The main aim of the QUEST project is to enhance student learning in the science subjects by adapting research based consensus criteria in the design and implementation of an innovative, large-scale TPD program for Danish science teachers. QUEST involves 43 schools and 450 teachers from 5 Danish municipalities. The duration is four years.

**QUEST-design**

QUEST is designed to implement sustainable and generative change processes locally. A central part of each QUEST activity is to introduce teachers to methods for inquiring into student learning and to support the teachers in sharing their knowledge in local science-PLCs (Vescio et al, 2008). The overall benefits are reported as high or very high by 68% of the teachers. They refer to changes in their own classroom and to new insight into student learning, but also to challenges related to disseminating the IBSE thinking to reluctant colleagues. The data indicates a generally positive attitude towards the QUEST-rhythm.

**Research Question**

How can a professional development program for science teachers be designed to acknowledge both research based consensus criteria and challenges, needs, and possibilities at multiple local sites?

**Research Methodology**

Design based research is characterized by repeated cycles of design, enactment, analysis and redesign (Kelly, 2003). Empirical data include a repeated web-based questionnaire with five point Likert scale questions plus open-ended questions, and multiple case studies. In each round of the questionnaire-survey the teachers are encouraged to look back and reflect on how the project has supported new enactments so far – individually in their classrooms and collaboratively at their school - and to look forward to new initiatives. Case studies include repeated observations in classrooms, interviews with teachers, students, and school leaders and observation of meetings in the local science-PLCs.

**Preliminary results**

The first cycles of research informed design presented here is from the course module about Inquiry Based Science Education (IBSE) referring to international research (Minner et al, 2009). The IBSE module is organized with 3 seminar periods: initial, interim, and follow-up, placed 4-6 weeks apart (duration). It is followed by a period of individual enactment in own practice and collaborative initiatives organised by the local science-PLC (active learning & collective participation).

**The QUEST-rhythm**

**Student learning must be the focus of all activities (content focus).**

This is supported by designing all QUEST activities so they follow a pattern of full day seminars, where participating teachers are introduced to research-based material. It is followed by a period of individual enactment in own practice and collaborative initiatives organised by the local science-PLC (active learning & collective participation).

Thus, during the entire project each semester is organized with 3 seminar periods: initial, interim, and follow-up, placed 4-6 weeks apart (duration).

Between the seminars, the teachers experiment with new approaches, and at the interim and follow-up workshops they share knowledge from the local enactment (coherence). This repeated structure is referred to as the QUEST-rhythm.

**QUEST-timetable**

The core features (the consensus criteria) of the project are:

- Content focus
- Coherence
- Active learning
- Duration and sustainability
- Collective participation

**QUEST in the course modules**

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<th>Module</th>
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<td>Introduction to IBSE</td>
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**References**


**Comments from teachers**

The IBSE module
- Good with many hand-on activities which I can bring home and use, it made me think about my own practice.
- Everyday in-service model. Good synergy between theory and practice. Good to share experiences at own school and then return to gain new knowledge and share experiences.
- Facilitation of enactment/change in own practice.
- Strengthened collaboration around science on the individual school and stimulated teaching related to science.

The QUEST-rhythm
- It is good to try "the didactics" in own practice and reflect on the new experiences with the network on the courses.
- More time for trials might be needed. Your colleagues have time to try it out.

The collaboration in the local PLCs
- We have developed a shared language.
- More collaboration and developing ideas together.
- It has been hard to get colleagues started.
- The change need to be maintained so it is not falling back.

**Period of 3-4 months**

- It has been hard to get the colleagues started
- More collaboration and developing ideas together
- The change need to be maintained so it is not falling back

**Course module 3 | 1 day**

- New knowledge activities
- Experiences
- Inquiries
- Suggestions
- Science team meeting at school

**Course module 2 | 1 day**

- New knowledge activities
- Experiences
- Inquiries
- Suggestions
- Science team meeting at school

**Course module 1 | 3 days**

- New knowledge activities
- Experiences
- Inquiries
- Suggestions
- Science team meeting at school

- It looks good. Things are really speeding up in the science teacher group. They have acquired new ways of collaborating.
- At my school a (limiting) framework for collaboration which previously was not functioning, has disappeared.
- I can see that they get new methods here which can be used by all my teachers.
- Thus the in-service training of the future - the entire concept is exciting.
- The science teacher group has shifted from dealing with dayly running to dealing with development.