UNITS OF MEASURES

English Summary

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The text presents activities facilitating the teaching and understanding of measurement units – units of length, area, volume, weight, time, and currency, and relations between them. The aim is to communicate this subject matter to trainees in an interesting way, and to find such methods of work which will facilitate its understanding. Correct mastering of the basic units is a necessary condition for working with complex units, such as speed, density, power, astronomical units, etc.

Calculations with physical units and named numbers cause trainees many problems, the most common being:

- a trainee's idea about the meaning of a particular dimension and unit is not correct
- a trainee cannot, even approximately, estimate particular measurements
- they have problems with measurement units conversion
- they do not comprehend the relation of measurement units conversion and multiplication and division of natural numbers or decimal numbers by numbers 10, 100, 1000, etc.
- they cannot use real life knowledge independently.

It is suitable to use a methodical method of gradual familiarizing trainees with measurement units. This method includes the following steps:

1. **Developing a correct idea about the unit of a particular dimension:**
   A trainee creates this idea by means of concrete objects which they use, parts of their body, and by means of various measurement instruments (measuring length, weight, etc.)

   - What is your height in centimetres – how tall are you. Say your height in decimetres, in metres.
   - In what height of your body is 1 metre?

- How many centimetres can you measure with your arms outstretched?
- Show one metre by outstretching your arms.
- What is your weight in kilograms?
- Imagine a kilogram of sand, a kilogram of paper, a kilogram of feather, a kilogram of iron. What is the difference between those amounts?
- How many minutes does it take you to get to school?
- How many litres of water do you drink a day? How big amount is it – which pot could you pour it in?

2. Objects measuring

Before we start teaching units conversions, it is necessary to perform concrete measurements of objects and to express measures in various units – at least in two, if possible also in three various units of the particular quantity. We measure the dimensions of the classroom, textbooks, exercise books, desks, corridors, and playgrounds, we determine the size of playgrounds for various sports (e.g. football, volleyball, basketball, handball, ice-hockey, tennis), the dimensions of a swimming pool. We determine the weight of textbooks, school bags, objects of every day use, shopping, etc. We construct and set out shapes of given dimensions (lines, rectangles, squares) – e.g. a course for running 60 metres, a square with the side of 10 metres (1 are), a volleyball playground, and so on.

3. Practising estimations

When reinforcing the subject matter of measurement units an indispensable role is played by practising estimation of objects size and its comparison with the real dimensions:

- What is the length of the journey from home to school?
- What is the distance to the nearest town, or village?
- What is the area of a lake, woods, a park, etc.?
- What is the weight of the shopping you are carrying home?
- Are you able to carry a million of nails if each of them weighs one gram?
- How many litres of water do you bathe in?
- How many hectolitres of water is there in a swimming pool?
- How many litres of water does your family use per day?
- Do you think you have been living for a million hours?
- Can you guess how many hours or minutes is a million seconds?
- Do you think it has been a million days since the birth of Christ?

- How many metres do you walk if you walk a million millimetres?
- How big is a pack of thousand pieces of one-thousand-crown notes?

4. Other activities:

- Preparing a list of daily activities (school schedule, holidays activities, etc.)
- „Selling in a shop“ game.
- Work with timetables (trains, buses, planes, etc.).
- Work with a currency exchange rate table.
- Using historical measurement units, or units of other countries.
- Preparing a project – measuring in the past.

5. Unit conversion

The trainer should be aware of the difficulties involved in the correct understanding of all activities, and they should, therefore, prepare a system of exercises which will facilitate mastering of this subject matter. The teaching should include mainly the following:

- multiplication and division of natural and decimal numbers by 10, 100, 1000,
- identifying the needs, problems and strategies of trainees when they do the conversions: some trainees prefer work with numbers (arithmetical type), they remember the relationships between units and they are able to apply them, others comprehend the subject matter more algebraically and they remember the tables of direct proportion for individual units. If a trainee needs some activities all the time, we can use grids for measure units conversion which facilitate trainees' work. Examples of such grids for unit conversion of length, area, volume, and weight are given in the methodological material.