Development of Working Life Competencies in a Project Course for Master Students at Aalto University

Education programmes are expected to fulfil many requirements in the uncertain environment that constitutes the beginning of the 21st century. Whilst the transmission of content, the development of comprehension and analytical skills, and specific skills related to a particular discipline are still valid, it is vital to equip students for working in groups that may be diverse, situations that may be challenging, and in a work environment that is changing at an increasing rate. Attempting to rise to these challenges, this article focuses on team and multicultural working life skills, utilising a survey and group interviews of masters students in the Department of Electrical Engineering and Automation at Aalto University, who are required to participate in a recently introduced 10 ECTS project-based course. The groups were formed in terms of their suitability to perform project tasks given by research groups in the department. The efficacy of such purposive grouping of students is assessed in terms of 26 skills, adapted from the national-level TEK (Academic Engineers and Architects in Finland) feedback survey for engineering 2016 graduates, with a deeper focus on two of these competencies, skills related to the international work environment and team working.

Introduction

The role of education programmes is a topic of much discussion at the time of writing (Davies, Fidler & Gorbis, 2011; Tynjälä, Slotte, Nieminen, Lonka & Olkinuora, 2006), and the changing work environment is also well chronicled, e.g., The Future of Jobs (World Economic Forum, 2016), as are the disturbing anthropogenic changes in our ecosystem, Risk and Resilience in a New Era (WWF, 2016). One activity that can promote the growth of respect for the other, the holding of views lightly and cooperative working is group working, especially if the groups are purposively formed and the students are aware that the group working is an exploration in itself, augmenting the more conventional objective of a given group project achieving a specific outcome.

According to Dillenbourg (2002), free collaboration does not systematically produce learning, which motivates purposive group forming coupled with good guidance of the groups and their instructors. The group formation used for the project work that forms the core of this paper was task oriented, where the responsible teacher matched research topics provided by research groups from the department with the most suitable students. This methodology pro-
produced groups ranging from culturally homogeneous to highly multicultural. Our work draws on the first two years of data (surveys and group interviews from 2016 and 2017).

The main target of this paper is to investigate the impact on working life competencies when master level students (appr. 100) are purposively placed in groups of 4 to 6 students according to academic suitability in a project work course. Purposive placement, in the context of tangible tasks issued by professors and research groups in the department, means selecting the students for each group according to their skill set (e.g., programming, circuit design, laboratory experience, power electronics...) and their study path in the Master’s Programme in Automation and Electrical Engineering (AEE) at Aalto University (e.g., Automation Software, Robotics, Electromechanics). The target of the project course this article draws data from is to produce high level results in terms of business planning, tangible engineering output (design, product, case study, etc.) and a final report. In doing so, by its very nature, framing and requirements, the project course enables the development of several identifiable working life competencies, and the development and discussion of these competencies is the main focus of this article.

Findings

Perceived Importance of Competencies

The results in Table 1 are based on the course quiz from 2017, although mean values and standard deviations are compared with the corresponding 2016 results to evaluate whether improvements based on the implemented changes in the course have occurred. Only results for the two competencies under focus, C11 (skills related to international work environment) and C19 (team working skills), are presented in Table 1. The table illustrates that both selected competencies were perceived to be important, are positively impacted by the project course and showed some improvement over the results from 2016.

Group results about how the course supported the development of different working life skills are illustrated in Fig 1. The left column lists the various working life skills (C1-C26), which are explained in Fig. 2. The top three rows give the letter symbols for each student group (A-Z), and an indication for the type of the group (U, M1, M).
Table 1. Answers to the three questions (Q1: perceived importance after graduation, Q2: support from project work course, Q3: support from overall master’s programme)

<table>
<thead>
<tr>
<th>Competence</th>
<th>Question</th>
<th>Not at all (0)</th>
<th>Very little (1)</th>
<th>Little (2)</th>
<th>Somewhat (3)</th>
<th>Much (4)</th>
<th>Unable to answer</th>
<th>Mean 2017 (2016)</th>
<th>Standard Deviation 2017 (2016)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C11 (international)</td>
<td>Q1</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>26</td>
<td>40</td>
<td>42</td>
<td>1</td>
<td>3.97 (3.82)</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>4</td>
<td>7</td>
<td>16</td>
<td>29</td>
<td>38</td>
<td>23</td>
<td>1</td>
<td>3.36 (2.63)</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>3</td>
<td>7</td>
<td>22</td>
<td>38</td>
<td>35</td>
<td>10</td>
<td>3</td>
<td>3.09 (2.85)</td>
</tr>
<tr>
<td>C19 (team working)</td>
<td>Q1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>27</td>
<td>81</td>
<td>1</td>
<td>4.62 (4.55)</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>23</td>
<td>49</td>
<td>42</td>
<td>1</td>
<td>4.09 (3.93)</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>3</td>
<td>5</td>
<td>12</td>
<td>44</td>
<td>35</td>
<td>16</td>
<td>3</td>
<td>3.31 (3.36)</td>
</tr>
</tbody>
</table>

Figure 1. Deviations from the average by project topic. See Fig. 2 for the Group definitions.
a young student is able to realistically assess the importance of different working life competencies in their future professional careers, and there may be some evidence that student opinions are adversely affected by overt university and governmental ambitions. It can be claimed that versatile training in all of the working life competencies in the Master’s programme is important, whilst acknowledging the diversity in aptitude and interest that exists in any given group of students.

In Fig. 1, deviations of the group specific results from the corresponding averages are colour coded combined with the numerical value for the deviation. The greener the colour, the better the students in the particular group experienced a development of the corresponding working life skill compared to the same result averaged over all groups. The difficulty in drawing conclusions regarding the contribution of a particular cultural composition of a group to the development of working life competencies in the Master’s programme is important, whilst acknowledging the diversity in aptitude and interest that exists in any given group of students.

Team working skills (M=4.62) was the second-most important competence in the students’ opinion, ranked just below problem solving skills (M=4.73). The competence considered least important on average was entrepreneurial capacities (M=3.33). It was clear that students consider some working life skills to be more important than others. Problem solving skills are something every engineer is likely to need, and while entrepreneurial capacities may be considered less important on average by the students, for some they will be essential during their professional career. It can be questioned whether a young student is able to realistically assess the importance of different working life competencies in their future professional careers, and there may be some evidence that student opinions are adversely affected by overt university and governmental ambitions. It can be claimed that versatile training in all of the working life competencies in the Master’s programme is important, whilst acknowledging the diversity in aptitude and interest that exists in any given group of students.

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and effort of the instructor, also play a large role in the learning experience of the students.

Comparing our results and the TEK results in Fig. 2 (Piri, 2016), it is apparent that the AEE and TEK importance values are practically identical. While the Project Work course is fulfilling its intended role in terms of developing a wide range of working life skills (falling clearly beneath the general Master’s programme in only skills 2 and 3), Fig. 2 reveals a weakness in the development of ethicality and career management capacities, and falls short of current university expectations in terms of entrepreneurial capacities.

**Qualitative Feedback from Group Interviews**

The interviews were conducted using the three questions of the quiz as guiding questions, and focused on working life skills C11 and C19. In general, all groups were well aware of the importance of the skills in working life. There was some development in interview technique with respect to ascertaining whether the students have any idea what they will be doing once they graduate. In 2016, there was some surprise in that most of the students professed to have no idea what they would be doing in working life. In 2017, the students were teased by asking, for instance, “Will you be a hair-dresser?” It emerged that many students have quite clear ideas about what they would do after graduating. The students acknowledged the fact that successful companies must be international and therefore employees need to be able to adjust to different cultural working environments. This does not imply that hair-dressing is inferior to engineering!

The interviews revealed mixed feelings about group work in general. According to group A the different background knowledge and motivation levels of the students put extra load on the “expert” (e.g. group instructor). According to group A, overlapping group assignments in parallel courses can be “really hard” to manage time-wise. Thus, in normal courses, optional paths should be available for passing the course. Group A also supported the forced group forming, and believe that in this way it will be easier to meet new people, which is good for the social life and for exchange students who do not know anyone. Group B concurred.

Group B supported the fact that a larger number of international students would be of benefit in developing international/multicultural skills. However, English language skills and cultural differences can be a challenge. The group suggested that it would be useful to have orientation on these issues before working in multicultural groups, but this was not offered.

Regardless of teamwork difficulties faced by Group C (a multicultural group) at the beginning of the project, which will be returned to in the discussion section, all members of the group had an overall positive learning experience resulting from the multicultural composition of the group. However, these students were aware of the challenges involved in working in multicultural teams (e.g. cultural differences, language barrier and problematic group dynamics). In spite of the challenges, one student in group C expressed interest in continuing to explore and understand Finns more deeply. The cultural challenges passed almost unnoticed with group D, the other multicultural group. This group maintained that academic background is more relevant than “whether you are white or orange”!

In spite of the mixed feelings related to group work, all groups were unanimous in supporting collaborative learning activities such as team and group work. Moreover, none of the group members manifested any opposition to work in culturally diverse groups, but both interviewers are themselves migrants to Finland, and so diplomacy may have prevailed.

**Discussion**

Addressing the aim stated in the Introduction, empirical support can indeed be gleaned from a project course about the efficacy of group work and other working life skills, given the survey responses and the interviews. The interviewed students were unanimous in agreeing that group and multicultural skills are needed in the workplace of the future, whether or not they are desired. It is clear that interviewing is an art, and the way questions are phrased has an impact.
Humour was used to good effect in cajoling the students out of feigned indifference and ignorance. The task-oriented grouping proved to provide fertile ground for developing many working life skills, not just the ones focused on in this article.

One particularly pleasing transformation was experienced with a multicultural group that initially had some interpersonal difficulties which, with some objective guidance, were resolved and led to a very good project result, both in terms of its intended outcome and the personal development of the students involved. This promotes the potential benefit of multicultural grouping, but also the need for good guidance. The instructor in this case had no specialised training in psychology, but he showed material to the students that pointed out the challenges and benefits that often arise in multi-cultural groups. This de-personalised the difficulties and gave perspective to the students.

In summary, well conducted group work can yield tremendous benefits, but poorly conducted, could exceed personal thresholds and even increase prejudice.

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REFERENCES


