process. The question is, though, whether it is recognised, seen and taken care of in such a way that the group experiments with different solutions and continues to develop the group processes. This is where the germ of high-performance is to be found – as a group that keeps working with the discrepancies and conflicts without freezing, stiffening, denying or avoiding the hassle.

6. Conclusion

This article has aimed to investigate the group-related dynamics and motivational strategies of becoming high-performance study teams in a university setting and to see what these study teams look like in practice. The ultimate goal has been to learn from this how we can help engineering students train these very valuable qualities in an ever more complex and challenging world and labour market.

To meet these aims we first developed an integrated framework for conducting a detailed analysis of team dynamics among first-year undergraduate engineering students. Theoretically, we established that high-performing study teams are characterised by an ability to stay curious and draw learning and nourishment from internal differences, while still keeping an explicit learning focus. Being able to acknowledge and work with unresolved differences is an ability that puts the team on a constantly evolving learning curve. Reflecting upon and being able to master 6 specific motivational strategies creates the most supportive and developing framework to do so. By developing this integrated framework we translated and detailed the concept of a high-performance team originally developed in a business setting to a learning setting at a university level.

From an empirical point of view, we then showed how this played out in three specific teams and concluded that our three engineering study teams are on their way to become high-performance teams, displaying qualitatively different versions of what an efficient study team looks like. Apart from giving 'flesh and blood' to the theoretical framework, the empirical work pointed out a few interesting conclusions. For one thing, looking specifically at the (negative) motivational strategy of self-handicapping, we get valuable information about the currently hidden conflicts in the group and what would make sense from an evolving point of view to acknowledge and address. Secondly, the empirical analysis revealed some common pitfalls for teams and highlighted that the goal is not to ignore these dynamics but to learn to embrace them and navigate them sensibly. Thus, the three cases jointly showed us that too few fruitful confrontations, too many delicate challenges, or not accepting to have unresolved conflicts are all situations that are worth keeping an eye out for. Thirdly, this is where we as teachers and supervisors can help them stay on track by either helping them acknowledge the importance of embracing difference, discover hidden or ignored differences, learn to ride and navigate their differences or support them when they do so.

As concerns the limitations of this study, they fall within those characteristics of a qualitative research approach. The data collected, although a large amount that makes analysis and interpretation very time-consuming, were nevertheless collected merely among first-year engineering students from just two study programs at Aalborg University. Especially, the fact that the students are all first-year engineering students might limit the analysis and interpretation since they are inexperienced in teamwork and also new to the PBL study context. This means that relational dynamics and motivational strategies could be more explicit and developed in more mature study teams and, as a result, more and more frequently these study teams might be high-performing as teams.

As pointed out this study contributes to the theoretical framework of high-performance teams in a new field. Although developed within a business world setting, the theoretical framework reflects very well a PBL setting with the aim of study teams creating common goals for which they hold each other accountable, and by daring to engage and resolve disagreements and conflicts within the team.

However, further studies and research into engineering study teams and their motivation to become high-performing teams are still needed as a means of studying and learning within a PBL setting. Following Wijnia et al., we still need more knowledge about why (and if) students in a PBL study context are generally motivated. A natural extension of this will also be to study how this motivation is reflected in students' teamwork and their collaborative skills and competences.

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