

# The Transformation Process of Engineering Curricula at University of Technical Education Ho Chi Minh City, Vietnam

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## ABSTRACT

*This paper discusses the process of integrating soft skills into engineering curricula at University of Technical Education Ho Chi Minh City, Vietnam. The integration process started at faculty level where a few faculty were trained and they applied to a small scale. Then, a course of "Introduction to engineering" was introduced which required a big number of faculty to involve in. Though there were many challenges, the integration process was quite successful so far. Through our experience, the faculty buy-in is the most important factor to ensure any transformation.*

**Keywords:** *soft skills, CDIO, engineering curriculum.*

## INTRODUCTION

Over the past 5 years, we have witnessed the complaint of lack of soft skills of recent graduates from employers. Survey and statistics are varied but all employers claimed that they had to retrain newly graduates both professional knowledge (hard skills) and soft skills. Recent graduates lack soft skills such as communication skills, teamwork, problem solving (Dang, 2012; Hoai, 2013). A quick search with key words "training soft skills" in Vietnamese on Google would come up with huge numbers of companies and training programs for soft skills. This implies that there is a significant need for the soft skills training of graduates to meet the requirement of the employers is significant.

Despite all those requirements and changes in the industry, a large number of faculties did not recognize the importance of soft skills and thus do not teach students. According to a survey by FALMI on 25000 students from HCMC National University, University of Technical Education HCMC and HCMC University of Agriculture and Forestry, only 10 percent of students recognized the importance of soft skills whereas 54 percent believed employers were concerned only about professional knowledge of graduates. Around 57 percent of students suggested soft skills could be gained through activities of student unions, extra curriculum, and part-time jobs (Dang Trinh, 2012). However, we would argue that soft skills need to be integrated to the curriculum to allow every student across the campus to be trained.

The fact that most students and faculty think technical skills are their most concern is a very big hindrance for the integration of soft skills into the curriculum. UTE leaders recognized the importance of training soft skills for students and thus provided strong support for the process of integration of soft skills into its current curricula. This paper describes this process over the years at UTE and shares the experiences gained.

## INTEGRATION OF SOFT SKILLS INTO CURRENT CURRICULUM

Over the last 10 year, UTE has redesigned its engineering curricula three times. In 2003, the engineering curricula contained 220 credit hours for 4.5 year bachelor programs where all students studied teaching

methodology for approximately half a year. In teaching and education courses, students had, though very modestly, opportunities to practice writing and presentation skills. Students had four week internships at vocational schools and colleges. During this 4 week internship, students had a few teaching sessions. Many surveys showed that only 10 percent of UTE graduates pursued teaching careers in vocational schools and technical colleges, the other 90 percent worked in the industry. Though no official survey was ever made to analyze the effect of those teaching-methodology and education courses, extensive feedback from alumni who were promoted to managerial positions quite fast compared to their peers in the industry suggested that the training of teaching methodology and education courses played an essential role for their promotion.

In 2008, UTE redesigned its curricula into two categories; 4.5 year programs and 4 year program (180 credit hours) for students who plan to work in industry. No soft skills were explicitly incorporated into these 180 credit hour curricula. IT was used more and more in classrooms but teaching was still performed mostly traditionally. Some faculty provided students with the opportunity to present their small projects. Since more and more courses utilizing simulation software, programming, engineering software were introduced, students were assessed through a final small project and with presentation. Students said that in those presentations, faculty and other students were mostly concerned about the technical knowledge of the presentation rather than the communication aspects.

### **HEEAP 1.0 Project**

In 2010, Intel Vietnam and US Agency for International Development (USAID) funded 2.5 million USD for a project called HEEAP (Higher Engineering Education Alliance Program) for five top Vietnamese engineering universities for 3 years starting from 2010 in which faculty from mechanical and electrical engineering schools of these universities were sent to Arizona State University, USA to be trained on topics such as ABET, active teaching and learning methodology, leadership, English communication (<http://hecap.org>). On their return in 2010, the first cohort of seven faculty from UTE redesigned their seven courses mostly for junior and senior year students (three in Mechanical Engineering and four in Electrical Engineering) to align with ABET criteria and soft skills such as oral and written communication skills were integrated into the courses (HEEAP, 2010). Active teaching methodology was very much applied in these courses. The lecture slides were all in English but faculty used Vietnamese in class. Table 1 shows an extract from the report made to the sponsors with data from student survey. There are a few ratings of some courses that are quite low compared to the other courses. This will be discussed in the following session.

Though the survey showed good feedback from students on the soft skills learned through these 7 courses, the most remarkable and sustainable aspect gained from these courses is that students were made aware of the importance of soft skills for engineers to be able to work in a global workplace. Faculty also recognized that students would gain more soft skills with engineering courses in their senior years if they were made aware of the importance of soft skills and were trained these skills at the very first semester when they started their engineering courses. It is also a common practice of modern engineering programs with ABET accreditation that the “Introduction to Engineering” course is designed and taught for freshmen.

### **Introduction to Engineering Courses**

In 2011, UTE initiated the redesign curriculum process in which CDIO framework (Crawley, Malmqvist, Lucas, and Brodeur, 2011) was adopted. These engineering curricula contained 150 credit hours for 4 year programs. The number of credit hours was reduced significantly from 180 to 150. This reduction in credit hours did not mean students would learn less but allowed students time to engage in active learning rather than just listened to traditional lectures. The “Introduction to Engineering” course is required strictly as one of CDIO standards (Standard 4). In the meantime, the second cohort of six faculties from UTE was trained for six weeks at ASU within HEEAP 1.0. On their return, they designed the “Introduction to Engineering” courses for mechanical and electrical students. A careful benchmarking process with introductory courses of other ABET accredited engineering programs was performed. Typical attributes and background of Vietnamese high school graduates were also carefully considered during the course design process. Many other introductory courses would put “student retention after first year” as one of the courses objectives. While most top Vietnamese engineering universities would not concern themselves much with this issue as they have enjoyed quite a high number of

applications and enrollment to engineering programs over the years, motivating students to pursue engineering careers enthusiastically and making students aware of the importance of soft skills in their careers were highly considered.

*Table 1: Percentage of students rating with Strongly Agree and Agree the knowledge and skills learned*

Questions	Courses						
	1	2	3	4	5	6	7
After taking this class, I feel more confident involving others in activities I value.	93	65	82	74	89	56	40
This class had a positive impact on my academic achievement this semester.	60	66	81	63	72	55	38
This class gave me opportunities to develop my soft skills.	66	83	75	83	26	51	50
This class provided me with skills/knowledge that I will be able to use in my career.	88	80	86	81	60	61	59
I was encouraged to work in team	86	80	88	79	38	74	83
I participated in class discussion more frequently than I usually do in other classes.	69	74	79	76	52	61	44
I believe that I can apply what I learned in realistic situations.	65	65	77	88	58	57	45
I was able to complete assignments within specified deadline.	65	71	85	72	90	61	50
After taking this class, I can manage to learn similar courses by myself.	70	71	89	72	65	65	52

The course objectives were as follows:

- To help engineering freshmen move forward on the way to become an engineer.
- To prepare freshmen for success at UTE
- Teach them important soft skills including: communication, teamwork, ethical decision making, orientation of engineering, etc

The content of the introduction to engineering courses are slightly different for each major, however, they contain 4 main parts in general as follows:

- Introduction to UTE and field trips
- Engineering orientation and engineering design process
- Soft skills
- Ethics in engineering

The courses were first taught to around 700 mechanical and electrical freshmen of 2011. An extract of student feedback related to soft skills gained and active learning and teaching methodology of these piloting courses is

shown in Table 2 with around 680 responses. The high rate of response was thanks to the face to face feedback collecting. It can be seen clearly that students were quite positive.

Table 2: Percentage of students rating with Strongly Agree and Agree in “Introduction to Engineering”

Questions	SA	A
The lecturer used teaching methodologies effectively to stimulate and encourage student learning process through electronic learning material, group discussion, movies...	57	33
The lecturer encouraged students to participate in the learning process through group assignments related to course objectives, open questions and review	45	44
The lecturer always encouraged students to share their ideas and ask questions	37	44
The lecturer respected students which was illustrated by proper behaviors, praised students and giving positive and constructive feedback to students	55	34
I understood the expectations and challenge for engineers in the 21st century and the outcomes that students must achieve through the training program. Students must have a good overview of the training program and related issues in engineering	38	48
I perceived the importance of soft skills and English	67	29
I gained presentation skill, presentation design with PowerPoint through the course	32	41
I gained the self learning skill of English through the course	23	42
I gained the team work skill, communication skill and leading the team work meeting	46	43
I am aware of the importance of work ethics through ethic standard in engineering	52	38
The field trip and the lectures helped me understand the profession I pursue better and the relation between engineering and life	40	46

The piloting of “Introduction to Engineering” courses to the second HEEAP cohort resulted in a significant impact and also provided a good showcase in the process of design and implementation of introductory courses across UTE campus and disciplines. The new CDIO adopted engineering curricula applied to freshmen of 2012 with about 3500 freshmen enrolling in the introductory courses. Another sustainable impact that comes from the design and implementation of the introductory courses across disciplines is the change in the mindset of faculty about the importance of soft skills for engineering graduates and the strong urge to teaching students those skills.

## CHALLENGES OF INTEGRATION OF SOFT SKILLS INTO CURRENT CURRICULUM

Any faculty would be able to show a long list of the challenges when integrating soft skills in their teaching of engineering courses. A few typical ones are discussed below.

**Limited time to cover the syllabus:** We believe this is the common thinking of faculty who were trained with traditional teaching methodology and have conducted traditional teaching for a long time. However, as the faculty member relaxes more on the amount of time to cover technical knowledge for soft skills and students engage more in active learning, he/she will be more confident to allow students to discover the technical content themselves and allow more lecture time for discussion and answers.

**Class size and teaching assistant system:** It is absolutely true that using active teaching methodology, training soft skills and assessing students in a big class size is a significant challenge. The low rating of students in Course No. 5 in Table 1 (under “teamwork” and “soft skill practice”) can be presumably explained with this reason as there were around 150 students in this class. This is especially difficult when faculty have to teach many classes in a semester. Obviously, teaching assistants help tremendously in this case but the cost of education will increase significantly. We believe this teaching assistant system will be affordable in the near future when tuition fees and funding for higher education sector are compatible with the standard training cost.

**Students' engagement and English competency:** Many students are not willing to participate in the active learning process and thus faculty find it hard to engage them in any class activities which, in turn, discourages the faculty to try active teaching methodology. Low English competency also discourages students to engage in activities that involve English usage. When delivering course No. 7 in Table 1, the faculty used English in the class. This resulted in a significant objection. In another survey of over 100 students in three different classes of three successive semesters where active teaching and learning methods were applied and students were asked to do a small project in a group of 2 students and present to the whole class, 20 percent of students disliked the discussion and the presentation as they felt left out of the discussion and considered the project and the presentation time. However, in the second course with the same faculty and same teaching and learning style, students were much more comfortable and the engagement was much improved. "Introduction to Engineering" courses are the key to this issue.

**Faculty's' competency in soft skills:** To teach students soft skills, faculty need to acquire them at an acceptable level. With a short "Train the trainers" seminar, it mostly helps make the faculty aware of the importance of the soft skills for graduates and some practice. In an ABET training by Fulbright scholar for UTE faculty in July – August 2013, around 50 percent of faculty answered "I lack of soft skills myself" when they were asked about the challenges in teaching soft skills to their students. From our own journey, we believe that as long as faculty can change their perception about the need to train soft skills and teach these skills over time, they will improve their own soft skills. Regular training and seminars on active teaching methodology and soft skills will help reinforce faculty confidence and engagement. Once active teaching and learning, integrating soft skills to the curriculum becomes the norm/teaching style of someone, going back to traditional teaching journey is just as hard as when he/she first tried active teaching and learning.

We believe these challenges are not unique at our university but they are nationwide. Once can see that our challenges are very similar to ones faced by authors in (Idrus, Dahan, and Abdullah, 2009).

## CONCLUSION

The success of UTE graduates benefiting from those changes in curriculum design and implementation is left for judging from employers and is hardly tangible but we believe we are on the right track. It is also a common practice to design a "Capstone project" course for engineering curricula to allow students to practice all the skills learned throughout the program as well as for assessment for accreditation purpose. UTE is willing to cooperate with local universities and look for support from international experienced partners.

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