



These materials are based on the work within the project Promoting Attainment of Responsible Research & Innovation in Science Education (PARRISE). Coordination: Dr. Marie-Christine Knippels & Frans van Dam, MSc (Utrecht University)

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# Course outline and lesson plans

## SSIBL teacher professional development

*University of Jaén, Department of Science Education. Spain*

### Overview course outline

**Duration:** This course consists of 20 hours distributed in 6 face-to-face sessions along three months in the context of three different compulsory subjects offered in a Post Graduate Course (PGC) at the University of Jaén to become science secondary school teachers.

**Short summary:** This teacher professional development (TPD) programme adopts a student teacher active approach in which they get acquainted with the SSIBL pedagogy through several experiential, reflective and design activities.

The first session focuses on the implications of scientific and technological advances, setting the scene for discussing the need to promote scientific literacy and responsible research and innovation (RRI) through science education. The following sessions are designed to experience and discuss the potential of SSIBL in addressing current needs in science education. For this purpose we ask pre-service teachers to identify SSIBL scenarios in the media, to perform inquiry on the related SSI, map the controversy and develop informed opinions taking on the role of learners. Afterwards, participants are asked to take on the role of reflective practitioners and analyse the educational potential of the approaches being experienced, reflecting on the teaching skills related to their use in the classroom. The following session works on some of those specific teaching skills, with special attention to how to guide open-ended tasks and the use of questioning to support student inquiry and argumentation. The final sessions are aimed at supporting pre-service teachers in the design of SSIBL classroom activities, providing them with quality criteria to self-evaluate and improve their designs.

### Objectives

This course allows pre-service teachers to:

- reflect on the specific reasons for students' low engagement and interest in science learning.
- reflect on current educational demands and the kind of science education required nowadays.
- explore and experience classroom activities and resources to learn



science through inquiry about socio-scientific issues (SSIBL).

- explore the potential of SSIBL for increasing students' interest and engagement in science learning.
- recognise the potential of SSIBL for the development of students' competences, critical thinking and scientific literacy.
- identify links between SSIBL and the Spanish curriculum for secondary school science.
- identify the key features associated with the SSIBL approach.
- reflect on the teaching skills required to implement the SSIBL approach successfully.
- design SSIBL classroom materials and develop a lesson plan for working on them, setting out the expected learning outcomes and how to assess them.
- critically evaluate SSIBL materials and interventions.
- develop skills related to the use of media for the introduction of relevant scenarios for inquiring on SSI.
- develop skills to identify different perspectives within an SSI (scientific, social, environmental, economic, ethical...) and various levels of analysis (individual, collective, local, global...).
- critically reflect on the TPD course and propose means for future improvement to address their needs

## Summary

Session	Duration	Main Activity	Approach
<b>1</b>	1 h	Reflecting on current challenges in Science Education	<i>Teachers as learners and teachers as reflective practitioners</i>
<b>2</b>	4 h	Use media and Mapping Controversy	<i>Teachers as learners and teachers as reflective practitioners</i>
<b>3</b>	4 h	Having an immersion experience in SSIBL-type activities and reflecting back	<i>Teachers as learners and teachers as reflective practitioners</i>
<b>4</b>	4 h	Effective Questioning. Questions to promote inquiry	<i>Teachers as learners and teachers as reflective practitioners</i>
<b>5</b>	4 h	Designing and evaluating SSIBL classroom activities	<i>Teachers as designers and teachers as reflective practitioners</i>
<b>6</b>	2 h	Presentation of SSIBL classroom activities	<i>Teachers as reflective practitioners</i>
<b>7</b>	1 h	Formative evaluation of the TPD course	<i>Teachers as designers and teachers as reflective practitioners</i>



## Lesson plan

### **SSIBL teacher professional development (TPD) course**

*University of Jaén, Department of Science Education. Spain*

### **Pre-service Teacher Lower secondary education (11-14 year olds)**

#### Session 1

**Duration:** 1 hour

**Reflecting on current challenges in science education**

#### Objectives

- To reflect on specific reasons for students' low engagement and interest in science learning.
- To reflect on current educational demands and the kind of science education required nowadays.

#### Description of activities

The main aim of this activity is to discuss what kind of education is required nowadays, in order to motivate the exploration of the PARRISE model as a response to current challenges in science education.

#### Materials used for this session

Power point presentation with guiding questions to stimulate the debate

**Resource:** *Presentation\_UJA* (Session 1, pp 2-6)



## Session 2

**Duration:** 4 hours

### Use of media and mapping controversy

#### Objectives

- To develop skills related to the use of media for the introduction of relevant scenarios for inquiring about SSI.
- To develop skills to identify different perspectives within an SSI (scientific, social, environmental, economic, ethical...) and various levels of analysis (individual, collective, local, global...).

#### Description of the activities

The main purpose of this TPD activity is to promote skills related to the use of media for teaching purposes (bringing a sense of authenticity and relevance and identifying powerful scenarios for SSIBL). Special attention is paid to supporting the mapping of controversies, the critical analysis of information, the identification of different perspectives (scientific, social, environmental, economic, ethical...) and different dimensions or levels of analysis (individual, collective, local, global...).

Additionally, this activity provides opportunities to discuss the objectivity and reliability of various sources of information, as well as the identification of biased and conflicting interests.

#### Materials

Activity designed by UJA for the use of media and mapping controversy. Presentation with guidelines and handouts for student teachers.

**Resources:** Presentation\_UJA (Session 2, pp 7-9) and Handouts\_UJA (Session 2, pp 1-2)



## Session 3

**Duration:** 4 hours

### Immersion experience in SSIBL-type activities

#### Objectives

- To explore the potential of SSIBL for increasing students' interest and engagement in science learning.
- To recognise the potential of SSIBL for the developing students' competences, critical thinking and scientific literacy.
- To identify links between SSIBL and the Spanish curriculum for secondary school science.
- To identify the key features associated with a SSIBL approach.

#### Description of the activities

Pre-service teachers are asked to inquire about the implications of experimentation with animals, to discuss arguments in groups and to make informed decisions. They have to "play" the role of science students throughout these immersion tasks. Afterwards, the teacher educator initiates a whole class discussion using some guiding questions:

- What can be learnt through this activity in terms of content knowledge, skills and values?
- What curriculum standards are addressed through this activity?
- What would I need to teach science through this approach?

#### Materials

PowerPoint presentation with guiding question and different scientific evidence and contexts. This session uses an adapted version of the activities related to "Animal testing" [© ENGAGE (2017)]. <https://www.engagingscience.eu/>



Resources: *Presentation\_UJA (Session 3, pp 10-13 )* & Module "Animal testing"(Retrieved from <https://www.engagingscience.eu/en/2015/10/13/animal-testing/>)



## Session 4

**Duration:** 4 hours

### **Questioning: Teaching skills for implementing SSIBL**

#### **Objectives:**

- To reflect on teaching skills required to implement the SSIBL approach successfully.

#### **Description of the activities:**

This session focuses on the development of important teaching skills for SSIBL. Special attention is paid to the effective use of questions and how to support students' reasoning and inquiry.

Ask pre-service teachers to reflect on different types of question which may be used in the classroom, their purpose and their effects on students. Afterwards, they watch a classroom video on how a teacher used questions to promote student reasoning, trying to identify the key features of good teachers' questions. Finally, discuss common mistakes when raising questions in order to promote the development of good questioning habits.

The role of teachers in initiating and guiding student's work was also analyzed, providing some guidelines about how to support the development of investigable questions by students.

#### **Materials**

The work on specific teaching skills (questioning) have been partly inspired for the materials available for TPD modules developed by PRIMAS European Project (*Promoting inquiry in mathematics and science education across Europe*).

**Resources:** Presentation\_UJA (Session 4, pp 14-20) and Handouts\_UJA (Session 4, pp 3-10)



## Session 5

**Duration:** 4 hours

### Designing SSIBL classroom activities and evaluating them

#### Objectives:

- To design SSIBL classroom materials and develop a lesson plan for working on them, setting out the expected learning outcomes and how to assess them.
- To critically evaluate SSIBL materials and interventions.

#### Description of the activities:

In the first part of the session, student teachers were asked to design SSIBL classroom tasks indicating the desired learning outcomes, how they would evaluate them and which materials and questions they would use to support their future pupils' activities.

After that, they were asked to evaluate their designs and improve them according to quality criteria provided in advance (see materials).

Quality criteria for the evaluation of SSIBL classroom activities and lesson plans they have to evaluate are related to:

- Relevance of the topics
- Connection to the curriculum
- Preparation of key questions for scaffolding
- Preparation of supplementary material
- Mapping controversy
- Setting out and assessing appropriate learning goals

#### Materials

Handouts and Template with criteria to improve the design of SSIBL classroom activities based on the SSIBL model

*Resources:* Presentation\_UJA (Session 5, pp 21-29) and Handouts\_UJA (Session 5, pp 11-14)



## Session 6

**Duration:** 2 hours

### **Presentation of SSIBL classroom activities**

#### **Objectives**

- To recognise the potential of SSIBL for the developing students' competences, critical thinking and scientific literacy.
- To identify links between SSIBL and the Spanish curriculum for secondary school science.
- To identify the key features associated with a SSIBL approach.
- Reflect on the teaching skills required to implement the SSIBL approach successfully.
- To design SSIBL classroom materials and develop a lesson plan for working on them, setting out the expected learning outcomes and how to assess them.
- To critically evaluate SSIBL materials and interventions.

#### **Description of the activities**

Participants present the SSIBL classroom materials they have designed and self-evaluated, and critically discuss them with the whole group.



## Session 7

**Duration:** 1 hours

### Formative evaluation of the TPD course

#### Objectives

- To critically reflect on the TPD course and propose means for future improvement to address their needs

#### Description of the activities

Student teachers are asked to complete a short questionnaire pointing out the most valuable contribution of the course and what further needs can they identify. In this session there is also room for discussing their understanding of the SSIBL model, how confident they feel in using it and the most or least useful aspects of the TPD course.

#### Materials

*Resources:* Handouts\_UJA (Session 7, pp 15-16)



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