

## Intercultural, Reciprocal and Multidisciplinary Learning Case Study

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Keywords: multidisciplinary, intercultural learning, engineering

## INTRODUCTION

Engineers often work in multidisciplinary and multicultural teams in the modern globalized working place. The idea of a company member or group travelling around the world as a troubleshooter is becoming more the exception, and more holistic and cross-functional way of thinking and working the rule. Therefore, new educational methods are being needed both in the engineering and business education to accomplish this demanding task.

This empirical paper describes the integration of two Finnish BSc courses, one from the degree programme of mechanical engineering, and the other, from the degree programme of international business during years 2014 and 2015. The aim of the two

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project based learning projects was threefold: first, to develop the students` diversity management skills and second, to increase the export marketing skills of the engineering students and third, to innovate new business models relevant for company development.

Findings of the qualitative learning experiments will be presented. Conclusions as to integrate diversity management at the university level and suggestions for the development of the engineering curriculum will be provided.

## **1 THEORETICAL BACKGROUND**

### **1.1 Learning in authentic context**

Multicultural teamwork skills are in urgent demand in the modern globalized working place, a reality for almost all graduating engineers. The best way to learn these skills is by learning by doing and not by cognitive learning alone. This calls for new educational methods in the engineering educational environment embracing multi-disciplinary and multicultural teams. Therefore, it is of paramount importance to understand the different mindsets of colleagues coming from other professional fields than engineering and different cultures in order to create a high- performing team based on intercultural competence [1].

In a similar line of thought Childs and Gibson [2] explain that Engineering Management Education although being very important as widely acknowledged, they call for a gap in literature regarding “the needs and perceptions of employers in relation to the skills and attributes that they perceive as being either essential or desirable for graduate engineers and the resulting influence this has on business performance” (p.2).

### **1.2 The need for new teaching methodologies**

As indicated above, our highly competitive and complex business environment demands holistic and cross-functional way of thinking and working. It is mainly this reason why engineering students need, for example, also marketing and innovation skills, as well as it would be beneficial for business students to understand engineering approach in order to provide tailored solutions. Some trend-setting Finnish companies have identified this scenario and regarded as a key success factors in their global success. Leiviskä [3] calls it “creative interdisciplinarity”. She highlights that Finnish companies are using this creative interdisciplinarity to reach higher quality levels, faster time-to-market, flexibility, creativity and continuous innovation. Moreover she explains that multidisciplinary cooperation is of great advantage specially when a problem occurs and the solutions rely on different knowledge expertise. Putting it into a nutshell, “organizations are able to benefit from the rich repertoire of knowledge that exists within the workforce when there is collaboration and sharing of knowledge [4, p1].

Educational theory suggests that authentic learning experiences produce good learning results [5]. The implication is that real life corporate cases are used to design learning tasks in engineering education to improve the learning results. This is supported by (REALs) “Rich Environments for Active Learning” [6, p. 5]. The authors stress that (REALs) “promote study and investigation within authentic contexts; encourage the growth of student responsibility, initiative, decision making and intentional learning; cultivate collaboration among students and teachers; utilize dynamic, interdisciplinary, generative learning activities that promote higher-order thinking processes to help students develop rich and complex knowledge structures;

and assess student progress in content and learning-to-learn within authentic contexts using realistic tasks and performances” [6, p.5].

At the same time, universities should also support or contribute to the local companies to develop their operations. The university's internationalization strategy attracts foreign students whose cultural diversity's potential could be better utilized and synergized with those of local students to bring several benefits to the host organization, e.g. multiplicity and diversity of ideas or creative ways of thinking [7], increasing flexibility and problem solving solutions [8], higher ability to work effectively with local clients and employees [9] or it helps to develop students' intellectual, social, and personal abilities [10].

Although many advantages have been recognized, the existence of shortcoming or challenges should not be underestimated. Challenges such as intercultural learning disorientation [11], ethnocentric behaviour [8], lack of shared understanding and lack of mutual knowledge [12] are to be overcome. Yorks, Marsick, Kasl and Dechant [13] focus on cultural differences affecting the learning outcome on the development of professional working in such multicultural teams. They suggest that this complexity requires “mindful and creative approaches to interventions to facilitating team learning through the use of metaphors and methods” (p.103) or interconnectedness and solidarity through teaching methods [14].

### **1.3 Intercultural, reciprocal and multidisciplinary learning concepts**

Intercultural competence comprises the ability to establish and maintain relationships, to communicate with minimal loss or distortion and to collaborate in order to accomplish something of mutual interest or need with people coming from other cultures. The bases for successful intercultural communication are emotional competence, together with intercultural sensitivity. Intercultural competence is needed in all human interactions. It is not enough to have social skills, but one has also to improve the sensitivity and understanding for other values, views, ways of living and thinking, as well as being self-conscious in transferring one's own values and views in a clear, but appropriate way. Intercultural competence helps to understand others and to achieve common goals and it can be learned [15].

Reciprocal learning (i.e., two-way exchange of information) occurs when learners are co-learners. They both bring information to the discussion and they learn together, from one another. They co-construct knowledge and both of them own what is being learned. When learners not only seek professional growth for themselves, but also assume a sense of responsibility for the professional growth of other learners, then they enter into a reciprocal, give-and-take learning relationship with each other. Thus the foundation of reciprocal learning is the ability to be in a relationship with those you are learning with. This implies that e.g. good communication and diversity management skills are being needed in reciprocal learning and in global settings especially intercultural competences are important [16].

Multidisciplinary approach refers to several disciplinary specialists working side by side in a complementary way. Multidisciplinary approach is not integrative, meaning that, e.g. in a team people might work together, but still behave as disciplinarians with different perspectives, each contributing one's own point of view. Multidisciplinary teams develop individual and collective decision making and an understanding and appreciation of other disciplines [17].

## 2 EMPIRICAL ANALYSIS

### 2.1 Description of the learning experiments

The learning experiments were based on an integration of two Finnish BSc courses, one course from the degree programme of mechanical engineering, and the other, from the degree programme of international business during years 2014 and 2015. In *Table 1*, the workshop setting is described in year 2014 vs 2015.

*Table 1.* Description of workshop setting

Time period	10-14 March, 2014	9-13 March, 2015
Courses	Workshop in International Projects 56 hours credit: 4 ECTS points  International Marketing Management 70 hours credit: 5 ECTS points	Workshop in International Projects / Distributed Energy Engineering 56-70 hours credit: 4-5 ECTS points  International Marketing Management 70 hours credit: 5 ECTS points
Main responsible lecturers	A team of engineering and business lecturers	A team of engineering and business lecturers
Learners	4 <sup>th</sup> year mechanical engineering students  2 <sup>nd</sup> year international business students  24 students, of which 7 female, 17 male students	4 <sup>th</sup> year mechanical engineering students  2 <sup>nd</sup> year international business students  46 students, of which 16 female, 30 male students
Learners' cultural background	Heterogeneous group, six nationalities	Heterogeneous group, thirteen nationalities
Task	Export plan for a product selected by each team	Export plan for a technical product provided by a local company
Team selection and size	Teams pre-selected by teachers  Multicultural and disciplinary teams of 4 persons	Teams pre-selected by teachers  Multicultural and –disciplinary teams of 4 to 6 persons.
Data collection	Open-ended questionnaire in the end of the workshop	Closed-ended questionnaire at the beginning of the workshop  Open-ended questionnaire in the end of the workshop

The engineering students and international business students were separately attending their own courses in their degree programmes, which were then integrated through an intensive workshop week in March 2014 and 2015. The engineering and international business students had not had any previous multidisciplinary courses together. The intensive weeks were organized as workshops where, in addition to student teamwork, a number of guest lectures were given by foreign professors and local company representatives. Students who came from mechanical engineering

and international business degree programmes were assigned into cross-disciplinary and multicultural teams. During the first experiment in 2014, all student teams were allowed to choose a product themselves, and then plan and present how this product would be exported to a foreign country. During the second experiment in 2015, the task was similar, but this time a local company provided their technical product, and all teams made their export plans for this product.

As we can see from Table 1, the basic workshop setting was similar on both years. The main differences were the product selected for the task (team decision in 2014 vs local company case in 2015) and the size of the student group (24 students in 2014 vs 46 students in 2015). Also, the number of nationalities represented doubled from 2014 to 2015. In 2014, students were from China (1), Finland (16), Ghana (2), Nigeria (1), Uganda (1) and Vietnam (3). In 2015, students were from China (3), Finland (14), France (2), Germany (6), Ghana (10), India (1), Morocco (1), Nepal (1), Russia (1), Spain (3), Sweden (1), the United States (1) and Vietnam (2).

Student's feedbacks were gathered at the end of the workshop with an open-ended questionnaire on both years, and a closed-ended questionnaire was also used at the beginning of the workshop in 2015.

## 2.2 Analysis and findings from students' feedback

During the first learning experiment in 2014, the students were given an open-ended questionnaire at the end of the workshop. Out of 24 students, 22 filled in the questionnaire. As a method for analysis, a qualitative content analysis was made, where preliminary meaning categories were deduced from the open-ended answers.

This paper presents the main results of the year 2014 experiment. As the second learning experiment has just been finished, this data analysis will be conducted during spring and summer 2015. The aim is to present these results in another forthcoming research paper.

The following *Figure 1* presents how students experienced the overall advantages of the workshop week in 2014. Three of them did not give any specific comment for this question, while one student mentioned two advantages and one student mentioned three advantages.



*Fig. 1.* Overall advantages

It can be clearly seen that teamwork was emphasized, but also the importance of new knowledge was mentioned by several students. When analysing more in-depth the written responses, further learning outcomes arouse, which are presented in *Figure 2*.

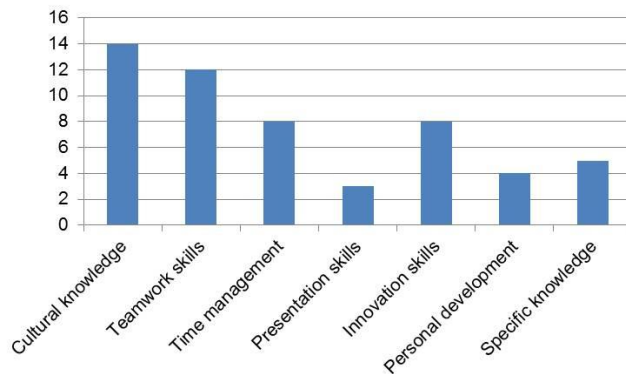


Fig. 2. Learning outcomes

As *Figure 2* shows, students evaluated that they had learnt cultural knowledge (14 mentions), teamwork skills (12), time management (8), presentation skills (3), innovation skills (8), personal development (4) and specific knowledge (5).

Students were also asked to give an overall grade for the workshop on a scale from 1 (poor) to 5 (excellent). The mean was 4.17, the lowest grade given was 3 and the highest grade given was 5. So, generally they were very satisfied with the learning experience. Still it was interesting to know their recommendations for improvement. Most of the ideas were related to the timing (7 responses): students suggested that the scheduling of the week could be changed, so that there would be more time for the teamwork, less work intensity or otherwise better timing (for instance, for the 4<sup>th</sup> year students this time can be very challenging as they are doing their bachelor theses at the same time). Secondly, ideas were related to the teaching methods (5 responses): students recommended having more foreign lecturers, presentations from other companies which they are not so familiar with, more interaction and using games to support the learning activity. Two students mentioned that the team composition could be done differently (self-selection or using personality traits as a criterion for team selection). Two students mentioned that the final presentations could be given to a larger audience. Five students thought that no improvements would be needed.

To summarize, the overall student experience was very positive. The overall advantages and learning outcomes were in accordance with our course objectives.

### 3 CONCLUSIONS AND RECOMMENDATIONS

The paper has presented a pedagogical experiment in BSc engineering and business education where engineering students have learnt non-technical skills required in the 21<sup>st</sup> century [18] by attending a multidisciplinary and multicultural intensive (duration 1 week) workshop. During the workshop reciprocal learning has been promoted by creating a positive and open learning atmosphere and the main focus has been on learning by doing. Based on the qualitative results there is evidence that this type of learning environment develops the students' intercultural competences, personal development and teamwork skills in general. Therefore it is strongly recommended that the universities should develop their curriculums in such a way that the curriculums should include courses where students from different disciplines (such as e.g. engineering and business) could study together and work on some common project (preferably on an authentic case) together in a team where different skills from different disciplines are being needed. In order to realize this type of co-operation in the curriculum development at the university level, the staff members



from different disciplines must first get to know each other and develop trust between the faculty members e.g. via common pilot projects. Suitable projects for this purpose can be common research projects (such as e.g. EU projects) or teaching experiments funded by the university. If the universities want to be innovative in pedagogy they must first invest in joint projects for the faculty coming from different disciplines. Also the organizational culture at the universities should support innovation and creativity. It is an imperative for the universities to further develop themselves and become truly international learning organizations from the pedagogical point of view, too.

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