

Module 10

INTERCULTURAL MATHEMATICS LEARNING OUTSIDE OF SCHOOL



This Module *outline* is based on the work within the project Intercultural learning in mathematics and science 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.

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General overview and aim

„Let's create our common space, little piece of our common World, full of game and joy. “

This is the message of education program entitled Architects. The target group of the program are pupils of 3rd – 9th grade at primary school who in the role of architects propose a new functional use of the concrete area. They are focused on the area which is well known and in which they have better experiences than adults. Thus their attention is aimed at the game and proposal of a new children playground.

The program Architects presents Cross-curricular learning which connects educational content of several teaching subjects especially mathematics, geography and computer science. Duration of the program is at least 4 lessons (180 minutes), but there is possibility to realize it as a long-term pupil's project. Realisation of the program allows connection of several pedagogic approaches e.g. Outdoor education, Inquiry-based learning (Project-based learning), Role playing, use of ICT in education, Adventure pedagogy principles etc.

Purpose of the Module is to introduce education program Architects to the students of teaching training studies (students of Initial Teachers Education (ITE) as an alternative for modern, active, multidisciplinary education. Through the individual activities students are gradually familiarized with a content of education program, methods and forms of learning used as well as with topic of intercultural education.

This module is part of:

- Mathematics and Science Subject dimension: (inter)cultural perspectives on the subjects themselves;
- Mathematics and Science Education dimension: pedagogical issues, in particular in respect to dealing with diversity in classrooms.

IO10 Intercultural mathematics learning outside of school

IO11 Intercultural science learning outside of school



Relevant topics

Intercultural perspectives in math and science education. Cooperation of pupils and teachers in interdisciplinary education. Efficient use of ICT in relation with outdoor and adventure education and IBL pedagogies principles application.



Learning Outcomes

Through this module prospective teacher will:

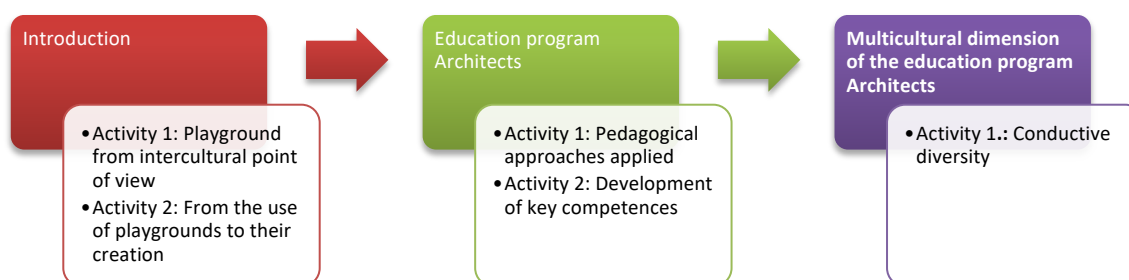
- get familiar in detail with the education program Architects and find out its benefits and hazards,
- connect intercultural learning to science and maths based on practical solution of problem situation,
- get familiar with principles of interdisciplinary education,
- connect the idea of IBL with realization of education through indoor as well as outdoor education,
- use ICT and online tool convenient for modernization and increasing efficiency of maths and science education,
- acquire skills to build a classroom atmosphere for team cooperation, communication and mutual respect in various cultural environments.



Flowchart and Module plan

This module involves 3 sections. It includes lecture parts, group discussions, debates and student presentations. The structure is as follows:

- Introduction to education program Architects: 40 min
- Education program Architects under pedagogic supervision: 40 min
- Intercultural dimension of education program Architects: 20 min



I. Introduction to education program Architects

1.1. Playground from intercultural point of view



Duration: 20 minutes

Introductory activity is entrance to the topic of children's play and playgrounds. The aim of the activity is to show the importance of children's play and playgrounds in global children's world, independently of continent or culture in which children grow up. The activity opens space for discussion with students about perception of common and different signs of various cultures in relation to design of children's playgrounds, their realization and use.

During this activity students work in groups. Each group has PC or notebook available to see movie entitled „East African Playgrounds - Why is Play Important“. Movie is freely available on YouTube:

<https://www.youtube.com/watch?v=vTYPLY1dYYk&t=>

Task for groups is to watch the movie carefully and to try answer the following questions:

Why are children's playgrounds important? (example of the answer: development of soft skills)

Which of common I features and differences is possible to follow between our (Slovak, European) playgrounds and those in the south Africa, seen in the movie (example of the



answer: common features – used by children, differences: different age structure of children on the playground, different playing elements, material used, number of children, safety requirements).

Each group presents its answers, in the discussion students exchange their remarks and ideas coming from the questions given.

1.2. From the use of playgrounds to their creation



Duration: 20 minutes

Activity is aimed at introduction of main idea and methodical process of education program Architects.

Teacher describes in detail education program Architects to students with use of presentation „Architects.pptx“. He introduces the main idea of the program – proposal of children’s playground by pupils of primary school. He also introduces individual methodical steps in the next part of the presentation:

- **Setting of the task** (creation of children’s playground) and discussion connected with experiences of pupils from various children’s playgrounds and their ideas on ideal children’s playground)
- **Selection of the area of interest and the space for children’s playground.** Proposal of children’s playground is linked with concrete area, concrete place where would be placed individual tools and equipment for play. The area can be selected by teacher or by the third person (school principal, major etc.)
- **Analysis of area of interest.** This step is realized directly on the area where the playground is intended. In the terrain pupils recognize the features of the area which could play an important role in proposal of individual zones and selection of playing elements for playground (suitability of area, dimensions of free space, presence of greenery, slope and orientation of area, existence of playing elements and their conditions...)
- **Definition of aims of proposals.** The aims of proposal are strictly specified based on actual state of area considered for playground. For instance proposal of brand new children’s playground, reparation or extending the playground existing.
- **Definition of proposal criteria.** Each group defines its own criteria within which it would adjust its proposal. The criterion could be for instance unique appearance of whole playground, multifunctionality of playing elements, low price, conformity with surroundings etc. Each group presents and gives reasons for its own proposal criteria.
- **Selection of potential playing elements.** Next step is selection of playing elements which will create children’s playground. Selection runs in two steps. Firstly each one pupil in group selects his favourite playing elements which he would like to get involved into the proposal. Playing elements are selected from various catalogues which are available in printed and online form. Consequently each pupil presents his selection to his group. During short discussion within groups pupils select set of elements which are considered in proposal.

- **Location of playing elements and proposal of budget.** Location of playing elements on selected area and for proposal of budget requires use of online tool <http://www.mat2smc-project.eu/> . The tool allows setting of dimensions of proposed area, selection of playing elements, setting of dimensions and creation of budget table. The total budget contains not only the total sum but also items of basic descriptive statistic which are calculated from playing elements used.
- **Presentation of proposals.** After completing of proposals, each group presents its own proposal. The groups do not present only final location of elements but also budget and criteria which they followed as well as results of descriptive statistics (minimum and maximum price for playing element, modus and median etc.)
- **Evaluation and feedback.** At the end teacher evaluates work of individual groups. Evaluation from the site of pupils is also important. Evaluation should consider results off groups but also work in groups, total evaluation of the program etc.

II. Education program Architects under pedagogical supervision

2.1. Pedagogical approaches applied



Duration: 20 minutes

Activity is aimed at familiarizing of pedagogical approaches which are combined in education program Architects. Students investigate by their own creative work which pedagogical approaches are used in the program. They also find out in which conditions is program realized and how to organize or optimize work of pupils with use of the principles.

Students work in groups. Their task within each group is to create conceptual map explaining the pedagogical approaches used in the education program Architects. For all groups the basic common level of conceptual map is the title of education program Architects. Based on this common starting point, each group according to its own will chooses other levels which present educational approaches used in the program (e.g. work in groups, role playing, outdoor education, out of school education, IBL, ICT).

In the next level students can define conditions in which the concrete principles are realized and how to organize or optimize work of pupils with use of the principles. For instance in the case of outdoor education they can create the branches like – safety, orientation in space, movement in the fresh air, practical measurements. Another example for branching IBL – openness of education, scientific approach, practical character of tasks,...

Within the groups students can create their own system in conceptual map design. The result of the activity is presentation of conceptual maps designed. Each group (one by one) presents one branch (one pedagogical approach) and other groups can add notes (what they consider as an important to add) within common discussion of groups.

Based on facts presented, teacher together with students can create one final complex conceptual map which summarizes all ideas and remarks together.

2.2 Development of key competences



Duration: 20 minutes

Activity is aimed at familiarization with interdisciplinary character of the education program Architects. Through the creative activity students think about the content of the education program. Not only do they define knowledge coming from various teaching subjects but they also develop soft and hard skills.

Students work in groups. The aim of each group is to fill in a worksheet. This means to define which concrete knowledge and skills are developed in the area of mathematics and science in each methodical step of the program Architects. Students fill in only columns Math and Science. At the end each group presents its notes and remarks to each methodical step of the education program. Teacher summarizes results of individual groups and points out wide interdisciplinary character of the education program.

Worksheet:

	Methodical steps	Math - knowledge, skills (Activity 2.2)	Science - knowledge, skills (Activity 2.2)	Intercultural dimension (Activity 3.1)
1	Setting the task and discussion			
2	Selection of area of interest and its analysis			
3	Definition of aims and criteria of proposals			
4	Selection of potential playing elements			
5	Creation of the future map			
6	Creation of the project budget			

III. Intercultural dimension of the education program Architects

3.1. Conductive diversity



Duration: 20 minutes

Short final activity showing how the intercultural approach can influence process of education program and its results.

Students continue in group work and in filling the worksheet. Now they focus on the last column - Intercultural dimension. They try to describe how the intercultural approach would influence each methodical step of the education program. Intercultural approach can be understood as two different levels. The first presents the case when the education program is realized in multicultural environment (pupils come from different cultures- e.g. gypsies or other national minorities, refugees etc.). The second level presents the case when children's playground is planned for multicultural target group.



Materials and resources



Presentation (pptx): Introduction to education program Architects



Workshhets: Development of key competences



Online material: <http://www.mat2smc-project.eu/>



Youtube video:

<https://www.youtube.com/watch?v=vTYPLY1dYYk&t=>



References

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