Problem-based teaching in construction law

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Abstract
The construction industry is an exciting place to work, often you are involved in interesting projects and creative problem solving is part of the daily work. In the construction engineering educations we prepare the coming engineers very well on all the positive work tasks and competencies they must hold. But, in the last decade there has been an increasing tendency towards using contracts, agreements and laws much harder and directly in construction projects. Some argues that the success of a project now depends on if one can remember the “general conditions” of Danish construction (called AB92, ABR89 and ABT92) in sleep. To prepare the students for this situation is much harder and sadly often neglected in the education. On the other hand, there is much attention on cooperation in construction, e.g. Partnering. The idea is then to decrease the focus on contracts and increase the cooperation to reach a smoother problem solving process. It is, however not either contracts or Partnering. The students must learn both, and in ever Partnering project the contractual agreements should still be well founded.

This paper describes how we at Aalborg University in Denmark teach construction law – in fact engineering students may take several different courses in that area. The teaching form is centred on Problem Based Learning and student engagements. Cases from the “real world” are, therefore, used and the students get to work in groups to discover problems and solutions them self. The teaching is hence not to compare with traditional lecturing, but instead it is more similar to workshops.

Experiences so fare has shown that the students are keen on this way of learning, and more over engineers with a couple of years practices and who has participated in these classes seems to be very well prepared for the continuous battling of laws, contracts and agreements.

Keywords: Problem Based Learning, Construction law, Teaching, Case study

1 Introduction
Engineers working with construction management face a lot different challenges in their highly dynamic workday. In a single day an engineer working as a contractor may work with such different areas as static calculation, management, legal issues, purchasing, and execution methods. It is hence become evident that a construction management education must have a broad scope. In recent years legal issues in construction are increased, i.e. dispute over tendering,
contracts, etc. (Ussing, 2008). But engineers with high knowledge within construction law and no cooperation skills will not revolutionize the industry. Construction is such a complex business that it is not possible to cover one up with contracts – cooperation between the different parties of construction is also necessary.

The purpose of the paper is by means of knowledge sharing to promote a holistic approach to teaching construction law for construction engineers. As mentioned above, there is a need for increased competencies within the field of understanding how construction law can be combined with cooperation ideas. Therefore, this paper describes how we at Aalborg University in Denmark teach construction law in a cooperation spirit. The teaching form is centred on Problem Based Learning and student engagements. Cases from the “real world” are, therefore, used and the students get to work in groups to discover problems and solutions them self.

Initially the paper describes the wider context of the construction management education at Aalborg University, e.g. what the aim of the education is and how it is structured.

2.1 Construction Management at Aalborg University

A construction project evolves through different phases, and in all phases engineers play a vital role. The Master of Science education in construction management at Aalborg University in Denmark holds its starting point in the construction process. Students follow the different phases, right from the first ideas of the construction and its use over design and erection to facilities management. Besides technical areas the education in construction management covers areas of organizational design, management accounting, financing, project management, work environment regulations, logistics, construction law, information technology, etc. The education aims at teach the students the bigger picture, i.e. the whole construction project, not separate sub specialized knowledge. Furthermore, the education must enable the engineers to work in strategic, tactical and operational environments.

A construction management engineer must hence both poses soft and hard skills. At Aalborg University the philosophy is that the students should first learn the hard basic skills such as statics, material theory, foundation design, etc. These courses are mandatory in their bachelor education. Afterwards the engineers can choose between five different master educations, where construction management is one of the possibilities. In total the students get a 5 years education (3 years BSc and 2 years MSc).

The pedagogical aspects is described in the next chapter, but initially it is necessary to point out that the students works in groups of 3-6 students, and that each group is connected to a specific industry company. The students visit the company several times to make e.g. interviews, observations, etc.

The first semester in the MSc education has focus on building production. It could both be on-site production or engineering-to-order production at a supplier, e.g. concrete elements, windows, etc. The students must analyze the production process from the customer gives the order to delivery. After this analysis the students must develop solutions that could further improve the production process. Courses in this semester are among others quality control, construction law, the building process, business law, production planning, etc.

The second semester of the MSc focuses on the management of a single company, i.e. production management at an aggregated level. The company’s management system such as quality, production planning, financial, etc. is analyzed. Often the students need to analyze the
The main courses of this semester are strategy, organizational design, change management, activity based costing, outsourcing, etc.

The third semester is a compulsory semester where the students can choose between making a traditional semester project, study a semester abroad or go into practical training. Around 80% of the students choose the practical training. Most of these students want to experience the job of on-site construction manager either in Denmark or Abroad. The rest of the students choose to make a more theoretical semester project in a topic of interest. In this semester there are no planned courses, but students are free to choose relevant courses form all over the university.

In the fourth and last semester all the students make their final dissertation. They are free to choose the topic, but it could be areas such as lean construction, strategic partnering, industrialized construction, payment systems, etc. Some projects are carried out in collaboration with industry companies, others are more theoretical. In this semester there are no courses.

Table 1 shows where the students are employed after graduation.

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<tbody>
<tr>
<td>Contractor</td>
<td>56 %</td>
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<tr>
<td>Consulting engineering</td>
<td>15 %</td>
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<tr>
<td>Research</td>
<td>10 %</td>
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<tr>
<td>Suppliers</td>
<td>9 %</td>
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<tr>
<td>Authority</td>
<td>4 %</td>
</tr>
<tr>
<td>Other</td>
<td>6 %</td>
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As the table illustrates the majority of the construction management students does in fact work with construction management. Moreover 94% of all graduates are employed within the building industry. We think it is very important that the students after graduation are hired within the building industry. Only in such a manner can the skills of the students benefit the continuous improvement of the industry.

In conclusion of this introductory section it can be concluded that the industry request engineers with a balanced knowledge of hard law aspects and more soft cooperation aspects. Exactly this balanced approach is the turning point of the construction law course at Aalborg University.

2 Pedagogical approach

The construction law course practices a special problem-based learning (PBL) approach including group work. By using this pedagogical approach the students are forced to getting hands on experience with problems taken from real construction projects. The PBL approach is essential for Aalborg University, where all educations follow this learning philosophy.

This problem-based learning model is organized around three central theoretical dimensions; the problem, the content and the team (Graaff and Kolmos, 2003). The problem is very central for creating motivation. It can be all kind of problems from a concrete, realistic problem, to a theoretical problem. The problem serves as the basis for the learning process, because it determines the direction of the learning process, and places weight on the formulation of a question rather than an answer. Integrated in the problem approach is learning in context. (Kolmos et al., 2004). The content approach is especially concerned with interdisciplinarity and examples from practice. Knowledge is the solution to the problem and may often span across traditional educational boundaries. By using examples from practice the students gets engaged.
The team principle refers to the idea of students working together in groups in the problem solving phase. This indicates ownership of the learning process.

PBL can however be a challenge for the teacher. To achieve the right mix between theory, practice, group work and lecturing can be difficult. But if achieved a very stimulating learning environment is achieved. The real benefit is that students after graduation can enter direct into an organization and work both independent and in groups and solve problems. The theoretical level may however be slightly lower than by lecturing in traditional classes.

Examples of how the construction law course uses the PBL pedagogical approach are described later in this paper. For more in-dept knowledge of how PBL is applied at Aalborg University the reading might look into “The Aalborg PBL model” (Kolmos et al., 2004).

3 Theoretical approach

As mentioned earlier we see two tendencies concerning management in the Danish construction industry. One is the strictly contract management approach where the project managers from the different companies involved in a building project focus on what is written in the contracts and their own interpretation of more vague statements – all from a selfish viewpoint. The other approach is a rather new way of cooperation – by many called Partnering. The main focus in Partnering is to optimise the value/cost ratio from a holistic approach - ultimately with regard to the lifetime cost, i.e. the parties involved tries to make the common pie larger. Subsequently the positive problem is how to share the larger pie between the client and the parties he has hired to design, build and maybe facilitate the finished building project.

A value approach is chosen as the foundation of the course, because it covers both the soft cooperation side and the hard legal side. Furthermore, the value approach is very suitable for a problem based teaching where the students are actively involved.

In our master programme in Construction Management, we have in mind that the contract view and the Partnering view can be combined in a positive way, i.e. used in a proper way the two viewpoints can create synergy. This perception is illustrated in figure 1.

Figure 1: Behaviour regulations in a project organisation, (Bejder & Wandahl, 2004).

In general the main objective in a project is to achieve consensus between the results and the goals, i.e. expose and meet the needs of the interested parties in an effective and efficient way. Traditionally, the interested parties who are taken into consideration when defining the goals are the owner and the coming users. The building process is with these goals normally managed and controlled by different systems and structures decided on in the project organisation, e.g. the
systems can be quality, time and financial management/control systems. Structures are among others the way in which the parties have organized themselves in the project organisation – the managerial organisation explaining how to coordinate as well as the legal organisation explaining who has a contract with who including the actual contract conditions.

Bejder & Wandahl (2004) define management of values (or Value Management) as the situation where you, in figure 1, only focus on the goals and framework, the systems and structures and the results. In this situation the goals traditionally reflect the (primary) product values of the owner and the users. The owner and users might also have some process values which they want to be part of their goals, but normally the main focus will be on product values. These values could be in areas like location, aesthetics, fitness for user purpose and more technical aspects – e.g. concerning materials, environmental aspects, health and safety, time aspects all related to the cost aspect - building cost as well as upkeep cost. In this situation one can say that you perform traditional Value Management. The tendencies in this situation is that much focus is put on the contracts – normally you see that the basic legal conditions (AB92, ABT93 and ABR89) are biased via additional statements – often in a way that the balanced common accepted basic condition are turned around to the special advantages of one party. This also involves that the legal part of the contract document becomes very voluminous.

Based on the characteristics of Partnering, you can say that a Partnering like cooperation occurs when you extend the goal settling process in a way so the building-project goals also include common accepted individual party goals (i.e. party values) of the other interested parties of the building process, i.e. the architect, the consulting engineer, the main contractor, the subcontractors and ultimately also the suppliers of the building materials. Carrying out the process in that way, one can say you begin to perform Value Management with Partnering.

Looking at figure 1 you see a supplementing management/control mechanism called Values related to the behaviour in the process, i.e. values you manage/control by. This means that these values are basically not necessarily goals themselves, but rather means by which you hit the goals (typically product values cf. above) in a more efficient way. These values are common accepted/shared process values, i.e. expressing the project “religion” or say express proper ethic behaviour in the project organisation. Besides operating as an extra control mechanism, the usage of these shared values might hypothetically ease some of the traditional control systems and structures, e.g. putting less focus on the development of often-biased formal legal terms and perhaps reduce the inspection activity on the building site performed by the architect and the consulting engineer. Having added this extra control mechanism to the figure and having involved the goals of the participating interested parties (involving the consultants and the executing parties), we define that we operate with Value-Based Management with Partnering, which could also be expressed as Value-Based Cooperation.

Anyway working with value based cooperating does not involve that you neglect the legal viewpoint. It is important that e.g. the different roles, the contribution from the different parties, the procedures for handing over the finished building etc. are clearly described in the contract. However, this should be done in a not biased way, i.e. the basic legal conditions (AB92, ABT93 and ABR89) should be used without adjustments, which favour one party in an unbalanced way. Therefore, we teach our master students in a way that they can operate with the system and structure viewpoint reflecting the legal approach as well as the process value viewpoint reflecting the more human/social approach, i.e. managing effective and efficient teams.
4 Description of the course

As mentioned the master programme in construction management involves courses in many disciplines. Especially the management aspect is highly prioritized. Among others production philosophies from the mechanical and electronic industries such as Supply Chain Management, Lean Production, Agile manufacturing, Virtual Enterprise in connection with Extended Enterprise and Change Management are presented and discussed with the students. The idea by this is to stimulate the students to see the possibilities for the building sector if we adopt these philosophies – of course adapted to the specific conditions in the building sector.

When we developed the course in construction law one of our challenge was not to stimulate to contractual management in the traditional way, but to see the legal aspects as a natural synergy creating supplement to the new management philosophies. As a building organization normally involves many different legal parties you need to be aware of the legal organization, i.e. who has which contract with who as well as the managerial organization, i.e. how we manage the building process in an effective and efficient way – especially inspired by the new production philosophies. Therefore when we run the specific course in construction law it is in the light of these new opportunities.

The course in specific legal subjects related to the building sector is a so-called 1M (one module) course. A 1M course consist of five half days which could be morning or afternoon sessions with a duration of three and a half our. Normally each session is divided in two sub sections – one with a lecture where the teacher introduce new topics and one where the students in groups work with a task e.g. a case related to the topics the teacher have introduced in the first sub section.

In the specific course, we used a model where one or two students present a topic, which they have prepared at home or in their group room for the rest of the students. During and after theses presentations it is possible for the rest of the students to ask questions to the persons who present the topic. This involves good and broad discussions in the classroom. The teacher’s role is in this situation to stimulate the discussions so that all relevant issues are highlighted and correct eventually misunderstandings, i.e. the teacher must also be well prepared and this demands considerable resources - at least analogous to a normal lecture. But the benefit is that the students are very actively involved in an effective and efficient learning process.

After having some topics presented within the first approximately two ours the teacher has prepared a case or copied part of a contract document from real world to be discussed in the classroom. In some situations the students go to their group rooms and discuss the case before the final discussion in the class room – some times the discussions can go on immediately in the classroom without going to the group rooms depending on the case and the situation.

The topics to be presented at the course are among others AB92, ABT93 and ABR89 (including supplementing regulations), which are previously mentioned in the paper. After these we look at the Danish departmental order concerning quality assurance, which must be followed by public supported building projects but normally also are followed in private building projects via a statement in the contracts. Then we look at The Danish tendering law, which also must be followed by public supported project. In addition, when the budget for a public supported building project or the fee for a consultant exceed a certain threshold value the European tendering legislation must be followed. Therefore, also these EU directives are included in our lessons.
Finally we also look at complain systems as well regarding the arbitration system referred to in AB92, ABT93 and ABR89 as The Danish Board of Complaints on Tendering referred to in the Danish tendering law and in the EU directives. In this session we invite a member from The Danish Board of Complaints on Tendering to comment on different cases he has dealt with in the complain system.

5 Feedback
The course has now been offered since year 2000. Students must evaluate each course, and we can, therefore, now evaluate the course on basis of eight years of student evaluations.

In total the students are overwhelming positive about the course. The main points from the evaluations are presented below:

- Few students says that there is too much reading of paragraphs, and asks for more general description of the different laws. They suggest making the whole course case-based. This critique contains both elements related to course content and to the pedagogical approach. The use of cases is a very good pedagogical approach, but it happens that the cases are too complex for the students' current level. Some of the paragraphs of e.g. the general conditions (AB92) are essential. These paragraphs benefits from been worked thoroughly one by one.
- There are few comments on the course content, e.g. missing construction law aspects, etc. The reason is that the students are not aware of other elements of construction law than what presented in this course, i.e. they do not know what might have been left out.
- This course is placed in the first semester of the master level, i.e. in the fourth year. It is argued that this is too late. Anyway bachelor students might follow the course as a free study activity and get this documented in their diploma. But this is freely and, therefore, you can finish as a bachelor without this knowledge which is open to criticism.
- Most of the students like the pedagogical approach where the students must participate actively, and do presentation in class of selected readings. This creates an informal atmosphere, where students not are afraid of asking question. Furthermore, it is recognized that learning increases when students actively participates in classes.

In a wider perspective there has been positive feedback from the construction industry. Partly from former students who now actively has used the learned knowledge from the course, and partly from companies who for a long time has asked for more knowledge in the area of construction law.

6 Conclusions
It is essential that coming leaders in the building industry are well informed concerning construction law, i.e. they must be able to understand contracts they might be or are involved in. But the contract approach to effective and efficient building processes should not stand alone because this will traditionally lead to biased statements in the contracts and that the parties involved therefore spend much time on fighting instead of focussing on common problem solving, i.e. making the common pie larger.

Instead a balanced approach with due attention to the law aspect as well as to the more soft aspect concerning building up an effective team spirit should take over, e.g. inspired by the value based management managing philosophy
Anyway, this is a large challenge for the rather conservative building industry – some people are changeable concerning new ways of cooperation, some are not. Therefore, the long-time solution to this challenge is to highlight the possibilities for the coming leaders in a proper way at the universities. This can among others be achieved by a stimulating problem-based learning environment where you stimulate the students to work together and take responsibility for their own and their colleagues learning.

7 References

