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MEASUREMENT UNITS. INTERCULTURAL EDUCATIONAL ACTIVITIES

Ioana Magdaş

Abstract: Today's society is characterized by a plurality of cultures in such a way that a person will often interact and interrelate with new cultures. The situation becomes even more complicated when one has to adapt to a new culture for a short period of time (travel or study visit) or a long period of time (new work place, emigration etc.). Any person's first impulse when getting ready to travel to a foreign country is to find out as much as possible about the respective country and its culture. Most of the time however, some details which are related to the practical aspects of such a visit are neglected. By this we mean everything from obtaining a visa (if necessary) to the shopping you need to do once you have arrived in the country. The first surprise might arise at the border when you might be asked to write you height or weight in a form using a different measurement unit (for instance feet or inch instead of cm) and can continue with distances being expressed in miles not in km, having to fill the gas tank using gallons and not liters and even being forced to shop where weight is expressed in lb instead of kg etc. Subsequently, intercultural education must not overlook the aspects formerly presented. In the present article we present a set of didactic activities which serve the purpose of familiarizing pupils with different measurement units so as to cope easily with situations that required interacting with new cultures or with people that are part of other cultures.

Key words: measurement units, interculturalism, educational activity

1. Introduction

Today's society is characterized by a plurality of cultures in such a way that a person will often interact and interrelate with new cultures. The situation becomes even more complicated when one has to adapt to a new culture for a short period of time (travel or study visit) or a long period of time(new work place, emigration etc.). Any person's first impulse when getting ready to travel to a foreign country is to find out as much as possible about the respective country and its culture. Most of the time however, some details which are related to the practical aspects of such a visit are neglected. By this we mean everything from obtaining a visa (if necessary) to the shopping you need to do once you have arrived in the country. The first surprise might arise at the border when you might be asked to write you height or weight in a form using a different measurement unit (for instance feet or inch instead of cm) and can continue with distances being expressed in miles not in km, having to fill the gas tank using gallons and not liters and even being forced to shop where weight is expressed in lb instead of kg etc. Subsequently, intercultural education must not overlook the aspects formerly presented. In the present article, we present a set of didactic activities which serve the purpose of familiarizing pupils with different measurement units so as to cope easily with situations that required interacting with new cultures or with people that are part of other cultures.

2. The International System of Units (SI) and nonstandard units measures

In 1960 the International System (usually abbreviated as SI) introduced the seven basic units, from which other units are derived. These units are:

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- For **length**: **meter** (with symbol **m**) defined as the distance traveled by light in a vacuum in 1/299,792,458 second;
- For **mass: kilogram (**with symbol **kg)** which equals 1,000 grams as defined by the international prototype Kilogram of platinum-iridium in the keeping of the International Bureau of Weights and Measures;
- For **time**: **second** (with symbol **s**) the duration of 9,192,631,770 periods of radiation associated with a specified transition of the cesium-133 atom;
- For **electric current**: **ampere** (with symbol **A**) which is the current that, if maintained in two wires placed one meter apart in a vacuum, would produce a force of 2×10^{-7} Newton per meter of length;
- For **luminous intensity**: **candela** (with symbol **cd**) defined as intensity in a given direction of a source emitting radiation of frequency 540×10^{12} hertz and that has a radiant intensity in that direction of $1/683$ watt per sterian
- For the **amount of substance**: **mole** (with symbol **mol**) defined as containing as many elementary entities of a substance as there are atoms in 0.012 kilogram of carbon-12
- For the **thermodynamic temperature**: **Kelvin** (with symbol **K**) which is $1/273.16$ of the thermodynamic temperature of the triple point (equilibrium among the solid, liquid and gaseous phases) of pure water.

In the educational systems of different countries students learn about these basic units, but in real life situations they operate mostly with measure units for length, time, mass and some of derived units for area, volume, temperature etc.

The derived units are:

- For **area** the most usual units are: hectare and square meter
- For **volume** (capacity) the most usual units are: liter for liquid measure and cubic meter
- For **temperature**: Fahrenheit degree and Celsius degree

All countries (except for USA, Great Britain, Liberia and Myanmar) use the international system of units. In the aforementioned countries some nonstandard units are used. The most frequently used measure units are:

- For **length**: inch (in), foot (ft), hand (hd), yard (yd), mile (mi)
- For **area**: acre, square feet (sq ft), square mile (sq mi)
- For **volume** (capacity): cube feet (cu ft), cube inch (cu in), gallon (gal) and other division or multiples of them depends of country USA or Great Britain
- For **mass**: ounce (oz), pound (lb), short ton (USA), long ton (British)

The difficulty of these measurement units appears at their multiples and submultiples which, unlike the units of the international system, are not multiplied or divided by the powers of 10.

Thus, we realize the difficulty in which a one finds oneself when having to adapt to nonstandard measurement units. Difficulties may occur in everyday conversations with people from these countries, namely the USA and GB.

3. Intercultural Educational Activities about Measurement

The activities proposed in this paragraph are aimed at 14 to 15 year old pupils who already have knowledge of the measurement units in their country. We have inferred however that the pupils are familiarized with measurement units of the international system in such a way that even though they do not come from countries such as USA or GB, the activities proposed can be easily adapted to the pupils in these two countries. The lessons will take place after a preliminary activity during which the teacher evaluates each pupil's life experience as far as interacting with other cultures is concerned.

From the two activities presented, others of the same type can be developed, these being merely an example of how to deal with measurement units from the point of view of interculturalism.

Activity 1. How the measurement units may hider a trip abroad

Objectives/ Competences:

- Identification of students' own experiences about the difficulties encountered in travels abroad
- Identifying non-standard measurement units used in USA and GB

Time: 50 minutes

Resources:

- Questionnaires completed beforehand by the students about the experiences their families or themselves had during trips abroad
- Movies, pictures, forms brought by the teacher and students to show various difficult situations encountered while traveling in the USA or GB (official forms: from entering the country, driving tests, books, product catalogues, etc.)
- Video-projector
- Flip chart

Lesson steps:

- Students are grouped in pairs.
- Students watch the film and / or and if needed the material is distributed among them.
- Students analyze the materials in pairs and identify the difficulties they have to solve: the filling of forms, the choice of products (food, clothing, household appliances, etc.).
- Each pair of students presents difficulties identified and the causes of the difficulties.

Reflection:

- A table it is draw on the board. Each pair writes down the difficulties and the possible ways of solving them.

Difficulties	**Causes**	**How can we solve the problem**

- Students identify the measurement units and the category (for example feet and inches are units for length, lb is a unit for weight, miles are used to measure distances etc.).

Follow-up suggestions:

- Students suggest the areas in which they have to extend their knowledge of measurement units.

Observations after the activity:

- Students fill out a form in which they express their opinion about the activity that took place.

Activity 2. Units of measurement for length

Objectives/ Competences:

- Identifying the measurement units for length, area and volume used in the USA and Great Britain
- Making conversions from one measurement unit to another

- Identifying a number of automatic convertors on the Internet and using them for conversions from one measurement unit to another

Time: 100 minutes

Resources:

- Working sheet
- Video-projector
- Network of computers connected to the Internet

Lesson steps:

Evocation:

- Students remember the measurement units for length from the international system:
  mm cm dm m dam hm km
- Students remember how to make the transformation from one measurement unit to another (multiplying or dividing by the powers of 10)

The sense realization:

- Students form groups of 2
- Students receive the work sheet
- Students analyze in pairs the materials the have received and identify the difficulties
- The students solve the first two problems on the sheet
- Each pair of students groups up with another pair and discuss the result they have obtained, if there are unsolved exercises they are discussed with the entire class
- Exercise number 3 is solved with the entire class and exercise number 4 is discussed
- The students solve exercises 4,5 and 6
- A flip chart with the heights of the students is created (an occasion for them to compare the results they have obtained). The table has the following structure

Height in cm	Height in inch and feet	Height in hands

- The teacher asks the students to find an automatic unit converter for length on the Internet
- The students search for 10 minutes and in the even they do not find anything the teacher suggests a website
- The students check their result using the automatic converter

Reflection:

- The students are asked to express their opinion on which of the two types of measurement units is easier to work with and why

Follow-up suggestions:

- The students try to solve the additional problem
- The students identify what measurement units appear in the additional problem (these are units for length and volume)
- The students are asked to further research measurement units for area and volume used in the USA and GB
- Further activities related to the measurement units for area and volume may be organized or the students can be asked to create a report on this theme

Observation after activity:

- The students complete a questionnaire in which they express their opinion about the activity that took place

Annexes

WORKING SHEET

Next there are presented the measurement units for length used in USA and Great Britain.

1 feet (ft)= 12 inch (in)
1 yard (yd)= 3 ft
1 hand (hd)= 4 in
1mile (mi)=5280 ft
1 in= 25 mm

Solve the next problems:

1) Draw a line segment of 15 cm. By using the ruler find the length of the line segment in inch.

2) A line segment of 3 inch is given. Find the length of the line segment:

a. by drawing and using the ruler
b. by using the formulas

3) Complete de equalities: 1mi=…km;

1 ft= … mm= … cm= … m
1 yd= … mm= … cm= … m
1 hd= … mm= …cm= …m

4) Find your height in inch and feet.

5) The distance between two cities is 120 km. Find the distance in miles.

6) Horses are measured in hands. A pony is a horse less than 14.2 hands tall. How much is that in cm? How tall are you in hands?

Supplementary question

A car consumes in town 12 l/km. Find car consumption in gal/mi. You may use:
1 gallon (gal) = 3,785 liter (l)

Other possible activities on the same theme

- Units of measurement for area and volume
- Cooking measurements (an integrate activity using temperature, weight, volume)

3. Conclusion

In our didactical activity we have often noticed that students have frequent difficulties when faced with everyday practical issues. The activities we propose in this article, and others that can be developed from them, are aimed at developing the abilities to adapt to typical daily circumstances that may occur when interacting with another culture or with people that come from another culture.

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Author

Magdaş Ioana, Babes-Bolyai University, Cluj-Napoca, Romania, e-mail: magdas_ioana@yahoo.com