



Blekinge Institute of Technology

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Teaching Empirical Software Engineering in Academia: An Experience Report

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Technology



Empirical Research Methods

Empirical research methods include:

- Controlled experiments
- Case studies
- Surveys

In many cases the intention is to perform a statistical analysis to determine whether one technique or method is better than another.

Motivation

- Software engineering is an engineering discipline and as such we should have an engineering approach to evaluate and validate research. Given that software development is human intensive, empirical studies are well suited.

Four Main Approaches

- Separate course
- Study as part of another course, for example, an inspection experiment as part of a course in verification & validation
- Study a student software development project
- Empirical studies in thesis project

Separate Course

This could be:

- A general course on research methodology
- A course on empirical software engineering
- A course on one empirical method, for example, experimentation in software engineering

Course Outline

- Course book
- Example studies

Assignments:

- Write a report on a specific sub-area
- Study: Plan, design, operate and analyse

Study as Part of Another Course

- An empirical study is a suitable way of illustrating how a method or a technique can be evaluated or validated, and
- It also illustrates some specific method or technique in its context

Part of Course

- An introductory lecture to empirical studies in general and to the method to use in particular
- Introduction to the subject, operation of the study and de-briefing

Study of Project

- The students should be informed that their project is a study object
- It is important that there is an educational goal of the study

Thesis Project

- Empirical studies are a good way for the students to learn both methodology and to get an engineering perspective on whatever subject they have.

This includes theses on different levels, for example, Master and Ph.D.



Separate Course: Experiences 1(4)

Separate courses on research methodology in general have been given.

A course on experimentation in software engineering was given based on published articles. The course resulted in a book published by Kluwer Academic Publishers in 2000.



Part of Another Course

Experiences 2(4)

Studies of inspections have been run as part of a verification & validation course.

Different empirical studies have been conducted in a general software engineering course, including that the same study was run both with students and professional engineers.

Study of Projects Experiences 3(4)

- Effort estimations have been studied in a large student project (17 students in 9 weeks)
- PSP data have been analysed
- Defect data have been studied in a large software project (15 students in a one semester project)

Theses Project Experiences 4(4)

- Surveys in industry as part of Master thesis projects
- Experiments as part of Ph.D. Theses, both with students and professional engineers
- Case studies as part of Ph.D. theses

Summary

- Empirical methods support an engineering approach to software development
- Educational goals are important if the empirical studies are part of other courses
- Learning by example is crucial. Empirical methods cannot be learned solely by reading a book