Addressing Attitudes Explicitly in Engineering Education - An Exercise to Stimulate Reflection through Pictures

Per Runeson and Thomas Thelin
Dept. Communication Systems
Lund University
Box 118, SE-221 00 Lund, Sweden
[per.runeson,thomas.thelin]@telecom.lth.se

1 INTRODUCTION

In the process of establishing goals for education programmes and courses, we often work with goals regarding knowledge, skills and attitudes [1]. When it comes to planning the content of the education programme or the course, the goal of knowledge and skills are much more tangible than the attitude goals. Hence, attitudes tend to be addressed implicitly rather than explicitly, if addressed at all.

In software engineering education, much of the learning is about attitudes. The student's attitudes before entering the programme tend to be that software engineering is mostly about programming and technical issues, while research shows that organizational and managerial issues are far more important contributors to success or failure in software engineering. Furthermore, software development is often considered art or craft, while we want to change it into and engineering discipline, which means fostering an attitude of teamwork, structured approaches and learning from own and others's experiences. In our software engineering education, we want to address and affect the student's attitudes regarding these issues.

In this paper, we present an exercise in an introductory software engineering course, which explicitly addresses attitudes towards the course topic and the students' future work roles, using pictures to stimulate discussion and analysis. We present the exercise and analyze briefly the outcome of the two occasions when it was given.

2 CONTEXT

The exercise addressing attitude goals was given in an introductory course in software engineering in the Information and Communication Engineering education programme at LTH. The course is given in the second semester of the first year of studies. Prior to the course, the students have taken mathematical courses, programming courses and an introduction to information and communication systems.

The goals of the course are threefold:

Knowledge: The student should know the most important phases in the process of software engineering for development of information and communication systems. Important concepts to know are requirements, design, verification and validation and quality issues. The student should also know a project model and the purpose of project monitoring and control.

Skills: The student should be able to write a requirements specification, make a design and a test plan for a small system. Furthermore, the student should be able to adapt and utilize a project model in a small project, which includes writing a project plan, controlling and monitoring a project.

Attitudes: The student should get an insight of development of information and communication systems and know that this contains several different parts, from idea to product release. Furthermore, the student should get an insight of development work, which requires cooperation, specific roles, milestones and scheduling. The student should understand the purpose of project management, and the trade-off between the parameters: functionality (technical solution), cost and quality, which are important for software projects. Furthermore, the student should gain knowledge and understanding of the importance of quality improvement.

The attitude goals of the course relate very much to the role of the software engineer, as we define it. In order to explicitly address the issue, we defined an exercise based on pictures.

3 THE PICTURE-BASED EXERCISE

The exercise consists of four parts, two in the beginning of the course and two in the end of the course; (1) select a picture related to the question "What is an engineer?"; (2) present the picture and the motivation orally in class. After the main part of the course, (3) write a short report, presenting the original ideas on the picture chosen, and how these ideas have changed during the course; (4) present the report orally in class.

The instructions to the students are presented in Figure 1 and Figure 2.

4 RESULTS

The pictures chosen show a wide variety, including people, screws and bolts, "kylskåpsingenjör Stig-Helmer Olsson" and computers. Their associations to the engineer role also varied, using many different keywords, of which some examples are listed below.

- Problem solver
- Improving life
- Technology interest
- Team-worker
- Busy
- Inventor
- Adaptive to changes

Seminar 1

SCOPE

What is an engineer? ...

TASK 1: PICTURES

1.Choose one picture which captures something of what it is meant to you to be an engineer.
2.Prepare to present a motivation.
3.Present the motivation
...

Fig. 1. Instructions for the tasks in the beginning of the course.

SUBTASK 2: ENGINEERING ROLE REPORT

This subtask requires Seminar 1as a prerequisite.

Write a one-page report on your original ideas on the picture chosen in Seminar 1, and how these ideas have changed (or remained the same) during the course. The report shall be entitled "*What is an engineer*?". Append the picture to the report when handed in.

SUBTASK 3: ENGINEERING ROLE PRESENTATION

Prepare overhead slides to present the results of subtask 2. You will be given 3-4 minutes time to present your slides.

Fig. 2. Instructions for the tasks in the end of the course.

- In control
- Well dressed
- Communication
- Serious
- ...

The set of keywords were an excellent starting point for the discussion about the role of an engineer. Not the least, it showed the wide variety of roles an engineer may take in her/his professional service and different characteristics that may be useful.

The picture selection was not systematically analyzed. However, the impression gained when facilitating the seminar is that one group, which was male dominated tend to be more technology focused, while the other group with mixed gender covered a broader range of aspects. Some examples of pictures chosen are presented in Figure 3.

The development during the course also shows a wide variation. Some students explicitly stated that they had changed their mind during the course regarding the attitudes towards software engineering, while other promptly reported that they had one imagination of the engineering role and it did not change during the course. However, most of them reported that they gained more insight of what an engineer can do.

The students were generally positive to the exercise as such, despite the fact that it is not a conventional exercise in the engineering education. The course contained three other non-traditional exercises, and the only complaint in the course evaluation was that they were clustered in the beginning of the course and not evenly spread. This was changed before the course was given in the subsequent year.

The picture-based training session gave the students an insight to the variety in the engineer role, and also opened up for addressing their own expectations on the education programme and their future work roles.

5 CONCLUSIONS

Attitude goals are seldom explicitly addressed in education programmes. In software engineering, the attitudes are very important in that we try to foster an engineering approach to development and evolution of software systems. The picture exercise gave an excellent opportunity to have the students reflecting on the roles of an engineer and to discuss the roles in a classroom situation.

REFERENCES

[1] P. Runeson, "A New Software Engineering Programme - Structure and Initial Experiences", *Proceeding 13th Conference on Software Engineering Education & Training* (CSEE&T), Austin, Texas, USA, pp. 223-232, 2000.

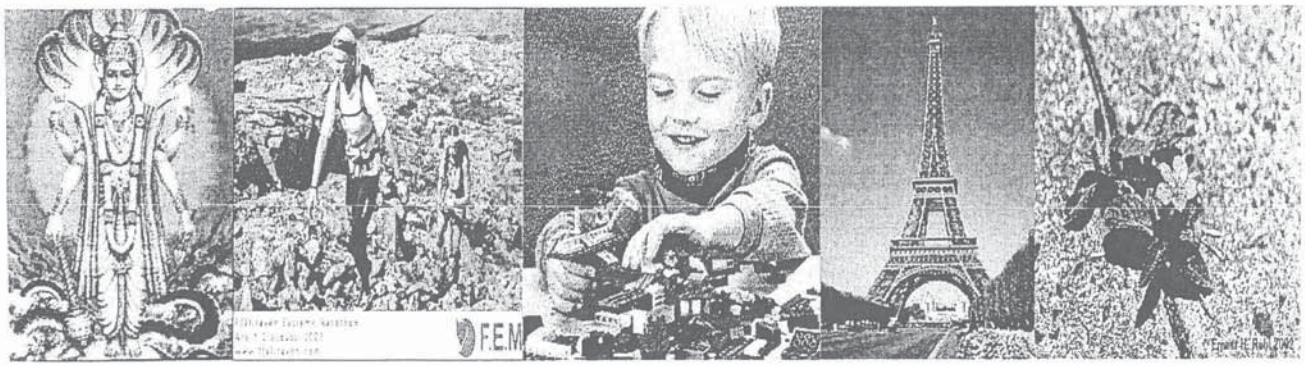

Fig. 3. Examples of pictures chosen to represent the view of an engineer. The pictures are, from left to right, Vishnu (the God of Hindu), two persons on a trip towards a goal, a boy constructing with Lego, the Eiffel Tower and a flower growing on tarmac.