

B Design and Research Processes

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Five main topics are introduced that have to be addressed in this competency. Next, a set of learning activities is presented that is needed for the embodiment of this competency in the TU/e ID bachelor curriculum. This set describes the minimal number of learning activities needed to reach the required level of competency development at the end of the bachelor. The chapter ends with a selection of relevant literature.

B.1 The Nature of Design

Students should get to understand what kind of activity design is, how it differs from other human activities, and which abilities one should develop to become a designer.

Students should be trained in some of the basic skills a designer needs (like: reflection, integration, achieving coherence, but also more general skills like argumentation, making value judgments, double loop learning)

B.2 The Dynamics of Design Processes

Students should be able to run their design processes efficiently and effectively, to reflect on different kinds and different ways of designing and be able to choose an appropriate design strategy for their design problems. This requires some support early on in the study, to make sure that the students don't get too many bad habits in this, and to help them get over the worst process problems, so that they can actually get to learning the content of design.

Later on in the study the subject of processes should be revisited, so that students are able to explicitly reflect on their processes, and develop their own way of working. They should also be aware of the many design models that exist, and be able to strategically choose methods and techniques for their projects. The latter means that they should experiment with different methods and techniques, and evaluate them on their merits.

B.3 Design in Context

Students should know what is expected from them in the context of a design agency or company, the roles designers have, and they should be aware of the stresses and strains the environment puts on a design process. They should also be able to make an explicit design project plan, for themselves and others to work in.

B.4 Research Processes

Students should, in the bachelors phase, learn the basics of the research process. They should be able to formulate a research question, set up a small study (understand the difference between exploratory research and hypothesis-testing), be able to find the relevant scientific literature and understand the structure of scientific papers...

B.5 Research and Design

Students should understand the link between research and design. At the end of the bachelors phase they should at least once have done a project in which the integration of design and research was an important issue.

B.6 Competencies

B. Design and Research Processes	
Master the design process and the research process and adjust these processes to the demands of the task at hand	
B.1 Design process	Plan, perform and reflect on the different phases in a design process.
B.2 Design research	Plan, perform and reflect on research to support the design process
B.3 Scientific research process	Plan, perform and reflect on the phases of a scientific research process.
B.4 Reasoning	Defend decisions and present results using coherent argumentation.

B.7 Literature

Design Methodology

- Bucciarelli LL (1994) *Designing Engineers*. MIT Press, Boston
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Dorst CH (2003) *Understanding Design*. BIS Publishers, Amsterdam
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Roozenburg NFM, Eekels J (1995) *Product Design: Fundamentals and Methods*. Wiley, Chichester
Ullman DG (1992) *The Mechanical Design Process*. McGraw-Hill, NY
Ulrich KT, Eppinger S D (1995) *Product Design and Development*. McGraw-Hill, NY

Research Methodology

- Kumar R (1999) *Research methodology*. SAGE Publ., London