ENSITE

Environmental Socio-Scientific Issues
in Initial Teacher Education

Module 8

TEACHERS' BELIEFS ABOUT TEACHING SOCIO-SCIENTIFIC ISSUES

This outline is based on the work within the project Environmental Socio-Scientific Issues in Initial Teacher Education (ENSITE). Coordination: Prof. Dr. Katja Maaß, UNIVERSITY OF EDUCATION FREIBURG, Germany. Partners: UNIVERSITEIT UTRECHT, Netherlands; ETHNIKO KAI KAPODISTRIAKO PANEPISTIMIO ATHINON, Greece; UNIVERSITÄT KLAGENFURT, Austria; UNIVERZITA KARLOVA, Czech Republic; UNIVERSITA TA MALTA, Malta; HACETTEPE UNIVERSITY, Turkey; NORGES TEKNISK-NATURVITENSKAPELIGE UNIVERSITET NTNU, Norway; UNIVERSITY OF NICOSIA, Cyprus; INSTITUTE OF MATHEMATICS AND INFORMATICS AT THE BULGARIAN ACADEMY OF SCIENCE, Bulgaria; UNIVERZITA KONSTANTINA FILOZOFA V NITRE, Slovakia.

General overview and aim

In this module future teachers in initial teacher education will explore the issue of beliefs, narratives, cultural backgrounds and personal identities and how these can influence how students engage with environmental socio-scientific issues on one hand, but also how they affect their own teaching practices and decisions. The intention is to make students in initial teacher education familiar with how dispositions can affect a person's decisions, and compare how different the approach is between teaching a STEM topic and teaching an environmental socio-scientific topic. In particular, teachers in initial teacher education will reflect on their own beliefs on specific environmental socio-scientific topics and how these might effect their understanding and teaching practices, they will explore cultural backgrounds and personal identities as issues hindering the discussion of SSI through two case studies, and will review and engage in teaching practices and pedagogical strategies that will help them to introduce environmental socio-scientific issues in their classes.

The module was designed to make connections to everyday life and place an emphasis on relevance of science and responsible citizenship. Therefore, activities and case studies aim to make this connection to the relevance of science to everyday life. Furthermore, one of the activities focuses on responsible citizenship by exploring the issue of taking actions with their students on the environmental socio-scientific issues they are working with.

This module is part of:

- LEARNING: Developing competences in dealing with environmental SSI themselves
- TEACHING: Acquiring teaching skills to supporting their students in developing these competences

Both learning and teaching relate to (i) scientific competences, (ii) critical thinking, argumentation, and evidence-based reasoning (iii) taking into account beliefs and dispositions of themselves as teachers, and their students.

IO 8 has crosslinks to other modules who explore pedagogical strategies on environmental socio-scientific issues. These crosslinks aim to support HE researchers who would like to use the modules as an integrated way of exploring environmental socio-scientific issues in initial teacher education. They also serve the purpose that the individual modules also can be used as stand-alone modules.

IO8 was crosslinks with IO1, IO2, IO6, IO7, IO9 and IO12

Relevant topics

In this module the emphasis is on pedagogical strategies related with the social aspect of the environmental socio-scientific issues. Students in initial teacher preparation will learn how their own beliefs and those of their students can constrain the understanding and discussion of the environmental socio-scientific issues. The activities also make the connection to key competences (i.e. critical thinking, evidence-based explanations (of the European Commission (COM 2019)

Then students in initial teacher preparation programs will explore how to adjust their lessons to account for different beliefs. They will familiarize themselves with beliefs in SSI through

two case studies, they will explore their own beliefs through a questionnaire, and will design a lesson accounting for different beliefs.

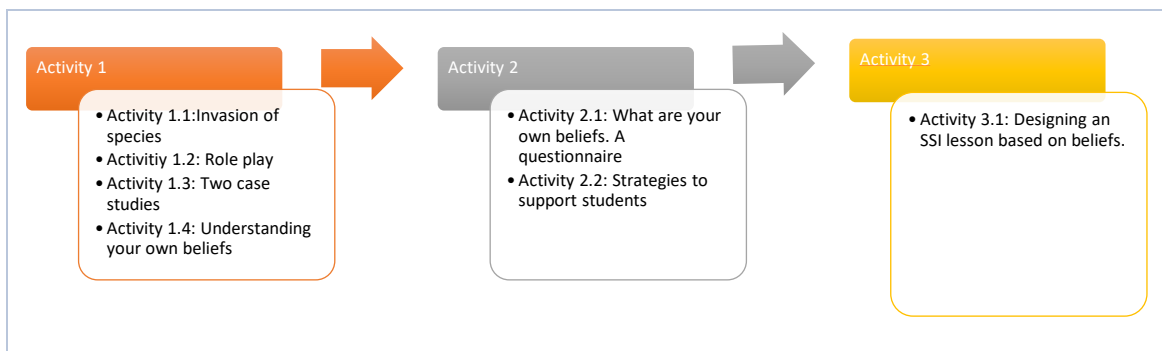## Learning Outcomes

Students will acquire:

- Awareness on reflecting on how their own beliefs, background and identity might affect their decisions when discussing environmental socio-scientific issues (Activity 1.1)

- Knowledge on identifying how beliefs might differ from evidence (Activity 1.1)

- Awareness in dealing with environmental socio-scientific issues under specific roles to appreciate how beliefs can affect us. (Activity 1.2)

- Skills on how to engage in role play games as a pedagogical strategy to deal with one's beliefs in environmental socio-scientific issues. (Activity 1.2)

- Skills on how to understand how people with different beliefs, cultural background and identities talk about environmental socio-scientific issue (Activity 1.3)

- Awareness that discussing an environmental socio-scientific issue might be affected by one's beliefs (Activity 1.3)

- Skills on how to identify their own beliefs and how these might hinder how they teach SSI (Activity 1.4)

- Awareness that beliefs, cultural backgrounds, and identities can hinder discussion of SSI (Activity 2.1)

- Awareness about the necessity to explicitly discuss beliefs as part of SSI (Activity 2.1)

- Understanding on how a specially designed questionnaire can support them in identifying their own beliefs and those of their students.

- Awareness about the necessity to include specific pedagogical support to help students in initial teacher preparation to understand how their beliefs can hinder the teaching and discussion of SSI (Activity 2.2)

- Awareness about the necessity that teaching science and mathematics should also include dealing with environmental SSI (Activity 2.2 and 3.1)

Flowchart and Module plan

This module involves three sections, all structured into several activities. It includes 250 minutes of sessions and 90 minutes of homework. It includes lecture parts, group discussions, debates, and student presentations. The structure is as follows:
- Activity 1. How our beliefs, cultural backgrounds and identities affect our decisions
- Activity 2. What are your own beliefs
- Activity 3. Designing an SSI lesson based on your beliefs

Activity 1	Activity 2	Activity 3
• Activity 1.1:Invasion of species • Activitiy 1.2: Role play • Activity 1.3: Two case studies • Activity 1.4: Understanding your own beliefs	• Activity 2.1: What are your own beliefs. A questionnaire • Activity 2.2: Strategies to support students	• Activity 3.1: Designing an SSI lesson based on beliefs.

1. How our beliefs, cultural backgrounds and identities affect our decisions

1.1.   The invasion of species

 Duration: 45 minutes

This is a "warm up" activity. The emphasis of this activity is on introducing the students in initial teacher preparation to their own beliefs, background, and identity, and how these might affect their decisions when discussing environmental socio-scientific issues.

Teacher Educators introduce the module using the ppt presentation [1] and then present the activity 1.1 to students in initial teacher preparation. For the first activity you will need two different colors of post-it notes. During the first question in Activity 1.1. draw a line of agreement on the board and write "I agree" on one end and "I disagree" on the other end. Give one colored post-it notes to each student (same color for all) and ask them to write their name. They will stick their post-it notes on the line of agreement during Step 1 of Activity 1. Then do the same but with a different color for Step 6. Ask students who changed their initial response to explain the reasons.

Finally, reflect with the students on how beliefs, cultural background and identity influence our decisions in environmental socio-scientific issues (slide 5).

This activity contributes to the achievement of the following learning outcomes:

- Reflecting on how their own beliefs, background and identity might affect their decisions when discussing environmental socio-scientific issues (Activity 1.1)

- Identifying how beliefs might differ from evidence (Activity 1.1)

1.2. Role play

 Duration: 45 minutes

The emphasis of this activity is on engaging students in initial teacher preparation in different roles when discussing an environmental socio-scientific issue to familiarize them with difficulties students and teachers have when their beliefs, cultural background and identities are in contrast with the evidence or the decisions they are asked to make.

Teacher Educators will introduce the role-playing game and will give students (in their groups) specific roles. The teacher educators should try to match students with roles that contrast with their own beliefs and facilitate the role-playing game. Finally, the teacher educator will ask the students to reflect on the process of debating under a certain role using specific beliefs, identities, and cultural backgrounds.

This session contributes to the achievement of the following learning outcomes:

- Experience in dealing with environmental socio-scientific issues under specific roles to appreciate how beliefs can affect us. (Activity 1.2)

- Engaging in role play games as a pedagogical strategy to deal with one's beliefs in environmental socio-scientific issues. (Activity 1.2)

1.3. Two case studies of how beliefs, cultural background and identity can affect our decisions in socio-scientific issues

Duration: 45 minutes

The purpose of this activity is to provide students in initial teacher preparation programs with two case studies showing how beliefs, cultural background and identity influences our decisions. An example from two classrooms is provided to discuss implications from discussing an environmental socio-scientific issues.

Teacher Educators present the activity 1.3 to preservice teachers and ask them to read the case study and reflect on the questions. After the group work and discussion of questions the Teacher Educator can present one of the slides with information on beliefs, cultural backgrounds, and identities in relation to socio-scientific issues.

This session contributes to the achievement of the following learning outcomes:

- Skills on how to understand how people with different beliefs, cultural background and identities talk about environmental socio-scientific issue (Activity 1.3)

- Awareness that discussing an environmental socio-scientific issue might be affected by one's beliefs (Activity 1.3)

1.4. Understanding your own beliefs

Duration: 15 minutes

The intention of this activity is to provide future teachers with the knowledge and skills understand their own beliefs and how these might affect how they talk or teacher an environmental socio-scientific issue.

Teacher Educators present activity 1.4 to preservice teachers.

This session contributes to the achievement of the following learning outcomes:

- Skills on how to identify their own beliefs and how these might hinder how they teach SSI (Activity 1.4)

2. Designing an SSI lesson taking account of beliefs

2.1. What are your own beliefs? A questionnaire on SSI beliefs

Duration: 35 minutes

In this activity students in initial teacher preparation will familiarize themselves with a questionnaire that has been developed for the purposes of ENSITE. The purpose of the questionnaire is: (a) to help them to understand their own identities, cultural background, and beliefs, (b) to help them understand how their beliefs might influence their teaching of environmental SSI, and (c) to discuss how this questionnaire can be used to support their students when they engage in environmental SSI.

Teacher Educators will present the activity. Teacher Educators can request access to the questionnaire for translation and editing by following this link: **https://docs.google.com/forms/d/1Hfbr55f3ki_VMh1v8nFatzl3YFmp6XyBR2G4yvKeedc/edit**

This session contributes to the achievement of the following learning outcomes:

- Awareness that beliefs, cultural backgrounds and identities can hinder discussion of SSI (Activity 2.1)

- Awareness about the necessity to explicitly discuss beliefs as part of SSI (Activity 2.1)

- Understanding on how a specially designed questionnaire can support them in identifying their own beliefs and those of their students.

2.2. What strategies can you use to support students to understand their beliefs when discussing environmental SSI

Duration: 25 minutes

In this session the teacher educator presents theory about teachers beliefs and SSI and pedagogical strategies that can be used to scaffold students to understand their beliefs.

This session contributes to the achievement of the following learning outcomes:

- Awareness about the necessity to include specific pedagogical support as a way to help students in initial teacher preparation to understand how their beliefs can hinder the teaching and discussion of SSI (Activity 2.2)

3. Designing an SSI lesson taking beliefs into account?

3.1. Designing an SSI lesson taking beliefs into account

Duration: 40 minutes + 90 homework

The intention of this session is to make prospective teachers reflect on their beliefs whether such tasks should be included in their teaching.

To this end, future teachers first deal with an environmental SSI at school student's level. They are supposed to solve the task and reflect on the question what students learn when dealing with this task. They also must reflect on their beliefs whether such tasks should be included in mathematics and science teaching.

This session contributes to the achievement of the following learning outcomes:

- Awareness about the necessity that teaching science and mathematics should also include dealing with environmental SSI (Activity 2.2 and 3.1)

Materials and resources

Presentation (pptx). Teacher Educator "Teachers' beliefs in SSI"

Readings and students' handouts

Access to computers for internet research and collaborative work

Granularity

- Skip 2.1
- Skip the reading in Activity 3.1

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Further readings

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