

TEACHING INTERPERSONAL SKILLS - THE CONCEPT OF SOCIAL RISK ANALYSIS

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ABSTRACT

In addition to the traditional learning outcomes for technical disciplinary knowledge, the CDIO-syllabus also specifies personal and interpersonal learning outcomes. The argument for teaching interpersonal skills rest upon the team-based working environment that is typical for engineers, where knowledge and skills in teamwork, leadership, and communications are highly required. Thus, the practice of interpersonal skills need to be implemented in engineering teaching, not only in terms of learning objectives, but realised in practical teaching activities and as an integrated part of the examination. This study aims at presenting and reviewing a practical approach to teaching of interpersonal skills, referred to as the Social Risk Analysis, which has been applied and integrated into the curriculum of two engineering courses. The Social Risk Analysis encourages and imposes a critical review of the social interaction in a small group of students and thus facilitates communication and teamwork operation. Students find the Social Risk Analysis being easy to apprehend and meaningful in engineering teaching, and most significantly, they perceive that the Social Risk Analysis facilitates the work performance. The study found it possible to successfully implement the Social Risk Analysis into the course curriculum of the two engineering courses. The implementation required, however, refinement of the pedagogical approach by integrating the Social Risk Analysis into the learning objectives, teaching activities and assessment of the course, and further, redesign of the engineering work assignments in order to impel cooperation, communication and participation of the students in a team. The establishment of an engineering context provides an important basis for the teaching of interpersonal skill using the Social Risk Analysis.

KEYWORDS

Interpersonal skills, social risk analysis, teamwork, CDIO

INTRODUCTION

The CDIO framework for engineering education rests upon the expressed need “*to educate students who are able to Conceive – Design – Implement – Operate complex, value-added engineering products, processes and systems in a modern, team-based environment*” [1]. The context of conceiving, designing, implementing and operating depicts the professional

role of engineers and it provides a realistic framework for teaching engineering skills which facilitates the understanding of the technical disciplines and imparts learning in personal and interpersonal skills [1]. The required professional engineering skills go beyond the down-right technical disciplinary knowledge and include the personal and interpersonal skills that are required when operating in the team-based environment that characterises professional engineering work to day.

Engineers are challenged by the ongoing globalization and they encounter problems of cross-disciplinary nature which e.g. requires team working skills with awareness and respect for other competencies [2]. The recognised competitive advantage of companies that succeed in creating cross-disciplinary team environments, in which engineers work side by side with other professions [3], [4], brings forward the argument and need for cross-disciplinary team learning for engineering and other university students in professional programs in order to qualify for a globalised marketplace [5]. Thus, team collaboration in cross-disciplinary environments includes social as well as technical skills [6]. Schaffer *et.al.* [7], Reichlmayr [8] and others conclude that the skills of communication with people with different skills backgrounds, to understand more than one discipline, are important in any teaching program preparing professional engineers. These knowledge areas apply to the skills inquired by industry, e.g., interdisciplinary skill, softer people-oriented skills, project-based experiences and creativity and critical thinking besides profound knowledge of engineering theory [2].

Derived from surveys of contemporary engineering practices, reviewed and validated from industry and academic stakeholders, the CDIO approach presents a comprehensive syllabus of knowledge, skills and attitudes which is well adapted for a variety of engineering educational programmes [1]. The guiding principles and features of a CDIO program are compiled in 12 standards which serve as a guideline and framework for redesign of engineering programs. The learning outcomes of engineering education, following the CDIO syllabus, are recorded in Standard 2 and includes “...*personal and interpersonal skills, and product, process, and system building skills, as well as disciplinary knowledge...*” [1]. The personal learning outcomes refer, in this context, to the students’ individual cognitive and emotional development, e.g. engineering reasoning, creative and critical thinking and professional ethics while the interpersonal learning outcomes consider individual and group interactions which include teamwork, leadership and communication.

Problem Statement

The implementation of an integrated curriculum of technical and personal, professional and interpersonal skills, of which the CDIO initiative provides a thorough and comprehensive example of an approach to engineering education, implies a change and reformation of existing engineering education programs. The emphasis on personal and interpersonal skills provides a new challenge for the existing teaching staff of the technical disciplines in consideration of the new subject fields, but also from a pedagogical perspective. The teaching of non-technical skills e.g. teamwork and communication skills require appropriate teaching methods different to the traditional didactic methods [9]. Besides, how can personal and interpersonal skills be implemented into an existing curriculum without detracting the technical disciplines?

Purpose and Objectives

This study takes on the challenge of creating an integrated curriculum in which teaching of the technical disciplines is integrated with teaching of interpersonal skills. The objective is to introduce a simple approach for teaching of interpersonal skills and to review the outcome on basis of two different cases, i.e. two different courses. The approach is in this context

referred to as the Social Risk Analysis. The definition of interpersonal skills refers directly to the CDIO syllabus, paragraph 3, Interpersonal Skills: Teamwork and Communication.

METHOD

The presentation and review of the Social Risk Analysis described in this context rests upon practical experiences from two different cases, i.e. two different courses, where case 1 took place at Lund University, Faculty of Engineering, in Sweden in the time period of 2003 to 2005 and case 2 refers to The Technical University of Denmark, Department of Management Engineering in 2009. Despite the different origins, there are a number of common denominators in the two cases. For example, the subject field is about construction management in both courses, the teaching is project based and includes industry involvement, the courses are optional for students in their final year of education, the course credits correspond to about 30% of full-time studies for a semester, there is about 15 students from different engineering programs in the class, the students work in groups of about four to five students and the groups are divided by the teacher.

The differences to be mentioned about the two cases concern the duration of the courses in which the course in case 1 ranged over seven weeks while the course in case 2 extends over 13 weeks. Civil-engineering students constitute the main target group for both courses, but both courses are characterised by a cross-disciplinary selection of students. In case 1, the group of civil-engineering students was supplemented by students from the architectural and land surveying programs. In case 2, the group of students were constituted by equal shares of civil-engineering and architectural-engineering students and the whole group represented three different nationalities.

The review of the practical application of the Social Risk Analysis rests upon, in case 1, course evaluations from 2001 and 2005 and, in case 2, a questionnaire survey that was carried out halfway through the course.

The structure and fundamental principles of the Social Risk Analysis was established with help and support from the department of Cognitive Science at Lund University, Sweden.

THE CONCEPT OF SOCIAL RISK ANALYSIS

The initial fundamental argument for introducing interpersonal skills in the curriculum of the engineering courses of case 1, and later in case 2, rests upon the conception that the teaching of interpersonal skills not only represent an important topic of its own but also facilitates the learning process of the technical skills, see figure 1. This line of thought accords with the CDIO concept in which the importance of interpersonal skills are emphasised besides the technical disciplines and other professional skills and it corresponds to the FIRO-theory of interpersonal relations which, among other things, explains how collaborative relationships in a team influence the work performance of the team, see Blackman [10] referring to the original work of Schutz [11] from 1958. Crawley *et.al.* [1] call for a better preparation of engineering education as the basic intent of the CDIO initiative and address, in this matter, not only the knowledge and skills that engineering students should learn but also how engineering students should learn these skills. Thus, the implementation of an integrated curriculum includes pedagogical considerations at all levels down to the design of individual courses, which e.g. corresponds with the findings of Varkey *et.al.* [9] and others.

A basic condition for the pedagogical design of the courses in case 1 and 2, was the context of the course, i.e. the scenario or the situation in which the students team up and act in the

role of professional engineers solving technical problems and, consequently, in the context where the interpersonal skills become authentic and relevant.

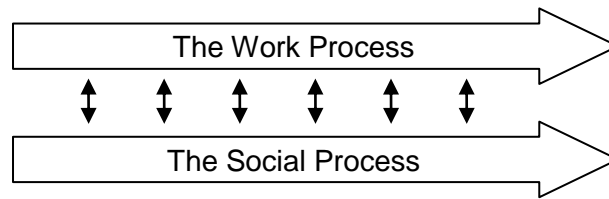


Figure 1. The Interaction of the Work and the Social Processes

The pedagogical design of the courses in case 1 and 2 in this context were based on a project assignment in which the students worked in teams, compelled to interact in order to complete the project. Further, the interpersonal skills as well as the technical subjects were included in the course curriculum, which was designed so that the learning activities and methods of assessment were aligned with the learning objectives of the courses. Thus, the curriculum design of the two cases followed the concept of constructive alignment as presented by Biggs [12]. The introduction and explanation of the Social Risk Analysis was done early on in the two cases, just after the project assignment was introduced and groups were established. The initial preparation, instructions and clarification on the rationale for the teamwork and in this case, the Social Risk Analysis, are essential for the student's view towards teamwork [8] and the team capacity for growth [7].

The Social Risk Analysis – Step by Step

The operation of the Social Risk Analysis, described step by step in the following section, constitutes a generic framework that follows the same procedure irrespective of the group composition or the group assignment. However, the issues of analysis derive from the individual members of the group and from the characteristics and context of the group assignment and, consequently, the issues of analysis can vary between different groups in the same project. Further, the new issues of relevance can be found during the work process as the group dynamics develops. In the first step of the Social Risk Analysis, the group identifies and agrees on some common issues of analysis.

Step 1: Identification of Common Issues of Analysis

The identification of some common issues of analysis provides the starting point for the Social Risk Analysis. As mentioned above, this step should be initiated at an early stage of the work process in order to provide an early opportunity for the group members to familiarise and to get to know the work assignment. Thus, the group assignment should be introduced and explained before the Social Risk Analysis, as it can influence the choice of relevant issues of analysis in the Social Risk Analysis.

The issues are identified with a traditional brainstorming within each group. The following list provides examples of relevant issues for the Social Risk Analysis described from an individual point of view:

- Priorities. How do I prioritize my loyalties? What is most important to me, e.g. my family and friends, my professional carer, my income, appreciation, duty, etc.?
- Conditions. Under which circumstances do I work and perform the best? Is it when I work against the clock, with great responsibilities, on my own, as the underdog, early in the morning, after lunch, at night etc.?
- Personality. How do I perceive my own personality type?
- Cooperation. Which type of personality do I prefer to cooperate with? Why?
- Cooperation. Which type of personality do I find it difficult to cooperate with? Why?
- Behaviour. What kind of behaviour do I appreciate from my team members? Why?

- Behaviour. What kind of behaviour do I dislike among my team members? Why?
- Ambition. What level of ambition do I have with this group assignment?
- Success criteria. Which are my success criteria for the performance of the group?
- ...

Step 2: Self-Conception

The list of issues of analysis from step1 provides a common starting point for the second step of the Social Risk Analysis, namely the self-conception. This step implies a meta-cognition, which accounts for the personality, set of values and qualities of each individual student in the group. Each student makes the self-conception in light of the given context, i.e. the team and the assignment that is to be carried out, and decide for them selves how open-hearted they like to be. Thus, the Social Risk Analysis does not require a total mental revision that reveals and explicitly express the student's innermost thoughts and values to all the other members of the group. It is, however, of greatest importance that everyone is honest and holds on to the truth in the self-conception. If that is not the case, it is likely that the Social Risk Analysis will impair rather than facilitating the teamwork. The results of the self-conception are presented to the other team members.

The role of self-conception is introduced and explained with reference to the Johari Window, developed by Luft and Ingham in 1955, which provides a framework for understanding and improving self-awareness [13] and describing the process of human interaction [14]. The self-conception part of the Social Risk Analysis aims at increasing the personal awareness of each student as well as the other team members and helps the students to better comprehend the interpersonal communication and relationship of their team. Self-conception represents, together with feelings and behaviour, three levels of human interaction according to the theory of FIRO, which posits that self-concept drives feelings, feelings drive behaviour and behaviour drives results [10]. The Social Risk Analysis is introduced when the groups are recently formed, the stage of Inclusion referring to the FIRO theory, and when insecurity and questions about acceptance characterises the individuals of the team. In this context, the Social Risk Analysis will help building self-respect, trust and a sense of group solidarity in order to facilitate the work performance of the team.

Step 3: Identification of Potential Conflict Areas

In step 3 of the Social Risk Analysis, the group jointly analyses the self-conceptions that has been accounted for by each team member in step 2, with the purpose of identifying potential problems or situations in which conflicts between team members may occur.

Step 4: Agreement on Fundamental Principles for the Teamwork

The list of potential problems prepared in step 3 is analysed by the group in order to elaborate suitable and preventive measures and policies for the teamwork in order to delimit the risk for conflicts and guidelines for how to handle conflicts that do occur.

It is important that the whole working process of the Social Risk Analysis, from the initial identification of common issues of analysis in step 1 to the concluding assessment and report in step 6, is well-documented by the members of the group. The documentation preserves the discussions and agreements of the group and constitutes kind of a social contract in the team.

Step 5: Recurrent Review the Social Risk Analysis

The Social Risk Analysis is to be considered a continuous process that, similar to the Social process illustrated in figure 1, should be run in parallel to the work process of the group. The

recurrent review of the Social Risk Analysis monitors the development of group dynamics over time. Besides, when students are new to the conceptions of interpersonal skills in general and/or the Social Risk Analysis in particular, it is likely that the initial analysis needs supplements and refinement when the work has commenced. Thus, step 5 of the Social Risk Analysis implies a recurrent update and review of step 1 to 4, see figure 2.

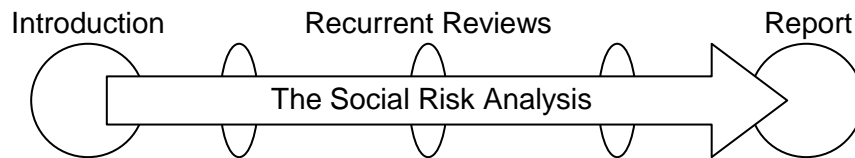


Figure 2. The introduction, reviews and report of the Social Risk Analysis

The initial introduction, the recurrent reviews and the final report of the Social Risk Analysis correspond to the approach to a course curriculum represented by constructive alignment, [12], in which the Social Risk Analysis can be included in the course objectives, implemented in learning activities and assessed as part of the course requirements.

Step 6: Assessment and Concluding Report of the Social Risk Analysis

The final step of the Social Risk Analysis, step 6, includes a critical assessment and debriefing of the interpersonal experiences and development of the team. Step 6 should be done after the work process has been concluded and eventual reports has been handed-in, in order to create some distance to the work process and allow for a review of the teamwork in some perspective. The documentation provides an excellent reference to the final evaluation of the group performance and its development.

EVALUATION OF THE SOCIAL RISK ANALYSIS

The Social Risk Analysis has been applied and tested in the two different cases, i.e. courses, described above and there is an overall positive attitude towards it among the students. In the course evaluation from case 1 in 2001, the students were asked to write down their own positive and negative judgements about the course and then, the other students could either agree or disagree to the total list of student judgements. The Social Risk Analysis was given four positive comments and a range of 84 to 95 percent of the students concurred with those positive comments. The same evaluation had no negative comments at all about the Social Risk Analysis. In the course experience questionnaire, CEQ, in case 1 from 2005, the students fully agreed to the statement, by a score of 95 out of 100, that their ability to work in groups had improved due to the course. The Social Risk Analysis was also mentioned in the list of personal comments to the best parts about the course and, in the same CEQ, there were no negative comments about the Social Risk Analysis.

In the questionnaire of case 2, which was specifically directed at the Social Risk Analysis, all students agreed to the opinion that the Social Risk Analysis had a positive impact on the work performance of their group (Positive: 50%, 50%, 0%, 0%: Negative). There were no explanatory comments to this question by the students, but it ought to be obvious that the students perceive a useful connection between the social aspects and the work performance, which constitutes the basic hypothesis and argument for the Social Risk Analysis in this context. Almost 90 percent of the students found it easy to understand the structure and content of the Social Risk Analysis (Easy: 38%, 50%, 13%, 0%: Difficult), which of course is of importance to the successful implementation.

An evident majority of the students agreed to the question about whether the Social Risk Analysis has made it easier and more acceptable to talk about interpersonal relations, potential conflicts or other relevant social issues in the groups (Agree: 13%, 63%, 13%, 13%: Disagree). This provides, together with the previous question about the relation between the Social Risk Analysis and the work performance, decisive arguments for the implementation of an integrated curriculum. Further, all students consider that teaching of interpersonal skills are of important relevance for engineering students at technical universities (Relevant: 75%, 25%, 0%, 0%: Irrelevant). However, to the question about whether any of the students have used the Social Risk Analysis or any similar teaching methods related to interpersonal skills in other courses during their previous university studies, the answer was clear (Yes: 0%, 100%: No). None of the students, despite being in their fourth or fifth year of university studies, could direct to any previous experience of explicit teaching activities in the field of interpersonal skills.

Even though the results from the evaluations and questionnaire of the two cases announce some generally positive and interesting aspects of the teaching interpersonal skills in an engineering context, the empirical data in this study must be considered limited and imperfect for comparisons or more profound conclusions. For example, the course in case 1, which represents an intensive seven week course, must be considered too short for the group dynamics to develop into the role seeking phase during which the risk for interpersonal conflicts increases. Thus, the impact and importance of the Social Risk Analysis is delimited when the course is too short to allow the group dynamics to develop.

The course in case 2 runs for a period of 13 weeks, which should provide better conditions for group development. However, the total workload of the two cases are about the same, which implies that the 13-week course is less intensive and consequently, it delimits the need for a consistent team effort and allows for the students to work more individually. Thus, the review of the two cases indicates that the design of the work process, i.e. the design of the engineering assignment that the students should solve as a team, is of the importance to the conditions for learning of interpersonal skills, and thereby, important to the relevance of the Social Risk Analysis or any similar method. The engineering assignment should be designed so that it requires the commitment and participation of the whole team, and consequently, facilitates the teaching and learning of interpersonal skills.

CONCLUSION

The Social Risk Analysis, as described in this context, provides as a tangible approach to the teaching of interpersonal skills that can be integrated in the curriculum of an engineering course as part of its learning objectives, teaching activities and assessment. The Social Risk Analysis encourages and imposes a critical review of the social interaction in a small group of students and thus facilitates communication and teamwork performance. Students find it easy to apprehend and consider it being meaningful in engineering teaching.

On basis of the experiences from the two cases reviewed in this context it is concluded, however, that the successful application of the Social Risk Analysis is dependent on the pedagogical approach and on the design of the work assignment. Generally, the implementation of interpersonal skills into the curriculum should follow the general pedagogical requirements regarding clearly stated learning objectives, learning activities and assessment. In this case, the implementation of the Social Risk Analysis is done according to the concept of constructive alignment. More specifically, it is concluded that the work assignment should be designed so that it impels cooperation, communication, commitment and participation of the whole team in order to facilitate the active experience and learning of interpersonal skills. The work assignment provides an engineering context in which the incentives for teamwork can be articulated and explained and thus, justify the introduction of the Social Risk Analysis.

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Biographical Information

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