

Science teachers' perceptions and needs on integrating engineering design

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Introduction

In Finland, engineering design became an explicit part of science education in 2016¹. The aim of this PhD study is to better understand

- how science teachers in Finland perceive the implementation of this new objective that is conventionally closer to the field of technology and engineering than science, and
- what kind of training and teaching materials teachers need for a successful implementation.

Literature review

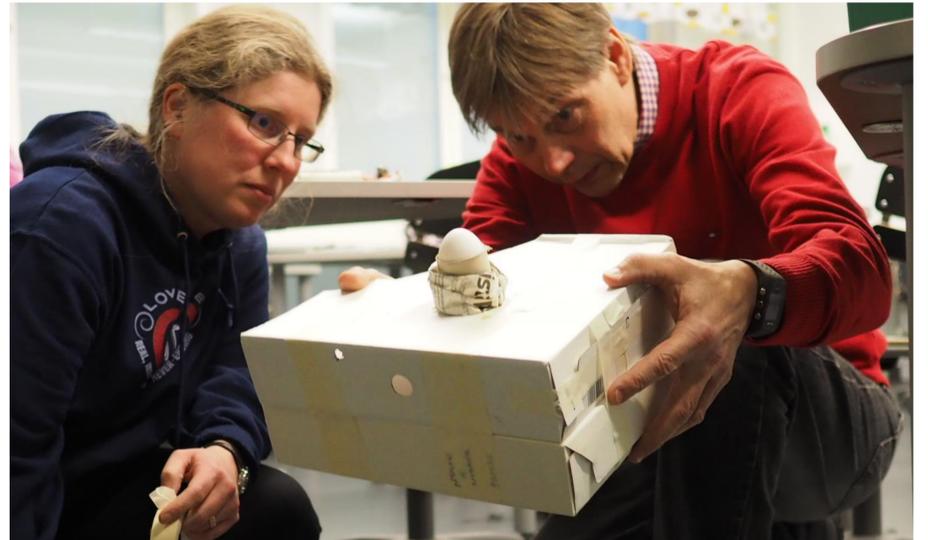
Design-based science

- is a form of problem-based learning where the design, construction and testing of a device is utilized in a way that students learn science²,
- has been shown to be an effective way of teaching if the curriculum is well prepared³, and
- is often implemented so that learning or applying science doesn't happen⁴.

In the earlier Finnish national core curricula

- engineering design has been practically absent in the parts related to science subjects⁵, and
- there was a cross-curricular theme that involved engineering design but it was barely implemented due to time constraints and a lack of teacher training⁵.

Well-prepared teacher training and teaching materials are needed for the successful implementation of design-based science^{3,4,5}.



Methods

RQ1

- A written survey about teachers' experiences and views about implementing technology education.
- A group of 26 middle school and high school science teachers before an in-service training.

RQ2 and RQ3

- Written surveys before and after a two-part in-service training about design-based science. Interviews after the training.

Preliminary findings

The data for RQ1 has been analyzed and the preliminary findings are:

- The use of educational technology as a way to implement technology education is emphasized in the answers.
- Some of the teachers have had engineering design projects and co-operation with craft teachers.
- Teachers wish that they could implement engineering design more in the future.
- Teachers see that the implementation is challenged by heterogeneous student population and time constraints.

References

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Research questions

RQ1 How is engineering design seen in teachers' experiences and perceptions about technology education in science teaching?

RQ2 What sort of knowledge and teaching materials should be offered in the teacher trainings so that they answer the needs of teachers but also address the known challenges of design-based science?

RQ3 How do teachers' perceptions and views about engineering design and its relevance for science teaching change after an in-service training?

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