Abstract
This thesis explores the roles of science and technology in young people’s images of the future and the potential of future-oriented science education to help students develop their futures thinking. Based on a conceptualisation of scientific literacy as a broad, critical civic skill covering also sociotechnical issues, the dissertation explores the relationship of students’ perceptions of the future, their relationship with agency, and issues such as hopes, fears and active citizenship. Furthermore, it advocates and illustrates the use of sociotechnical futures as a resource and context in science and technology education. Previous research on demonstrated that technology plays a central role in how young people imagine the future and the kinds of agency that shape it, and thus there is potential in addressing the interrelations of science and technology and human agency in students’ thinking, as it may instruct the development of action-oriented critical scientific literacy, as well as reflect various facets of socioscientific issues such as uncertainty. By qualitatively analysing students’ written images of the future, and interviews after an experimental science course focused on related issues, this dissertation argues for and elaborates on the development of future-oriented science education. A tentative definition of future-oriented science education is provided and situated in close relation to Vision III of scientific literacy. Three empirical studies are used to explore and provide concreteness to the aims, methods, and issues central to this dissertation’s suggestion for a definition of the emerging conceptualisation of future-oriented science education.

In Study I, by employing qualitative thematic analysis of 58 upper secondary school students’ essays describing “a typical day” in the future, students’ images of the future were found to feature technological changes ranging from improved everyday devices to large-scale technologization. The effects of technology on future worlds spanned improvements to everyday convenience, environmental impacts, transformations in employment, privacy issues, and general societal progress or decline. In Study II, these depictions of future science and technology were found to span minimal and radical transformation, nonproblematic and complex entanglement with society, and various framings of who, if anyone, has agency. Indications of agency were mostly vague, but students occasionally attributed relevant agency to the general public, specialised experts, and themselves in both expert and nonexpert roles. These two studies shed light on the various roles technology has in imagined futures, and provide dimensions to understand, analyse and address students’ perceptions of sociotechnical change and sociotechnical agency. Study III employed phenomenographic analysis on 22 interviews with upper-secondary school students who had attended a course focused on futures thinking skills in the context of quantum computing and technological approaches to global problems. Exploring changes students self-reported in their futures and agency perceptions, this study found students perceived the future and technological development as more positive but also more unpredictable, saw their possibilities for agency as clearer and more promising, and felt a deeper connection to the future. This study illustrates some pedagogical phenomena relevant to future-oriented science education and the various kinds of interplay between futures thinking and science learning.