Aalto EEA Tyyli-Septet Activities, 2015-2017

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Introduction

Four electrical engineering lecturers were baptised and nurtured in pedagogical development by Kirsti and the professors – thus was born the Tyyli quartet within the Tyyli septet.

Our actions under the auspices of this project were varied, ranging from:

- A methodical analysis of the major compulsory courses in the AEE Master's programme
- Analysis of a new project course run by Timo Oksanen at Aalto.
- A brief foray into the esoteric at the IV UskoMus Symposium (*ref. 4*)
- The development of a 'multi-cultural' group forming algorithm (as Professor Kyyrä has commented, "What could you expect from a gang of engineers?"...) (in progress)
- The preparation of a teaching guide to justify and illustrate the incorporation of working life skills in teaching in engineering education (in progress)

AEE Master's programme

A broad programme, consisting of three majors: Electrical Power and Energy Engineering; Control, Robotics and Autonomous Systems; and Translational Engineering.
Our first job in Tyyli was to investigate the compulsory courses in each major by studying the course descriptions and interviewing the responsible professors and teachers. Some results are shown on the right: Fig. 1 shows a matrix in chronological form and Fig. 2 graphically represents the emphasis each course has on the chosen working life skills.

One aim is ***to aid students and course planners in choosing a study path that not only contains a credible set of technical courses, but also covers a good set of working life skills, i.e., so that the study paths students are most likely to take contain training in such skills***.
An idea that has come up in Tyyli is *to offer some credits for students who take a brief introductory seminar in working life skills and complete courses that have a set number of working life skills embedded in them in their Master's programme*.

Early on, we decided that the new 10 credit Project Work course introduced to this Master's programme would be the perfect subject for a case study in working life skills, and this formed source material for two publications *(refs. 2 and 3).*

Project Work Course

For analysing this, we borrowed heavily from the excellent work done by TEK *(ref. 1)*, choosing three skills from TEK's list of 26, entrepreneurial capacities, skills related to international work environment, and team working skills for student interviews and deeper qualitative analysis. Some results are shown in Fig. 3.

Group Forming Algorithm

This is designed to automatically form heterogeneous or homogenous groups based on: nationality, personality, gender, academic background, work experience. There are numerous attributes offered by the algorithm, but only an appropriate subset of those would typically used, with full options for students to opt out if they feel something is too sensitive or inappropriate. The teacher can also stipulate 'must have' attributes for each group, in which case the algorithm will make sure each group has the necessary attributes (e.g., academic background, at least one non-Finn, etc.) Some indication of what is required and how the algorithm operates is given in Fig. 4

References
Ref. 1 https://public.tableau.com/profile/arttu.piri#!/vizhome/TEKGraduateSurvey2016/TEKGraduateSurvey2016.
Ref. 2 Keltikangas, K., Belahcen, A., Oksanen, T. , Pinho, P., Vuorinen, V., Forsman, P. & Millar, J. 2016, "Improving working life competences in a project work course – self assessment as a tool to improve self-confidence", *44th SEFI Conference*, 12-15, September 2016, Tampere, Finland
Ref. 3 Millar, R. J. , Keltikangas, K., Pinho P., Vuorinen V., Forsman, P., Belahcen, A., Kyyrä J., "A Tool to Aid the Formation of Heterogeneous Project Groups to Enhance the Development of Key Working-Life Competencies in a Changing World" (Submitted to Yliopistopedagogiikka, Journal of University Pedagogy in October, 2017)
Ref. 4 Millar, R. J., "A secular but experientially-based glance at the terms Islam, faith, no-self, and the ney – with links to pedagogical innovation", presented at the *IV UskoMus Symposium, "Music and Islam"*, https://uskomus.com/2017/03/

Acknowledgements
Deep gratitude is expressed to Timo Oksanen for providing us data and permission to delve into the Project Work Course. John is grateful to Tyyli for allowing a brief forage into deep waters, noting once again, that "research tends to go where it goes" (*Ref. 4*)

Year + period	Course	Group working skills	Project mgment skills	International/multicultural skills	Core team planning the course (min. prof. + 2 lecturers)
1.year/autumn I + II	ELEC-E8001 Embedded Real-Time systems (5 CR), VV	Mini project (group of 3 students)	Mini project	Mini project (international groups highly encouraged)	Seppo Ovaska
1.year/spring III-V	ELEC-E8002 Project work A, Theory (5 CR), VV	Group of 3 -7 students	All groups have one project manager	International and multidisciplinary groups targeted	Timo Oksanen, Tomi Laurila, Lauri Palva
1.+ 2.year/spring V till autumn II	ELEC-E8003 Project work B, Practice (5 CR), VV	Group of 3 -7 students	All groups have one project manager	International and multidisciplinary groups targeted	Timo Oksanen, Timo Laurila, Lauri Palva
1.year/autumn I-II	ELEC-E8101 Digital and Optimal Control (5 CR)	Design exercise done in groups or individually	none	Mixed Finnish and international students, working language English	Kai Zenger
1.year/autumn I-II	ELEC-E8102 Distributed and Intelligent Automation Systems (5 CR)	Group of 3 -7 students	none	Mixed Finnish and international students, working language English	Valeriy Vyatkin
1.year/autumn I-II	ELEC-E8103 Modelling, Estimation and Dynamic Systems (5 CR)	none	none	Mixed Finnish and international students, working language English	Quan Zhou
1.year/autumn I-II	ELEC-E8104 Stochastic models and estimation (5 CR)	Group of 3 -7 students	none	Mixed Finnish and international students, working language English	Arto Visala
1.year/autumn I-II	ELEC-E8405 Electric Drives (5 CR), JM	2 students in group	none?	Mixed Finnish and international students, working language English	Marko Hinkkanen, Jorma Kyyrä
1.year/autumn I-II	ELEC-E8407 Electromechanics (5 CR), JM	Group work every second lecture	Time management within laboratory works (2 lab works + pre-report and final report. Tight time schedule)	Mixed Finnish and international students, working language English	Anouar Belahcen, Antero Arkkio
1.year/autumn I-II	ELEC-E8412 Power Electronics (5 CR), JM	Groups of 2 possible in simulation assignments, groups of 3 in labs	none?	Mixed Finnish and international students, working language English	Jorma Kyyrä, Marko Hinkkanen
1.year/autumn I-II	ELEC-E8413 Power Systems (5 CR), JM		none?	Mixed Finnish and international students, working language English	Matti Lehtonen, John Millar
1.year/autumn I-II	ELEC-E8700 Principles and fundamentals of lighting (5 CR), PP	Students will work in groups in the laboratory and collaborative learning activities during the lectures.		English is used as a language of instruction.	Liisa Halonen, Paulo Pinho
1.year/autumn I-II	ELEC-E8730 Design of electronic equipment (5 CR), PP	none	Own working timeline	none	Pekka Eskelinen, Lauri Palva, Raimo Sepponen
1.year/spring III-IV	ELEC-E8731 Design of electronic prototype (5 CR), PP	laboratory design and measurement work	Team timeline management	none	Pekka Eskelinen, Lauri Palva, Raimo Sepponen
1.year/spring III-IV	ELEC-E8710 Principles of materials' science	Activating group works during lectures and excersices	none	none	Tomi Laurila, Vesa Vuorinen

Figure 1: AEE chronological matrix with the chosen working life skills.

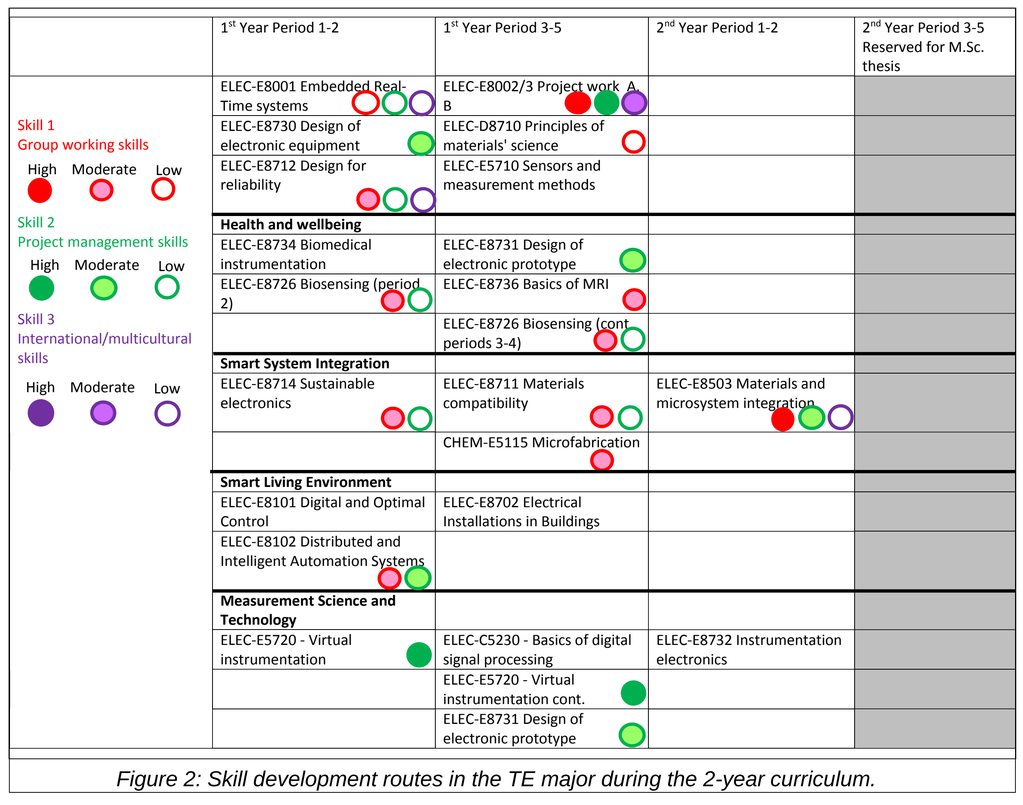

Figure 2: Skill development routes in the TE major during the 2-year curriculum.

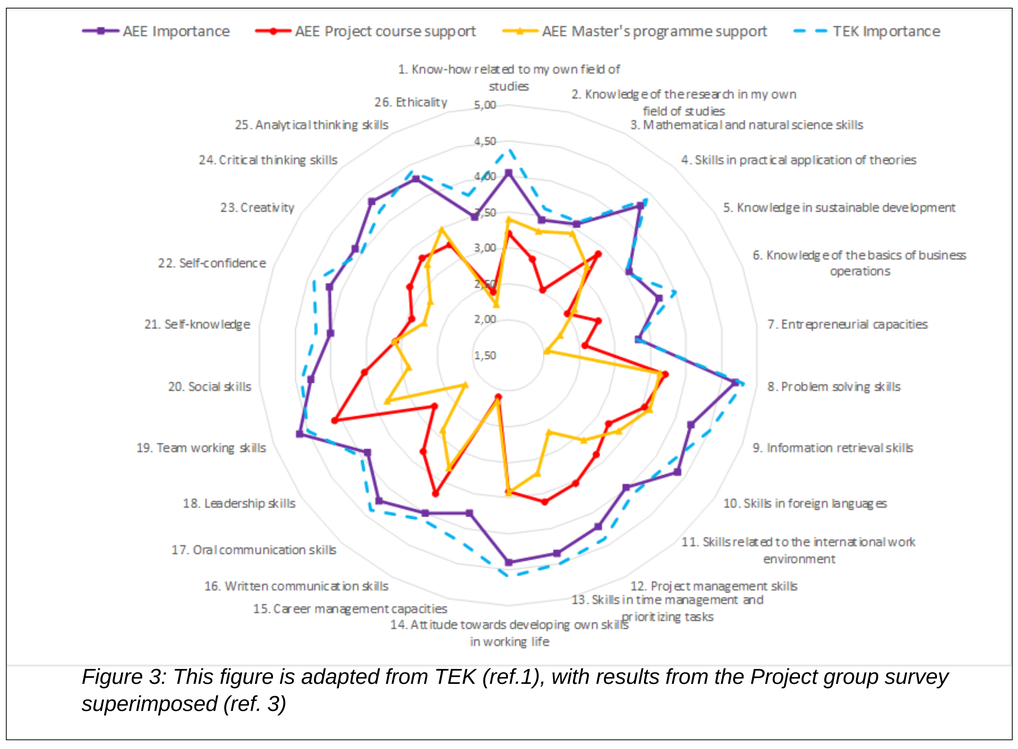

Figure 3: This figure is adapted from TEK (ref.1), with results from the Project group survey superimposed (ref. 3)

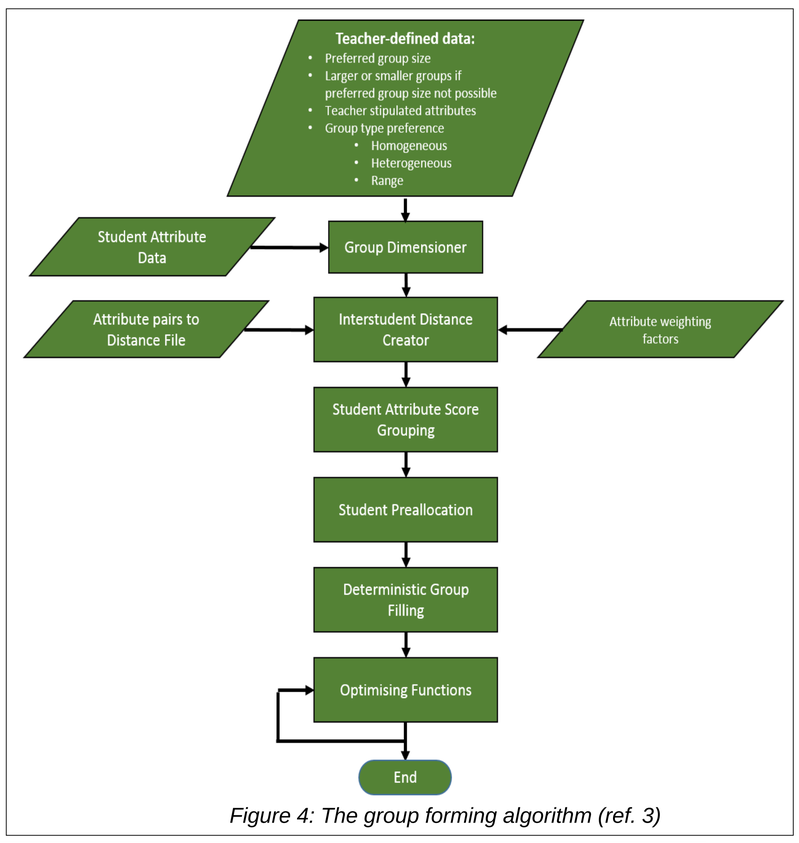

Figure 4: The group forming algorithm (ref. 3)

TYYLI
Työelämäjaksoja ja työssäoppimista yliopisto-opintoihin

Elinkeino-, liikenne- ja ympäristökeskus

Vipuvoimaa EU:lta 2014–2020

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