

The Changing Role and Competences of the Teacher

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ABSTRACT

This paper describes a research about the changing role and competences of teachers and the willingness of the teachers to change. The researchers developed and conducted a survey at Fontys University of Applied Sciences department engineering to find out how teachers teach and how they would want to teach. The conclusion drawn from this research results in five subjects of attention:

- 1 To investigate new teaching competences
- 2 To investigate new teaching strategies
- 3 To develop collaborating professional environments for teachers
- 4 To develop a formal declaration of how companies can participate effectively in the process of the transition of youngsters to professional practitioners
- 5 To investigate how the organization should change their culture and structure towards a professional learning environment for students and teachers.

The above mentioned items will be subject of further research in the coming study year. The main goal is to develop a business case or strategic plan on how to implement change in teaching engineering education.

Keywords

Teachers role, competence-based, action-based, innovative education.

1. INTRODUCTION

Technology is changing rapidly. Engineering companies are building more complex and high technology systems with combined intelligence from different disciplines (psychosocial elements, project management, communication, ethical, sustainability, etc.) Within the EU, engineering companies are forced to be innovative and creative to maintain the lead on emerging economies like China and India. The engineering professional has to keep pace with these new technologies and has to train or educate himself to be of importance and to maintain his position as professional for engineering companies. So how can the universities prepare themselves and their engineering students to cope with these challenging demands? And more important what impact does this have on the teacher in engineering education?

2. PROBLEM STATEMENT

The organization and more specific management have a vision and strategic mid-long term goals. The goals set by management can only be achieved when the teachers are provided and facilitated with the necessary resources and teaching environment (financial, material, time, etc.). The teacher is the first contact for the students. The quality and the enthusiasm of the teacher determine the quality of the education and the quality of the learning processes. In most cases the teacher will be a "role model" for the student.

Figure 1 shows that the teacher is the most important actor situated in the center and surrounded by actors such as student, manager and the expert teams of which the teacher is a vital member. The triangle is situated within the organization with a certain culture and structure. The external environment (government, companies, etc.) also influences the organization.

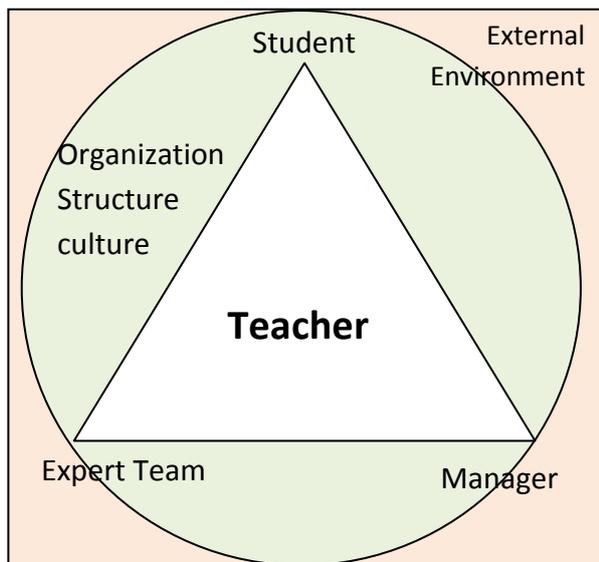


Figure 1. Teacher and other actors [1]

Because of the changing external environment and increasing demand of companies for more highly skilled young professionals, the current way of teaching and the structure of engineering education do not fit. We believe that the role and competences of the teacher (most of the time an engineer with educational skills) should change. The traditional way of teaching is built on knowledge transfer preparing the student for their future profession. Weggeman [5] defines this as a routine professional. This person Problems arise when teachers have to accept that learning time has to be spent on items less directly related to knowledge and skills. It is of major importance that they should be convinced that attitudes and behaviors are important in addition to knowledge and skills (competence-based).

As we mentioned earlier the teacher is most of the time an engineer with educational skills.

When the teacher is expected to be a “role model” for students the teacher should act and behave like an engineer (students don’t want to copy a role model of a teacher, they want to be an engineer). That is why the teacher must have a good understanding of the engineering field and the engineer’s attitudes, working environment etc. The transition that is necessary means changing the teacher into a professional with combined competence of knowledge and educational skills. Weggeman [5] defines this as the so-called professional worker. The professional worker in engineering education is a team player. It is actually the teacher’s role extended with the role of researcher, expert, intra- or entrepreneur.

TEACHER’S EXPERT DEVELOPMENT

The University should become a “learning community” where knowledge is shared among colleagues and students. Especially when young teachers are hired they should be teamed up with a more experienced teacher so the young professional can learn from the experienced teacher. From university perspective this means changing the organization. For example new forms of learning strategies, new tools, with impact on the engineering curriculum. From the teachers perspective changes will affect the role, attitude and behavior of the teacher. According to David Berliner [1] the development of expertise (technical and educational) by teachers is divided in five (5) levels. See table 1.

Table 1. Five levels of expertise development of teachers by David Berliner.

1. Novice	First year teacher (uses the common ‘rules’)
2. Advanced beginner	Uses the common ‘rules’ but also experiential knowledge
3. Competent	Goals and materials are balanced according to a given situation
4. Master	Flexible with great observing skills. Holistic ¹ view of the whole
5. Expert	Performance is seamless and without great effort. Reaction is intuitive

Bob Glaser [1] on the other hand distinguishes three (3) different phases of expertise development. See also table 2.

Table 2. Three phases of expertise development by Bob Glaser.

1. Beginners Phase	External support when learning for its profession
2. Transition Phase	Less scaffolds, approaches professional standards
3. Self-regulating Phase	Deliberate practice in relation to high professional standards

In our opinion it takes roughly five (5) years to achieve level three (3), according to the findings of table 1:

¹ Holistic = relating to or concerned with wholes or with complete systems rather than with the analysis of, treatment of, or dissection into parts

competent. Deliberate practices are a prerequisite for expertise. Experts follow trends, interpret situations, draw their conclusions and can even predict what the next step will be. There is a difference between traditional teachers and expert teachers. Traditional teachers merely follow the standards whereas expert teachers don't only follow but also use the standards in an effective way. This also means that experts are not afraid to learn with and from students. Only a few teachers achieve level four (4) and even less teachers accomplish level five (5).

Here we focus on learning as a bidirectional activity. We are not studying but we are learning within a dynamic 'learning community'. Shared experience creates the deepest understanding and the most lasting bonds of attachment [3]. The role of teachers according to four philosophers: Plato, Confucius, Buber and Freire [2]:

“The teacher promotes a mutual learning through co-investigation of teachers and students.”

The environment should change from a static, fully programmed environment to a dynamic hybrid environment. With hybrid we mean that certain aspects of the learning agenda are static and other parts are dynamic. Here there is the opportunity to be innovative and creative. For example setting up an honors program to challenge excellent and very motivated students. To coach excellent students we need excellent teachers, therefore, setting up an honors program also will help the teacher to attain a certain level of expertise in engineering education. But how do we implement these changes within the university? How do we start the transformation process from traditional teacher to professional worker?

3. APPROACH

We know that beliefs and acceptance are quite difficult subjects when it comes to changing people's behavior and attitude. At Fontys University of Applied Sciences department Engineering we developed and conducted a research. The research is divided in different stages and has two (2) parts: a literature study and a practical study. We found several documents on how to organize the education using different strategies and models such as the MERID model and the 4C-IC model (Geraedts, 2010). How to implement competence based education and how to increase the intrinsic motivation of students. The practical part of this research will focus on the current situation at Fontys University, the so-called 'IST' situation. We designed a small survey to find out what learning strategy teachers work with, how they are facilitated when they teach, in what environment they work and teach, what their needs are and if they are willing to change as a teacher into a professional on an expert teaching level.

The next step is to analyze the data from the survey. This should result in a strategic plan of where to start and how to implement the change that we expect to achieve, the so-called 'SOLL' situation. This document can help in

setting new long-term goals and strategies to achieve more effectiveness and efficiency of engineering education. Figure 2 shows the research model used for this paper.

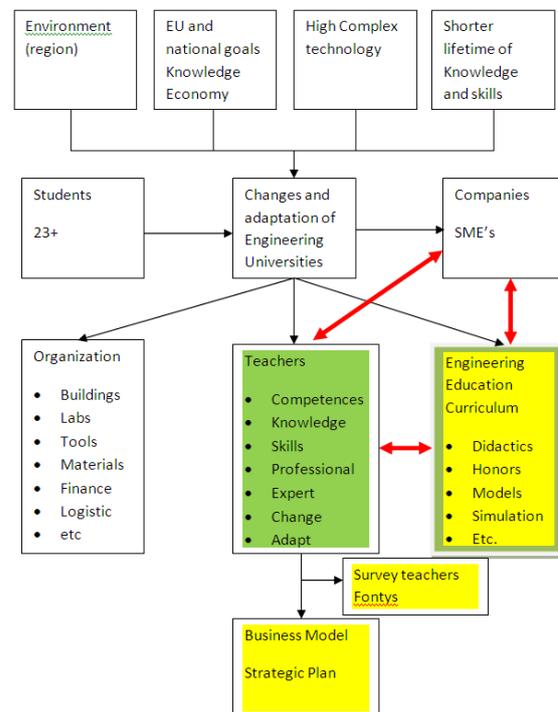


Figure 2. Research Model

4. RESULTS OF THE SURVEY

The goal of the survey was to find out whether the teachers are willing to change and what their ideas are about what this change should be and how this change can be achieved. Teachers are working hard to teach students the knowledge and skills to prepare these students to the standards of their future work. These teachers use their knowledge and skills as they experienced and learned it by them self in the past. Nowadays there is some reasoning to change the old beliefs of teaching where only knowledge was and still is the centre of focus into a form of education, where more adaptation is growing towards the context of the real environment students will encounter in the future in their daily work.

For this change it is crucial that teachers adapt this new development in education and find these new ways to fit in their daily work of teaching. Therefore Fontys University of Applied Sciences, department of engineering started doing an investigation on obtaining information of the opinions of teachers in the willingness to change. A survey is carried out among a total of 70 teachers of which 35 respondents filled in and returned the questionnaire. In this questionnaire the respondents were asked to give their opinions in five categories of

questions on a scale of five pre-described answers. These categories are:

1. Opinions of today's situation in education
2. Personal positive experiences in carrying out education
3. Opinion of ideal situation in education and contacts with companies
4. Ideal strategy in carrying out new education and willingness to change
5. Opinions on ideal organisation.

For each category three questions, except category 5 only one, were asked. For each question on a scale of five pre-described answers teachers could choose the description that fit most to their own opinion. The pre-described answers were carefully chosen so teachers could tick a wide range of opinions. Besides the teachers also other personnel who have a strong relation with conducting education were asked to fill out the questionnaire. So, a wide range of opinions was gathered on strategies and relations with the external world and the way of organizing the education of engineering.

The outcome of the survey will be used to identify possible markers for new strategies to be chosen to change the education into new approaches. The results of each category are presented below.

Results of category 1: *Opinions of today's situation in education.*

Teachers recognise (43%) that students are very critical about the quality of the education, so there is reason to think about change.

Teachers do not have a high level consensus about the opinion of company's judgement on the quality of education. Some believe companies are satisfied and some are less satisfied about the engineering education. On one point they fully agreed and that is that they believe companies do not have a negative judgement on the engineering education.

Teachers state they believe (83%) that the staff of teachers could make a difference in enhancing the quality of the education when the organisation will give more possibilities to each teacher to use or to strengthen his expertise more.

Results of category 2: *Personal positive experiences in carrying out education.*

Teachers state firmly that they (62%) would become more satisfied about their work when they get more opportunities to make their own choices on developing education towards a higher level of professional education. Teachers say also they are capable of doing a lot of different work. They feel they are competent in carrying out education on knowledge but also on guiding students during their projects. The respondents also state that they have capabilities to work more in a research environment. Teachers are asked to provide students with good lectures and coaching students in several projects,

but they are also saying they have interest in participating in research.

Results of category 3: *Opinion on ideal situation in education and contacts with companies.*

Teachers do not have a strong preference on a specific method of education. Teachers (41%) see more combinations of several methods as ideal to be the basis of a viewpoint to arrange educational methods. Teachers do believe that having relations with companies as crucial to the quality of education, where more than half (57%) of the respondents state that this relation should not damage the education. Teachers would like (37%) to organize themselves in expert teams to develop better education and organize significant relations with companies. Some teachers (29%) choose a solitary way of working. Teachers see an important condition that the organisation will facilitate this activity otherwise no or too little outcome will be developed.

Results of category 4: *Ideal strategy in carrying out new education*

Teachers are not focussed on one learn and teach strategy. Teachers (51%) see more prosperity in combinations of several strategies combining theory and practice. They (89%) state to put effort in and develop changes in the education if it pursues a higher goal. They (52%) would like to organise themselves more, to find new strategies, in expert teams where they can work with colleagues with likewise expertise.

Results of category 5: *Opinions about ideal organisation.*

For teachers an ideal organization is an organization that will provide the teachers (55% of the answers) with a challenging working environment against a routine based environment (7% of the answers). Some answers (23%) of the teachers indicate that they like an organization that would support them in their activities and support them in developing the education they are responsible for. Where 16% of the answers say they are satisfied about the nowadays organization.

As a resume of the outcome of the survey at Fontys University of Applied Sciences department engineering, the following five (5) points could be part of a strategic plan.

1. It is important to understand the changing conditions of the teacher working with students on development of competences. The competences of the teacher himself/herself will be investigated and will lead to better understanding of the new way of working of these teachers and in what way they should be facilitated.
2. New strategies of carrying out education (competence-based, action-based or even simulation-based) (Geraedts, 2010) need to be investigated. Choices need to be made to encounter a change in the strategy to learn and teach students to fit on the one-side to the expectancies of students

but also on conditions of companies where graduate engineers will start their work.

3. Teachers stated in several ways they want to collaborate with their fellow teachers in so-called expert teams. The working conditions and facilitating circumstances need to be developed. The main goal in this is to create an inspiring and goal-striving environment where the teacher is willing to use his expertise to improve the quality of the education.
4. Companies are seen as an important alliance in teaching students the skills of an engineer and they should not mix up their striving for profits when they participate in the alliance of training students. It is seen as important that companies work in a positive way with the university. Investigations should be carried out to understand in what way the long-term connections could be made.
5. The organisation of the university is always on the run to handle the formal activities within the engineering educational activities. It is important that the organisation is supporting the activities of the teacher. This calls for new understandings in what way the formal organisation partly can change into a participating organisation.

In the next year the chosen strategies will be carried out and in 2012 the outcome will be measured. It is important that the focus of the educational organisation is directed to the main goal and that is to develop youngsters who decided to become an engineer to guide their transformation into strong engineering practitioners.

6. REFERENCES

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5. Conclusion

We think that change is necessary. Our society is changing and the engineering challenges are getting bigger and more complex. To deliver excellent students who will start as professional in a certain engineering area who will make a difference in the engineering world as perhaps intra- or entrepreneur, we need to better understand what the competence and roles of our teachers should be. The teacher is the 'role model' of the student. As a teacher we will have to be pro-active and become part of the dynamic world of the engineering profession. As input for a strategy the next five items are seen as crucial.

- 6 To investigate new teaching competences
- 7 To investigate new teaching strategies
- 8 To develop collaborating professional environments for teachers
- 9 To develop a formal declaration of how companies can participate effectively with the process of the transition of youngsters to professional practitioners
- 10 To investigate how the organization should change their culture and structure towards a professional learning environment for students and teachers.

"It is the supreme art of the teacher to awaken joy in creative expression and knowledge"

-Albert Einstein-