Module 2

CULTURE-RELATED CONTEXTS FOR MATHEMATICS AND SCIENCE
This module is based on the work within the project Intercultural learning in mathematics and science initial teacher education (IncluSMe). Coordination: Prof. Dr. Katja Maass, International Centre for STEM Education (ICSE) at the University of Education Freiburg, Germany. Partners: University of Nicosia, Cyprus; University of Hradec Králové, Czech Republic; University of Jaen, Spain; National and Kapodistrian University of Athens, Greece; Vilnius University, Lithuania; University of Malta, Malta; Utrecht University, Netherlands; Norwegian University of Science and Technology, Norway; Jönköping University, Sweden; Constantine the Philosopher University, Slovakia.

The project Intercultural learning in mathematics and science initial teacher education (IncluSMe) has received co-funding by the Erasmus+ programme of the European Union under grant no. 2016-1-DE01-KA203-002910. Neither the European Union/European Commission nor the project’s national funding agency DAAD are responsible for the content or liable for any losses or damage resulting of the use of these resources.

IncluSMe project (grant no. 2016-1-DE01-KA203-002910) 2016-2019, lead contributions by Boerée-Kamphorst, C., Jonker, V. & Wijers, M., Utrecht University, the Netherlands. CC-BY-NC-SA 4.0 license granted (find explicit terms of use at: https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en)
General overview and aim

In this module student-teachers ITE (initial teacher education) at lower secondary level are introduced to the role and the use of culture-related contexts for the teaching and learning of mathematics and science.

Background

Students will perform better in science and mathematics when the central concepts are grounded in contexts that can be recognised from daily life – which is dependent on the cultural background of the students and the (prospective) teachers. To prepare future teachers for teaching in cultural diverse classrooms, acknowledging and appreciating the cultural background (including subcultures and personal cultural identities) of their students.

Aim

The aim of this module is twofold:

1. To equip future teachers with the knowledge, skills, values and resources necessary to enhance science and mathematics learning in culturally diverse classrooms. We will have them involved in activities to learn to appreciate and respect the rich history and rich applications of science and mathematics. In order to do so we present them with 8 examples (based on a review of literature and a collection of good practices) of rich, diverse cultural contexts for learning science and mathematics.

2. To promote an unprejudiced, open minded and appreciative attitude towards the use of mathematics and science in different cultures (including subcultures and personal cultures).

This module is part of:

- Mathematics and Science Subject dimension: (inter)cultural perspectives on the subjects themselves;
Relevant topics

In this module, the following topics will be addressed:

- Definitions of relevant terms like: culture, context, indigenous science etc.
- Theory and background on the use of contexts to enhance concept development for student in mathematics and science.
- Background on intercultural perspectives on mathematics and science, including ethno-mathematics and ethno-science.
- Connecting theory to educational practice in mathematics and science, by
  - studying specific examples
  - exploring sources of culture-related contexts
  - analysing textbooks and identifying examples and opportunities to use culture-related contexts
  - designing a lesson based on a culture-related context fitting the classroom situation and the ‘cultures’ of your students

Learning Outcomes

Through this module prospective teacher will be able to:

- Analyse the role of (diverse) cultural contexts for learning science and mathematics;
- Find and explore events in the history of mathematics and science that illustrate contributions from different cultures;
- Appreciate and respect the rich history and rich applications of science and mathematics;
- Experiment with and reflect on the use of tasks for mathematics and science teaching that are cast in contexts from different cultures;
- Refer to examples from different (sub)cultures (including personal identities) when trying to raise interest for mathematics and science in their (future) classrooms;
- Use pedagogical approaches which promote an unprejudiced, open minded and appreciative attitude towards the use of mathematics and science in different (sub)cultures (including personal culture) and allow reflection and own investigations into science and mathematics.
Flowchart and Module plan

This module involves four sections, all structured in several tasks and activities for 3 (+1 optional) face-to-face sessions (60-90 min.) and (optional) homework between sessions. It includes interactive presentations, group discussions, debates, small group design activities and student presentations. The structure is:

I. Introduction and background (session 1):
   - Introduction into the topic through the use of an exemplary culture-related context (30 min).
   - Group introduction by forming cultural subgroups (30 min).
   - Theoretical background on culture (30 min).

   Homework (optional):
   Find out at school:
   - how your STEM-colleagues and your students think and feel about 'culture' and 'contexts' in STEM-teaching.
   - To what cultural groups (some of) your students belong (according to themselves).

II. Culture-related contexts (session 2):
   - Discussing the roles of (culture-related) contexts by connecting an example to theory (15 min).
   - Analysing examples (see worksheets) of culture-related contexts for mathematics and science education (45 min).
   - Read background on sources and examples of culture-related contexts and write statement to discuss (15 min.)

   Homework (optional):
   Finish reading background texts and writing a statement for the debate

III. Connecting to practice (session 3 and optional session 4):
   - Analyze textbooks on the use of culture-related contexts (30 min).
   - Design a lesson or teaching activity using a context related to culture (60 min).
   - Optional: Presentation and discussion of the lessons (30-60 min).

   Homework (optional):
   Finish the design and (optional) try out the lesson/teaching activity.
I. Introduction and background
  • Activity 1.1 Example of a context
  • Activity 1.2 Group introduction
  • Activity 1.3 Theoretical Background on culture

II. Culture-related contexts
  • Activity 2.1 Roles of (culture-related) contexts: 1 example and theory
  • Activity 2.2 Analysing examples of culture related contexts
  • Activity 2.3 Background on culture related teaching

III. Connecting to practice
  Activity 3.1 Debate statements
  Activity 3.2 Analyse textbook and design a lesson/activity using a culture related context
  Activity 3.3 (optional) Presentations of lessons and experiences
I. Introduction and background (on culture related contexts for mathematics and science)

1.1. Warming up – an example

This is a “warming up” activity. The intention is to explore previous knowledge, experiences and beliefs about the use of culture-related contexts.

Introduce the example of building a school with bottles in Honduras briefly. This is an example of a context most European students and teachers will not be familiar with. This example is intended to make the pre-service teachers aware of different ways to think about of ‘building’ and about ‘waste’ and appreciate creative technological solutions to overcome problems. First ask participant to discuss the example in small groups using the questions on the worksheet (and in the ppt), next collect the outcomes in the whole group.

In this group discussion also ask the pre-service teachers about their own experience with using culture-related contexts in their teaching: how familiar are they with the use of contexts; what type of contexts do they use; do they know of contexts that relate to culture (including subcultures and personal cultures)? What do the mean when they use/hear ‘culture’? What is their belief (and opinion) about the value of addressing culture-related aspects through the use of context?

You may also ask a more specific question to get the discussion started like: What is your favourite example of a context for your subject-teaching that is related to your personal culture?

Note: you may refer to the theoretical background (about culture) presented in module 1.

Note: definition and aspects of culture and contexts will be further explored in the next activities. So you may decide to keep the discussion brief.

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

- Investigate the role of (diverse) cultural contexts for learning science and mathematics
- Develop pedagogical approaches which promote an unprejudiced, open minded and appreciative attitude towards the use of mathematics and science in other cultures and allow reflection and own investigations into science and mathematics.
I. Introduction and background (on culture related contexts for mathematics and science)

1.2. Group introduction: cultural subgroups

The intention of this assignment is to stimulate the pre-service teachers to get acquainted with each other and apply the notion of cultural diversity to their own group. Especially when the group composition is different from your normal practice, or new for this occasion, this activity is of special interest. It can also be done in existing groups.

Give your group of pre-service teachers the following assignment:

“Divide the group into four small groups that are culturally different.”

Write down per subgroup:

- How you define your subgroup with respect to culture
- Who are members of this group and why
- Any limitations you experienced when forming the subgroup

Let the teacher-students discuss the cultural characteristics that define each of the groups and possible limitations they experienced. Is there anyone who thinks he/she should switch groups after hearing the characteristics and definitions of all four groups?

Let them debate in which group they would place you (the teacher educator) if they had to decide this.

In the next activity definitions of culture will be further explored.

Note: the groups can be based on anything, for example characteristics like: nationality, sports, subject they teach, favourite music/food/hobby etc.. The only limitation is that there have to be four groups.

A related activity you could also use instead of this example is the “giant steps” roleplay activity from module IO13.

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

- Refer to examples from different (sub)cultures (including personal cultural identities) when trying to raise interest for mathematics and science in their (future) classrooms;

- Develop pedagogical approaches which promote an unprejudiced, open minded and appreciative attitude towards the use of mathematics and science in other cultures and allow reflection and own investigations into science and mathematics.
I. Introduction and background (on culture related contexts for mathematics and science)

1.3. Theoretical background on culture

Duration: 30 minutes

In this activity the pre-service teachers deepen their knowledge of the theoretical background on the use, the benefits, characteristics and sources of culture-related contexts and they discuss their opinions (expressing their beliefs).

Text 1 is used to gain knowledge on what is meant by culture and how to define culture.

See worksheet for 1.3 for text 1 as well as for questions to discuss concerning the text. You may want to start with two questions for the whole group (see ppt). Next have pre-service teacher do the activity on the worksheet.

Pre-service teachers read the definition of culture presented by OECD and they reflect on what they perceive as their "personal cultural identity".

Come back to the two questions on the worksheet.

Homework (optional): Ask your pre-service teachers to find out at school:

- how their STEM-colleagues think and feel about 'culture' and 'contexts' in STEM-teaching.
- What the cultural groups of (some of their) students are. They may use the questions discussed in this activity and in activity 1.2.

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

- Refer to examples from different (sub)cultures (including personal cultural identities) when trying to raise interest for mathematics and science in their (future) classrooms.
## II. Culture-related contexts

### 2.1. Roles of (culture-related) contexts

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Duration: 15 minutes</th>
</tr>
</thead>
</table>

**Homework (optional)**

Briefly check the homework (10 min). Ask for one or two special findings (see ppt). The results of the conversations with colleagues and pupils will provide a reference when discussing examples, analysing textbooks and designing a lesson (in the next activities).

**Discussing the roles of contexts**

Use the example of building with bottles in Honduras discussed in the previous session, to remind your group of what we mean by culture-related contexts. Discuss what role this context has.

You are also encouraged to use another strong example of a culture-related contexts used in classroom practise (note: it should be applicable to all subjects represented in your group).

Have the students read the text (on worksheet 2.1) on the definition of the context-based approach and roles and characteristics of contexts. Have them discuss the value of using (culture-related) contexts by answering the questions on the worksheet (in pairs)

Discuss the answers briefly in the whole group.

### II. Culture-related contexts

### 2.2. Examples of culture-related contexts

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Duration: 45 minutes</th>
</tr>
</thead>
</table>

On worksheet 2.2 there are eight examples of culture-related contexts (Note: these examples you can also find online at: [http://www.fisme.science.uu.nl/toepassingen/28592/](http://www.fisme.science.uu.nl/toepassingen/28592/). The task for the pre-service teachers is also on worksheet 2.2. You may want to discuss this task first in the whole group to make the purpose and the way of working clear (see ppt).

In this activity pre-service teachers are presented with eight contexts, that are culture-related in some sense. In small groups participants chose 2-4 of the examples to analyse and to reflect on the way each example may be used to address culture-related aspects. The focus of the analysis and discussion is on these five aspects:

- Relation to STEM-subject, -content or – concepts
- Possibilities for intercultural teaching/learning
• Connection to the ALL students’ interests and background (personal culture)
• Practical issues to deal with when using each context
• Culture-related reflection and personal appreciation of the context

Each small group prepares a poster about one of the examples to share their findings in the whole group. Organize a poster-session for all groups to see each other’s work. Finally discuss the findings (see ppt).

For the discussion you may use as input what is written on the posters and you can use questions like:

• What did you learn: what was an eye-opener for you?
• Did this activity help you to become:
  o more aware of your own culture?
  o more respectful to the (personal) cultures of others?
  o more aware of cultural aspects related to mathematics and science?
• What would be the most important reason for you to use culture-related contexts? How does this reason relate to the theory (and your beliefs) about culture and contexts?
• What in your opinion are the 3 most important characteristics of a good culture-related contexts for your teaching?

Note: This last question prepares for the next activity.

**Background information on the context-examples**

We will briefly say something about each context here and suggest specific aspects to address in reflective questions. This is background information you may use when helping the small groups or in the discussion.

**Example 1: Patterns**
Main subject(s): mathematics, (biology)

Patterns are common in all cultures although they may have different characteristics. They can be studied for their mathematical (geometrical) structures and characteristics like types of symmetry, fractals, tessellations (filling the plane), geometrical shapes etc.. Some patterns may have a culture-related meaning for certain groups.

**Example 2: Water**
Main subject(s): biology, science (physics)

Water is a universal context and can be addressed from a lot of perspectives: access to clean water; risks of flooding; source of energy; uses of water; meaning of water; cost of water and spilling. See also module 5 about different (culture-related) perspectives to water.

**Example 3: Building**
Main subject(s): science, (mathematics)

Living in a house is a basic experience for everybody. The construction of houses, the use of materials, the sustainability will differ from region to region. You may connect this to students’ personal situation and the living situation of their ancestors.

**Example 4: Food and Health**
Main subject(s): biology
The fast growth of the world population of people is a growing concern for all countries. Who do we stay healthy? How do we produce enough food? Can the world feed us? What are eating habits and meals in different countries/cultures? You can relate this context to indigenous science about medical use of plants. Food (eating habits) is easy to relate to students’ personal cultural identity(s).

Example 5: Pascal’s Triangle
Main subject(s): mathematics

This is a more sophisticated example coming from the heart of mathematics. In much of the Western world, it is named after French mathematician Blaise Pascal, although other mathematicians studied it centuries before him in India, Persia (Iran), China, Germany, and Italy. By this example students can become aware of the non-western origins of mathematics and the cultural aspects connected to it (language, images, symbols).

Example 6: Energy
Main subject(s): science

In 2007 the primary sources of energy consisted of petroleum 36.0%, coal 27.4%, natural gas 23.0%, amounting to an 86.4% share for fossil fuels in primary energy consumption in the world. Non-fossil sources in 2006 included nuclear 8.5%, hydroelectric 6.3%, and others (geothermal, solar, tidal, wind, wood, waste) amounting to 0.9%. At that time world energy consumption was growing about 2.3% per year. You may use this example to discuss how the production of energy impacts on peoples living conditions in different regions of the world.

Example 7: Navigation
Main subject(s): mathematics

In this example the main focus is on finding Mecca and the techniques that can be used for this purpose. Nowadays there are applications on the web and for smartphones. Like for instance: https://www.halaltrip.com/prayertimes/qibla-direction/. For Muslims Mecca is an important religious place. Other religions have important places (and orientation) well. See for example: https://en.wikipedia.org/wiki/Orientation_of_churches. This context can be used to become more aware of other religions and cultures and the use and meaning of mathematics.

Example 8: Music and Musical Instruments
Main subject(s): science, mathematics

Music is part of the tradition of every country. Music is strongly connected to personal culture and background. We like to listen to music (melody, theme, repetition), and a lot of people learn to play an instrument. The making of an (easy) instrument can be an interesting problem-solving activity involving science (physics) and mathematics. This context can be used to connect to students’ (persona) culture(s).

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

- Investigate the role of (diverse) cultural contexts for learning science and mathematics
- Investigate the role of (diverse) cultural contexts for learning science and mathematics
- Explore some events in the history of mathematics and science that illustrate contributions from different cultures;
- Learn to appreciate and respect the rich history and rich applications of science and mathematics
## II. Culture-related contexts

### Activity 2.3. Back to the theoretical background

Duration: 30 minutes

This assignment is a further exploration of theoretical background followed by a whole-group discussion/debate on statements formulate by the pre-service teachers.

Texts on the following topics are used (see sources on worksheet 2.3):

1. Contributions from indigenous science
2. White teachers in Urban classrooms
3. Concepts and contexts in engineering and technology
4. The history of mathematics
5. Multicultural mathematics

Note: You can find the worksheet with the five texts in English also on the web here: [http://www.fisme.science.uu.nl/toepassingen/28593/](http://www.fisme.science.uu.nl/toepassingen/28593/)

Distribute the texts among small groups of pre-service teachers and assign each group to read and discuss 1 or 2 of these texts. Ask them to formulate a statement based on the texts (relating to contexts and/or culture), to debate in the whole group in the next session.

Let the participants hand in a slide (ppt) with their statement at the end of this session or have them send it in by email before the next session. In this way you may select the most interesting or strongest statements to debate.

Also ask them to bring their textbooks to the next session.

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

- Investigate the role of (diverse) cultural contexts for learning science and mathematics
- Explore some events in the history of mathematics and science that illustrate contributions from different cultures;
- Learn to appreciate and respect the rich history and rich applications of science and mathematics
### III. Connecting to practice

#### Activity 3.1. Debate on statements

**Duration: 30 minutes**

Have each group present their statement (from activity 2.3) in max. 1 minute. Next all participants choose to agree or disagree (you can use cards in 2 colours or have everybody move to a side of the room). Ask some of them to clarify their choice.

At the end wrap up the debate by asking participants to reflect on how their knowledge and appreciation of culture-related contexts have developed.

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

- Learn to appreciate and respect the rich history and rich applications of science and mathematics
- Develop pedagogical approaches which promote an unprejudiced, open minded and appreciative attitude towards the use of mathematics and science in other cultures and allow reflection and own investigations into science and mathematics.

#### Activity 3.2. Analyse textbooks and design a lesson

**Duration: 60 minutes**

The aim of this activity is to have pre-service teachers (individually or in small groups) design their own lesson/activity, using a culture-related context or addressing a context from an intercultural perspective or connecting to students’ cultural identities.

Working in single-subject groups participants first analyse their textbooks for the occurrence of culture-related contexts (part A on worksheet ##). Most likely not many of these contexts will be found. In that case participants explore possibilities to include such contexts for a specific topic: where would it fit?

They may use the examples they studied in the previous activities for inspiration and try to fit these in; they could also explore some of the sources addressed in previous session sessions to find appropriate contexts.

Next participants design the lesson/teaching activity (part B on the worksheet). Pre-service teachers should prepare a lesson-plan and the teaching materials. Also ask them to make clear how they addressed the cultural aspects in their design.
Note: If the time is too short to finish the design-process during the session, make this into homework (see worksheet).

At the end of this session have all student groups present, in a short 1-minute pitch, their plans for the lesson/activity.

Finishing this design and preparing a brief presentation (of 5 minutes) is the homework to be done before the last (optional) session of presentations. If possible, you can ask the pre-service teachers to try out (parts of) this lesson in class. Have them fill in the assessment evaluation form (see worksheet).

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

- **Investigate the role of (diverse) cultural contexts for learning science and mathematics**
- **Develop pedagogical approaches which promote an unprejudiced, open minded and appreciative attitude towards the use of mathematics and science in other cultures and allow reflection and own investigations into science and mathematics.**

### III. Connecting to practice

**Activity 3.3. Presentation of lessons designed by students**

Have participants present their lesson/teaching activity and experiences (see previous activity and worksheet). They should focus on:

- **WHY** they choose this specific context, also in relation to the content of the activity/lesson;
- **HOW** they address cultural aspects and connect to their students (personal) culture(s) especially in a diverse classroom;
- **WHAT** they learned from the try-out with students.

Have the pre-service teachers give each other feedback in the form of tips and tops.

At the end have a whole group evaluation on the learning outcomes of this module (see ppt).

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

- **Investigate the role of (diverse) cultural contexts for learning science and mathematics**
- **Develop pedagogical approaches which promote an unprejudiced, open minded and appreciative attitude towards the use of mathematics and science in other cultures and allow reflection and own investigations into science and mathematics.**
Materials and resources

Presentation (pptx). Teacher Educator. Includes sheets for all sessions.

Worksheets: Include all activities and links to websites and youtube videos for this module.

Textbooks: brought by pre-service teachers (or the teacher educator)

Access to computers for internet research, accessing some of the resources with worksheets and collaborative work.

Granularity

If fewer time is available

• Skip Activity 1.2
• Select fewer examples in Activity 2.2
• Skip activity 3.3 (session 4): Instead of presentations by pre-service teachers have them hand in the lesson/activity they designed as well as the assessment evaluation form.

If more time is available

• Have groups give each other peer-feedback in activity 3.3 during the design process
• Have an extra session for presentations of the teaching activities

References


Further readings


Multicultural education is conceptualized in this review as a field that consists of the five dimensions formulated by Banks (1991a, 1992). These are (a) content integration, (b) the knowledge construction process, (c) prejudice reduction, (d) an equity pedagogy, and (e) an empowering school culture and social structure


This article introduces a three-domain model for concept-context learning that supports both the design process as well as the idea of concept learning. The model shows how practical and abstract knowledge should be combined to improve context-concept learning.


Contextualizing science instruction involves utilizing students’ prior knowledge and everyday experiences as a catalyst for understanding challenging science concepts. This study of two middle school science classrooms examined how students utilized the contextualizing aspects of project-based instruction and its relationship to their science learning.

Assessment

Assessment for this module can be connected to the design and presentation of the lesson/teaching-activity.

Apart from the presentation you can have students hand in the evaluation form about the design and try-out of their lesson. See worksheet.

You can use this to assess to what extend pre-service teachers understood and used different aspects of culture-related contexts and were able to connect to their students (personal) cultural identities.
Module 2

CULTURE-RELATED CONTEXTS FOR MATHEMATICS AND SCIENCE

Worksheets
This worksheet is based on the work within the project Intercultural learning in mathematics and science initial teacher education (IncluSMe). Coordination: Prof. Dr. Katja Maaß, International Centre for STEM Education (ICSE) at the University of Education Freiburg, Germany. Partners: University of Nicosia, Cyprus; University of Hradec Králové, Czech Republic; University of Jaen, Spain; National and Kapodistrian University of Athens, Greece; Vilnius University, Lithuania; University of Malta, Malta; Utrecht University, Netherlands; Norwegian University of Science and Technology, Norway; Jönköping University, Sweden; Constantine the Philosopher University, Slovakia.

The project Intercultural learning in mathematics and science initial teacher education (IncluSMe) has received co-funding by the Erasmus+ programme of the European Union under grant no. 2016-1-DE01-KA203-002910. Neither the European Union/European Commission nor the project's national funding agency DAAD are responsible for the content or liable for any losses or damage resulting of the use of these resources.

IncluSMe project (grant no. 2016-1-DE01-KA203-002910) 2016-2019, lead contributions by Boerée-Kamphorst, C., Jonker, V. & Wijers, M., Utrecht University, The Netherlands. CC-BY-NC-SA 4.0 license granted. CC-NC-SA 4.0 license granted (find explicit terms of use at: https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en)
I. Introduction and background

Activity 1.1: warming up: an example

Study the example and discuss the things you notice. Use these questions:
- Do you see this as an example of a culture-related context and why?
- Which topics, concepts or problems from mathematics or science relate to this context?
- For whom (which students in your class) can this context be of interest: Why do you think so?

First we collect old plastic bottles
Fill them with sand
Make foundations with rocks

And start to build
And build
Then plaster the walls

Source: https://www.primas.mathshell.org/pd/modules/1_Student_led_inquiry/html/index.htm

Summarizing: What is your feeling and opinion on addressing culture-related aspects through the use of contexts?
I. Introduction and background

### Activity 1.3: Theoretical background on culture

<table>
<thead>
<tr>
<th>Duration 30 minutes</th>
</tr>
</thead>
</table>

Read the text about defining culture. Discuss the questions you find below the text.

**Text 1: Defining culture**

“Culture” is difficult to define because cultural groups are always internally heterogeneous and contain individuals who adhere to a range of diverse beliefs and practices. Furthermore, the core cultural beliefs and practices that are most typically associated with any given group are also constantly changing and evolving over time. However, distinctions may be drawn between the material, social and subjective aspects of culture, that is, between the material artefacts that are commonly used by the members of a cultural group (e.g. the tools, foods, clothing, etc.), the social institutions of the group (e.g. the language, the communicative conventions, folklore, religion, etc.), and the beliefs, values, discourses and practices that group members commonly use as a frame of reference for thinking about and relating to the world. Culture is a composite formed from all three of these aspects, consisting of a network of material, social and subjective resources. The full set of cultural resources is distributed across the entire group, but each individual member of the group only uses a subset of the full set of cultural resources that is potentially available to them (Barrett et al., 2014; Council of Europe, 2016a).

Defining culture in this way means that any kind of social group can have its own distinctive culture: national groups, ethnic groups, faith groups, linguistic groups, occupational groups, generational groups, family groups, etc. The definition also implies that all individuals belong to multiple groups, and therefore have multiple cultural affiliations and identities (e.g. national, religious, linguistic, generational, familial, etc.). Although all people belong to multiple cultures, each person participates in a different constellation of cultures, and the way in which they relate to any one culture depends, at least in part, on the perspectives that are shaped by other cultures to which they also belong. In other words, cultural affiliations intersect, and each individual has a unique cultural positioning.

People’s cultural affiliations are dynamic and fluid; what they think defines them culturally fluctuates as an individual moves from one situation to another. These fluctuations depend on the extent to which a social context focuses on a particular identity, and on the individual’s needs, motivations, interests and expectations within that situation (Council of Europe, 2016a).

**References:**

- Council of Europe (2016). Competences for Democratic Culture: Living Together as Equals in Culturally Diverse Democratic Societies, Council of Europe, Strasbourg

Discuss in the group:

- What is new for you in this text about the meaning of culture?
- What are aspects of your **unique cultural positioning** (cultural identity)?
- How can this personal cultural identity influence your teaching?
II. Culture-related contexts

Activity 2.1: Roles of (culture-related) contexts

Duration: 15 minutes

Read the excerpts below.

“In this study the definition of a context-based learning environment follows that of the context-based approach by Bennett et al. (2007) in their review of research into the subject:

“Context-based approaches are approaches adopted in science teaching where contexts and applications of science are used as the starting point for the development of scientific ideas. This contrasts with more traditional approaches that cover scientific ideas first, before looking at applications” (p. 348).

“An important element of a context-based learning environment is active learning (Gilbert, 2006; Parchmann et al., 2006): the students are required to have a sense of ownership of the subject and are responsible for their own learning. The combination of self-directed learning and the use of contexts is consistent with a constructivist view of learning (Gilbert, 2006). As current research in science education points out: people construct their own meanings from their experiences, rather than acquiring knowledge from other sources (Bennett, 2003). “[p.9].

“The context should cause a need for students to explore and learn concepts and to apply them to different situations.” [p.11]

“According to the joint statement on the context-based approach published by the Dutch innovation committees, contexts have on the one hand a pedagogic purpose and on the other hand they can be the connector to the social experience domain where science and mathematics are involved. It is however important to select contexts and relevant scientific concepts that are closely related. Also the contexts must be adapted to education in such a way students can acquire the intended scientific concepts (Boersma et al., 2006). “[p.43]


Discuss in a small group:
- which of the roles and characteristics of contexts cited above, do you recognize in the example Building with bottles in Honduras and in your own teaching materials?
- which elements of a context-based approach do you find most valuable for your teaching?
- how important it is for you to use contexts that can contribute to addressing culture-related aspects in science and mathematics teaching.
II. Culture related contexts

**Activity 2.2: Examples of culture-related contexts**

Duration 45 minutes

Eight examples of contexts are presented on the next pages. Some are specific, some are rather general. Note that they are just contexts, and not ready-made classroom activities. Some are clearly related to a specific culture or cultures, some you will be able to address from a 'personal' cultural perspective. Some will fit your subject, a specific domain from your subject or even a specific concept, some won’t fit at all. Some you will like, or you expect your students to like. Some you won’t connect to. Some will be clear, some will be fuzzy.

The contexts are:
- Patterns
- Water
- Building
- Food and Health
- Pascal's Triangle
- Energy
- Navigation
- Musical instruments

Note: Unless stated otherwise all pictures are copyright-free CC0 downloaded from [https://pixabay.com](https://pixabay.com) or [https://pixabay.com/nl](https://pixabay.com/nl)

Your task as a small group is to select 2-4 examples and discuss and analyse these, focussing on the following aspects:
- Relation to STEM-subject, -content or – concepts
- Possibilities for intercultural teaching/learning
- Connection to all students’ interests and backgrounds (cultural identities)
- Practical issues to deal with when using each context

Also reflect on the question:
- Is the example meaningful to you? does it relate to your cultural background and identity?

Write your findings (of at least one example) on a poster to present and share in the whole group.
Example 1 Patterns

Patterns are all around us: patterns of nature and man-made patterns. Did you ever wonder: what is the use of patterns? What is their structure or how are they ‘constructed’, formed’, ‘grown’? What are their characteristic and properties? What makes it a pattern? Can we classify patterns, according to what criteria?

<table>
<thead>
<tr>
<th>Celtic knots</th>
<th>Aboriginal painting</th>
<th>Bridge</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Celtic knots" /></td>
<td><img src="image2" alt="Aboriginal painting" /></td>
<td><img src="image3" alt="Bridge" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Islamic tiling</th>
<th>Zebra</th>
<th>Muqarnas</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image4" alt="Islamic tiling" /></td>
<td><img src="image5" alt="Zebra" /></td>
<td><img src="image6" alt="Muqarnas" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pineapple</th>
<th>Batik Indonesia</th>
<th>Native American weaving</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image7" alt="Pineapple" /></td>
<td><img src="image8" alt="Batik Indonesia" /></td>
<td><img src="image9" alt="Native American weaving" /></td>
</tr>
</tbody>
</table>

Source: Tom Goris
Example 2: Water, friend and foe

Water is one of the most important resources for all live on earth. Each country, ecosystem and/or culture struggles with the demand for fresh water and the dangers water brings differently.

<table>
<thead>
<tr>
<th>Dike</th>
<th>Bath</th>
<th>Well</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Dike Image" /></td>
<td><img src="source" alt="Bath Image" /></td>
<td><img src="source" alt="Well Image" /></td>
</tr>
<tr>
<td>Source:</td>
<td>Source:</td>
<td>Source:</td>
</tr>
<tr>
<td><a href="https://www.aanmaas.nl/pagina/leren-over-water/leerkrachten/leerkrachten.html">https://www.aanmaas.nl/pagina/leren-over-water/leerkrachten/leerkrachten.html</a></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ice</th>
<th>Food</th>
<th>Dam</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Ice Image" /></td>
<td><img src="source" alt="Food Image" /></td>
<td><img src="source" alt="Dam Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Landslide</th>
<th>Agriculture</th>
<th>Rice field</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="source" alt="Landslide Image" /></td>
<td><img src="source" alt="Agriculture Image" /></td>
<td><img src="source" alt="Rice field Image" /></td>
</tr>
</tbody>
</table>
**Example 3: Building**

Constructing houses, towers and other buildings can be done in a lot of different ways. Different material can be used and different constructions can be made. Circumstances (location, weather, costs, available materials, sustainability etc.) may determine possibilities and constraints.
Example 4: Food and Health

Food and Health traditions are very different amongst different cultures. We do use plants (and animals) for meals, but also for healing. The use of plants as healing agents is ancient. We also know that sport is good for our bodies (and mind). Who do we stay healthy? How do we produce enough food?

You may watch one or more videos about food around the world:
What does the world eat for breakfast: https://www.youtube.com/watch?v=ry1E1uzPSU0
School lunches around the world: https://www.youtube.com/watch?v=Po0O9tRXCyA&t=4s
Example 5: Pascal’s triangle

You may be familiar with Pascal’s Triangle from your math lessons. It is used in Mathematics for example for determining coefficients of polynomials and for combinatorics. It also has a lot of interesting number patterns in it. But how old is this idea? And did Pascal really invent it?

https://www.wiskundeleraar.nl/page3.asp?nummer=11720

Example 6: Energy

There are a lot of ways to produce energy. Not all energy is ecological friendly. Not all energy is made in a people friendly way.

Find out the different fossil and non-fossil fuels. What kind of energy resources do you use yourself?

<table>
<thead>
<tr>
<th>Solar cells in the desert</th>
<th>Windmills</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Solar cells" /></td>
<td><img src="image2.png" alt="Windmills" /></td>
</tr>
<tr>
<td>Coal mining</td>
<td>Windmill in Greece</td>
</tr>
<tr>
<td><img src="image3.png" alt="Coal mining" /></td>
<td><img src="image4.png" alt="Windmill in Greece" /></td>
</tr>
<tr>
<td>Nuclear power</td>
<td>Reservoir lake</td>
</tr>
<tr>
<td><img src="image5.png" alt="Nuclear power" /></td>
<td><img src="image6.png" alt="Reservoir lake" /></td>
</tr>
</tbody>
</table>
Example 7: Navigation: where is Mecca?

All over the world Muslims pray five times a day. They do so in the direction of Mecca. But how can they find this direction? And how would you do this?

Study this link for 5 methods of finding Mecca:

https://www.wikihow.com/Find-the-Qibla-for-Prayer

Equidistant azimuthal projection, centered to Mecca and green lines showing the Qibla (shortest direction to Kaaba in Mecca, 21° 25′ 21″ N, 39° 49′ 34″ E).


Source: https://en.wikipedia.org/wiki/Qibla

Al-Ashraf's diagram of the compass and Qibla. From MS Cairo TR 105, copied in Yemen, 1293.
Example 8: Music and musical instruments

People like to play music. It makes people happy. You have traditional music, classical music, modern music, experimental music, digital music, etc. Can you play an instrument? What kind of instrument? Do you play together with other people? Do you play by heart? Are there any rituals where music plays an important role?
II. Culture-related contexts

Activity 2.3: Back to the theoretical background

You will be assigned two texts (in English) by your educator that provide background on concepts and theory used in this module. These texts are on this worksheet. Note: you can also find these texts online at http://www.fi.uu.nl/toepassing/28593/

Topics of the texts are:
1. Contributions from indigenous science
2. White teachers in Urban classrooms
3. Concepts and contexts in engineering and technology
4. The history on mathematics
5. Multicultural mathematics

- Read the two texts you are assigned to by your course educator.
- For each text you read formulate (in your small group) one statement that you want to debate in a whole group discussion (in the next session).
- Hand in your statement on a ppt-slide.

Text 1: Contributions of indigenous science

“Numerous traditional peoples’ scientific and technological contributions have been incorporated in modern applied sciences such as medicine, architecture, engineering, pharmacology, agronomy, animal husbandry, fish and wildlife management, nautical design, plant breeding, and military and political science (Weatherford, 1988, 1991). In the Americas, traditional scientists developed food plants that feed some three-fifths of humanity. They also developed thousands of varieties of potatoes, grain, oilseed, squashes, and hot peppers, as well as corn, pumpkins, sunflowers, and beans. They first discovered the use of rubber, vulcanizing, and also platinum metallurgy (Weatherford, 1988, 1991). Meso-American mathematicians and astronomers used base 20 numeracy to calculate calendars more accurate than those used by Europeans at the time of contact, even after the Gregorian correction (Kidwell, 1991; Leon-Portilla, 1980). Native Americans developed highly articulated and effective approaches to grassland management (Turner, 1991) and salmon [p.13] production (Pinkerton, 1989). Traditional Native American healers discovered and used quinine, Aspirin, and ipecac (a drug still
used in traumatic medicine to expel stomach contents), as well as some 500 other important drugs (Weatherford, 1988, 1991)”. [p.14]

[Indigenous Science] “Provides time-tested in-depth knowledge of the local area which results in more accurate environmental assessment and impact statements. People who depend on local resources for their livelihood are often able to access the true costs and benefits of development better than any evaluator from the outside. Involvement of the local peoples improves the chance of successful development (Johannes, 1993; Warren et al., 1993, 1997)”. [p.18]

Text 2: White teachers in Urban Classrooms

“Christopher Emdin (2010b) has successfully interwoven hiphop and popular culture into urban science classrooms, embracing students’ culture and the traditional science curriculum (see also Emdin, 2010a). During his work in a Bronx school, before every class, Emdin would look at pictures that represent hip-hop culture and deconstruct them scientifically; if a picture happened to be of a rapper with an array of “chains” hanging from his neck, then students would think about the physics of this chain and the chemical components of the metal. Emdin’s (2008) work has focused on finding “effective approaches to science instruction in urban schools that will allow students and teachers to have shared positive experiences” (p. 773)”. [p.128]

“Ensign (2003) specifically examined how fifth grade students were more engaged when teachers used math problems that directly related to specific costs and issues that were relevant to their lives, such as living expenses. As previously discussed, because “urban students were acutely aware of how much their rent and other necessities cost,” the students were more engaged in the math problems that seemed important to their lives (Ensign, 2003, p. 419).” [p.129].

Text 3: Concepts and Contexts in Engineering and Technology Education

“We have asked not only for concepts but also for contexts in which the concepts can be taught. This should be seen against the background of recent developments in educational research. Such research has led to the insight that concepts are not learned easily in a top-down approach (i.e., learning the concepts at a general, abstract level first and then applying them to different contexts). Even an approach in which concepts are first learned in a specific context and then transferred to a different context has proved unfruitful (Pilot and Bulte 2006). The most recent insights developed reveal that concepts should be learned in a variety of contexts so that generic insights can grow gradually (Westra et al. 2007). This growth leads to the ability to apply the concepts in
new contexts. In this approach, it is important to identify the concepts that should be learned as well as the contexts that are suitable for learning those concepts.” [p.411]

“Analyzing the comments, the proposed contexts and the general remarks on the context part, we find roughly nine approaches, each with a different view on what the main criteria for suitable contexts should be. In random order, they state the following:

“The contexts should...”:

1. Be truly relevant to students’ lives
2. Exemplify enduring human concerns, being fundamental to human nature and relevant in a variety of cultures and societies
3. Be situated around societal issues/problems
4. Encompass the Human-Made World
5. Be big examples, like the development of the paper clip, as described by Petroski
6. Be local (culturally, geographically)
7. Cover the technological domains
8. Use the “Designed World Standards” in “Standards for Technological Literacy”
9. Best fit three considerations:
   (a) fit to the concepts;
   (b) familiarity to the learner;
   (c) ability for the instructor or curriculum designer to provide more and less complex versions of the contexts that help make salient the critical feathers and relationships.” [p.419]

**Text 4: History of mathematics**

The study of mathematics as a demonstrative discipline begins in the 6th century BC with the Pythagoreans, who coined the term "mathematics" from the ancient Greek mathema, meaning "subject of instruction". Greek mathematics greatly refined the methods (especially through the introduction of deductive reasoning and mathematical rigor in proofs) and expanded the subject matter of mathematics. Chinese mathematics made early contributions, including a place value system. The Hindu–Arabic numeral system and the rules for the use of its operations, in use throughout the world today, likely evolved over the course of the first millennium AD in India and were transmitted to the west via Islamic mathematics through the work of Muhammad ibn Mūsā al-Khwārizmī. Islamic mathematics, in turn, developed and
expanded the mathematics known to these civilizations. Many Greek and Arabic texts on mathematics were then translated into Latin, which led to further development of mathematics in medieval Europe.

From ancient times through the Middle Ages, periods of mathematical discovery were often followed by centuries of stagnation. Beginning in Renaissance Italy in the 16th century, new mathematical developments, interacting with new scientific discoveries, were made at an increasing pace that continues through the present day.


"Knowledge construction." This component refers not only to group consensus within a discipline but also to the process whereby individual students construct knowledge for themselves. In mathematics classes, teachers can help students understand that even though there are certain elements of mathematics that are universal—such as counting, locating, measuring, designing, playing, and explaining (Bishop, 1988) there are differences in the ways diverse cultural groups view some of the major aspects of mathematics. For example, Indians and Chinese believe that a result in mathematics can be validated by any method, including visual demonstration, whereas Europeans expect a conjecture to be proven step by step, starting with self-evident axioms.

Teachers can help students see that mathematics is derived from real-life situations by exposing them to ethnomathematics, the mathematics "practiced among identifiable cultural groups, such as national-tribal societies, labor groups, children of certain age brackets, professional classes, and so on" (D'Ambrosio, 1985, p. 45). Ethnomathematical methods vary according to interest, motivation, and certain codes and jargons that do not belong to the realm of academic mathematics.

An example is the "case price technique" developed and used by milk drivers to compute delivery charges. Suppose a driver has an order of 32 quarts of milk at $.68 per quart. Instead of computing 32 x $.68, which is hard to do mentally, the driver might take the case price (a case holds 16 quarts) and double it. If a case costs $10.88, the driver can compute the cost mentally as $10.88 x 2 (Scribner, 1984).

Discussion of ethnomathematical procedures can prompt the exploration of methods that students bring with them into the classroom. The validation of student-invented algorithms is important for self-esteem and belief in their ability to do mathematics. Moreover, these invented algorithms are grounded in real-life experiences and students' own construction of knowledge, thereby making the mathematics more meaningful.
The sources of these texts are:


- **Text 4**: https://en.wikipedia.org/wiki/History_of_mathematics (last access 20181212)

## III. Connecting to practice

### Activity 3.2 Analyse a textbook and design a lesson

<table>
<thead>
<tr>
<th>1 or</th>
<th>3</th>
<th>optional</th>
<th>Duration 60 mins</th>
</tr>
</thead>
</table>

#### Part A

Work in single-subject groups and analyse your textbooks for the occurrence of culture-related contexts, the role of these contexts and the opportunities to connect to your students (personal) cultures.

#### Part B

Prepare – in your small group - a lesson or a teaching activity for your subject using a context and addressing culture in some way. Base your design on a textbook example and be inspired by the context-examples you studied in the previous activities). In your design you may:

- use one or more culture-related context(s)
- connect to your students (personal) cultural identities
- make your students become aware of cultural aspects connected to mathematics and science.

Include a lesson-plan (including learning goals) and all teaching and student materials in your design.

Fill in the assessment evaluation form on worksheet 3.3.

Prepare a 1-2 minute pitch about your lesson/activity to present the end of this session. Be sure to address the way you activity/lesson relates to culture.

### Homework (optional - ask you educator about this)

Finish the design of the teaching activity and plan how to use it in a lesson.

If possible: Try-out this activity with your students and ask them for feedback.

For the next session. Prepare a 5 minute presentation on the design of your activity, the way you address cultural aspects and connect to your students (personal) culture and the 'lessons learned' from the try-out.

Fill in the assessment evaluation form on worksheet 3.3.
### III. Connections to practice

#### Activity 3.3: presentation and assessment

<table>
<thead>
<tr>
<th>Name</th>
<th>School</th>
<th>Subject</th>
<th>grade</th>
</tr>
</thead>
</table>

Which activity was used (short description of resources, characteristics of the context and of the teaching method(s))

How does your activity address cultural aspects? What is the role of the context?

How and why do you think that your activity connects to your students (personal) cultures?

Experiences during the lesson: what student behavior did you observe (different than normal)? How did your students react to the context? What did you observe with respect to cultural aspects?
CULTURE-RELATED CONTEXTS FOR MATH AND SCIENCE

Initial teacher education of prospective mathematics and science teachers
Overview
Structure of the module

• Three sessions of 60-90 minutes each
  I. Introduction and background
    • Group introduction
    • Example and theoretical background on culture
  II. Culture-related contexts
    • Studying examples
    • Theoretical background on culture-related contexts
  III. Connecting to practice
    • Analysing textbooks
    • Design a lesson/activity with a context related to culture
    • (optional) Presentations and discussion of the lessons

• Homework (optional) in between sessions
I. Introduction and background

- Activity 1.1 Example of a context
- Activity 1.2 Group introduction
- Activity 1.3 Theoretical Background on culture

II. Culture-related contexts

- Activity 2.1 Roles of (culture-related) contexts: 1 example and theory
- Activity 2.2 Analysing examples of culture related contexts
- Activity 2.3 Background on culture related teaching

III. Connecting to practice

Activity 3.1 Debate statements
Activity 3.2 Analyse textbook and design a lesson/activity using a culture related context
Activity 3.3 (optional) Presentations of lessons and experiences
Aims

• Introduction into the use of (culture-related) contexts for STEM
  • by studying concrete examples
  • by reflecting on theory
  • by discussing sources

• Connection to your educational practices
  • by analysing textbooks
  • by talking to STEM colleagues and students
  • by designing (and trying out) a lesson/activity
I. Introduction

1.1 an example
Activity 1.1 – see also worksheet 1

Source: https://www.primas.mathshell.org/pd/modules/1 Student led inquiry/html/index.htm
Activity 1.1 – see worksheet

• Study the example and discuss the things you notice. Use these questions:
  • Do you see this as an example of a culture-related context? why?
  • Which topics, concepts or problems from mathematics or science relate to this context?
  • For whom (which students in your class) can this context be of interest: Why do you think so?
Activity 1.1 – wrapping up

• Report outcomes from the discussion about the example *building with bottles in Honduras*.
  • In what ways is it culture related?
  • Which STEM content can be related?
  • For whom (students) is this of interest?

• What are your own experiences with the use of (culture-related) contexts in your teaching?
I. Introduction

1.2 Cultural subgroups
Activity 1.2 - Group introduction: cultural subgroups

“Divide this group into four groups that are culturally different.”

Write down (for each subgroup):

• How you define your subgroup with respect to culture
• Who are members of this group and why
• Any limitations you experienced when forming the subgroup

• Switch?
1. Introduction

1.3 Theoretical background on culture
Activity 1.3 – theoretical background

“What is culture according to you?”

Read text 1 on worksheet 1.3 and discuss the questions.

Would you answer this question differently after reading the text?

“What is culture according to you?”
II. Culture-related contexts

2.1 Roles of (culture-related) contexts
Remember activity 1.1?

Source: https://www.primas.mathshell.org/pd/modules/1_Student_led_inquiry/html/index.htm
Activity 2.1 – theoretical background on roles of contexts

Read text 2 on worksheet 2.1 and discuss the questions.
II. Culture-related contexts

2.2 Study examples of culture-related contexts
Activity 2.2 – Examples – see worksheets

Study 2-4 of the 8 examples on the worksheet and discuss them considering ….

- Relation to STEM-subject, -content or – concepts
- Possibilities for intercultural teaching/learning
- Connection to the ALL students’ interests and backgrounds (personal cultures)
- Practical issues to deal with when using each context

Also discuss:

- Is the example meaningful to you? does it relate to your personal culture?
Poster-session

• For one of the examples as a small group present your findings on a poster

• Study all posters and note similarities and differences
Discussion – whole group

• What did you learn:
  “What was a real eye-opener for you during this session?”

• Did this activity help you to become:
  • more aware of your own culture?
  • more respectful to the (personal) cultures of others?
  • more aware of cultural aspects related to mathematics and science?
Discussion – continued – preparing for activity 3.1

• What would be the most important reason for you to use culture-related contexts? How does this reason relate to the theory (and your beliefs) about culture and contexts?

• What in your opinion are the 3 most important characteristics of a good culture-related contexts for your teaching?
II. Culture-related contexts

2.3 Back to the theoretical background
Activity 2.3 – Back to the theoretical background

In a small group

- Read 1 or 2 of the texts on worksheet 2.3.
- Formulate a statement based on these texts that relates to contexts and/or culture (hand in on ppt slide at the end of the session).

Whole group debate (next session)

- Present your statement in max 1 minute
Homework - optional

• Find out at your school
  • how your STEM-colleagues think and feel about 'culture' and 'contexts' in their STEM-teaching
  • what the personal cultures of (some of your) students are.
III. Connecting to practice

3.1 Debate on statements
Activity 2.3 – Back to the theoretical background

Whole group debate

• Present your statement in max 1 minute
• Everybody takes position in favour of or against the statement
• Some people are asked to clarify their position
III. Connecting to practice

3.2 Analyse textbooks and design a lesson/activity
Activity 3.2 – in small single-subject groups

Part A: Analyse textbooks – see worksheet

• Does your textbook include (culture-related) contexts?
• What is the role of these contexts?
• Does your textbook present opportunities to relate to culture in general and your students (personal) culture(s)?
Activity 2.2 – in small single-subject groups

Part B – see worksheet

In your small group prepare a lesson or a teaching activity for your subject using a context and addressing culture in some way. For example by:

- using one or more culture-related context(s)
- connecting to your students (personal) cultures
- making your students become aware of cultural aspects connected to mathematics and science.
Activity 2.2 – in small single-subject groups

Part B – Homework - see worksheet for details

Further prepare and design the teaching activity and plan how to use it in a lesson.

If possible: Try-out this activity with your students and ask them for feedback.

Fill in the lesson evaluation form (see worksheet).

For the next session. Prepare a 5 minute presentation
III. Connecting to practice

3.3 presenting your lesson
Activity 3.3 – Presenting the lesson

Focus on:

• WHY you choose this specific context, also in relation to the content of the activity/lesson;

• HOW you address cultural aspects and connect to their students (personal) culture(s) especially in a diverse classroom;

• WHAT you learned from the try-out with students.
Evaluation and next steps

• What conclusions do you draw about the use of culture-related contexts (or an intercultural approach to contexts) in science and mathematics education?

• How will you use what you learned in this module in your teaching practice?
This presentation is based on the work within the project Intercultural learning in mathematics and science in initial teacher education (IncluSMe). Coordination: Prof. Dr. Katja Maaß, International Centre for STEM Education (ICSE) at the University of Education Freiburg, Germany. Partners: University of Nicosia, Cyprus; University of Hradec Králové, Czech Republic; University of Jaen, Spain; National and Kapodistrian University of Athens, Greece; Vilnius University, Lithuania; University of Malta, Malta; Utrecht University, Netherlands; Norwegian University of Science and Technology, Norway; Jönköping University, Sweden; Constantine the Philosopher University, Slovakia.

The project Intercultural learning in mathematics and science initial teacher education (IncluSMe) has received co-funding by the Erasmus+ programme of the European Union under grant no. 2016-1-DE01-KA203-002910. Neither the European Union/European Commission nor the project's national funding agency DAAD are responsible for the content or liable for any losses or damage resulting of the use of these resources.

IncluSMe project (grant no. 2016-1-DE01-KA203-002910) 2016-2019, lead contributions by Boerée-Kamphorst, C., Jonker, V., & Wijers, M. Utrecht University The Netherlands.

CC-BY-NC-SA 4.0 license granted (find explicit terms of use at: https://creativecommons.org/licenses/by-nc-sa/4.0/deed.en)