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# Concepts for teaching units

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| **Environment** | The educational process is nowadays increasingly characterized by the presence of migrant or culturally non-mainstream students.<br>In such an environment, even the didactic activities planned and proposed by the mathematics teacher must therefore favour the development of skills and competences in disciplinary fields, such as those referring to geometry, with respect to which there seems to be less attention from the school systems of some countries, with consequent lower interest and greater difficulty in learning on the part of pupils coming from them.<br>The mathematical teaching units proposed – *M4M_IT-AREA_TU-2 & M4M_IT-AREA_TU-3* – therefore want to foster in all pupils, but above all in pupils with a cultural background in these countries, the curiosity and interest in the aspects of mathematics that refer to the analysis, interpretation and representation of situations, figures and objects also of everyday life.<br>The proposed TUs aim to examine, from a geometric point of view, situations, figures and objects that may also have a culturally relevant significance for migrant pupils.<br>To encourage the enhancement and development of individual skills, but also collaboration and a more effective process of inclusion and cultural exchange, the teacher will organize the work in the classroom in small groups or, at least, in pairs. |
| **Age of students/grade** | M4M_IT-AREA_TU-2: Grade 5 / 6<br>M4M_IT-AREA_TU-3: Grade 8 |
| **Length of the unit** | The length of the teaching units depends on the teacher's choice to progress or not in the development of the activities that are proposed to the class and of the mathematical contents referable to them and usable for the school level in which the TUs are proposed.<br>M4M_IT-AREA_TU-2: 2 lessons, at least<br>M4M_IT-AREA_TU-3: 2 lessons, at least |
| **Materials needed** | M4M_IT-AREA_TU-2<br>• Sheets of paper<br>• Pencil<br><br>M4M_IT-AREA_TU-3<br>• Sheets of paper<br>• Pencil |
| **Objectives** | M4M_IT-AREA_TU-2 & M4M_IT-AREA_TU-4<br>• Introduce isometries starting from movements on the plane made with the use of concrete material.<br>• Identify geometrical properties in real contexts. |

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| | • Reflect and conjecture.<br>• Debate among peers and with the teacher. |
| **Content related anchor points** | M4M_IT-AREA_TU-2<br>• Isometries of the plane:<br>  ○ translation<br>  ○ axial symmetry<br>  ○ central symmetry<br>  ○ rotation<br>M4M_IT-AREA_TU-3<br>• Elementary plane geometry<br>• Elementary geometric solids (parallelepiped, cube, pyramid, sphere, cylinders, cones…)<br>• Two-dimensional representation of solids |
| **Methodology related anchor points** | • Teaching units should be developed in problem-solving mode.<br>• Students work mainly in small groups so as to favour, among other things, the best inclusion of non-mainstream pupils and the development of their ability to use the language of the classroom, often a foreign language for them.<br>• Teachers will mainly have a mediator role.<br>• Only at the end of the didactic proposal teachers should propose to the students the reorganization of the mathematical concepts and instruments used.<br>• The discussions are usually placed at the end of each activity; sometimes they are anticipated so as to meet the needs of students who encounter greater difficulties in the task.<br>• The role of teachers is crucial, as they have to effectively manage the reflections and comments from students, in order to share with them a definition of the concepts they want to introduce. |
| **Language related anchor points** | Teachers must help their pupils overcome the learning barrier represented by the contrast between the simplicity of classroom language and the complexity of mathematics language. Indeed, teachers have to bear in mind that the language used in class is an element of further complexity for pupils from minority cultures with a different native language.<br>Therefore, in addition to the mathematical aims the following aims should be considered as to the classroom language and migrant pupils:<br>• increase of learners' capacity to understand and to elaborate the mathematical discourse;<br>• improvement of the ability of reading and understanding mathematics textbooks and word problems;<br>• improved usage of mathematical language;<br>• reinforcement of mathematical glossary knowledge;<br>• development of the ability to find a proper balance between natural language and mathematical language; |

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| | • identification of pre-knowledge and attitudes towards mathematics by migrant students.<br><br>In the activities the teacher should be a facilitator used by each pupils group both on the mathematical point of view and on the language point of view: each further interplay allows further improvement, and a step in mastery of communication in mathematics deals with a proportional step in mathematical knowledge too.<br><br>Word meaning problems, and figures meaning support processes of conscious reflection on the relationship between mathematical language and everyday language for all the students, native and non-native speakers. More productive too, the activities on lexical and word-in-text meanings need to be considered by students who are taught mathematics in a second language because it allows them to correlate the meanings of the words to the different contexts in which they occur: mathematical or ordinary everyday communication language. |

**Appendixes**

Sample activities: See ready-to-use teaching units “M4M_IT-AREA_TU-2” (PATTERNS AND GEOMETRIC TRANSFORMATIONS IN THE PLANE) and “M4M_IT-AREA_TU-3” (PLANE REPRESENTATION OF SOLIDS)