8. “ARE THEY READY?”

The Technical High School as a Preparation for Engineering Studies

INTRODUCTION – THE TECHNICAL HIGH SCHOOL – HTX

The Confederation of Danish Industry (DI) has warned, time and time again, that in the near future Danish companies will have severe difficulties hiring enough qualified engineers. The main reason is that most young people, as they transition from second level schools, simply do not want to pursue a career in engineering, science and technology. A European Commission (2011) survey and the so-called ROSE project (Jenkins & Pell, 2006) both provide evidence for this hypothesis; namely, that awareness of and interest in science and technology is absent from most youngsters’ minds. There has been, therefore, an increased interest in attracting more students to engineering studies. The Danish technical high school HTX (Higher Technical Examination Program) was established in the 1980s partly to increase participation in such studies, and partly to provide an admissions track into engineering studies for apprentices from the technical colleges. The HTX is now well established within the Danish educational system, and it provides an alternative to the traditional high school. For admission to Danish universities students must have graduated from one of the high school education streams (general upper secondary school) or from similar educational institutions. The majority of Danish university students have a background in the ordinary high school – STX. STX offers a broad general education in classical fields such as modern languages, math, physics, etc. In 2013, 27,000 students were enrolled in STX schools. In addition to STX, the Danish educational system also includes the business high school – HHX which had 10,000 students enrolled in 2014, and the technical high school HTX, introduced above, which had 5,000 students enrolled in 2014.

The key research question addressed in this chapter is: does the HTX technical high school prepare Danish students for a future as engineering, science or technology students? Does it equip the students with the study competences necessary for such studies?

Using direct participant observation and other sources, I explore its original purpose, analyse its curricular content, highlight some prominent issues, and basically critically explore the ability and potential of the HTX technical high school to equip its students with the requisite study competences.
The empirical basis for this chapter draws on the following: it is partly based on ministerial orders and guidelines, curricula and other written materials related to the study program; interviews with teachers and students from four HTX schools in the Jutland area of Denmark; interviews with engineering students at Aalborg University with a background in HTX; teaching observation, observation of exams and the students' written work. The study does not include all schools or all students and not even a representative sample of schools; it can, therefore, only provide a snapshot of what is possible. The question is, therefore, not whether all students in all schools achieve the required study competences, but whether it is possible, within the current framework, to implement a form of education that allows students to achieve the required study competences. The purpose of this study is to explore whether it is possible to achieve the required study skills—not that all students, in all cases achieve them. The study program provides opportunities, but other issues can get in the way of the desired results or outcomes. These are not included in this study—the intent is only to look at what is possible.

The purpose of all high school education in Denmark is to equip its students with study competences and with a general formation of character (Bildung) (ministerial order §1). In this chapter study competences will be described as students’ ‘knowledge of the tradition’, that is, knowledge of the discipline, theories and methods, and the students’ formation (Bildung), that is, how students change through meeting with the school’s challenges and the students’ ability to produce new knowledge, that is, students’ ability to apply theories and methods in practice. This means that the requirement for study skills or study competences require both Bildung and the ability to solve problems using the theories and methods learned at the school. In the process which equips students with the necessary study competences, different forms of knowledge are included. These forms of knowledge can be summarized as episteme, techne and phronesis: roughly translated these correspond to theoretical, practical and social knowledge, all of which are necessary for students’ study competences (Gallagher, 1992; Henriksen, 2013, p. 49). The following sections examine whether this is the case in the Danish HTX program.

THE HTX PROGRAM – BACKGROUND

The technical high school was inaugurated in 1982, first as an experiment, and later from 1995 as a permanent addition to high school education at the same level as the ordinary high school. This started out as a supplement to the technical colleges’ apprenticeship programs. The initial idea was to have a high school education stream explicitly directed at science and engineering as well as combining theory and practice in an innovative way. The study program was very much influenced by the Problem Based Learning (PBL) principles of the new Danish universities – Aalborg and Roskilde – and was, therefore, interdisciplinary with project work included as part of the curriculum right from the very beginning. In HTX there is a special emphasis placed on what are known as ‘profile subjects’. Profile subjects are subjects