

# S-TEAM

## WP 8 Training materials Part 1

Drama, Scientific Literacy and Student Interest

October 2010

Deliverable 8b







S-TEAM deliverable 8b: WP8 Training materials Part 1: Drama, Scientific Literacy and Student Interest

**Table of contents**

Preface.....	2
S-TEAM Product 8.2: Professional Development Programme in Scientific Literacy.....	4
S-TEAM Product 8.3: Teacher Professional Development Programme on the Use of Students' Questions to maximise Student Interest in Biology .....	19
S-TEAM Product 8.4: Teacher Professional Development Programme on Drama and Scientific Literacy .....	27
References .....	46

## ***Preface***

This document combines the training materials of three separate sub-projects within Work package 8, which deals with Scientific Literacy in relation to inquiry-based science teaching and learning (IBST/L)

### **Work package 8a (product 8.2)**

WP8a (University of Copenhagen) incorporates research and practice based methodologies for achieving scientific literacy teaching competencies into a training package for teacher educators. This package will include annotated video sequences of teaching for scientific literacy. It will be designed to be useable in several ways, including workshops, short courses and on-line.

### **Work package 8b (product 8.3)**

WP8b (Israel Institute of Technology - Technion) is developing teaching methods for scientific literacy using student-interest-focused biology learning materials and teaching strategies.

Many students find standard science curricula largely out of touch with their personal interests. This factor contributes to the declining number of students who choose to pursue scientific studies and careers. In this workshop teachers will develop, enact and evaluate teaching materials, which are based on students' genuine interests, as reflected by their questions. A comparison of themes emerging from students' questions with the content dictated by the syllabus is used to identify overlaps between the syllabus requirements and genuine students' interests, as well as missing themes, which are not addressed by the formal syllabus. This way, teachers will be able to harness the individual interests of their students' to create situational interest in their biology teaching.

### **Work package 8c (product 8.4)**

#### **Drama and scientific literacy**

WP8c (IIT in collaboration with NTNU) has produced a training package on the use of drama to enhance motivation and cognitive processes in relation to scientific literacy. (NTNU's contribution will come from the four storylines on water developed in WP8d, due in Month 24, April 2011) The aim of this training package is to construct a workshop enriching the teacher with tools adapted from theatre and drama, with the intention of achieving higher student engagement in science. The project will focus on two main points.

(1) Providing the teacher with presentational tools. The role of the teacher has often been compared to that of an actor, and indeed there is an overlap of many skills such as presentation, presence, the ability to tell a story, etc. Sharpening these tools using techniques drawn from theatre can help teachers when presenting to the class. The first part of the planned workshop will focus on the teacher.

## S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

(2) Providing the teacher with theatrical tools to be used by the students. Theatrical tools, such as role-play maybe used to depict scientific concepts making the lesson more exciting and lively. Other tools such as forum theatre can be used to raise moral and ethical issues involving science in an engaging manner. The ability to conduct such discussions is at the foundation of scientific literacy. The second part of the workshop will provide the teacher with different methods of play/drama that can be used as learning activities together with the students.

## **S-TEAM Product 8.2: Professional Development Programme in Scientific Literacy**

**Robert Evans, Department of Science Education, University of Copenhagen**

## 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.

## Differentiation between 8.2 and teacher educator professional development packages 6.7 and 6.8 developed for WP6

The workbook (6.7) and professional development package (6.8) developed by WP8 for WP6 were designed to introduce teacher educators to a two-day teacher development workshop which they could then replicate in their own in-service and pre-service methods instruction for primary and secondary science teachers. This professional development package (8.2) is broader and more flexible in scope in that while also designed for teacher educators, it presents an array of development activities that can be configured in a variety of ways including as a one-meeting workshop, sequential workshops, short course, and on-line courses.

## Array of eleven development activities

### Self-efficacy

**Goal:** Develop teacher self-efficacy with IBST to increase the likelihood that they will use inquiry in their teaching and to measure and track the effect of the IBST-units in increasing IBST relevant self-efficacy.

**Method:** Measure self-efficacy before the first IBST-unit and periodically afterwards, including when teachers return to their classrooms. Consciously use four methods for increasing self-efficacies among participants: enactive mastery experiences, vicarious experiences, verbal persuasion and physiological and affective states.

Activity	Duration	Topic	Materials to be used	Outline of Activities
Self-efficacy	10 minutes	Pre-activity self-efficacy	Self-efficacy instrument*	Complete the self-efficacy instrument with names or self-identifying symbols Use four methods to increase self-efficacy during TPD

### Conceptions about inquiry teaching

**Goal:** Elicit conceptions about IBST and scientific literacy to discover just where participants stand in their basic understanding of these concepts. Such perceptions are useful both for making teaching decisions and assessing module effectiveness

**Method:** Use open-ended questionnaire to assess conceptions before major methods teaching sequences and at the conclusion of development programmes

Activity	Duration	Topic	Materials to be used	Outline of Activities
Conceptions about inquiry teaching	10 minutes	Elicitation of conceptions about IBST and scientific literacy	Pre-conceptions questionnaire*	Written pre-conceptions questionnaires

### Sharing an experience with science inquiry

**Goal:** To give all participants an authentic experience with inquiry at a level that is both fresh and challenging to them. The analysis and discussion of the activity can stimulate renewed understanding and motivation to emulate inquiry teaching strategies.

**Method:** Teach the lesson to the participants (about 40 minutes) and share reflections about the experience afterwards.

Activity	Duration	Topic	Materials to be used	Outline of Activities
Sharing an experience with science inquiry	45 minutes	Clarification of concept of Inquiry Based Science teaching through experience	Komodo Dragon PowerPoint* Komodo Dragon transparency* Transparency marker pens Hand-outs of DNA sequences for Komodo Dragon *	A. Experience a 30 minute science inquiry lesson 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) Short model based explanation of what we mean by Inquiry Based Science Teaching



### Inquiring into inquiry

**Goal:** Discover the elements of inquiry through reflection and discussion.

**Method:** Facilitate participant construction of the concept of IBST by analyzing a given inquiry lesson to discover its fundamental sequences and elements. Introduce a nomenclature for the discovered elements of inquiry (e.g. engage, explore, explain, extend, evaluate).

Activity	Duration	Topic	Materials to be used	Outline of Activities
Inquiring into inquiry	30 minutes	Clarification of concept of Inquiry Based Science teaching through discussion	Figure 1: 6Es*	Group discussion of experience with inquiry lesson Use their observations of lesson to clarify inquiry teaching 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 Short model based explanation of what we mean by Inquiry Based Science Teaching

### Explore inquiry teaching videos

**Goal:** Discover both good and deficient examples of teachers using inquiry teaching methods.

**Method:** Watch short segments of science teachers using IBST methods to identify which of the teaching acts result in inquiry among students and which do not.

Activity	Duration	Topic	Materials to be used	Outline of Activities
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S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

<p>Explore inquiry teaching videos</p>	<p>75 minutes</p>	<p>Exploring videos of teaching for inquiry methods and scientific literacy</p>	<p>Video examples at:  <a href="http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/videos">http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/videos</a>                  Videos on S-Team USB drives                  S-Team earphones                  Participant laptop computers</p>	<p>A. Use USB stored videos (or the Web site) to explore short teaching videos of science teachers using inquiry to teach for scientific literacy. 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. 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.</p> <p>B. Whole group sharing of which elements of the videos are examples of inquiry teaching and which are contra-examples</p>
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### Exploration of meaning of Scientific Literacy

**Goal:** Discover the meaning of scientific literacy in both national and international contexts.

**Method:** Use inquiry methods to compare and contrast concept maps of what scientific literacy means in different countries. Discuss similarities and differences.

Activity	Duration	Topic	Materials to be used	Outline of Activities
Exploration of meaning of Scientific Literacy	90 mins	Exploration of what Scientific Literacy means in several EU countries and PISA	PowerPoint about using SL maps to understand SL in different countries* Map examples at: <a href="http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/maps">http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/maps</a> Maps on S-Team USB drives	<p>A. Explore the concept of scientific literacy in PISA and several EU countries</p> <p>Situate concept maps of SL.</p> <p>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</p> <p>Use concept map data stored on USB drives (or the Web site) to explore the concept maps of scientific literacy as defined in PISA and several other countries.</p> <p>Prepare to answer these questions:</p> <p>What similarities and differences can you identify among these definitions?</p> <p>Using the comparative cluster maps, what are the large general issues of scientific literacy commonly addressed in these definitions?</p> <p>How do these other definitions of SL compare to your own country's definition?</p> <p>B. Whole group sharing of the map explorations with the goal of constructing both general EU and national perspectives on scientific literacy goals.</p>

**Discover and prepare for cross-disciplinary opportunities for teaching scientific literacy**

**Goal:** Discover synergies among different disciplines which provide opportunities for cross-disciplinary teaching of scientific literacy.

**Method:** Comparing and contrasting various national scientific literacy concept maps provide suggestions and even obligations for non-scientific concepts which relate to scientific literacy to be taught in science classrooms. Then, an example of an interdisciplinary approach to teaching about climate change is shared with the participants.

Activity	Duration	Topic	Materials to be used	Outline of Activities
Discover and prepare for cross-disciplinary opportunities for teaching scientific literacy	90 mins	Finding in the existing national statements of scientific literacy, ideas for cross-disciplinary teaching	Map examples at: <a href="http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/maps">http://www1.ind.ku.dk/mtg/wp3/scientificliteracy/maps</a> Maps on S-Team USB drives Theoretical basis and example of cross-disciplinary teaching about climate change ppt*	A. Explore the concept of scientific literacy in PISA and several EU countries Use concept map data stored on USB drives (or the Web site) to find calls for using both science and other disciplines to achieve scientific literacy Prepare to share: - What and where are these synergies found? - An outline, following the 6E model) of a lesson using interdisciplinary objectives and methods to meet a scientific literacy objective B. Whole group sharing and discussion of these synergies and lesson outlines C. Consider an example of lessons about climate change using interdisciplinary approaches

**Creating and teaching short ‘invitations to inquiry’**

**Goal:** Apply understanding about inquiry by creating an ‘invitation’ to inquiry for students in their content area.

**Method:** In small groups, participants create five minute ‘invitations to inquiry’ which could be used to set-up an inquiry lesson with a class. The group actually ‘teaches’ this invitation to the workshop participants.

All discuss each lesson looking for good elements of inquiry teaching.

Activity	Duration	Topic	Materials to be used	Outline of Activities
Creating short ‘invitations to inquiry’	30 minutes 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*	<p>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. 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.</p> <p>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’</p>

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Activity	Duration	Topic	Materials to be used	Outline of Activities
Teaching short 'invitations to inquiry'	150 minutes	Group teaching and sharing		<p>A. The groups will all teach their chosen lesson to the whole group for appreciation and comment</p> <p>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.</p> <p>The goal will be to acknowledge good examples of inquiry based science teaching as well as alignment to scientific literacy goals</p> <p>B. Discussion of resulting teaching and the challenges of inquiry based science teaching</p>

**Application of IBST to traditional teaching materials**

**Goal:** Use understanding of IBST to examine typical good science teaching activities and suggest revisions, which would make them more inquiry oriented for students.

**Method:** Participants will as a whole group revise a traditional science activity, applying the tenets learned in other IBST-units. Then, in pairs the teachers will similarly revise plans in their own content area and at their teaching level to make them more inquiry oriented, using the tenets of IBST. Each pair will share their ideas with the entire group.

Activity	Duration	Topic	Materials to be used	Outline of Activities
Application of IBST to traditional teaching materials	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*	<p>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</p> <p>Results of these conversions are shared and discussed and digital copies of all of the revisions are taken home by all participants</p>

### Classroom tryouts of IBST in a short term

**Goal:** Participants will evaluate their growing understanding of IBST by teaching such a lesson to school students.

**Method:** Each participant will design an IBST lesson, based on the tenets developed from other IBST-units and try it with school pupils. They will record the lesson and write reflections about the results. They will then share from five to eight salient minutes of the lesson with either IBST participating teachers from their own school or via teaching sharing Web places such as YouTube. In all cases they will reflect upon their lesson with colleagues.

Activity	Duration	Topic	Materials to be used	Outline of Activities
Classroom tryouts of IBST in a short-term	Varies	Follow-up	Availability of video recording equipment (fx: a 'smart' mobile phone) Access to the Internet 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. Participants share a five minute video from their own class showing an 'invitation to inquiry' on <i>YouTube</i> by sending the URL link to the rest of the participants Complete the self-efficacy instrument with names or self-identifying symbols

**Classroom tryouts of IBST in the long term**

**Goal:** Participants will evaluate their growing understanding of IBST by teaching such a lesson to school students.

**Method:** Each participant will design an IBST lesson, based on the tenets developed from other IBST-units and try it with school pupils. They will record the lesson and write reflections about the results. They will then share from five to eight salient minutes of the lesson with workshop participants at a succeeding meeting. In all cases they will reflect upon their lesson with colleagues.

Activity	Duration	Topic	Materials to be used	Outline of Activities
Long-term follow-up	150 minutes	Long-term follow-up (one-week to two months after workshop)	Various apparatus to play a variety of video formats Self-efficacy instrument*	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 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. Complete the self-efficacy instrument with names or self-identifying symbols



## **Possible configurations of development activities**

### **One-meeting workshop**

When used at one time for teacher educator development, the development activities of 8.2 are best used over two full days with either the short-term or long-term follow-up activity. The sequence for this workshop would be:

- Self-efficacy
- Conceptions about inquiry teaching
- Sharing an experience with science inquiry
- Inquiring into inquiry
- Explore inquiry teaching videos
- Exploration of meaning of Scientific Literacy
- Discover and prepare for cross-disciplinary opportunities for teaching scientific literacy
- Creating and teaching short 'invitations to inquiry'
- Application of IBST to traditional teaching materials
- Classroom tryouts of IBST in a short term **AND/OR** Classroom tryouts of IBST in a long term
- Conceptions about inquiry teaching
- Self-efficacy

### **Series of workshops**

When used as a series of teacher educator workshops, the development activities might best be divided into five sequential sessions as follows:

#### Session One (three hours)

- Self-efficacy
- Conceptions about inquiry teaching
- Sharing an experience with science inquiry
- Inquiring into inquiry
- Explore inquiry teaching videos

#### Session Two (three hours)

- Exploration of meaning of Scientific Literacy
- Discover and prepare for cross-disciplinary opportunities for teaching scientific literacy

#### Session Three (three hours)

- Creating and teaching short 'invitations to inquiry'

#### Session Four (two hours)

## S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

- Application of IBST to traditional teaching materials

### Session Five (time varies)

- Classroom tryouts of IBST in a short term AND/OR Classroom tryouts of IBST in a long term
- Conceptions about inquiry teaching
- Self-efficacy

### **Short course**

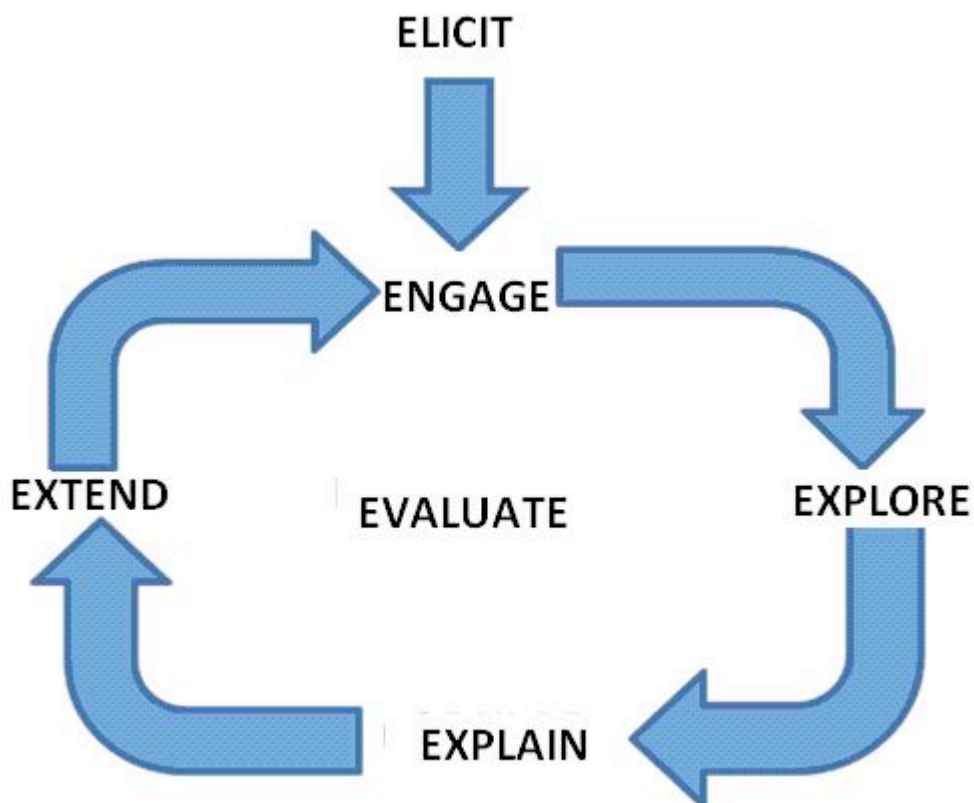
When experienced as a short course, the teacher educator development activities can be configured into the same sessions as above, into the given time dimensions of the short course.

### **On-line courses**

All of the development activities, including the teaching videos and scientific concept maps will be accessible on the 'under development' S-Team WP8 Web site so that all can be configured and coordinated according to the various needs of the teacher and participants.

### **Notes for teacher educators on how to use PDP development activities**

These same development activities are also 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 (below):



## S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

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.

Either the short-term or long-term follow-up, 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.

### Comprehensive list of accompanying materials

#### **Teaching Videos**

The videos are temporarily available at the following URL:

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

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

#### **Scientific Literacy Maps**

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.

**PowerPoint slides/presentations (note: for review purposes these are available on the S-TEAM memory stick provided, or from the S-TEAM website: [www.ntnu.no/s-team](http://www.ntnu.no/s-team))**

The first set of PowerPoint slides are for the **Sharing an experience with science inquiry** activity for use during the sample IBST lesson. The set is available as:

8.2 Exploration of meaning of Scientific Literacy

The second set of PowerPoint slides are for the **Sharing an experience with science inquiry** activity for use during the concept map exploration. The set is available as:

8.2 Sharing an experience with science inquiry

The third set of PowerPoint slides are to give an example of using cross-disciplinary teaching methods to teach about climate change. The set is available as a pdf file:

8.2 Theoretical basis and example of cross-disciplinary teaching about climate change

Activity sheets

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:

8.2 Sharing an experience with scientific inquiry handout

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

8.2 Creating and teaching short invitations to inquiry

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

8.2 Application of IBST to traditional teaching materials

Figure and transparency master

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

8.2 6E Figure (see Fig.1 above)

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

8.2 Inquiring into inquiry

Assessment/evaluation documents

WP8.2 will use two assessment/evaluation instruments during the TPDP. Each is available as follows:

Modified version of STEBI<sup>1</sup> Self-efficacy Instrument WP8 S-Team

8.2 Self-efficacy

Conceptions Questionnaire

8.2 Conceptions about inquiry teaching

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<sup>1</sup> Modified from Enochs, L., & Riggs, I. (1990)

**S-TEAM Product 8.3: Teacher Professional Development Programme on the Use of Students' Questions to maximise Student Interest in Biology**

**Ran Peleg**

**Technion - Israel Institute of Technology**

### **Rationale & purpose**

The need to create a scientifically literate citizenry is a widely accepted educational goal. Many interacting factors influence students' achievements and engagement with science education, and by extension the likelihood that they will become scientific literate people and make science related career choices.

Declining enrolments in science and technology are very often attributed to the uninteresting and difficult content of science courses. Our approach focuses on the importance of course content and its relevance to students' interests. We attempt to provide science teachers with the means to confront the gap between students' interests in science and the curricula they are required to learn in school science.

In research conducted with high school students, we found that there is a large gap between the interests of students as reflected in their self-generated questions and curriculum across three topics taught in the biology classroom. Further research showed that many topics, suggested by students, are addressed by teachers in the classroom, although, according to the curriculum, there is no need to teach them.

Academic literature has shown that more interested students will learn better and be better achievers. Pre-collection of students' self-generated questions, and instruction which seriously relates to these questions and integrates them in the proper chronological position in the teaching, should increase interest and motivation to learn science amongst high school students.

The purpose of the TPDP is to train high school science teachers to identify their students' interest in their appropriate field and integrate these into their teaching.

The TPDP addresses the appropriate theoretical background relating to the "student's voice". Relevant research results are presented and interest based teaching is practiced. A system is introduced which may help teachers identify their students' interest and integrate them into their teaching in accordance with the official curriculum.

The TPDP stressed the importance of practical application of the material learned. It is therefore a requirement of the program that participants collect information and apply the learned system in their teaching. It is also hoped that it would give teachers more confidence when teaching science, thus increasing their self-efficacy.

### **Proposed Duration**

The workshop consists of 14 three-hour sessions. For some of the sessions participants are requested to bring materials collected in the classes they teach. In addition, one of the sessions is conducted individually by each participant in the class. One meeting is conducted online.

**Outline of meetings, activities & list of materials**

Meeting No.	Duration	Topic	Materials to be used (PowerPoint's, videos, activity sheets etc)	Outline of Activities
1a		Self-efficacy questionnaire	Self-efficacy questionnaire-4.9.IIT.WP8.TPDP8.3.doc	Before the workshop, participants are asked to fill in the self-efficacy questionnaire. They are asked to put an identifying symbol as to leave the questionnaire anonymous.
1	1.5 hours	Motivation and interest in science teaching and the gap between students' interests and topics that appear in the curriculum	Introductory Powerpoint presentation (3.1.IIT.WP8.TPDP8.3)	Lecture and discussion on the topic of interest and motivation. Participants are requested to collect students' questions on subjects taught in the classroom for the next session.
2	1 hour	Methods to identify and locate areas of interest of students.	Powerpoint presentation on methods of identifying students' interests (3.2.IIT.WP8.TPDP8.3).  Questions collected by participants since last session. Sample of questions collected on the topic of the excretory system (4.1.IIT.WP8.TPDP8.3).	Lecture and discussion to familiarize participants with methods of identifying areas of interest using the questionnaires collected by participants.
3	1 hours	Locating interests of children through online sites	Powerpoint presentation on identifying children's interests from on-line internet sites (3.3.IIT.WP8.TPDP8.3)	Lecture that discusses how to students' interests may be collected through online knowledge sites on the Internet.
4	1 hours	Familiarity with the biology curriculum.	Powerpoint presentation on the biology curriculum (3.4.IIT.WP8.TPDP8.3).	Lecture and discussion on the development of curriculum throughout history and acquaintance with the two main approaches of curriculum development.

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting No.	Duration	Topic	Materials to be used (PowerPoint's, videos, activity sheets etc)	Outline of Activities
5a	1 hours	Students questions.	Powerpoint presentation on students' question (3.5.IIT.WP8.TPDP8.3).	Lecture and discussion on students questions.
5b	1 hour	The psychological contribution of teaching relevant and interesting issues to adolescents.		Guest lecture by a child psychologist.
6	1 hour	Comparison of student questions and the biology curriculum.	Excel sheet comparing students' questions and the curriculum (4.2.IIT.WP8.TPDP8.3).	The comparison to the biology curriculum is done with reference to 564 questions collected in science classrooms. This meeting is conducted online.
7	1 hours	Integrating students' interests into the curriculum – part 1.	Powerpoint presentation on Integrating students' interests into the curriculum (3.6.IIT.WP8.TPDP8.3).	Participants experience in integrating interest reflected from students' questions into the curriculum in the topics of genetics and circulation.  This is followed by a discussion whether teachers should explicitly mentions the topic being taught or implicitly teach without mentioning the topic in advanced.



S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting No.	Duration	Topic	Materials to be used (PowerPoint's, videos, activity sheets etc)	Outline of Activities
8	3 hours	Integrating students' interests into the curriculum – part 2.	<p>Presentation on research results in identifying students' interests and their integration in the classroom (3.7.IIT.WP8.TPDP8.3).</p> <p>Sample lesson plan (4.3.IIT.WP8.TPDP8.3 ).</p> <p>Worksheet describing assignment for next session (4.4.IIT.WP8.TPDP8.3).</p>	<p>Lecture on a research which identified students' interests and their integration in the classroom.</p> <p>A sample lesson conducted by the TPDP teacher which was constructed with the aim of integrating students' questions into the curriculum (in the topic of genetics).</p> <p>Assignment for next session: Preparation and implementation of a lesson which integrates students' question into the curriculum.</p>
9	1.5 hours	Report and reflection on the implementation of the interest-based instruction model.	<p>Example of sample lessons and reports (4.5.IIT.WP8.TPDP8.3 &amp; 4.6.IIT.WP8.TPDP8.3)</p>	<p>Participants are asked to report back on the lesson they planned and implemented. At the end of each report feedback will be given by the other participants.</p>

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting No.	Duration	Topic	Materials to be used (PowerPoint's, videos, activity sheets etc)	Outline of Activities
10	1 hours	Summary of the course and feedback.	Feedback questionnaire (7.1.IIT.WP8.TPDP8.3).  Self-efficacy questionnaire-4.9.IIT.WP8.TPDP8.3.doc  Requirements for the final assignment (4.7.IIT.WP8.TPDP8.3).	Participants will fill a feedback questionnaire on the workshop. The model we propose will be checked According to observations carried out by participants.  Participants are given their initial self-efficacy questionnaires back. They are asked if they would like to change any of their replies as a result of the workshop.  The final assignment for submission involves preparing an activity for high school biology teaching that integrates the students' interests and curriculum requirements.
11**	1 hours	Biology teachers' conference	Conference schedule - 4.10. IIT.WP8 TPDP8 3	The conference is an optional continuation of this professional development.

\*\* Not an integral part of the course

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

For the TPDP to be most effective it must include practical application of the material learned. It is therefore critical that participants apply the material learnt in class in their teaching during the program. It also important that participants be active teachers or have access to an ongoing class.

Times above are estimates and if lively discussions start-up they should be encouraged.

**Comprehensive list of accompanying materials**

Description	Number
Advertising the TPDPs in local contexts	1
Powerpoint slides/presentations	7
Reflection prompts, activity sheets etc	10

## S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Videos	0
Figures etc	0
Assessment/evaluation documents	1

### PowerPoint slides/presentations

Presentation to be used as an introduction in the first meeting is given in 3.1.IIT.WP8.TPDP8.3.ppt

A powerpoint presentation on methods of identifying students' interests is given in 3.2.IIT.WP8.TPDP8.3.ppt

Powerpoint presentation on identifying children's interests from on-line internet sites 3.3.IIT.WP8.TPDP8.3.ppt

Powerpoint presentation on the biology curriculum is given in 3.4.IIT.WP8.TPDP8.3.ppt

Powerpoint presentation on students' question is given in 3.5.IIT.WP8.TPDP8.3.ppt

Powerpoint presentation on Integrating students' interests into the curriculum is given in 3.6.IIT.WP8.TPDP8.3.ppt

Presentation on research results in identifying students' interests and their integration in the classroom is given in 3.7.IIT.WP8.TPDP8.3.ppt

### **Reflection prompts, activity sheets etc**

Sample of questions collected on the topic of the excretory system are shown in 4.1.IIT.WP8.TPDP8.3.doc

Excel sheet comparing students' questions and the curriculum is given in 4.2.IIT.WP8.TPDP8.3.xls.

A sample lesson plan is given in 4.3.IIT.WP8.TPDP8.3.doc

A worksheet describing assignment for next session is given in 4.4.IIT.WP8.TPDP8.3.doc

Example of sample lessons and reports are shown in 4.5.IIT.WP8.TPDP8.3.doc

Requirements for the final assignment are detailed in 4.6.IIT.WP8.TPDP8.3.doc

Requirements for the final assignment are detailed in 4.7.IIT.WP8.TPDP8.3.doc

Activities conducted within the framework of deliverable 8.3 are detailed in 4.8.IIT.WP8.TPDP8.3.doc

A self efficacy questionnaire adapted for the drama TPDP is provided in 4.9.IIT.WP8.TPDP8.3.doc.

Biology teachers' conference schedule - 4.10. IIT.WP8 TPDP8 3.

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Assessment/evaluation documents

The WP9 S-team Workshop Questionnaire is in 7.1.IIT.WP8.TPDP8.3.doc

## **S-TEAM Product 8.4: Teacher Professional Development Programme on Drama and Scientific Literacy**

**Ran Peleg**

**Technion - Israel Institute of Technology**

### **Rationale & purpose:**

#### **Work package WP8c, drama and scientific literacy, aims to increase teacher self-efficacy in two main domains:**

- Providing teachers with drama activities and tools that can be used by the teachers as inquiry based activities in the classroom to study scientific topics as well as to discuss socio-scientific issues.
- Providing teachers with tools adopted and adapted from drama and theatre, which can be used to improve their teaching. These tools were constructed by comparing the role of the teacher to that of the actor. These tools allow teachers to increase their presentational skills when teaching.

The work package aims at making science teaching more lively and personal, and allows for inquiry based science teaching using drama activities. It is hoped that this would lead to improved understanding of scientific phenomena, more positive attitudes towards science and a better understanding of the impact of science and technology on society, all of which are important components in the developments of students' scientific literacy. It is also hoped that it would give teachers more confidence when teaching science, thus increasing their self-efficacy.

### **Proposed Duration**

This document describes a three meeting TPD workshop for new teachers with an optional fourth meeting on the topic of socio-scientific issues and drama. As was done in several pilot trials of the TPD, it may easily be adapted for shorter or longer workshops as well as for in-service teachers (a full list of pilot trials may be found in **4.7.IIT.WP8.TPDP8.4.doc**).

Each of the first three meetings is due to last four hours. The optional fourth meeting is three hours long.

The first day concentrates on basic drama activities and acting skills aimed at introducing participants to theatre and acting. Whilst only a small amount of science will be discussed on the first day, links between teaching and acting will be stressed. The second day introduces science drama activities, i.e. activities that can be used to teach science in class. This is done by means of analogies. For the third meeting teachers are required to construct a drama activity and (if possible) test it with students. The third meeting concentrates on the activities the teachers constructed and a discussion of their experiences.

It is best to space out the three meetings in order to leave time for experiences to sink in and leave time for the teachers to create and try out their drama activities. A recommended arrangement is to hold weekly meetings on the same weekday.

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

An additional optional three-hour meeting is also detailed on the topic of drama and socio-scientific issues. This is suggested for participants who have previous knowledge in socio-scientific issues and would be expected to teach them.

**Outline of meetings, activities & list of materials**

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
	First day  4 hours + 20 minute break			
1a		Self-efficacy questionnaire	Self-efficacy questionnaire - 4.8.IIT.WP8.TPDP8.4.doc	Before the workshop, participants are asked to fill in the self-efficacy questionnaire. They are asked to put an identifying symbol as to leave the questionnaire anonymous.
1b	20 minutes	Differences and similarities between the arts and the sciences		A short discussion of differences and similarities between the arts and the sciences. How different are they really and how may science education benefit from art? Participants are asked to write down their opinions on paper. Selected answers are presented in class to raise a discussion. Reference will be made to Ashkenazi (2006).
1c	40 minutes	Introduction to the workshop	Introductory PowerPoint presentation - 3.1.IIT.WP8.TPDP8.4.pptx	Topics discussed: Workshop rationale and aims Advantages of using drama and theatre in science education Humanistic science education Where and how does drama meets science Details of the workshop structure

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
1d	40 minutes	Warm up and participation 'contract'	Warm up and ice-breaker activities - 4.1.IIT.WP8.TPDP8.4.docxd Videos of possible warm up exercises- 5.1.IIT.WP8.TPDP8.4.avi 5.2.IIT.WP8.TPDP8.4.avi	<p>Participants are asked to stand up and push chairs and tables back to free enough working space.</p> <p>Warm up activities are conducted as suggested in the worksheet. Not all of the activities need to be conducted on the first day and the workshop leader should choose the most appropriate for the group.</p> <p>After the first warm-up activity, the participants are asked to take a step forward in agreement to participate in the workshop, respect the other participants and to keep a 'safe' and comfortable environment in the workshop.</p> <p>Most of the activities can be easily adapted for classroom use.</p>
1e	120 minutes (a 20 minute break may interrupt this session as needed)	Elements of acting	The drama exercises are detailed in 4.2.IIT.WP8.TPDP8.4.docx A video of an exercise on subtext and presence- 5.3.IIT.WP8.TPDP8.4.avi	<p>Drama exercises that introduce the following basic elements in acting:</p> <ul style="list-style-type: none"> <li>Presence</li> <li>Subtext</li> <li>Use of body language</li> <li>Taking on a character</li> </ul> <p>All of these elements are linked to examples that occur in the classroom and how they may assist the teacher.</p>



S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
1f	20 minutes	Summary of first day	Details of the homework assignment may be found at the end of 4.2.IIT.WP8.TPDP8.4.docx	<p>Reflection on the first day of the workshop. Points to be raised in the discussion:</p> <p>Teachers' feelings in acting and standing in front of an audience</p> <p>Links, similarities and differences to their feelings when they teaching</p> <p>As a home assignment teachers are asked to be aware and attentive in their teaching and in their everyday life to the elements discussed in the workshop. For example:</p> <p>Can they spot subtext of their students, colleagues, people in a shop?</p> <p>Can they spot different bodily posture of people? What do their students look like when they are attentive, bored, etc.? How does their own body change when feeling confident or unconfident in class?</p> <p>Do they feel project different presence in class on different days/hours/lessons?</p>
	Second day 4 hours + 20 minute break			

## S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
2a		Collection of topics recently learned in the teachers training		<p>As participants enter the room they are asked to write a topic they have recently discussed in their teacher training classes on a small piece of paper. This can either be a topic in their subject matter (in biology this might be DNA transcription, photosynthesis, etc.). or a topic from their education studies (learning by inquiry, informal education, etc.).</p> <p>The notes may be sorted out and the best scientific/educational topics are put into a hat for later use.</p>
2b	25 minutes	Introduction to day two and discussion of teacher's experiences of the past week		<p>An explanation of the second day's programme is given.</p> <p>A short reminder of the principles introduced in the first session is given. Teachers are invited to discuss their home assignment (i.e. whether and where they met these elements in 'real' life).</p> <p>Teachers are also asked to mention ways where they have used drama in their teaching both before and after the first meeting (if they have enough teaching experience)?</p>
2c	35 minutes	Discussion of analogies	Analogies and Simulations in science education from McSharry and Jones (2000) is found in the introductory presentation - 3.1.IIT.WP8.TPDP8.4.pptx (slide 7).	<p>Analogies as a method of depicting a scientific phenomena following McSharry and Jones (2000).</p> <p>Discussion of the advantages and limitations of using analogies. Discussion of the advantages and limitations of models in general.</p>

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
2d	15 minutes	Short Warm up and agreement to participate	Warm up and ice-breaker activities - 4.1.IIT.WP8.TPDP8.4.docx	A similar warm-up to day one will be conducted. Different warm up activities may be chosen from the worksheet.
2e	40 minutes	Analogy in three pictures		<p>Participants are asked to split into groups of 3-4. One participant is asked to be the director of the group. The groups draw a note out of the hat (prepared previously). The group must then depict the phenomena in three pictures/scenes. These can be still scenes or moving scenes.</p> <p>The groups are given some 10 minutes to create the piece and then are asked to present it to the class.</p> <p>After the presentation the other participants or the teacher may ask the group to improve or change something in the piece.</p> <p>During the presentations the following points should be brought up in the discussion: Drawing back to the limitations of models discussed earlier the limitations of the analogy presented should be raised. It is important that this be also done in class</p> <p>Difficulties the participants faced The creative nature of the presentation and why the group chose to present the way they did. If more than one group depicts the same phenomena, usually very different products are obtained</p>

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
2f	40 minutes	Demonstration of more complex analogies	Activity on particles in the three states of matter activity is detailed in 3.2.IIT.WP8.TPDP8.4 Neuro-transmitter activity is presented in 4.3.IIT.WP8.TPDP8.4.doc Videos on the neuro-transmitter activity conducted in class with students can be seen in 5.4.IIT.WP8.TPDP8.4.avi 5.5.IIT.WP8.TPDP8.4.avi	<p>Two analogies are presented together with explanations on how they can be used in class to enhance the teaching and how they can be used to raise discussion on the scientific topic.</p> <p>The first is on particles in the three states of matter. Each child represents a particle. The teacher gives instruction to heat up, disperse, etc. Allowing for the investigation of the three states of matter.</p> <p>The second is an activity constructed by a participant in one of the workshops on propagation of nerve impulses and neurotransmitters. This allows for an investigation on how neuro-transmitters work and how different drugs effect them.</p>
	20 minute break			

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
2g	15 minutes	Explanation of home assignment	Description of the home assignment is presented in 3.3.IIT.WP8.TPDP8.4  Article on drama in science education by Peleg and Baram-Tsabari (2009) is provided in 4.6.IIT.WP8.TPDP8.4.pdf	The home assignment involves creating a lesson plan that involves a dramatic enactment of an analogy.  The activity should be tested with real students in class for the next meeting. If the participants do not teach at this point of their teacher training they can try test the activity with the other participants acting as students in the next meeting.  Participants may seek help for the assignment in an article written within the framework of this workshop (Peleg & Baram-Tsabari, 2009)
2h	35 minutes	Group work – constructing a drama activity		In groups of 3-4, participants should brainstorm, consult each other and start constructing the drama activities they will do for their assignment.
2i	20 minutes	Group discussion on the homework assignment		Following the brainstorming session, questions may arise. These can be raised in the group forum.  This discussion should also raise practical questions on how to conduct the activity in class.

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
2j	15 minutes	Short lecture on informal education	List of aims of informal education - 3.4.IIT.WP8.TPDP8.4. Sample lecture/discussion on drama in science education and informal education – 5.6.IIT.WP8.TPDP8.4.avi	<p>As a summary to the second meeting, a short lecture is given on the aims of informal education.</p> <p>Participants are asked to state their view of what informal education might be. The teacher then suggests definitions found in the literature and a short discussion follows on the aims of informal education. Several aims are listed in the presentation. Participants usually provide more in the discussion.</p> <p>Finally the teacher should wrap up the discussion by showing how and where drama in science education fits in with the aims of informal education. This should provide a strong link between what has been taught in the workshop and the teaching practice.</p>
	Third day 4 hours + 20 minute break			
3a	20 minutes	Short Warm up and agreement to participate	Warm up and ice-breaker activities - 4.1.IIT.WP8.TPDP8.4.docx	<p>A similar warm-up to day one will be conducted. Different warm up activities may be chosen from the worksheet.</p> <p>Teachers are invited to provide an activity for the warm up</p>

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
3b	150 minutes (20 minute breaks may interrupt this session as needed)	Presentation of participant's home assignment	Sample presentations participants projects may be seen in – 5.7.IIT.WP8.TPDP8.4.avi and 5.8.IIT.WP8.TPDP8.4.avi	<p>Each participant should present his/her lesson plans and drama activities.</p> <p>This should include enactment of the activity in class (the other participants could play the students) and a reflection on how the activity was accepted by the students.</p> <p>After each presentation a short discussion is relate to the following concepts discussed earlier in the workshop: Analogies and models Informal education Drama activities Difficulties of enactment in class</p>
3c	40 minutes	Putting concepts into use.		<p>Discussion of how to best enact the drama activity in class. Following questions should be related to:</p> <p>How can students' reluctance be overcome? Should such such activities be assessed and how? What is the role of the teacher – should he/she lead the drama or should he let the students create the drama independently? What is the role of research and inquiry in the drama activity?</p>

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
3d	30 minutes	Summary of workshop	<p>Self-efficacy questionnaire - 4.8.IIT.WP8.TPDP8.4.doc</p> <p>Summary presentation 3.5.IIT.WP8.TPDP8.4.pptx. Sample of a summary discussion may be seen in - 5.9.IIT.WP8.TPDP8.4.avi</p> <p>Sample assignments are in 4.4.IIT.WP8.TPDP8.4.doc and 4.5.IIT.WP8.TPDP8.4.doc</p>	<p>Participants are given their initial self-efficacy questionnaires back. They are asked if they would like to change any of their replies as a result of the workshop. This serves as a preparation for the summary discussion. The questionnaires are collected at the end of the workshop. If conditions permit, the same questionnaire is sent to participants several months after the workshop as a follow-up.</p> <p>Summary of the ideas learned and discussed. Further ideas of using drama in science education are discussed using examples in the presentation: DSP – Dramatic Science Project in Denmark End of year project Professional theatre in science education</p> <p>The home assignments presented in the class should be written up and handed in. Conclusions may and should be drawn from the trials done in the classroom and in the workshop. The written assignment should include the following elements: The rationale Details of the drama activity as presented orally Reflection on the enactment in class and suggestions for improvements. Requirements and the grading scheme for the assignment are in the presentation (slides 6-7). Grade is given according to the breakdown in the syllabus.</p>



S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
	Fourth day (optional meeting) 3 hours + 20 minute break			
4a	20 minutes	Short Warm up and agreement to participate		A short warm up as done in the previous meetings.
4b	40 minutes	Introduction to socio-scientific issues and simulations	Analogies and Simulations in science education from McSharry and Jones (2000) - 3.6.IIT.WP8.TPDP8.4.pptx <b>(slide 2)</b> .	<p>The topic of socio-scientific issues should be introduced and their importance in developing scientific literacy. Participants are expected to have some prior knowledge on the topic.</p> <p>The difference between analogies and simulations are discussed with reference to McSharry and Jones (2000).</p>

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
4c	30 minute	Sample simulations on socio-scientific issues	<p>Information on “My sister’s keeper” can be found on 3.6.IIT.WP8.TPDP8.4.pptx (slide 3) or on <a href="http://en.wikipedia.org/wiki/My_Sister%27s_Keeper">http://en.wikipedia.org/wiki/My_Sister%27s_Keeper</a></p> <p>The cloned chicken simulation is detailed in 3.6.IIT.WP8.TPDP8.4.pptx (slide 4).</p>	<p>Two simulations are demonstrated which raise socio-scientific issues. The added value of such simulations to the ‘normal’ teaching is in the firsthand experience of the students. Students can experience a stakeholder speaking in the first person about his thoughts and feelings.</p> <p>The first simulation is a TV-style host show following the fictional story of “My sister’s keeper” by Jodi Picoult</p> <p>The following characters are ‘cast’ for the simulation:          The host (could be the teacher)          The mother          The daughter who is suing her parents</p> <p>A brief review of the story and the characters is given in the presentation. The simulation is then allowed to run. After a few minutes, the audience may interrupt and add questions of their own.</p> <p>Following points should be raised after the simulation:          The simulation allows both the participants who act in the drama and those watching to experience the social implication of a scientific issue firsthand – “a first person experience”.</p> <p>Whilst the host show scenario allows for firsthand experience, it does not require extraordinary acting skills.</p> <p>The social and scientific issues raised should be written on the board. These can be further investigated as homework or in class (What is leukaemia? What are the legal issues involved? Have such cases really</p>

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Meeting Number	Duration	Topic	Materials to be used (PowerPoints, videos, activity sheets etc)	Outline of Activities
4d	60 minutes	Participant's self created simulations	Presentation of possible scenes for the simulation, possible topics and details of the assignment are in 3.6.IIT.WP8.TPDP8.4.pptx (slide 5-7).	<p>Participants are asked to create their own simulation in groups of 3-4.</p> <p>The groups must choose their socio-scientific issue. A list of possible scenarios is given. Participants may choose from the list or create their own scenario.</p> <p>The groups are given some 15 minutes to create the piece and then are asked to present it to the class.</p> <p>In the presentation the members of the group may enact the simulation themselves or ask participants from the rest of the class to participate.</p> <p>After each presentation a short discussion should reflect on the following points:</p> <p>Emotion in the enactment Ease or difficulty of acting a certain character Difficulties the participants faced</p>
4e	30 minutes	Summary		<p>Summary of the main concepts discussed in the third meeting. Advantages and disadvantages of using drama in socio-scientific issues should be discussed as well as further elaboration on how such simulations may be effectively used in class.</p>

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

The PDP has two main goals:

To provide teachers with drama activities that can be used in the classroom to enhance their science teaching.

To provide teachers with tools adapted from drama for improvement of their teaching skills.

These two goals are addressed are interlinked. It is therefore important that the teacher educator highlight these two goals in each activity. For example when participants present a drama activity on scientific phenomena, the teacher educator should feel free to gently comment on the acting and/or the directing and how they may be improved. When doing a 'pure' drama exercise links should be raised by the teacher educator to the classroom context (when do we encounter sub-text in class for example).

Whilst it is important that the teachers are encouraged to actively participate in all activities, it is important to stress that at no point are they expected to become professional actors or show any acting skills or talents. The goal of the workshop is to provide the teachers with tools as teacher. It is crucial that a comfortable and encouraging atmosphere be created to supports such ends.

During the workshop it is vital that practical tips are given as to how the drama activities may be implemented in class.

### Additional materials for teachers educators are available for this deliverable:

The PowerPoint presentation of a lecture on drama in science education in Israel given at the annual ASE conference in Nottingham (Peleg, 2010) may be found in **3.7.IIT.WP8.TPDP8.4.ppt**

An article written in the context of this deliverable on the topic of drama in science education (Peleg & Baram-Tsabari, 2009) is presented in **4.6.IIT.WP8.TPDP8.4.pdf**

Activities conducted within the framework of deliverable 8.4 are detailed in **4.7.IIT.WP8.TPDP8.4.doc**

### Comprehensive list of accompanying materials

File Number	Description	Number
2.1.IIT.WP8.TPDP8.4.doc	Advertising the TPDPs in local contexts	5
2.2.IIT.WP8.TPDP8.4.doc		
2.3.IIT.TPDP8.4.docx		
2.4.IIT.TPDP8.4.doc		
2.5.IIT.TPDP8.4.doc		

3.1.IIT.WP8.TPDP8.4.pptx 3.2.IIT.WP8.TPDP8.4.pptx 3.3.IIT.WP8.TPDP8.4.pptx 3.4.IIT.WP8.TPDP8.4.pptx 3.5.IIT.WP8.TPDP8.4.pptx 3.6.IIT.WP8.TPDP8.4.pptx 3.7.IIT.WP8.TPDP8.4.ppt	PowerPoint slides/presentations	7
4.1.IIT.WP8.TPDP8.4.docx 4.2.IIT.WP8.TPDP8.4.docx 4.3.IIT.WP8.TPDP8.4.doc 4.4.IIT.WP8.TPDP8.4.doc 4.5.IIT.WP8.TPDP8.4.doc 4.6.IIT.WP8.TPDP8.4.pdf 4.7.IIT.WP8.TPDP8.4.doc 4.8.IIT.WP8.TPDP8.4.doc	Activity sheets, etc.	8
5.1.IIT.WP8.TPDP8.4.avi 5.2.IIT.WP8.TPDP8.4.avi 5.3.IIT.WP8.TPDP8.4.avi 5.4.IIT.WP8.TPDP8.4.avi 5.5.IIT.WP8.TPDP8.4.avi 5.6.IIT.WP8.TPDP8.4.avi 5.7.IIT.WP8.TPDP8.4.avi 5.8.IIT.WP8.TPDP8.4.avi 5.9.IIT.WP8.TPDP8.4.avi	Videos	9
7.1.IIT.WP8.TPDP8.4.doc 7.2.IIT.WP8.TPDP8.4.xlsx 7.3.IIT.WP8.TPDP8.4.docx	Assessment/evaluation documents	3

### Additional documents

The following are advertisements of TPDP's which were used as pilots:

The syllabus of a compulsory two-day workshop of a TPDP which was given in the teacher education programme of Safed College in May-June 2010 is detailed in **2.1.IIT.WP8.TPDP8.4.doc**. This was the final pilot conducted and is almost identical to the TPDP detailed in this document.

**2.2.IIT.WP8.TPDP8.4.doc** is an invitation for a workshop for in-service teachers which consisted of seven three hour meetings given at IIT. This was the first major pilot of the TPDP.

**2.3.IIT.TPDP8.4.docx** is a proposal for a half-day workshop for both pre-service and in-service teachers within the framework of a TPDP for new teacher to MUTAV (a science for all programme in Israel) given at

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

IIT. The workshop discussed the use of drama with socio-scientific issues and is similar to the fourth optional meeting detailed in this document.

**2.4.IIT.TPDP8.4.doc** is an invitation for a voluntary two day workshop for pre-service teacher at the end of their teacher training at IIT.

**2.5.IIT.TPDP8.4.doc** details two meetings on drama in science education given within a biology teaching course in IIT.

### **PowerPoint slides/presentations**

Presentation to be used as an introduction in the first meeting - **3.1.IIT.WP8.TPDP8.4.pptx**

The particles in the three states of matter activity is detailed in **3.2.IIT.WP8.TPDP8.4.pptx**

Explanation of the home assignment for the third meeting is in **3.3.IIT.WP8.TPDP8.4.pptx**

A list of aims of informal education is given in **3.4.IIT.WP8.TPDP8.4.pptx**

The summary presentation for the end of the third meeting is **3.5.IIT.WP8.TPDP8.4.pptx**

Presentation on drama as a tool to teach socio-scientific issues is in **3.6.IIT.WP8.TPDP8.4.pptx**

The PowerPoint presentation of a lecture on drama in science education in Israel given at the annual ASE conference in Nottingham (Peleg, 2010) may be found in **3.7.IIT.WP8.TPDP8.4.ppt**

Activity sheets etc

Some possible warm up and ice-breaker exercises are provided in **4.1.IIT.WP8.TPDP8.4.docx**

The drama exercises for the first lesson and homework assignment are detailed in **4.2.IIT.WP8.TPDP8.4.docx**

An activity sheet on neuro-transmitters written by a participant of one of the pilot workshops is in **4.3.IIT.WP8.TPDP8.4.doc**

Sample written assignments are in **4.4.IIT.WP8.TPDP8.4.doc** and **4.5.IIT.WP8.TPDP8.4.doc**

An article written in the context of this deliverable on the topic of drama in science education (Peleg & Baram-Tsabari, 2009) is presented in **4.6.IIT.WP8.TPDP8.4.pdf**

Activities conducted within the framework of deliverable 8.4 are detailed in **4.7.IIT.WP8.TPDP8.4.doc**

A self efficacy questionnaire adapted for the drama TPDP is provided in **4.8.IIT.WP8.TPDP8.4.doc**.

Videos

S-TEAM deliverable 8b: Drama, Scientific Literacy and Student Interest

Videos of possible warm up exercises:

5.1.IIT.WP8.TPDP8.4.avi

5.2.IIT.WP8.TPDP8.4.avi

Videos of an exercise on subtext and presence:

5.3.IIT.WP8.TPDP8.4.avi

Videos on the neuro-transmitter activity conducted in class with:

5.4.IIT.WP8.TPDP8.4.avi

5.5.IIT.WP8.TPDP8.4.avi

Sample lecture/discussion on drama in science education and informal education:

5.6.IIT.WP8.TPDP8.4.avi

Sample presentations of participants' projects –

5.7.IIT.WP8.TPDP8.4.avi

5.8.IIT.WP8.TPDP8.4.avi

Sample of a summary discussion:

5.9.IIT.WP8.TPDP8.4.avi

### **Assessment/evaluation documents**

A shortened translation of the WP9 questionnaire may be found in **7.1.IIT.WP8.TPDP8.4.doc**. The questionnaire was shortened as some of the questions did not apply to the participants.

Summary of the results of the filled-in WP9 questionnaire are found in **7.2.IIT.WP8.TPDP8.4.xlsx**.

Several reflections of participants in the workshops is presented in **7.3.IIT.WP8.TPDP8.4.docx**

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(1) To March 2010

(2) From April 2010

(3) From June 2010