Report

# S-TEAM

## Collected papers no. 5

Teacher Professional Development Programmes

October 2010

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## Preface

This document summarises the teacher professional development packages which are being designed and tested in Work Package 6 of the S-TEAM project. The objective of WP6 is to incorporate state-of-the-art knowledge about inquiry-based methods in science into effective teacher professional development programmes (TPDPs), with a view to improve attitudes, motivation and career choice disposition towards science for pupils in the partner countries and elsewhere, within the theoretical framework of IBST/E.

The S-TEAM project has adopted the following interpretation of inquiry based science teaching and learning. Inquiry-based science teaching and education engages students in:

- authentic, **problem-based** learning activities where there may not be a correct answer
- experimental procedures, experiments and "**hands on**" activities, including searching for information
- self-regulated learning sequences where **student autonomy** is emphasized
- discursive **argumentation** and communication with peers ("talking science")

Partners have situated their TPDPs within this framework and the current document provides instances of how their materials identify the differences between this framework and conventional teaching practice.

One TPDP (the draft version of Product 6.5/6.6) is currently only available in Swedish, but has a comprehensive set of links to video material, which provides a sense of the teaching techniques being used. As with all the TPDPs in this document, piloting is in progress. The results of these pilot trials will feed into the Month 24 deliverable from WP6.

Supporting documents from these Teacher Professional Development Programmes have been made available on USB stick for review purposes and will also be available from the S-TEAM website at www.ntnu.no/s-team

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*University of Aarhus: Motivating to learn – learning to motivate*

**Teacher Professional Development Programme**

**Work Package 6f**

**September 2010**

## Rationale & Purpose

This TPDP entitled *Motivating to learn – learning to motivate* is intended to enhance teachers' capacities to motivate students. This overall aim is accomplished through introducing teachers to relevant contemporary motivational theories in workshop settings, and facilitating their transformation into teaching practice through exercises, -workshops and trialing in teachers' own classrooms, and subsequent discussions in Video-Club-sessions.

The TPDP aims at developing participating teachers':

- Recognition that teachers can actually "learn to motivate"
- Awareness of individual students' motivation and motivational cues/aspects within the science classroom
- Capacities to analyze and discuss motivational issues, using notions and perspectives from motivational theory
- Repertoire of motivational strategies, and their deliberate use of these in planning and implementing teaching

## Proposed duration

The TPDP consists of 5 workshop-sessions, each of 3 hours duration, and teachers' independent work (reading theoretical articles, planning, trialing interventions, action-(micro) researching) in between the workshops. The total intended work-load for teachers is 50 hours.

## Outline of meetings, activities & list of materials

| Meeting Number | Duration | Topic | Materials to be used (PowerPoints, videos, activity sheets etc) | Outline of Activities |
|---|---|---|---|---|
| Preparation | | Teachers experience with motivation in their own classroom | Activity sheet:<br>• Essay writing about motivation in the classroom: personal motivational strategies and experiences - positive and negative case<br>• Reflections in relation to a student case - K's motivation | • Reflections on cases of motivation in the classroom |

| Meeting Number | Duration | Topic | Materials to be used (PowerPoints, videos, activity sheets etc) | Outline of Activities |
|---|---|---|---|---|
| | | | for physics | |
| 1 | 3 hrs | Introduction to Motivation in Practice (MIP) and motivational theory | Activity sheet:<br>• How do classroom organisation and interaction influence students' motivation?<br>PowerPoint:<br>• Introduction<br>• Motivational theory<br>Literature:<br>• Skaalvik & Skaalvik (2007)<br>• Reeve (2006) | • Exploring teachers' motivational strategies and experiences<br>• Presentation of motivational theory – Self determination theory (SDT)<br>• Influence of organisation and interaction on students' motivation in terms of SDT? |
| Application & Preparation | | Teaching practice in the perspective of motivational theories | Activity sheet:<br>• Motivational theory and your teaching<br>Literature:<br>Brophy (2008) | Reflections on how motivational theory can shred light on existing teaching practice |
| 2 | 3 hrs | Motivational theory and awareness of students' motivation | Activity:<br>• Goal orientation in practice<br>• What kind of questions are useful in an investigation of students' motivation? (Stipek inspired questions) | Teachers' practice examples discussed in a theoretical perspective<br>Presentation of motivational theory – Self-efficacy, Goal orientation theory, Attributional theory<br>Teachers' awareness of students' motivation<br>Qualifying questionnaire on students' motivation |
| Application & Preparation | | Investigation of students' motivation in teachers' classrooms | Activity sheets:<br>• Inner motivation (IMI)<br>• Students' motivation (self-report and teacher's evaluation) | Investigation of students' inner motivation (IMI) in own classroom<br>Investigation and evaluation of students' motivation (Stipek) in own classroom |
| 3 | 3 hrs | Developing teaching sequences based on motivational theory | Activity sheet:<br>• Motivational activity - Modelling | Discussion of students' motivation and correspondence between teachers' evaluation and students' self-reports<br>Planning a motivational activity based on models |

| Meeting Number | Duration | Topic | Materials to be used (PowerPoints, videos, activity sheets etc) | Outline of Activities |
|---|---|---|---|---|
| | | | | and modelling<br>Introduction to video recordings and video clubs |
| Application & Preparation | | Video recording of all teachers' practice – selected sessions | Activity sheet:<br>• Video recording – preparation and reflection<br>• Video club – preparation and reflection | Planning of teaching and motivational focus<br>Selection of video excerpts for video-club |
| 4 | 3 hrs | Video based analysis and reflections on students' motivation | | Video club incl. formative evaluation<br>Motivational theory: Catch & Hold (Interest), Task value (Expectancy –Value Theory) |
| Application & Preparation | | Video recording of all teachers' practice – selected sessions | Activity sheet:<br>• Video recording – preparation and reflection<br>• Video club – preparation and reflection<br>Literature:<br>• Pintrich & Schunk (2002) | Planning of session and motivational focus<br>Selection of video excerpt for video-club |
| 5 | 3 hrs | Video based analysis and reflections on students' motivation | | Video club<br>Consolidation and teachers' future work on students' motivation<br>Evaluation of TPDP |

## Notes for teacher educators on how to use TPDP-materials

Such notes will be written along with the revised TPDP. The first version has been developed and trialed with the AU-participants as teacher educators, and obviously usual teacher educators would need more elaborate directions/suggestions for use.

## Video submission

We would prefer that our TPDP video-clips be made available to teachers from an URL, and we are presently working to establish a platform on http://cse.au.dk/?id=videoarkiv and transform our heavy HQ-files to formats that maintain quality and can still be played from such a platform.

To make sure that parts of our video-material are accessible for documentation, we will ship data-files (MPEG-4, M4V formats) on a CD/DVD.

**NB**: The videos submitted for the draft TPDP are video-clips selected by participant teachers for discussion in the Video-Club sessions. *Our final TPDP will contain video-clips selected by us for use also beyond Video-Club sessions*. All video-clips will originate from video-takes of our participant teachers as they were trying out different parts of the draft TPDP. Here we have an estimated 25 hours of high-technical-quality video (half of it with two cameras, all of it with 2 external microphones and editable source strength). In other words: The videos submitted for this draft is indicative of the technical quality of our material, but **most probably we will change videos for the final TPDP!** The final selection of video clips will adhere to different functional criteria, and furthermore we will develop a fruitful framing of each video or sequence of videos.

Only a few hand-out-summaries transcended our ppt-presentations. They will be available from the S-TEAM website www.ntnu.no/s-team.

### Comprehensive list of accompanying materials

| Description | Number |
|---|---|
| Advertising the TPDPs in local contexts | 2 |
| Powerpoint slides/presentations | 1 |
| Reflection prompts, activity sheets etc | 13 |
| Videos | 9 |
| Figures etc | 3 |
| Assessment/evaluation documents | 2 |

*European University Cyprus (CYCO): Inquiry for kindergarten teachers*

**Teacher Professional development Programme**

**Work Package 6.1a**

**September 2010**

This document contains a brief description of the scope, rationale and purpose of the CYCO TPDP that will be delivered to kindergarten teachers in Cyprus (November 2010 – May 2011). Details about the duration, an outline of the meetings and activities, a list of related materials and how they are used and notes (if any) to teacher educators that might be using these TPDP materials are also included..

### 1.1. Rationale & purpose

This TPDP, which CYCO has designed for kindergarten teachers, will focus on teacher responsiveness. This means helping teachers develop their abilities to identify, interpret, and appropriately respond to their in-class students' scientific thinking. In order for these responses to support children's inquiry and learning, teachers need to practice, develop and hone their perceptions through deliberate, explicit reflection on their teaching strategies. The TPDP offers repeated opportunities for such strategies to be observed, discussed and practised. This in turn will help teachers to support student inquiry by reasoning substantively about their students' scientific ideas and to utlise productive ideas from students, which reflect good understanding, even when these are perhaps expressed in students' unconventional ways.

Furthermore, the TPDP will focus on the challenges faced in the participants' own classrooms and will support them in finding contemporary science teaching approaches and inquiry strategies to cope with these challenges whilst maximising learning.

### 1.2 Proposed Duration (number of meetings & hours).

The PDP consists of ten 2½ hour meetings twice a month. Taking into consideration national holidays and academic commitments this means that the seminars will run from November 2010 to May 2011.

### 1.1. **Outline of meetings**

| Meeting | Duration | Topic | Materials to be used | Outline of Activities |
|---|---|---|---|---|
| 1 | 2,5 hrs | • Introductions<br>• What is Science? What is Scientific Knowledge and how is this constructed?<br>• Challenges faced in teaching science in Kindergarten<br>• Phases of the moon I | | |
| 2 | 2,5 hrs | • Current trends in teaching and learning in Science in Kindergarten<br>• The national Science curriculum (the development of scientific skills and beyond)<br>• Young children's ideas concerning science<br>• Phases of the moon II | | |
| 3 | 2,5 hrs | • Inquiry as a process of teaching and learning in science<br>• Conceptual Understanding in Science: different perspectives<br>• Epistemological competence<br>• Phases of the moon III | | |
| | | Christmas Holidays | | |
| 4 | 2,5 hrs | • Present work on phases of the moon | | |
| 5 | 2,5 hrs | • Principles of lesson plan design for teaching science in KG<br>• Preparation of re-designed lessons | | |
| 6 | 2,5 hrs | • The role of experiments in science teaching and learning<br>• The development of abilities for analogical reasoning<br>• The development of abilities for Mechanistic reasoning | | |
| 7 | 2,5 hrs | • Video club/teachings reflections and discussions I<br>• Teaching Strategies I | | |
| 8 | 2,5 hrs | • Video club/teachings reflections and discussions II<br>• Teaching Strategies II | | |
| 9 | 2,5 hrs | • Video club/teachings reflections and discussions III<br>• Teaching Strategies III | | |
| 10 | 2,5 hrs | • The teacher's role in the classroom – The overall picture<br>• The development of abilities for | | |

the Scientific Method

### 1.2. Notes for teacher educators on how to use PDP materials

### 1.3. Videos

Seven video excerpts are included in the TPDP which include subtitles accordingly

### 1.4. Comprehensive list of accompanying materials

| Description | Number |
|---|---|
| Advertising the TPDPs (brochure & application form) | 2 |
| Powerpoint slides/presentations | 10 |
| Reflection prompts, activity sheets etc | 15 |
| Videos | 7 |
| Figures etc | 0 |
| Assessment/evaluation documents | 1 |

1. **<u>Advertising the TPDPs</u>**

   The attached brochure and application form were sent to all kindergarten schools, both private and public, inviting participation to the TPD. The documents are attached as

   **2.1.CYCO.WP6.TDPD6.1.pdf**

   **2.2.CYCO.WP6.TDPD6.1.doc**

2. **PowerPoint slides/presentations**

   The following 10 .ppt presentations accompany the 10 seminars which make up the TPDP

   **3.1.CYCO.WP6.TDPD6.1.ppt**

   **3.2.CYCO.WP6.TDPD6.1.ppt**

   **3.3.CYCO.WP6.TDPD6.1.ppt**

   **3.4.CYCO.WP6.TDPD6.1.ppt**

   **3.5.CYCO.WP6.TDPD6.1.ppt**

   **3.6.CYCO.WP6.TDPD6.1.ppt**

   **3.7.CYCO.WP6.TDPD6.1.ppt**

   **3.8.CYCO.WP6.TDPD6.1.ppt**

   **3.9.CYCO.WP6.TDPD6.1.ppt**

   **3.10.CYCO.WP6.TDPD6.1.ppt**

3. **Reflection prompts, activity sheets etc**

The reflection sheets are used at pertinent points during the seminars to support reflection and group discussion on a number of topics

**4.1.CYCO.WP6.TDPD6.1.docx**

**4.2.CYCO.WP6.TDPD6.1. docx**

**4.3.CYCO.WP6.TDPD6.1. docx**

**4.4.CYCO.WP6.TDPD6.1. docx**

**4.5.CYCO.WP6.TDPD6.1. docx**

**4.6.CYCO.WP6.TDPD6.1. docx**

**4.7.CYCO.WP6.TDPD6.1. docx**

**4.8.CYCO.WP6.TDPD6.1. docx**

**4.9.CYCO.WP6.TDPD6.1. docx**

**4.10.CYCO.WP6.TDPD6.1. docx**

**4.11.CYCO.WP6.TDPD6.1. docx**

**4.12.CYCO.WP6.TDPD6.1. docx**

**4.13.CYCO.WP6.TDPD6.1. docx**

*European University Cyprus (CYCO): inquiry for elementary school science teachers*

**Teacher Professional Development Programme:**

**Work Package 6a**

**September 2010**

### 1.1. Rationale & purpose

This TPDP has been designed for elementary school science teachers and focuses on using modelling-based approaches to teaching and learning in science. The main idea is that learning in science can be implemented through the process of engaging students in the practice of using models as tools for exploration, synthesis, prediction, and, ultimately, knowledge construction. Modeling-based learning (MbL) in science can provide the context in which the construction and refinement of models can achieve better quality outcomes in terms of the fundamental conceptual understanding of concepts, operational understanding of the nature of science and help develop the ability to employ procedural and reasoning skills, than currently possible through alternative learning environments/tools. Additionally, modeling can provide students with opportunities to think and talk scientifically about physical phenomena, to share, discuss and critique their ideas and to reflect upon their own understanding. The current TPDP is designed to provide teachers with opportunities to learn about contemporary pedagogical ideas concerning the use of Information Technology to support teaching and learning in Science, to learn about approaches of using models of natural phenomena and the process of their construction in science lessons, to plan science lessons with these approaches within the National Curriculum, to study and discuss videotaped excerpts of modeling-based teaching and learning lessons and finally to familiarise themselves with a modeling software used in public elementary schools in Cyprus.

### 1.2 Proposed Duration (number of meetings & hours).

The PDP consists of eight 2½ hour meetings.

### 1.3. Outline of meetings

| Meeting | Duration | Topic | Materials to be used | Outline of Activities |
|---|---|---|---|---|
| 1 | 2,5 hrs | • Introductions<br>• Contemporary trends in Teaching and Learning Science<br>• Becoming familiar with the software Stagecast Creator I | | |
| 2 | 2,5 hrs | • The modeling approach as a learning process in Science<br>• Becoming familiar with the software Stagecast Creator II | | |
| 3 | 2,5 hrs | • Inquiry as a process of teaching and learning in science<br>• Becoming familiar with the software Stagecast Creator III | ?. | |
| | | Christmas Holidays | | |
| 4 | 2,5 hrs | • Pedagogical principles of integrating and utilising Information technology and Communications in Science lessons<br>• Becoming familiar with the software Stagecast Creator IV | | |
| 5 | 2,5 hrs | • Principles of lesson plan design for teaching science<br>• Preparation of re-designed lessons | | |
| 6 | 2,5 hrs | • Video club/teachings reflections and discussions I<br>• Teaching strategies I | | |
| 7 | 2,5 hrs | • Video club/teachings reflections and discussions II<br>• Teaching strategies II | | |
| 8 | 2,5 hrs | • Video club/teachings reflections and discussions III<br>• Teaching strategies III | | |
| | | | | |

### 1.3. Notes for teacher educators on how to use PDP materials

### 1.4. Videos

Nine video excerpts are included in the TPDP which include subtitles accordingly

### 1.5. Comprehensive list of accompanying materials

| Description | Number |
|---|---|
| Advertising the TPDPs (brochure & application form) | 2 |
| Powerpoint slides/presentations | 8 |
| Reflection prompts, activity sheets etc | 5 |
| Videos | 9 |
| Figures etc | 0 |
| Assessment/evaluation documents | 1 |

4. **<u>Advertising the TPDPs</u>**

   The attached brochure and application form were sent to all kindergarten schools, both private and public, inviting participation to the TPD. The documents are attached as

   **2.1.CYCO.WP6.TDPD6.1b.pdf**

   **2.2.CYCO.WP6.TDPD6.1b.doc**

5. **PowerPoint slides/presentations**

   The following 10 ppt presentations accompany the 10 seminars which make up the TPDP

   **3.1.CYCO.WP6.TDPD6.1b.ppt**

   **3.2.CYCO.WP6.TDPD6.1b.ppt**

   **3.3.CYCO.WP6.TDPD6.1b.ppt**

   **3.4.CYCO.WP6.TDPD6.1b.ppt**

   **3.5.CYCO.WP6.TDPD6.1b.ppt**

   **3.6.CYCO.WP6.TDPD6.1b.ppt**

   **3.7.CYCO.WP6.TDPD6.1b.ppt**

   **3.8.CYCO.WP6.TDPD6.1b.ppt**

6. **Reflection prompts, activity sheets etc**

14 ready-made simulations are included in this TPDP, to be used by teachers in order to facilitate their learning of the software (Stagecast Creator) and its use as a tool in science teaching and learning. These are included in a the following folders.

**4.2.CYCO.WP6.TDPD6.1b.**

**4.3.CYCO.WP6.TDPD6.1b.**

**4.4.CYCO.WP6.TDPD6.1b.**

**4.5.CYCO.WP6.TDPD6.1b.**

**7. Videos**

**5.1.CYCO.WP6.TDPD6.1b**

**5.2.CYCO.WP6.TDPD6.1b**

**5.3.CYCO.WP6.TDPD6.1b**

**5.4.CYCO.WP6.TDPD6.1b**

**5.5.CYCO.WP6.TDPD6.1b**

**5.6.CYCO.WP6.TDPD6.1b**

**5.7.CYCO.WP6.TDPD6.1b**

**5.8.CYCO.WP6.TDPD6.1b**

**5.9.CYCO.WP6.TDPD6.1b**

**8. Assessment/evaluation documents**

**7.1.CYCO.WP6.TDPD6.1b.docx**

*European University Cyprus (CYCO): Inquiry for Physics secondary school teachers*

**Teacher Professional Development Programme**

**Work Package 6a**

**September 2010**

This document contains a brief description of the scope, rationale and purpose of the CYCO TPDP that will be delivered to Physics teachers in Cyprus (November 2010 – May 2011). Details about the duration, an outline of the meetings and activities, a list of related materials and how they are used and notes (if any) to teacher educators that might be using these TPDP materials are also included.

### 1.1. Rationale & purpose

This TPDP, which CYCO has designed for Physics secondary school teachers, will focus on teacher responsiveness, which means helping teachers develop their abilities to identify, interpret, and appropriately respond to their in-class students' scientific thinking. In order for these responses to support students' inquiry and learning, teachers need to practice, develop and hone their perceptions through deliberate, explicit reflection teaching strategies. The TPDP offers repeated opportunities for such strategies to be observed and discussed from both exemplary videos and the participants' own videos of teaching Physics. This in turn will help teachers to reason substantively about the students' scientific ideas and how to utlise productivly their ideas, which reflect good science understanding, even if/when this is perhaps expressed in students' unconventional ways.

Furthermore the TPDP will focus on the challenges faced in the participants' own classrooms and will support them in finding contemporary science teaching approaches and inquiry strategies to cope with these challenges whilst maximising learning.

### 1.2. Proposed Duration (number of meetings & hours).

The PDP consists of ten 2½ hour meetings twice a month. Taking into consideration national holidays and academic commitments this means that the seminars will run from November 2010 to May 2011.

## 1.6. **Outline of meetings**

| Meeting | Duration | Topic | Materials to be used | Outline of Activities |
|---|---|---|---|---|
| 1 | 2,5 hrs | • Information about the seminar / introductions<br>• Introduction: What is science, what is scientific knowledge, how is this constructed?<br>• Challenges in teaching physics in secondary school<br>• Phases of the moon I | | |
| 2 | 2,5 hrs | • Contemporary trends in teaching and learning in Sciences<br>• The science National Curriculum in secondary education<br>• Students' ideas in/about Science<br>• Phases of the moon II | | |
| 3 | 2,5 hrs | • The Inquiry approach as a process for teaching and learning in science<br>• Developing conceptual understanding and scientific competence<br>• Phases of the moon III | | |
| Christmas Holidays | | | | |
| 4 | 2,5 hrs | • Teaching approaches and their consequences in teaching and learning in science | | |
| 5 | 2,5 hrs | • Principles of lesson planning in science | | |
| 6 | 2,5 hrs | • Role of experiments in teaching and learning in science.<br>• Managing uncertainty in measurements in science | | |
| 7 | 2,5 hrs | • ·Reflection and discussion of video lesson excerpts I<br>• Teaching strategies I | | |
| 8 | 2,5 hrs | • Reflection and discussion of video lesson excerpts II<br>• Teaching strategies II | | |
| 9 | 2,5 hrs | • Reflection and discussion of video lesson excerpts III<br>• Teaching strategies III | | |
| Easter Holidays | | | | |
| 10 | 2,5 hrs | • The teacher's role in the class during science lessons Developing Mechanistic Reasoning<br>• Developing the skills of Mechanistic Reasoning<br>• Developing the skills of Analogical Reasoning | | |
| National Workshop Presentations | | | | |

## 1.7. Notes for teacher educators on how to use PDP materials

**1.8. Video:17 video excerpts are included with subtitles where necessary**

**1.9. Comprehensive list of accompanying materials**

| Description | Number |
|---|---|
| Advertising the TPDPs (brochure & application form) | 2 |
| Powerpoint slides/presentations | 10 |
| Reflection prompts, activity sheets etc | 15 |
| Videos | 17 |
| Figures etc | 0 |
| Assessment/evaluation documents | 2 |

**9. <u>Advertising the TPDPs</u>**

The attached brochure and application form were sent to all kindergarten schools, both private and public, inviting participation to the TPD. The documents are attached as

**2.1.CYCO.WP6.TDPD6.1c.pdf**

**2.2.CYCO.WP6.TDPD6.1c.doc**

**10. PowerPoint slides/presentations**

The following 10 ppt presentations accompany the 10 seminars which make up the TPDP

**3.1.CYCO.WP6.TDPD6.1c.ppt**

**3.2.CYCO.WP6.TDPD6.1c.ppt**

**3.3.CYCO.WP6.TDPD6.1c.ppt**

**3.4.CYCO.WP6.TDPD6.1c.ppt**

**3.5.CYCO.WP6.TDPD6.1c.ppt**

**3.6.CYCO.WP6.TDPD6.1c.ppt**

**3.7.CYCO.WP6.TDPD6.1c.ppt**

**3.8.CYCO.WP6.TDPD6.1c.ppt**

**3.9.CYCO.WP6.TDPD6.1c.ppt**

**3.10.CYCO.WP6.TDPD6.1c.ppt**

**11. Reflection prompts, activity sheets etc**

The reflection sheets are used at pertinent points during the seminars to support reflection and group discussion on a number of topics

**4.1.CYCO.WP6.TDPD6.1c.docx**

**4.2.CYCO.WP6.TDPD6.1c.docx**

**4.3.CYCO.WP6.TDPD6.1c.docx**

**4.4.CYCO.WP6.TDPD6.1c.docx**

**4.5.CYCO.WP6.TDPD6.1c.docx**

**4.6.CYCO.WP6.TDPD6.1c.docx**

**4.7.CYCO.WP6.TDPD6.1c.docx**

**4.8.CYCO.WP6.TDPD6.1c.docx**

**4.9.CYCO.WP6.TDPD6.1c.docx**

**4.10.CYCO.WP6.TDPD6.1c.docx**

**4.11.CYCO.WP6.TDPD6.1c.docx**

**4.12.CYCO.WP6.TDPD6.1c.docx**

**4.13.CYCO.WP6.TDPD6.1c.docx**

**4.14.CYCO.WP6.TDPD6.1c.docx**

**4.15.CYCO.WP6.TDPD6.1c.docx**

**12. Videos**

**5.1.CYCO.WP6.TPDP.6.1c**

**5.2.CYCO.WP6.TPDP.6.1c**

**5.3.CYCO.WP6.TPDP.6.1c**

**5.4.CYCO.WP6.TPDP.6.1c**

**5.5.CYCO.WP6.TPDP.6.1c**

**5.6.CYCO.WP6.TPDP.6.1c**

**5.7.CYCO.WP6.TPDP.6.1c**

**5.8.CYCO.WP6.TPDP.6.1c**

**5.9.CYCO.WP6.TPDP.6.1c**

**5.10.CYCO.WP6.TPDP.6.1c**

**5.11.CYCO.WP6.TPDP.6.1c**

**5.12.CYCO.WP6.TPDP.6.1c**

**5.13.CYCO.WP6.TPDP.6.1c**

**5.14.CYCO.WP6.TPDP.6.1c**

**5.14.CYCO.WP6.TPDP.6.1c**

**5.15.CYCO.WP6.TPDP.6.1c**

**5.16.CYCO.WP6.TPDP.6.1c**

**5.17.CYCO.WP6.TPDP.6.1c**

**13. Assessment/evaluation documents**

**7.1.CYCO.WP6.TDPD6.1c. docx**

**7.2.CYCO.WP6.TDPD6.1c. docx**

## *Gazi University: Interactive computer simulations/animations in IBST/E*

**Teacher Professional Development Programme**

**Work Package 6k**

**September 2010**

This document contains brief information about the scope, rationale and purpose of our Teacher Professional Development Program (TPDP) that will be delivered, along with details about its duration, outline of meetings and activities, a list of related materials and how they are used and notes to teacher educators that might be using these TPDP materials.

### 1.1. Rationale & purpose

| OUTLINE OF MEETINGS, ACTIVITIES & LIST OF MATERIALS | | | | |
|---|---|---|---|---|
| Meeting Number | Duration | Topic | Materials to be used (powerponts, videos, activity sheets etc) | Outline of Activities (Expected outcomes) |

GU will produce a teacher development module on the use of interactive computer simulations or animations (ICA) in IBST/E. The function of these simulations/animations is to clarify underlying mechanisms of natural phenomena. The module will be available online as well as in hardcopy-workbook format and can also be used as the basis of teacher professional development workshops. It will enable teachers to develop content knowledge as well as pedagogical approaches and tools for teaching natural phenomena.

1.**2. Proposed Duration (number of meetings & hours)**

The Teacher Professional Development Program (TPDP) will take approximately 2-3 hrs to complete in the online and hardcopy versions and we will also provide a 3 days extended workshop.

| | | | | |
|---|---|---|---|---|
| 1 | 3 hrs | Information Communication Technologies in Science Education and Computer Assisted Science Teaching | 2 power points (ppt)<br>4 assessment tools (before PDP) | • Technology, education technology and the place of technology in teaching science<br>• Technology enhanced science teaching<br>• Computer Assisted Teaching)<br>• Effective use of computers in science teaching<br>• The role of teacher and student in Computer Assisted Science Teaching |
| 2 | 3 hrs | Inquiry-based interactive computer animations enhanced science lessons | 2 ppt | • The role of interactive animations in science<br>• The role of inquiry in science<br>• Doing science with inquiry-based interactive computer animations |
| 3 | 4 hrs | 6th grade "Force and Motion" Unit and teaching it with inquiry-based interactive computer animations (IBICA) | 2 animations<br>1 lesson plan<br>1 sample ppt (force and motion content knowledge) | • Subjects: Speed in our life and measuring forces<br>• The importance of teaching these subjects in science<br>• Discussion about teacher actions in these subjects for facilitating student inquiry<br>• Examining animations, sample ppt and lesson plans for creating effective technology enhanced science environments |
| 4 | 3 hrs | 6th grade "Force and Motion" Unit and teaching it with inquiry-based interactive computer animations (IBICA) | 2 animations<br>1 lesson plan<br>1 sample ppt (force and motion content knowledge) | • Subjects: Balanced and unbalanced forces, weight is a force<br>• The importance of teaching these subjects in science<br>• Discussion about teacher actions in these subjects for facilitating student inquiry<br>• Examining animations, sample ppt and lesson plans for creating effective technology enhanced science |

| | | | | |
|---|---|---|---|---|
| | | | | environment |
| 5 | 4 hrs | 7th grade "Force and Motion" Unit and teaching it with inquiry-based interactive computer animations (IBICA) | 4 animations<br>1 lesson plan<br>1 sample ppt (force and motion content knowledge) | • Subjects: Examining the springs work and energy, kinds of energy.<br>• The importance of teaching these subjects in science<br>• Discussion about teacher actions in these subjects for facilitating student inquiry<br>• Examining animations, sampe ppt and lesson plans for creating effective technology enhanced science environment |
| 6 | 3 hrs | 7th grade "Force and Motion" Unit and teaching it with inquiry-based interactive computer animations (IBICA) | 4 animations<br>1 lesson plan<br>1 sample ppt (force and motion content knowledge) | • Subjects: kinds of energy, conversion of energy, simple machines, energy and friction force<br>• The importance of teaching these subjects in science<br>• Discussion about teacher actions in these subjects for facilitating student inquiry<br>• Examining animations, sample ppt and lesson plans for creating effective technology enhanced science environment |
| 7 | 4 hrs | 8th grade "Force and Motion" Unit and teaching it with inquiry-based interactive computer animations (IBICA) | 4 animations<br>1 lesson plan<br>1 sample ppt (force and motion content knowledge) | • Subjects: buoyancy force in liquids, why some objects float?<br>• The importance of teaching these subjects in science<br>• Discussion about teacher actions in these subjects for facilitating student inquiry<br>• Examining animations, sample ppt and lesson plans for creating effective technology enhanced science environment |

| | | | | |
|---|---|---|---|---|
| 8 | 3 hrs | 8th grade "Force and Motion" Unit and teaching it with inquiry-based interactive computer animations (IBICA) | 3 animations<br>1 lesson plan | • Subjects: force causes the pressure<br>• The importance of teaching these subjects in science<br>• Discussion about teacher actions in these subjects for facilitating student inquiry<br>• Examining animations, sample ppt and lesson plans for creating effective technology enhanced science environment |
| 7 | 2 hrs | Assessing the PDP and feedbacks | 6 assessment tools (after PDP) | • Assessment tools<br>• How to be a member of Professional development website |

**Notes for teacher educators on how to use PDP materials**

This module can be used in 6th, 7th and 8th grade "Force and Motion" units in order to clarify underlying mechanisms of natural phenomena. The developed animations belong to the subject of National Primary School Science Programme (NPSSP). There is at least one interactive computer animation belonging to NPSSP. In order to enhance science lessons with ICA the samples of 6th, 7th and 8th grade "Force and Motion" units lesson plans, content knowledge power points will be shared through the web site of PDP.

There are no videos in our PDP. We have 19 interactive computer animations.

**A comprehensive list of accompanying materials:**

| Description | Number |
|---|---|
| 1. Advertising the TPDPs in local contexts | 1 |
| 2. Animations | 19 |
| 3. Powerpoint slides/presentations | 9 |
| 4. Reflection prompts, activity sheets etc | 6 |
| 5. Assessment/evaluation documents | 7 |

**2. Advertising the TPDPs in local contexts**

2.1.GU.WP6.TPDP6.14.pub

**3. Powerpoint slides/presentations**

3.1.GU.WP6.TPDP6.14.ppt

3.2.GU.WP6.TPDP6.14.ppt

3.3.GU.WP6.TPDP6.14.ppt

3.4.GU.WP6.TPDP6.14.ppt

3.5.GU.WP6.TPDP6.14.ppt

3.6.GU.WP6.TPDP6.14.ppt

3.7.GU.WP6.TPDP6.14.ppt

3.8.GU.WP6.TPDP6.14.ppt

3.9.GU.WP6.TPDP6.14.ppt

**4. Reflection prompts, activity sheets etc**

4.1.GU.WP6.TPDP6.14.doc

4.2.GU.WP6.TPDP6.14.doc

4.3.GU.WP6.TPDP6.14.doc

4.4.GU.WP6.TPDP6.14.doc

4.5.GU.WP6.TPDP6.14.doc

4.6.GU.WP6.TPDP6.14.doc

**5. Interactive Computer Animations**

5.1.GU.WP6.TPDP6.14.fla

5.2.GU.WP6.TPDP6.14.fla

5.3.GU.WP6.TPDP6.14.fla

5.4.GU.WP6.TPDP6.14.fla

5.5.GU.WP6.TPDP6.14.fla

5.6.GU.WP6.TPDP6.14.fla

5.7.GU.WP6.TPDP6.14.fla

5.8.GU.WP6.TPDP6.14.fla

5.9.GU.WP6.TPDP6.14.fla

5.10.GU.WP6.TPDP6.14.fla

5.11.GU.WP6.TPDP6.14.fla

5.12.GU.WP6.TPDP6.14.fla

5.13.GU.WP6.TPDP6.14.fla

5.14.GU.WP6.TPDP6.14.fla

5.15.GU.WP6.TPDP6.14.fla

5.16.GU.WP6.TPDP6.14.fla

5.17.GU.WP6.TPDP6.14.fla

5.18.GU.WP6.TPDP6.14.fla

5.19.GU.WP6.TPDP6.14.fla

**7. Assessment/evaluation documents**

7.1.GU.WP6.TPDP6.14.doc

7.2.GU.WP6.TPDP6.14.doc

7.3.GU.WP6.TPDP6.14.doc

7.4.GU.WP6.TPDP6.14.doc

7.5.GU.WP6.TPDP6.14.doc

7.6.GU.WP6.TPDP6.14.doc

7.7.GU.WP6.TPDP6.14.doc

*Helsinki University: Motivation for Science Teachers*

**Teacher Professional Development Programme**

**Work package 6h**

**September 2010**

## Rationale and purpose

According to the OECD report (OECD, 2007), the great majority of secondary school students participating in the PISA survey consider science to be important for understanding the natural world and that it usually improves people's living conditions. However, only half of them consider science to be especially relevant to them personally, and even less would like a career involving it.

Historically, students' motivation and interest in science and technology (S&T) have been intensively researched since the 1960s. Science in general is quite interesting for students, but most students, especially girls, do not find school science or careers and occupations in those fields interesting (Osborne, Simon & Collins, 2003). Furthermore, such dichotomous motivation and interest in S&T—science is important, but not for students themselves—is the most critical factor that accounts for students' better understanding in science (Kim & Song, 2009).

In WP6, University of Helsinki (HU) is engaging in design-based research aiming to produce a professional development package, a web-based teacher material for science teachers. Design is based on their previous analysis of nation-wide data from the ROSE project and from the PISA 2006 Scientific Literacy Assessment.

The concept 'motivation' in previous studies has been used to describe the factors within an individual (including interactions with the environment), which arouse, maintain, and channel behaviour towards the aims of Science and Technology (S&T) teaching. *Self-Determination Theory* (SDT) has conceptualised motivation from the viewpoint of students' psychological needs which are assumed to be both innate and universal. These needs consist of the *need for autonomy*, the *need for competence*, and the *need for relatedness (need to belong to a group)* (Deci & Ryan, 2004).

In addition to these basic psychological needs, motivation could originate from the *interest* of the student in a learning activity. Interest as an outcome of interactions in the learning environment can be approached from two major points of view: personal or situational. Situational interest is spontaneous and it exists only for a limited period of time. If situational interest is maintained long enough, usually with external support, it may develop into personal interest, which is topic specific, persists over time, develops slowly and tends to have long-lasting effects on a person's knowledge and values. Personal interest is a content-specific concept and a facilitator of learning and it consists of two kinds of valences: feeling-related and value-related valences. Feeling-related valences are feelings that are associated with a topic or an object, for instance, feelings of enjoyment and involvement. Value-related valences refer to the attribution of personal significance to an object. (Krapp, 2007).

Consequently, well-organized learning activities and teacher instructions could increase the motivation of a learner. This is because self-determined learning occurs when a learning activity itself supports fulfilment of basic psychological needs or development of interest. The previous studies, mentioned above, have proved that student motivation could be increased through emphasizing the following features in learning activities:

1. Autonomy-supporting activities or support for choices
    a. The student-centred learning methods or use of ICT;
    b. Co-planning of the learning activities or students have choices of how to study;
2. **S**upport for students' feeling of competency
    a. Choice of tasks, which are possible for the student to solve;
    b. Choice and use of constructive evaluation methods;
3. **S**upport for students' social relatedness
    a. Choice of activities and ICT use which help students to feel close to peers;
    b. The feeling that the students can trust each other;
4. **S**upport for interest
    a. To awaken feeling related components of interest (enjoyment);
    b. To awaken value related components of interest (usefulness);
    c. Content and context.
5. **S**upport for feeling of relevance
    a. Celevance of S&T from the point of view of practical everyday life problems
    b. Relevance of S&T from the point of view of S&T studies and careers

**Purpose**

The professional development package for science teachers in pre- and in-service training will enable them to integrate motivational and interest features to science activities in order to increase students' motivation, through support for student autonomy, competency, social relatedness, interest, and feeling of relevance of science studies. In the interdisciplinary perspective, teachers will obtain ideas for developing student awareness of the nature of careers in Science, Technology, Engineering and Mathematics (STEM).

Participating teachers familiarise themselves with inquiry based science teaching from various perspectives. In more detail, teachers get acquainted with learning science through reading and writing activities, using narratives in science learning, using graphical network presentations (GNP) in science learning, conducting science inquiry activities in the classroom, and conducting industry site visits as an out-of-school inquiry activity. By obtaining a multifaceted view of the inquiry approach, teachers are more likely to adopt this student-activating way of organizing their teaching into their teaching procedure.

### 1.2 Proposed duration (Number of meetings and hours)

The HU TPDP consisted of three meetings, each of which lasted for two days (always Friday and Saturday). Friday meetings were whole day meetings, starting at 0900 and ending at 1600 or 1630. Saturday meetings started at 0900 as well and ended at 1300-1400. So the overall time spent with the meeting was 12,5 h + 12 h + 11 h = 35,5 h. The dates of the meetings were 26-27.11.2009, 22-23.1.2010 and 12-13.3.2010

### 1.3. Outline of meetings, activities & list of materials

| Meeting Number | Duration | Topic | Materials to be used (powerponts, videos, activity sheets etc) | Outline of Activities |
|---|---|---|---|---|
| 1, 26.-27.11 | 12,5 hrs | Introduction to inquiry approach in teaching science | Powerpoint presentations | • Overview of the conventional and IBST/E approaches to science teaching<br>• Discussion about teacher actions for facilitating student inquiry<br>• Overview of meaningful learning<br>• Overview of supporting students' motivation and interest<br>• Planning teachers' own way of applying the inquiry approach |
| 2, 22.-23.1 | 12 hrs | Many ways of applying the inquiry approach | Powerpoint presentations, videos of participating teachers' inquiry approach experiments | • Introducing teachers' own inquiry experiments and discussing them<br>• Overview about narrative approach to science teaching<br>• Overview of reading and writing within the inquiry approach<br>• Overview of the role of interest and motivation in teaching science<br>• Planning teachers' |

| | | | | |
|---|---|---|---|---|
| | | | | own inquiry teaching sequences in small groups<br>• discussing teachers' plans |
| 3, 12.-13.3 | 11 hrs | Teachers' experiences about inquiry approach & further ideas | Powerpoint presentations | • Introducing teachers' second experiments and discussion about these experiments<br>• Overview of POE approach in inquiry activities<br>• Overview of industry site visit as a means of inquiry |

### 1.3 Notes for teacher educators on how to use TPDP materials

There are five different perspectives from which the idea of inquiry based science teaching is approached in the HU PDP, and based on these approaches, a teacher guide that consists of five modules has been developed. Each module contains some video clips captured from real classroom situations (subtitled in English), and guiding themes for discussion in face-to-face or virtual teacher training session. There is an introduction and background information as well as examples of relevant learning activities in each module. Finally each module has some tasks for teachers. These modules will be evaluated in real classroom situations. Powerpoint presentations related to these modules are listed below. The modules of the professional development package for science teachers are designed as follows:

### Module 1. Learning science through reading and writing activities

Various types of texts, such as course books, encyclopaedias, commercial materials, brochures, and websites, are used as sources of information in science learning activities. Reading represents an active process in which students acquire new knowledge by reconstructing given texts. As a personal process of making meanings, reading may facilitate learning by writing exercises and discussions. This module consists of exercises that motivate students' science learning as follows:

- Activating students' previous views and knowledge,
- Comparing students' previous conceptions with the information featured in the given texts,
- Dissecting the viewpoints presented in the text,
- Applying the general principles presented in the text to imaginary/practical settings,
- Supporting learning in small groups for deepened discussion and reflection,

- Voicing critical opinions,
- Writing a final summary.

As with reading, a teacher should consider that writing is a whole process, which involves students in synthesising new ideas through re-organising the ideas into sentences and paragraphs. Students' writing should be guided so as to be in logical order by setting out paragraphs with their main idea(s), and by supporting their main points with pieces of evidence, by drafting, and by editing.

### Module 2. Narratives in science

Storytelling has long been an effective teaching method at primary level. It has been argued that, through stories, growing children create meaning from school experiences that can relate to their lives. The hypothesis is that, by increasing the use of narratives and stories in science classroom, students will be shown the value of science, and therefore, their interest towards science will be enhanced. The stories are fantasy stories, biographies of renowned scientists, and anecdotes about how challenges were overcome trough scientific knowledge. Narrators could be guest speakers from out of school. It is important to highlight two of the main sources of confusion: animisms and radical behaviourism. In animism, physical phenomena are explained by the intentions of inanimate objects. In contrast, radical behaviourism interprets human actions with natural laws.

### Module 3. Use of graphical network presentations (GNP) in science learning

In order to help the students to form a holistic view of science topics, the graphical network presentation (GNP) will link students to practical problems in everyday life and to science in society. GNP consists of two-dimensional displays of concepts (usually represented within boxes or circles), connected by directed arcs encoding brief relationships (linking phrases) between pairs of concepts forming propositions. GNP has emerged as one of the most effective methods in representing and communicating knowledge. This helps students to organise their thinking and to summarise their objects of study. In educational studies, a growing body of research indicates that the use of GNP can facilitate the development of meaningfulness in students' learning activities. This method has also been valuable as a tool for knowledge acquisition during the construction of expert systems and performance support systems, by capturing and sharing advanced knowledge.

### Module 4. Science inquiry activities

From the point of view of student motivation, inquiry based activities could demonstrate the relevance of science education if these activities are linked to practical day-to day life problems or to construction and the manufacturing of products. For example, matter and materials are easily connected toother science issues. Inquiry activities, connected to matter and materials, could, for example, help students to become familiar with properties and behaviour of common materials, their usage, microscopic models describing their properties and behaviour, and moreover, the use of (raw) materials in constructions and manufacturing products. Predict-Observe-Explain (POE) activities could be used for these purposes. The use of POE requires students to integrate the macroscopic and microscopic views, and to provide a particulate and molecular explanation of structure, properties, and behaviour of materials. The validity of models will be analysed from the point of view of the properties of materials, the use of materials in daily life, and their use as raw ingredients in manufacturing. Consequently, this module aims to enhance students' understanding of the nature of matter, and microscopic and sub-microscopic models, as well as the relationships among the structure, properties, and applications of materials.

### Module 5. Industry site visit as an out-of-school activity

Industry site visits can provide students with opportunities to learn in-depth about certain science topic. Before the visit, students are familiarised with the relevant products, materials and processes. During the visit, students will learn about the use of materials as raw ingredients in manufacturing and producing artefacts. In addition, the students will become familiar with careers at these industrial sites. After the site visit, teachers will continue the analysis of properties and use of materials in science class. Consequently, this module presents materials not only as a body of scientific knowledge. Rather, science is integrated and studied as a subject which influences the lives of students and their society. Lastly, this module will offer possibilities to meet role models at the industry sites.

### 1.4 comprehensive list of accompanied materials

| Description | Number |
|---|---|
| Advertising the TPDPs in local contexts | 3 |
| Powerpoint slides/presentations | 9 |
| Reflection prompts, activity sheets etc | 0 |
| Videos on five dvd's | 5 |
| Figures etc | 0 |
| Assessment/evaluation documents | 1 |

*Mälardalen University: dialogic teaching for IBST/L*

**Teacher Professional Development Programme**

**Work Package 6c/d**

**September 2010**

## 1.1 Syfte och upplägg

Detta fortbildningsmaterial vänder sig till alla lärare i naturvetenskap/teknik oavsett vilka åldersgrupper du undervisar i. Fortbildningen ger tillfälle till reflektion kring din egen och andras undervisning. Det är alltså arbetet i klassrummet som är i fokus. För att få idéer och kanske nya tankar läser du också en del kurslitteratur och aktuell forskning som beskriver både faktisk undervisning och de grundläggande tankar den vilar på.

Men hur ska man kunna analysera sin egen och andras undervisning? Vi kommer att behandla olika analysmetoder- och verktyg, som du sedan får använda praktiskt. Vi kommer även att visa utdrag ur videoclips som vi diskuterar och analyserar tillsammans. Materialet består av kurslitteratur, lektionsmaterial, goda undervisningsexempel samt tips på användbara länkar. Fortbildningsmaterialet fördelas på 6 träffar enligt följande program:

Litteratur som förväntas läsas mellan träffarna återfinns i separat bilaga.

Första träffen ger en överblick över vad som menas med 1) inquiry based science teaching and learning, 2) lärares kommunikativa förhållningssätt 3) skrivande och samtal i dialog samt 4) lärande för hållbar utveckling. Här presenteras också de lektionssekvenser vi kommer att analysera och träna på under träffarna. En första planering av egna enklare klassrumsstudier förbereds. Ni presenterar också vilken undervisning ni själva arbetar med just nu, och som ni skulle kunna arbeta med under denna fortbildning.

Andra träffen presenterar hur man kan analysera lektionsaktiviteter, och göra enkla analystabeller om man sitter med en kollega för att analysera. Vid detta tillfälle så övar vi på att analysera en lektion som handlar om Vattnets kretslopp. Deltagarna analyserar sedan videoclips med avseende på flera aktiviteter och innehåll. Vi summerar sedan gruppernas analyser och får en helhetsbild av vad som försigår. Analyser av samtal genomförs på video A och B.

Tredje träffen handlar om Lärarens kommunikativa förhållningssätt (Mortimer & Scott), och Dialogic Inquiry (Alexander, Robin, 2008: Towards dialogic teaching. Rethinking classroom talk. Daidos.) En modell för fyra olika sätt att kommunicera i helklass innehåller de två dimensionerna interaktion och monolog-dialog. Samtalets karaktär diskuteras utifrån denna modell, och gruppers samtal som sonderande eller redigerade (Barnes &Todd, 1995) berörs. Här behandlas elevers frågor som utgångspunkt för experiment och nya undersökningar. Analyser av samtal genomförs på video A och B.

Fjärde träffen handlar om skrivande och samtal i dialog, samt argumentationens betydelse. Två huvudriktningar i skrivforskningen diskuteras: 1) Writing Across the Curriculum (WAC) – Skrivande i alla

ämnen – kan användas oavsett ämne. Spontanskrivande och skriva för att utforska hjälper eleverna att "göra ämnet till sitt eget" som i loggböcker t.ex. 2) Writing in the Disciplines (WID) – skrivande i specifika ämnen – här betonas begrepp, terminologi och specifika genredrag i varje enskilt skolämne, t.ex. kemi, historia. Gruppövningar från video A och B genomförs.

Femte träffen gör en syntes av **Dialogiskt och hållbart förhållningssätt för *Inquiry based science teaching/learning IBST/L*** och diskuterar lärande för hållbar utveckling som en modell att genomföra en dialogisk undervisning som använder ett undersökande och prövande arbetssätt. Här initieras några frågor att fundera kring i din egen undervisning:

6. Hur låter du eleverna utveckla ett demokratiskt förhållningssätt?
7. Hur låter du eleverna utgå ifrån sina personliga erfarenheter?
8. Hur främjar du helhetssyn?
9. Hur lyfter du in olika perspektiv i no-undervisningen såsom historiskt, globalt, miljö, lokalt, etiskt och underifrånperspektiv?
10. Hur låter du eleverna möta olika lärorum?

Inför sista träffen ska deltagarna förbereda sig för att redovisa sina egna klassrumsstudier.

## 1.2 Tidsåtgång

Materialet är tänkt att användas vid 6 träffar med ett visst tidsintervall emellan då man hinner att bearbeta och pröva nya tankar i sin egen undervisning, samt läsa relevant litteratur.

De 6 träffarna kan förläggas under en termin eller under kortare eller längre tid. Varje träff bör vara ca 3h, då varje träff innehåller dels en föreläsning och dels en övning då vi analyserar lektionsavsnitt.

## 1.3 Innehåll I de olika träffarna

| Meeting number | Duration | Topic | Materials to be used | Outlines of Activities |
|---|---|---|---|---|
| 1 | 3h | Träff 1. Presentation . IBST/L . Litteraturgenomgång och presentation. Översikt av videoclips att senare bearbeta. Lektionsinnehållet för senare analys. Planering av egna klassrumsstudier. | Power-point 1 Träff 1,+ Litteratur. | Översikt av video-clips: A Vattnets kretslopp- The Water Cycle Part 1-10, B Laddningsprovaren – The Part 1-3, C Ficklampan – The Electric Torch Part 1-5 |
| 2 | 3h | Träff 2. Att analysera lektionsinnehåll map aktiviteter. Kategorisering. | Power-point 2 Träff2 ,+ Analys-schema 1 | Gruppvis analys av korta videoclips från video A Part 1 -10 |
| 3 | 3h | Träff 3. Att bli medveten om lärarens kommunikativa förhållningssätt. Skillnad | Power point 3, | Gruppvis analys av video A, B, C |

| | | | | |
|---|---|---|---|---|
| | | på samtal i klass och i grupp.<br>Mortimer & Scott (2003)<br>Barnes &Todd,1995) | +Analys-schema 2 | |
| 4 | 3h | Träff 4. Skrivande och dialog + övning ( att analysera filmsekvenser i grupper ) | Power point 4+ reflektionsuppgift | Videoclips A Part 1-10<br><br>Att analysera filmsekvenser i grupper |
| 5 | 3h | Träff 5. Dialogiskt lärande för hållbar utveckling . | Power point 5, Träff 5, + Sekvens genomgång+ Sekvens Handen+ Sekvens Loggbok | Videoclips A Part 1-10<br>Att analysera filmsekvenser i grupper |
| 6 | 3h | Träff 6. Redovisning av egna analyser.Utvärdering.Samtal. | - | Redovisning av egna klassrums analyser. |

### 1.4 Instruktioner för fortbildningsledare

För att leda en fortbildningsaktivitet måste instruktören vara införstådd med vad som menas med a) Inquiry based science teaching and learning, b) kommunikativa förhållningssätt ( Mortimer & Scott,2003) c) skrivande och samtal i dialog samt d) lärande för hållbar utveckling .

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### 1.6 Lektionsbeskrivningar som diskuteras ur didaktiska perspektiv

**Version 1**

**Under träffarna kommer vi att diskutera dessa lektion ur didaktiska perspektiv och som inquiry based science teaching/learning – på dialogisk grund.**

#### Vattnets kretslopp

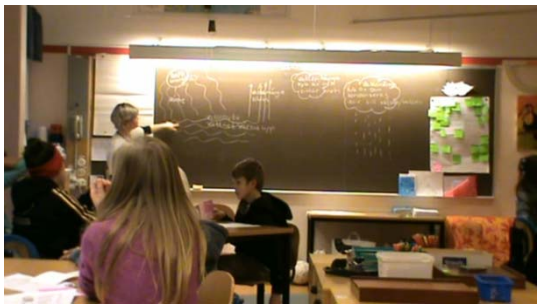
Denna lektion genomfördes av två lärare som tillsammans utvecklat sin undervisning i samarbetet med S-TEAM. Vi har följt dessa lärare med fem träffar under ett läsår, och de har deltagit i litteraturstudier och seminarier. De hade ingen utbildning i Science Education, men erfarenhet av undervisning sedan flera år. I videosekvenserna återges den andra lärarens lektionsavsnitt.

Lektionen innefattar flera olika delar. Efter en kortfattad instruktion, påbörjas en genomgång av begreppen energi, avdunstning och kondensation. Varje begrepp noteras på tavlan, och Läraren inbjuder till diskussion och samtal kring begreppens innebörd.

Flera elever deltar ivrigt i samtalen, men läraren frågar också andra elever om deras tankar och uppfattningar kring begreppen. När samtliga begrepp med förklaringar finns noterade på tavlan, uppmanas eleverna att fundera på hur de ser påvattnets kretslopp.

De ska först enskilt notera i sin tankebok, som inte tas in för rättning, hur de föreställer sig vattnets kretslopp. De uppmanas att använda begreppen från tavlan. De ska vidare diskutera i grupper vadde kommit fram till och sen redovisa gruppvis. Läraren  går runt i grupperna och diskuterar och hjälper eleverna igång.

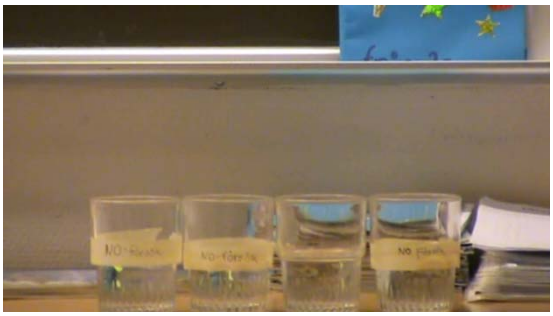
Eleverna redovisar sina tankar, och berättar om hur vattnet avdunstar från havet, stiger i gasform men sen kondenserar till vattendroppar i molnen och faller tillbaka till havet som regn. Även andra kretslopp, som vatten från kranen som vi dricker , kissar ut och som går till reningsverket och sen kan bli dricksvatten igen diskuteras. Läraren ritar in på tavlan det eleverna kommer fram till.



Man övergår sen till att diskutera det försök man påbörjat. Vad tror eleverna? Vilket glas har minst vatten kvar och varför? Läraren tar fram glasen och klassen får gå fram och titta och diskutera. Man kommer fram till slutsatser, och lär sig vad som menas med ordet slutsats.De flesta eleverna har inte svenska som modersmål, så alla nya ord måste presenteras med eftertanke. Eleverna konstaterar att alla glas har lägre vattennivå, men de som stått varmast har minst vatten kvar. Efter den gemensamma diskussionen, ska eleverna skriva och förklara försöket i ett förberett papper, där det även finns plats för att rita om försöket.

k

Här samtalar elever om anledningar till att vattnet avdunstat olika mycket. De sammanfattar sedan experimentet skrifligt.



Nästa aktivitet förbereds genom ett samtal om det är mer än öppet vatten som kan avdunsta. Eleverna föreslår att även avdunstning från andra kärl som tex kastruller förekommer. Läraren frågar vidare, om det kan vara även levande varelser som avdunstar vatten,och elever föreslår djur, t ex hundar. Tillslut kommer man fram till att ävenmänniskor måste nog avdunsta.

Läraren delar ut plastpåsar, och eleverna får sitta man ena handen i plastpåsen. Till allas förvåning, fylls påsarna, och små droppar av kondens avsätts på plasrtpåsens insida. Elevena är fascinerade.

De har nu haft lektion i 80 min utan rast, men avslutar med att notera även detta försök i sina anteckningsböcker.

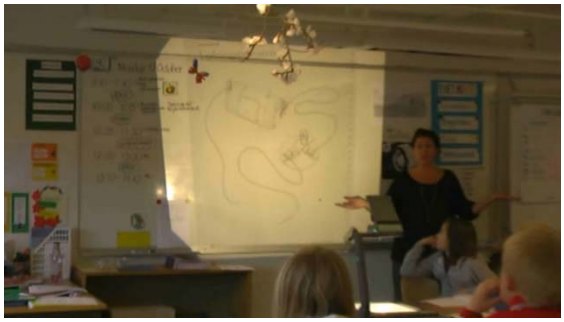
## Ledningsprovaren

Läraren är utbildad  No-lärare, med flera års erfarenhet. Hon arbetar nu för första gången med NTA-lådor, ett undervisningsmaterial där lärare lär sig vissa Teman och får tillsänt till klassrummet ett färdigt laborationsmaterial.

Läraren har påbörjat en undervisningssekvens om elektricitet med en lektion om atomen, för att kunna prata om elektricitet, ström och elektroner som rör sig i en krets. De har vidare gjort uppdrag 4 och 5 i NTA-enheten Elektriska kretsen. Den lektion vi besöker pågår 12.00 – 14.10, och är uppdelat i två delar med rast emellan. Första delen kallar vi lektion 1, och då ska uppdrag 6 genomföras; att använda en ledningsprovare de tidigare byggt. En ledningsprovare är ett batteri med två ledningstrådar och en lampa. Det går att sluta kretsen genom att föra ihop ledningstrådarna, och då lyser lampan. Andra delen , som vi kallar lektion 2, då arbetar klassen med sin arbetsbok, och övningarna avser naturvetenskap i historien.  (Se Hans Perssons lärobok Fysik och kemi.Liber.)

### Beskriving av lektionsinnehåll

0-5 min: Lärarens första lektion börjar med samtal om läxa, och uppgifter som ska redovisas genom att klistras in  i en bok. Detta tar 5 minuter av lektionen. Sedan påbörjas en genomgång av hur klassen ska genomföra uppdrag 6, att med hjälp av ledningsprovaren de tidigare tillverkat, avgöra vilka material som leder ström och vilka som inte gör det.

5 – 14min: Genomgången om Uppdrag 6, går ut på att få eleverna att förstå hur uppdraget ska genomföras. Ledningsprovaren ska få lampan att lysa om man sätter in ett ledande material i kretsen.

För att kunna identifiera vad påsen med materialbitar innehåller, går T igenom de som hon vet kommer att leda till frågor senare. Trådspik och aluminiumspik ser olika ut, men vilken är vilken?


Mässing vilken färg har det?  Vad har brons för färg? Vad är det som man ibland kallar jungfruben? Porslinskulan är i själva verket en glaskula. Under tiden delar t ut påsar till alla grupper

Eleverna får samarbeta och de får diskutera, och i första fasen ska de gissa, och här behöver man inte tycka lika.


Först ska de gissa vilka material som leder ström, och kryssa i detta i en tabell som T delar ut.

14 – 20 min: T vill få uppmärksamhet innan alla börjar, för att alla ska vara på det klara med hur man avgör frågan om material är ledande eller inte. Man måste testa att den fungerer, och eleverna svarar att då måste lampan lysa när man för ihop ledningstrådarna. Några upptäcker att det gör inte deras ledningsprovare, och T får börja rycka in och felsöka dessa.

21 – 30 min: Alla grupper arbetar intresserat och ivrigt, och löser snabbt uppgiften. Vissa elever diskuterar med varandra och jämför resultat.

30 – 45 min: Diskussion om resultaten. T frågar vilka ämnen som leder ström, och vilka som inte gjort det. Elever klistrar in sina resultat, lämnar till T papper.

## 1.5 Om samtal i klassrummet

### Det naturvetenskapliga samtalet

Att lära sig naturvetenskap, innebär att lära sig tala naturvetenskap, och det innefattar att kunna läsa och skriva texter där man använder  begrepp och resonemang, men också att kunna lösa problem och utföra undersökningar (Lemke,1995, p 1). Lemkes bok fick stort inflytande på klassrumsforskning och analysmetoder av det naturvetenskapliga samtalet. Han påpekade hur betoningen på elevdeltagande i klassrumsdiskussioner hade lett fram till  undervisningsmetoder där läraren inte längre föreläste så mycket, men ändå behöll initiativet genom att använda sig av monologiska strategier, s.k. triadiska dialoger. Ett starkt intresse för lingvistik och språkvetenskap för att analysera den naturvetenskapliga diskursen har efter detta växt fram. Douglas Barnes, en lingvistiker, hade redan på 70-talet analyserat 10-åringars

gruppsamtal, och funnit att de pratade i sonderande samtal (exploratory talks) om de fick samtala fritt, medan de gick över till redigerat tal (final draft talk )så fort läraren vände sig till dem. Sonderande samtal känns igen på att diskursiva steg, där samtalet initieras, forsätter genom att någon uppmuntrar med följdfrågor eller motfrågor, och såsmåningom avsutas genom att man blir överens (Barnes,1973; Barnes & Todd,1995).

Mortimer och Scott (2003, p.21) beskriver en undervisningsmodell som bygger på en post-konstruktivistisk (socio-kulturell) syn på lärande, baserad på texter av Vygotsky, (1978), Bahtin (1981) och Wertsch (1991). Mortimer och Scott påpekar att vilket förhållningssätt man använder beror av situationen, men det är viktigt att lärare är medvetna om de olika kommunikativa förhållningssätten, och lär sig att använda dem.

Lärarens uppgift är att introducera vetenskapliga begrepp för studenterna, och att stötta studenterna så att de gradvis utvecklar förståelse för och gör dessa begrepp meningsfulla. Läraren måste också ge möjlighet för studenterna att prova ut och praktisera de vetenskapliga idéerna själva; att de gör dessa idéer till sina egna.

Mortimer och Scott utvecklade en modell för det naturvetenskaliga samtalet i klassrummet. Samtalet kan studeras i dimensionerna interaktion /icke-interaktion samt auktoritativ(monologisk)/dialogisk. ( Ur Enghag,M. (forthcoming))

**Lärares kommunikativa förhållningssätt**

Mortimer och Scott (2003) påpekar att vilket kommunikativt förhållningssätt lärare använder beror av situationen, men det är viktigt att lärare är medvetna om olika kommunikativa förhållningssätt, och lär sig att använda dem.

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Mortimer och Scott (2003) utvecklade en modell för det naturvetenskaliga samtalet i klassrummet i bokem ”*Meaning-making in secondary science classrooms*”

Lärarens förhållningssätt till samtal kan studeras i dimensionerna interaktion /icke-interaktion samt

| | INTERAKTION | NON-INTERAKTION |
|---|---|---|
| AUKTORITATIVT (monologiskt) | Interaktion/Auktoritativt<br><br>Här lotsar läraren studenterna mot ett givet mål, genom att med frågor och svar, nå fram till ett visst resultat. | Non-interaktion/ Auktoritativt<br><br>Här är det läraren som står för ett visst påstående och argumenterar för detta. Demonstrationsexperiment kan ingå. Föreläsning, genomgång av innehåll. |
| DIALOG | Interaktion/Dialogiskt<br><br>När samtalet är interaktivt/dialogiskt, utvecklar och utforskar läraren och eleverna tillsammans idéer skapar ny mening och bearbetar olika sätt att angripa en frågeställning. Eleverna uppmuntras att berätta om sina tankar. | Non-interaktion/Dialogiskt<br><br>Här är det läraren som själv utreder olika sätt att betrakta en situation,<br><br>t ex visar olika sätt att lösa ett problem. Kan vara en sammanfattning av elevernas idéer som diskuterats under lektionen. |

**auktoritativ(monologisk)/dialogisk**.

Med denna modell kan samtalet analyserasmed hjälp av hur samtalskedjorna byggs upp. Det triadiska samtalet IRE (initiation-respons- evaluation), som är typiskt för monologiskt/interaktivt samtal, särskiljer sig

från det dialogiska interaktiva IRFRF (initiation-respons-feedback-respons –feedback), där studenten får större utrymme. Här får studenten inte bara svara rätt eller fel, utan tillåts uttrycka sina tankar i längre kedjor. Det gäller alltså att medvetet växla inom fyra moduler av samtal. Läraren planerar också för tre steg i en lektionsserie:

1. Läraren presenterar naturvetenskapligt stoff
2. Studenter/elever internaliserar detta genom samtal, experiment, projekt
3. Läraren överlämnar ansvar till studenter/elever som tillämpar sina kunskaper på problemställningar (Mortimer & Scott, 2003)

Med ”dialogic teaching” tänker man nu på Robert Alexander, och grundprinciperna för att undervisa i ett levande samtal med sina elever. Alexander (2006) anger följande grundprinciper för att genomföra en undervisning i dialog:

*Kollektivt*: Lärare och barn ta itu med uppgifter tillsammans, antingen som grupp eller klass, istället för ensamma

*Ömsesidigt*: Lärare och barn lyssnar till varandra, delar idéer, och begrundar alternativa synpunkter

*Stödjande*: Barnen uttrycker sina idéer fritt – utan att vara rädda för att “göra bort sig” eller “svara fel”: de hjälper varandra att nå förståelse

*Kumulativt*: Lärare och barn bygger på egna idéer, och infogar dem i sammanhängade kedjor av tänkande och undersökande;

*Målinriktad*: Läraren planerar och understödjer undervisning mot specifika mål i åtanke

Några praktiska tips att fundera över i sin egen undervisning kan vara:

1. Välj frågor och teman som får elever/studenter att tänka till och ger en utmaning! ( Undvik att ställa ja/nej frågor, eller frågor som går ut på att fylla i ett ord som du tänker på)
2. Ge eleven/studenten tid till långa svar, som kan vara intressanta för alla att ta del av! ( Om du får korta svar, försök få eleven/studenten att berätta mer om sina tankar genom att ge stödfrågor av typen: -Berätta mer! Hur menar du ? Kan du ge oss något exempel på ur du menar! Fortsätt berätta, det låter spännande!)
3. Låt eleven/studenten få tid tänka och formulera sig! ( Det tar tid att tänka, och man måste ge tid för tystnad och tankeverksamhet, även om detta känns tålamodsprövande för dig som lärare!)
4. Låt eleven/studenten få tillgång till de ord och begrepp som krävs för att kunna föra ett samtal – skkriv dem på tavlan t ex. ( De kan inte gärna formulera sig utan vokabulär)

5. Låt elever sitta så de ser varandra, och kan höra varandra. Vänj dem vid att prata till varandra, och inte bara till dig som lärare
6. Deltag i diskussionerna och utvidga samtalet! (Ställ inte bara ja/nej frågor, eller enkla faktafrågor)
7. Vill du att elever/studenter ska svara direkt, så ge dem besked.
   ( Tänk på att handuppräckning försätter dem i en konkurrenssituation. Kanske behöver de tid att förbereda ett längre inlägg I diskussionen innan de svarar?)

Värdera samtalet som ett redskap för att tänka och att lära. (Ge många tillfällen till samtal istället för att prata själv hela tiden!)

### 1.6 Om skrivande

#### Två diskurser

Bakhtin (1997) behandlar i sin forskning begreppen *primär* och *sekundär diskurs*. Begreppet diskurs kan ges olika definitioner, men i detta sammanhang kan det närmast definieras som ”språk i användning” eller en form av språk som får vissa särdrag beroende på i vilken kommunikationssituation det används. Med den primära diskursen avses den diskurs som alla barn utan ansträngning lär sig i hemmet, de *tillägnar sig* den. Den sekundära präglas i högre grad av formalitet och abstraktioner och lärs främst i skolan, eleverna måste *förvärva* den. Dessa två diskurser motsvarar Vygotskys teorier (1978) om barns spontana, vardagliga, kontextbundna begrepp som möter skolans abstrakta, vetenskapliga, kontextobundna. De barn som inte växer upp i exempelvis akademiska hemmiljöer riskerar att stanna kvar i vad Bachtin kallar den primära diskursen om inte skolan tar ansvaret för att föra in eleven i den sekundära diskursen, i vilken bl.a. olika ämnens begrepp ingår. För att kunna göra detta krävs att läraren har god kunskap om vad som karaktäriserar den sistnämnda diskursen och om hur undervisningen kan utformas för att på bästa sätt stödja elevernas kunskapsutveckling.

Låt oss tänka oss två fiktiva elever, A och B, som har olika språkliga utgångspunkter för sitt lärande. Som lärare måste man ha beredskap att möta dels elev A som har tillägnat sig den primära diskursen, dels elev B som tillägnat sig såväl primärdiskursen som en hel del av sekundärdiskursen bl.a. genom att den används i hans omgivning, t.ex. i hemmet. Elev A har en betydligt större uppgift framför sig då han ska förvärva sekundärdiskursen än elev B. Det språk elev B använder stämmer i större utsträckning överens med skolans kod än elev A:s, och därmed underlättas hans studier. De mål som anges i läroplaner och kursplaner är för båda eleverna desamma, men vägen dit kommer att kräva olika stora insatser av såväl elever som lärare. ”Olika grupper [...] har skilda frihetsgrader och de står inför olika hårda begränsningar när de försöker

uppnå samma projekt", skriver Danermark m.fl. (2003:147). Att utforma en undervisning så att elever inte fastnar i den primära diskursen är således en stor demokratisk uppgift för läraren. Säljö (2000:102) skriver: "Utvecklandet av kunskaper är därför också ett demokratiskt problem som har att göra med social skiktning och med skapandet av både utanför- och innanförskap." Säljö menar också att denna maktaspekt i lärandet glöms bort. I stället framställs ofta lärandet som om det ägde rum i ett socialt vakuum (ibid 2000:103). Elever som kommer från språkfattiga miljöer, men som har svenska som modersmål, har delvis samma problem att erövra den sekundära diskursen som elever som har annat förstaspråk än svenska. Den sistnämnda gruppen har dock ofta en ännu svårare uppgift då de ska lära sig ett helt nytt språk samtidigt som de ska inhämta ämneskunskaper.

I utvecklingen av den vetenskapliga, sekundära diskursen, det språk som används i skolans ämnen, är skrivandet ett viktigt redskap.

### Två typer av skrivande

Det finns två typer av skrivande som kan användas som redskap för att hjälpa eleverna förstå och reflektera över ämnesinnehållet. På engelska är benämningarna och förkortningarna *Writing Across the Curriculum* (WAC) and *Writing in the Disciplines* (WID). På svenska skulle vi kunna översätta dem med "Skriva för att lära i alla ämnen" och "Skrivande i specifika ämnen".

### Skriva för att lära (WAC)

Olika skriva för att lära-strategier fokuseras inom WAC. Dessa kan användas oavsett inom vilket ämne eleverna skriver. Spontanskrivande och skriva för att utforska används för att hjälpa eleverna "göra ämnet/innehållet till sitt eget" som i loggböcker och andra korta texter genom vilka eleverna blir medvetna om vad de kan och eventuellt inte kan. I denna typ av skrivande kommunicerar eleverna i regel inte ett budskap till någon annan läsare än de själva och därför behöver de inte tänka på stavning, bra formuleringar etc. Det är ju bara de själva som ska förstå, om inte läraren vill ha denna typ av skrivande som utgångspunkt för lektionsplanering och genomgång. Förslag på övningar ges i bilaga 1.

### Skrivande i specifika ämnen (WID)

I skrivande inom specifika ämnen, såsom teknik, matematik etc., betonas ämnets specifika begrepp, terminologi och de specifika genredrag som varje ämne har. En argumenterande text i teknik skrivs inte på samma sätt som inom ämnet historia exempelvis. I undervisningen är det viktigt att behandla argumentation, information och instruktion etc. och lära eleverna det språk och sätt att skriva som är typiskt för ämnet. Detta förutsätter att även lärare i t.ex. naturvetenskap har kunskap om det egna ämnets genrer på ett sådant sätt att de kan *explicit* undervisa om de specifika drag en viss text har. Ofta har lärare

kunskap om olika genrer så att de själva kan skriva i dem, men är omedvetna om vad de faktiskt gör när de skriver. En typisk genre i naturvetenskapliga ämnen är laborationsrapporten, som kan utföras på olika sätt. Den ger ju exempelvis tillfälle till argumentation.

## 1.7 Om Lärande för hållbar utveckling

### Lärande för Hållbar utveckling

Ett lärande för hållbar utveckling beskrivs i rapporten Education for change, en projektrapport 2009 som beskriver resultatet av ett mångårigt EU-projekt bland annat med syftet att sammanfatta årtionden av forskning om undervisning för hållbar utveckling. Lärande för hållbar utveckling LHU, kan sammanfattas enligt följande (Liepin & Jutvik, 2009; Sellberg, 2007 ) :

- Utgör ett förhållningssätt – ett undervisningsperspektiv
- Utgångspunkten är att alla kan, alla ska vara med!
- Syftesdriven och holistisk, använder det ämnesinnehåll som krävs för att lösa aktuella frågor
- Arbetar med verkliga uppgifter
- Livslångt lärande som pågår inom samhällets alla delar
- Kunskaper och allmänna demokratiska förmågor.
- Självständigt kritiskt tänkande
- Processorienterad undervisning
- Läraren en expert – som vågar lära i dialog
- Tvivel, osäkerhet – förändring en resurs för undervisning
- Arbetslaget en förutsättning

En undervisningen med syfte att ge ett lärande för hållbar utveckling kan med anledning av ovan innebära att eleverna ges möjlighet att berätta om sina personliga erfarenheter och sina kunskaper om valda teman och frågeställningar. Viktigt är att utgå ifrån varje elevs egna förkunskaper och låta dessa uttryckas för att eleven ska kunna genomgå en utvecklingsprocess. Undervisningen bör omfatta samtal med eleverna om teman och frågeställningar för att därigenom främja helhetssyn. Det är lämpligt att inleda med samtal om de ramar som ekologin sätter (olika kretslopp, energiflöden, olika samspel i naturen etc.). för att sedan beröra mänskliga behov, olika kulturer, etiska frågor och vilka tekniska strategier och lösningar som behövs för att lösa framtidens problem.  Det är väsentligt att låta eleverna träna på att ta hänsyn till och lyssna på andra samt uttrycka egna tankar, utveckla ett demokratiskt förhållningssätt samt att eleverna övar på att samarbeta och ta ansvar samt på att reflektera, argumentera och vara delaktiga. Undervisningen bör även

belysa olika perspektiv varför det är viktigt att välja teman och frågeställningar och låt eleverna behandla dem från historiskt perspektiv, globalt-, miljö-, lokalt- etiskt- och underifrånperspektiv. Det är även viktigt att eleverna ges möjlighet att belysa frågor ur ett framtidsperspektiv, se framtida teknikutveckling etc. En ytterligare aspekt är vikten av att låta eleverna möta olika lärorum. Beroende på från vilket perspektiv frågeställningar behandlas är det viktigt att lämna klassrummen för möten med omgivande samhälle och natur för att stimulera till aktivt deltagande i samhällsfrågor och för att förstå människans utveckling (Liepin & Jutvik, 2009; Sellberg, 2007).

### 1.7 Att använda videoinspelat material

De videoclips som används i analyserna, finns tillgägliga som streamad video via You Tubes tjänst för olistad video. Detta innebär att filmerna kan ses av den som vet länken till filmen, men filmen kan inte laddas ner, och inte sökas fram på YouTube. Därmed hindras missbruk och de etiska riktlinjer som gäller för forskningsmaterial upprätthålls.

### VIDEO A: The teaching sequence *The Water Cycle*

**The Water Cycle-Part 1-Penny.wmv**

http://www.youtube.com/watch?v=c6VjFh2gO1Q

**The Water Cycle - Part 2 -Penny.avi**

http://www.youtube.com/watch?v=MnPuhC76jz4

**The Water Cycle-Part 3-Penny.wmv**

http://www.youtube.com/watch?v=lqSVNpTjlSo

**The Water Cycle - Part 4 -Penny.avi**

http://www.youtube.com/watch?v=Zqie8fK303I

**The Water Cycle - Part 5 -Penny.avi**

http://www.youtube.com/watch?v=rNr2vYwc180

**The Water Cycle - Part 6 -Penny.avi**

http://www.youtube.com/watch?v=PTSZIvVDbXY

**The Water Cycle - Part 7 -Penny.avi**

http://www.youtube.com/watch?v=HBw0HN12MpM

**The Water Cycle - Part 8 -Penny.avi**

http://www.youtube.com/watch?v=gxhc5oAE3a4

**The Water Cycle - Part 9 -Penny.avi**

http://www.youtube.com/watch?v=rtUm6oDi3IY

**The Water Cycle - Part 10 -Penny.avi**

http://www.youtube.com/watch?v=uXfByf2DzlM

**VIDEO B: The teaching sequence *The Charging Indicator***

The charging indicator -Part 1.avi

http://www.youtube.com/watch?v=cujgPoS7IUc

The charging indicator -Part 2.avi

http://www.youtube.com/watch?v=m62W6D28aCU

The charging indicator -Part 3.avi

http://www.youtube.com/watch?v=S0G8bdxfFwc

**VIDEO C: The teaching sequence *The Electric Torch***

The Electric Torch – Part 1

http://www.youtube.com/watch?v=BxJiQTzgNpY

The Electric Torch – Part 2

http://www.youtube.com/watch?v=-dp4Zyx3dqc

The Electric Torch – Part 3

http://www.youtube.com/watch?v=fPzKmCY2v7Y

The Electric Torch – Part 4

http://www.youtube.com/watch?v=-0Uw_sN6c7Q

The Electric Torch – Part 5

### 1.6 Ett antal bilder från filmerna görs tillgängliga i ppt-materialet för att användas vid reflektionsuppgifterna.

Bilderna i som presenteras som illustration får inte spridas vidare pga etiska riktlinjer i Sverige.

### 1.7 Beskrivning av material: version 1

| Beskrivning | Antal |
|---|---|
| Advertising the TPDPs in local kontext | - |
| Powerpoint presentations | 1 (includes 5 separate Meetings) |
| Reflection prompts, activity sheets | 7 |
| Videos | 18 |
| Figures | Included in the ppts |
| Assessment/evaluation documents | - |

*University of Copenhagen (Department of Science Education): Scientific literacy*

**Teacher Professional Development Programme**

**Work package 6e**

**September 2010**

## Rationale & purpose

The overall goal of WP8 is to provide specialist input in the field of scientific literacy, producing packages designed to stimulate teacher self-efficacy and the use of scientific literacy as a motivating concept. Part of the University of Copenhagen's (UCPH) contribution to this goal in WP6 is to incorporate research and practice based methodologies for achieving scientific literacy teaching competencies into a training package for teacher educators. This package will include various national examples in the form of videos of teaching for scientific literacy. It will be designed to be useable in several ways, including workshops, short courses and on-line. Through this professional development program (PDP), WP8 will keep scientific literacy and student/teacher engagement at the centre of S-TEAM, relating these to wider issues of teacher competence and student motivation.

## Proposed Duration

The basic PDP will take two days consisting of five hours of meeting each day, one-hour for lunch and two breaks of 20 minutes each. The optional follow-up workshop one-week to two-months later will take one-half of a day consisting of three hours of meeting and one 20 minute break.

## Outline of meetings, activities & list of materials

| Meeting Number | Duration | Topic | Materials to be used (PowerPoint's, videos, activity sheets etc) | Outline of Activities |
|---|---|---|---|---|
| | First Day<br>5 hours + breaks and lunch | | • | |
| 1a | 20 minutes | Elicitation of conceptions about IBST and scientific literacy | • Self-efficacy instrument<br>• Pre-conceptions questionnaire | • Complete the self-efficacy instrument with names or self-identifying symbols<br>• Written pre-conceptions questionnaires |
| 1b | 75 minutes | Clarification of concept of Inquiry Based | • Komodo Dragon PowerPoint<br>• Komodo Dragon transparency<br>• Transparency | A. Experience a 30 minute science inquiry lesson<br>• This lesson will follow a 6Es learning cycle approach to inquiry teaching and |

| | | | | |
|---|---|---|---|---|
| | | Science teaching through experience and discussion | marker pens<br>• Hand-outs of DNA sequences for Komodo Dragon<br>• Figure 1: 6Es | be specifically linked to scientific literacy objectives (see Figure 1 for the model)<br>B. Group discussion of experience with inquiry lesson<br>• Use their observations of lesson to clarify inquiry teaching<br>• Together identify elements of lesson towards development of a 'learning cycle' model of inquiry instruction and evolution of model (Figure 1) to be used for the rest of the workshop<br>• Short model based explanation of what we mean by Inquiry Based Science Teaching |
| 1c | 75 minutes | Exploring videos of teaching for inquiry methods and scientific literacy | • Video examples at: http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/videos<br>• Videos on S-Team USB drives<br>• S-Team earphones<br>• Participant laptop computers | A. Use USB stored videos to explore short teaching videos of science teachers using inquiry to teach for scientific literacy.<br>• Groups of teachers (same content areas) together explore and discuss videos of inquiry science teaching linked to scientific literacy goals in their content area. Several videos in each content area are analyzed by participants.<br>• The goal is to observe and note what makes a specific aspect of a teaching video an example of inquiry teaching based on the model in Figure 1. Participants will discover what parts are good and not-as-good examples of inquiry teaching. Here they are both applying their evolving understanding of IBST and exploring new examples of its use.<br>B. Whole group sharing of which elements of the videos are examples of inquiry teaching and which are contra-examples |
| 1d | 90 minutes | Exploration of what Scientific Literacy means in several EU countries and PISA | • PowerPoint about using SL maps to understand SL in different countries<br>• Map examples at: http://www1.ind.ku.dk/mtg/ | A. Explore the concept of scientific literacy in PISA and several EU countries<br>• Situate concept maps of SL. Very briefly show, via ppt, how concept maps of scientific literacy are made so that all can understand how to read the maps… not enough detail to actually ever make them |

| | | | | |
|---|---|---|---|---|
| | | | wp3/scientificliteracy/maps<br>• Maps on S-Team USB drives | • Use concept map data stored on USB drives to explore the concept maps of scientific literacy as defined in PISA and several other countries.<br>• Prepare to answer these questions:<br>  • What similarities and differences can you identify among these definitions?<br>  • Using the comparative cluster maps, what are the large general issues of scientific literacy commonly addressed in these definitions?<br>  • How do these other definitions of SL compare to your own country's definition?<br>B. Whole group sharing of the map explorations with the goal of constructing both general EU and national perspectives on scientific literacy goals. |
| 1e | 45 minutes<br>Continued overnight until the next day to finish creating the group lessons. | Creating short (five minute) 'invitations to inquiry' in small groups to exemplify the teacher's part in initiating an inquiry lesson linked to one national scientific literacy goal | • Templates with the 6Es to draft inquiry lessons | A. Each member of each group of three selects one scientific literacy goal from their national map and decides how a teacher could initiate an inquiry lesson to teach for that goal.<br>• Using the template, each teacher decides on an inquiry teaching approach and what the teacher's role would be in setting up the lesson. The groups then carefully review, discuss and analyze the three group member lessons and plan how they could lead a science class they currently teach to achieve that scientific literacy goal, using some of the ideas from the videos.<br>B. Each group chooses one of the three lessons and creates a teaching lesson from it<br>• The lesson will NOT be telling what they would do, but ACTUALLY TEACHING it as they would to a class (recognizing of course, that such a set-up in their own classes would take longer). They can interact with the other participants as 'the students' if they wish, in their role as 'teachers' |

| | | | | |
|---|---|---|---|---|
| | Second Day<br>5 hours + breaks and lunch | | • | |
| 2a | 150 minutes | Group sharing of teaching | • | A. The groups will all teach their chosen lesson to the whole group for appreciation and comment<br>• The group will not identify the scientific literacy goal addressed by their teaching, so that afterwards the other participants can try to determine from the teaching itself, which scientific literacy goal was addressed.<br>• The goal will be to acknowledge good examples of inquiry based science teaching as well as alignment to scientific literacy goals<br>B. Discussion of resulting teaching and the challenges of inquiry based science teaching |
| 2b | 105 minutes | Application of IBST and SL to given traditional teaching materials | • Copies of popular science teaching activities not framed for IBST nor scientific literacy | • Teachers are challenged through given standard science lessons in their own content area and at their teaching level, to revise them just enough to convert them to IBST lessons for scientific literacy<br>• Results of these conversions are shared and discussed and digital copies of all of the revisions are taken home by all participants |
| 2c | 45 minutes | Workshop evaluation and feedback | • Self-efficacy instrument<br>• Module improvement questionnaire<br>• WP9 S-team questionnaire | • Complete the self-efficacy instrument with names or self-identifying symbols<br>• Questionnaire about how to improve this module for teacher workshops similar to this one.<br>• WP9 S-team workshop questionnaire |
| | Two Weeks to two Months afterwar | | • | |

| | | | | |
|---|---|---|---|---|
| | d | | | |
| 3a | Varies | Follow-up | • Availability of video recording equipment (fx: a 'smart' mobile phone)<br>• Access to the Internet<br>• Self-efficacy instrument | • Participants take their ideas back to their own classrooms to incorporate a goal of inquiry based scientific literacy education, based on ideas, perhaps from another EU country, into their repertoire.<br>• Participants share a five minute video from their own class showing an 'invitation to inquiry' on YouTube by sending the URL link to the rest of the participants<br>• Complete the self-efficacy instrument with names or self-identifying symbols |
| 3b | 150 minutes | Optional long-term follow-up (one-week to two months after workshop) | • Various apparatus to play a variety of video formats | • An optional follow-up workshop for half a day will be held where teachers bring ten-minute videos of their own 'invitations to inquiry' to share with the group for feedback and appreciation<br>• An alternative in certain circumstances would be for PDP leaders to visit the classrooms of the participating teachers to witness a 'live' use of the workshop's content. |

**Notes for teacher educators on how to use PDP materials**

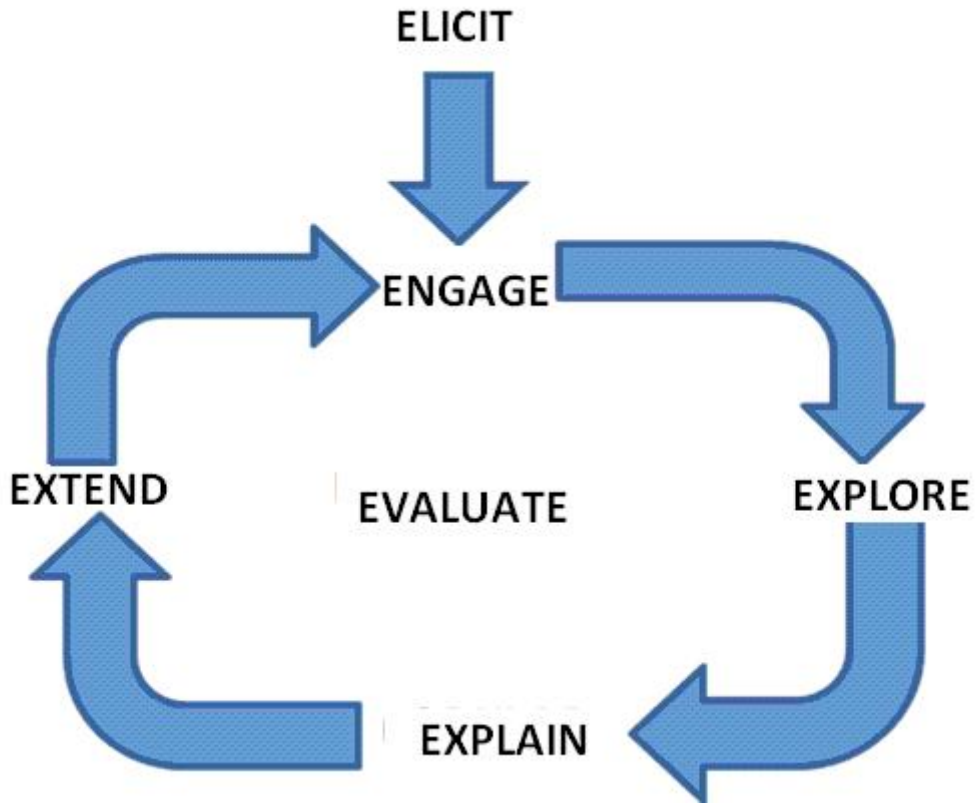
The two-day PDP is designed to be used with teachers in the same manner as for teacher educators. Throughout, the PDP adheres to the same model of Inquiry Based Science Teaching which it advocates in the Figure 1 model (see below). This means that the workshop for both teacher educators as well as for pre-and in-service teachers does not 'transmit' material, but instead assists participants in the construction of their own understanding of IBST for scientific literacy. So, for example, after communicating their **pre-conceptions** of the PDP content, participants are **engaged** to **explore** IBST/SL through an illustrative lesson they experience. They then use their experience as a group to construct and **explain** the model given in Figure 1 before **extending** this understanding to the analysis of teacher videos to identify instances of IBST/SL. Because they are actively engaged in constructing and trying out their growing understanding as they proceed through the PDP, they are able to continuously **evaluate** their progress. Cycles of this inquiry method continue throughout the PDP including the concluding teaching episodes which are both further explorations of IBST/SL as well as extensions and applications of what they have learned.

Pre-testing of this PDP has shown that the relatively long times devoted to each activity are necessary for full construction by the participants. The amount of time necessary for inquiry learning is

normally longer than that for traditional methods and since this PDP models IBST, the length of the lesson is both an authentic example of this variable and an opportunity to raise this relevant issue and discuss it with teachers.

The one-half of a day follow-up of the two-day PDP, where teachers bring videos of an application of IBST/SL in their own classrooms for appreciation and reinforcement is likely to significantly enhance the long-term impact of this PDP. An alternative in certain circumstances would be for PDP leaders to visit the classrooms of the participating teachers to witness a 'live' use of the workshop's content.

Figure 1




**Video submission**

The videos are temporarily available at the following URL:
http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/videos

The final versions (selected, refined, re-edited) will be moved to a dedicated UCPH WP8 Web site and to the forthcoming S-TEAM video portal. The videos made by teachers back in their own classrooms and either uploaded to *YouTube* or brought to a one-half of a day follow-up workshop, will be available only to participants.

The scientific literacy concept maps are temporarily available at the following URL:

http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/maps

The final versions (selected, refined, re-edited) will be moved to a dedicated UCPH WP8 Web site.

## Comprehensive list of accompanying materials

| File Number | Description | Number |
|---|---|---|
| 2.1. UCPH.W6.TDPD8.1.doc | Advertising the TPDPs in local contexts | 1 |
| 3.1. UCPH.W6.TDPD8.1.ppt<br>3.2. UCPH.W6.TDPD8.1.ppt | PowerPoint slides/presentations | 2 |
| 4.1. UCPH.W6.TDPD8.1.doc<br>4.2. UCPH.W6.TDPD8.1.doc<br>4.3. UCPH.W6.TDPD8.1.doc | Reflection prompts, activity sheets etc | 3 |
| 6.1.UCPH.W6.TDPD8.1.jpeg<br>6.2.UCPH.W6.TDPD8.1.doc | Figure and Transparency Master | 2 |
| 7.1.UCPH.W6.TDPD8.1.doc<br>7.2.UCPH.W6.TDPD8.1.doc<br>7.3.UCPH.W6.TDPD8.1.doc<br>7.4.UCPH.W6.TDPD8.1.doc | Assessment Instruments | 4 |

**Note: all documents etc. listed below are available from [www.ntnu.nu/s-team](http://www.ntnu.nu/s-team)**

**3. Advertising the TPDPs in local contexts**

The attached announcement of a two-day workshop of this TPD for WP8 is attached. It is an example for Scottish teacher educators. The document is available as

**2.1. UCPH.W6.TDPD8.1.doc**

**4. PowerPoint slides/presentations**

The first set of PowerPoint slides are for the **1b** activity from the matrix for use during the sample IBST lesson. The set is available as:

**3.1. UCPH.W6.TDPD8.1.ppt**

The second set of PowerPoint slides are for the **1d** activity from the matrix for use during the concept map exploration. The set is available as:

**3.2. UCPH.W6.TDPD8.1.ppt**

**5. Reflection prompts, activity sheets etc**

The first activity sheet is a hand-out of DNA sequences for Komodo Dragons, to facilitate teacher hypothesis formation in the inquiry activity. It is attached as:

**4.1. UCPH.W6.TDPD8.1.doc**

The second activity sheet is a template to facilitate teacher creation of IBST for SL lessons. It is attached as:

**4.2. UCPH.W6.TDPD8.1.doc**

The third activity sheet is a set of traditional science activity lessons, which teachers will transform into IBST/SL lessons with the least changes necessary. They are attached as:

4.3. UCPH.W6.TDPD8.1.doc

**6. Videos**

All are currently on the Web site at URL: http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/videos

For the workshops they will be distributed on USB memory drives and will also be available on a new WP8 Website

**7. Figure and transparency master**

One figure will be used throughout the TPDP. It is titled Figure 1 and is available as follows:

6.1.UCPH.W6.TDPD8.1.jpeg

One transparency will be used, with enough copies for each participant group of 3. It is attached as:

6.2.UCPH.W6.TDPD8.1.doc

**8. Assessment/evaluation documents**

WP8a will use four assessment/evaluation instruments during the TPDP. Each is attached as follows:

Modified version of STEBI[1] Self-efficacy Instrument WP8 S-Team

7.1.UCPH.W6.TDPD8.1.doc

Pre-Conceptions Questionnaire

7.2.UCPH.W6.TDPD8.1.doc

Workshop Improvement Questionnaire

7.3.UCPH.W6.TDPD8.1.doc

WP9 S-team Workshop Questionnaire

7.4.UCPH.W6.TDPD8.1.doc

[1] Modified from Enochs, L., & Riggs, I. (1990)

# *Curriculum for Excellence in the Sciences: Developing inquiry based approaches to teaching for scientific literacy*

**Dr Robert Evans**

Associate Professor, Department of Science Education, University of Copenhagen

**Proposal** Robert has developed and piloted the following two day workshop which aims to provide an opportunity to use inquiry based learning in Science to develop approaches to teaching for scientific literacy, using national statements of literacy from across the EU. It is proposed that Robert delivers this workshop to a group of Scottish Science Teachers on the 15th & 16th October 2010 in Glasgow with the intention that these teachers in turn could return to their establishments and offer the workshop to their colleagues.

## Workshop Objectives

- Demonstrate pre-workshop personal conceptions of scientific literacy and inquiry based science education by:
  - Answering two open ended questions in writing
  - Analyzing a video of a science teacher for evidence of use and non-use of inquiry methods
- Be able to identify important and relevant characteristics of inquiry based scientific literacy through participating in a 30 minute science inquiry lesson.
- Be able to identify themes of scientific literacy from several EU countries in writing and from given concept maps
- Analyze videos of teaching for examples of good and/or deficient use of inquiry teaching methods in teaching for scientific literacy
- Create a short invitation to inquiry which exemplifies teaching at least one goal of scientific literacy from their country using inquiry based methods, and teach it to the group

## How does this relate to Curriculum for Excellence?

Sciences Principles and Practice Paper page 3:

*The experiences and outcomes in science provide opportunities for children and young people to develop and practise a range of* ***inquiry and investigative skills, scientific analytical thinking skills,*** *and develop attitudes and attributes of a* ***scientifically literate citizen****; they also support the development of a range of skills for life and skills for work, including literacy, numeracy and skills in information and communications technology (ICT).*

www.ltscotland.org.uk/Images/sciences_principles_practice_tcm4-540396.pdf

*Workbook 6.7 to accompany UCPH Professional Development Programme 6.8*

## Rationale & purpose

The overall goal of WP8 is to provide specialist input in the field of scientific literacy, producing packages designed to stimulate teacher self-efficacy and the use of scientific literacy as a motivating concept. Part of the University of Copenhagen's (UCPH) contribution to this goal is to incorporate research and practice based methodologies for achieving scientific literacy teaching competencies into a training package for teacher educators. This package will include various national examples in the form of videos of teaching for scientific literacy. It will be designed to be useable in several ways, including workshops, short courses and on-line. Through this professional development program (PDP), WP8 will keep scientific literacy and student/teacher engagement at the centre of S-TEAM, relating these to wider issues of teacher competence and student motivation.

## Lists of Workbook 6.7 materials to be used with the 6.8 Workshop activities

| Meeting Number | Duration | Topic | • 6.7 Materials to be used (PowerPoint's, videos, activity sheets etc)<br>• All materials highlighted are attached as part of this 6.7 Workbook | 6.8 Outline of Activities |
|---|---|---|---|---|
| | *First Day*<br>*5 hours + breaks and lunch* | | • | |
| 1a | 20 minutes | Elicitation of conceptions about IBST and scientific literacy | • Self-efficacy instrument<br>• Pre-conceptions questionnaire | • Complete the self-efficacy instrument with names or self-identifying symbols<br>• Written pre-conceptions questionnaires |
| 1b | 75 minutes | Clarification of concept of Inquiry Based Science teaching through experience and discussion | • Komodo Dragon PowerPoint<br>• Komodo Dragon transparency<br>• Transparency marker pens<br>• Hand-outs of DNA sequences for Komodo Dragon<br>• Figure 1: 6Es | A. Experience a 30 minute science inquiry lesson<br>• This lesson will follow a 6Es learning cycle approach to inquiry teaching and be specifically linked to scientific literacy objectives (see Figure 1 for the model)<br>B. Group discussion of experience with inquiry lesson |

| | | | | |
|---|---|---|---|---|
| | | | | • Use their observations of lesson to clarify inquiry teaching<br>• Together identify elements of lesson towards development of a 'learning cycle' model of inquiry instruction and evolution of model (Figure 1) to be used for the rest of the workshop<br>• Short model based explanation of what we mean by Inquiry Based Science Teaching |
| 1c | 75 minutes | Exploring videos of teaching for inquiry methods and scientific literacy | • Video examples at: http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/videos<br>• Videos on S-Team USB drives<br>• S-Team earphones<br>• Participant laptop computers | A. Use USB stored videos to explore short teaching videos of science teachers using inquiry to teach for scientific literacy.<br>• Groups of teachers (same content areas) together explore and discuss videos of inquiry science teaching linked to scientific literacy goals in their content area. Several videos in each content area are analyzed by participants.<br>• The goal is to observe and note what makes a specific aspect of a teaching video an example of inquiry teaching based on the model in Figure 1. Participants will discover what parts are good and not-as-good examples of inquiry teaching. Here they are both applying their evolving understanding of IBST and exploring new examples of its use.<br>B. Whole group sharing of which elements of the videos are examples of inquiry teaching and which are contra-examples |
| 1d | 90 minutes | Exploration of what Scientific Literacy means in several EU countries and PISA | • PowerPoint about using SL maps to understand SL in different countries<br>• Map examples at: http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/maps<br>• Maps on S-Team USB drives | A. Explore the concept of scientific literacy in PISA and several EU countries<br>• Situate concept maps of SL. Very briefly show, via ppt, how concept maps of scientific literacy are made so that all |

| | | | | |
|---|---|---|---|---|
| | | | | can understand how to read the maps… not enough detail to actually ever make them<br>• Use concept map data stored on USB drives to explore the concept maps of scientific literacy as defined in PISA and several other countries.<br>• Prepare to answer these questions:<br>  • What similarities and differences can you identify among these definitions?<br>  • Using the comparative cluster maps, what are the large general issues of scientific literacy commonly addressed in these definitions?<br>  • How do these other definitions of SL compare to your own country's definition?<br>B. Whole group sharing of the map explorations with the goal of constructing both general EU and national perspectives on scientific literacy goals. |
| 1e | 45 minutes<br>*Continued overnight until the next day to finish creating the group lessons.* | Creating short (five minute) 'invitations to inquiry' in small groups to exemplify the teacher's part in initiating an inquiry lesson linked to one national scientific literacy goal | • Templates with the 6Es to draft inquiry lessons | A. Each member of each group of three selects one scientific literacy goal from their national map and decides how a teacher could <u>initiate</u> an inquiry lesson to teach for that goal.<br>• Using the template, each teacher decides on an inquiry teaching approach and what the teacher's role would be in setting up the lesson. The groups then carefully review, discuss and analyze the three group member lessons and plan how they could lead a science class they currently teach to achieve that scientific literacy goal, using some of the ideas from the videos.<br>B. Each group chooses one of the three lessons and creates a teaching lesson from it |

| | | | | |
|---|---|---|---|---|
| | | | | • The lesson will NOT be telling what they would do, but ACTUALLY TEACHING it as they would to a class (recognizing of course, that such a set-up in their own classes would take longer). They can interact with the other participants as 'the students' if they wish, in their role as 'teachers' |
| | *Second Day*<br>*5 hours + breaks and lunch* | | • | |
| 2a | 150 minutes | Group sharing of teaching | • | A. The groups will all teach their chosen lesson to the whole group for appreciation and comment<br>• The group will not identify the scientific literacy goal addressed by their teaching, so that afterwards the other participants can try to determine from the teaching itself, which scientific literacy goal was addressed.<br>• The goal will be to acknowledge good examples of inquiry based science teaching as well as alignment to scientific literacy goals<br>B. Discussion of resulting teaching and the challenges of inquiry based science teaching |
| 2b | 105 minutes | Application of IBST and SL to given traditional teaching materials | • Copies of popular science teaching activities not framed for IBST nor scientific literacy | • Teachers are challenged through given standard science lessons in their own content area and at their teaching level, to revise them just enough to convert them to IBST lessons for scientific literacy<br>• Results of these conversions are shared and discussed and digital copies of all of the revisions are taken home by all participants |
| 2c | 45 minutes | Workshop evaluation and | • Self-efficacy instrument<br>• Module improvement questionnaire | • Complete the self-efficacy instrument with names or self-identifying symbols |

| | | | | |
|---|---|---|---|---|
| | | feedback | • WP9 S-team questionnaire | • Questionnaire about how to improve this module for teacher workshops similar to this one.<br>• WP9 S-team workshop questionnaire |
| | *Two Weeks to two Months afterward* | | • | |
| 3a | Varies | Follow-up | • Availability of video recording equipment (fx: a 'smart' mobile phone)<br>• Access to the Internet<br>• Self-efficacy instrument | • Participants take their ideas back to their own classrooms to incorporate a goal of inquiry based scientific literacy education, based on ideas, perhaps from another EU country, into their repertoire.<br>• Participants share a five minute video from their own class showing an 'invitation to inquiry' on *YouTube* by sending the URL link to the rest of the participants<br>• Complete the self-efficacy instrument with names or self-identifying symbols |
| 3b | 150 minutes | Optional long-term follow-up (one-week to two months after workshop) | • Various apparatus to play a variety of video formats | • An optional follow-up workshop for half a day will be held where teachers bring ten-minute videos of their own 'invitations to inquiry' to share with the group for feedback and appreciation<br>• An alternative in certain circumstances would be for PDP leaders to visit the classrooms of the participating teachers to witness a 'live' use of the workshop's content. |

**Video submission**

The videos are temporarily available at the following URL:

http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/videos

The final versions (selected, refined, re-edited) will be moved to a dedicated UCPH WP8 Web site and to the forthcoming S-TEAM web portal. The videos made by teachers back in their own classrooms and either

uploaded to *YouTube* or brought to a one-half of a day follow-up workshop, will be available only to participants.

The scientific literacy concept maps are temporarily available at the following URL:

http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/maps

Their descendants (selected, refined, re-edited) will be moved to a dedicated UCPH WP8 Web site.

### Comprehensive list of accompanying materials

| File Number | Description | Number |
|---|---|---|
| 2.1. UCPH.WP6.TDPD6.7.doc.doc | Advertising the TPDPs in local contexts | 1 |
| 3.1. UCPH.WP6.TDPD6.7.ppt.ppt<br>3.2. UCPH.WP6.TDPD6.7.ppt.ppt | PowerPoint slides/presentations | 2 |
| 4.1. UCPH.WP6.TDPD6.7.doc.doc<br>4.2. UCPH.WP6.TDPD6.7.doc.doc<br>4.3. UCPH.WP6.TDPD6.7.doc.doc | Reflection prompts, activity sheets etc | 3 |
| 6.1.UCPH.WP6.TDPD6.7.jpeg.JPG<br>6.2.UCPH.WP6.TDPD6.7.doc.doc | Figure and Transparency Master | 2 |
| 7.1.UCPH.WP6.TDPD6.7.doc.doc<br>7.2.UCPH.WP6.TDPD6.7.doc.doc<br>7.3.UCPH.WP6.TDPD6.7.doc.doc<br>7.4.UCPH.WP6.TDPD6.7.doc.doc | Assessment Instruments | 4 |

**9. Advertising the TPDPs in local contexts (if applicable)**

The announcement of a two-day workshop of this TPD for WP8 is attached. It is an example for Scottish teacher educators. The document is available as:

**2.1. UCPH.WP6.TDPD6.7.doc.doc**

**10. PowerPoint slides/presentations**

The first set of PowerPoint slides are for the **1b** activity from the matrix for use during the sample IBST lesson. The set is available as:

**3.1. UCPH.WP6.TDPD6.7.ppt.ppt**

The second set of PowerPoint slides are for the **1d** activity from the matrix for use during the concept map exploration. The set is available as:

**3.2. UCPH.WP6.TDPD6.7.ppt.ppt**

**11. Reflection prompts, activity sheets etc**

The first activity sheet is a hand-out of DNA sequences for Komodo Dragons, to facilitate teacher hypothesis formation in the inquiry activity. It is available as:

**4.1. UCPH.WP6.TDPD6.7.doc.doc**

The second activity sheet is a template to facilitate teacher creation of IBST for SL lessons. It is available as:

**4.2. UCPH.WP6.TDPD6.7.doc.doc**

The third activity sheet is a set of traditional science activity lessons which teachers will

transform into IBST/SL lessons with the least changes necessary. They are available as:

**4.3. UCPH.WP6.TDPD6.7.doc.doc**

**12. Videos**

All are currently on the Web site at URL: http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/videos

For the workshops they will be distributed on USB memory drives and will also be available on a new WP8 Website

**13. Figure and transparency master**

One figure will be used throughout the TPDP. It is titled Figure 1 and is attached as follows:

**6.1.UCPH.WP6.TDPD6.7.jpeg.JPG**

One transparency will be used…with enough copies for each participant group of 3. It is attached as:

**6.2.UCPH.WP6.TDPD6.7.doc.doc**

**14. Assessment/evaluation documents**

WP8a will use four assessment/evaluation instruments during the TPDP. Each is attached as follows:

Modified version of STEBI[2] Self-efficacy Instrument WP8 S-Team

**7.1.UCPH.WP6.TDPD6.7.doc.doc**

Pre-Conceptions Questionnaire

**7.2.UCPH.WP6.TDPD6.7.doc.doc**

Workshop Improvement Questionnaire

**7.3.UCPH.WP6.TDPD6.7.doc.doc**

WP9 S-team Workshop Questionnaire

**7.4.UCPH.WP6.TDPD6.7.doc.doc**

[2] Modified from Enochs, L., & Riggs, I. (1990)

**End of document**

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