

## THE IMPORTANCE OF FOREIGN LANGUAGE IN TEACHING MATHEMATICS AT TECHNICAL FACULTIES

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### ABSTRACT

*The paper was written in order to investigate how much the knowledge (or lack of knowledge) on foreign languages can affect the student's success in solving mathematical assignments. There were analyzed three types of assignments concerning the mode of their defining. Such investigation is particularly important in the light of Bologna process implementation.*

**Key words:** Mathematical idea, linguistic component, mathematical language, foreign language, translation

### 1. INTRODUCTION

Each mathematical idea consists of three components: linguistic, conceptual and procedural. In teaching mathematics the most time is dedicated to a procedural component, because it sets up concrete procedures for solving a problem. This particularly refers to standard type assignments where solving is presented by a range of well known operations, methods and procedures.

On the other hand, the conceptual component is very important in assignments of non-standard type or, generally speaking, in assignments encountered for the first time. In order to solve such an assignment an appropriate method is needed. We can establish the method if we manage to connect the assignment with one or more similar ones that we are able to solve.

In this paper we will focus on a linguistic component. Our interest has arisen from the fact that Bosnia and Herzegovina is a signatory of Bologna Declaration and therefore its universities are obliged to meet certain requirements. One of them is to provide mobility of students for the purpose of further study and employment. This brings forth the issue of language and its role in this process.

### 2. LINGUISTIC COMPONENT AND ITS ROLE IN SOLVING A MATHEMATICAL PROBLEM

Firstly, it should be noted that mathematics has its own language with specific syntax and specific vocabulary. If any word or phrase in the text of an assignment is unknown to a student, he cannot solve that assignment. While studying mathematics a student is studying a mathematical language. Thus, linguistic component can be regarded as translation from native to mathematical language and vice versa. Sometimes, linguistic component can pose an unsurmountable problem even if an assignment is written in native language, the one we know the best. Certainly, the situation is getting more complex if the assignment is written in a foreign language.

The problem of linguistic component can be bypassed only in case of assignment written by exclusively standard mathematical symbols understood by mathematicians in the whole world.

However, the linguistic component in assignment solving is inevitable if the assignment is given in a textual (verbal) form. Let us suppose that a student gets a verbal assignment written in a foreign language. In order to solve it he must go through the following phases:

1. Translation of the text of assignment into a native language.
2. Translation of the text of assignment from native into mathematical language i.e. setting a mathematical model (equation, inequality, system of equations etc.).
3. Translation of the obtained mathematical result into native language (i.e. formulating the final solution of a problem).
4. Translation of an obtained solution into a foreign language.

There are numerous traps hidden in each of these phases. Their nature can be either linguistic or mathematical but quite often the both.

In certain cases, when the language of the assignment text is not familiar to a student, the assignment could be understood and subsequently solved if the student manages to recognize a key word in the text, the one that sounds similar in majority of languages. Certainly, this could be possible only if a student has a significant knowledge in mathematics and if there are many mathematical symbols incorporated in the text.

For example, here is an assignment written in Romanian:

*Să se verifice că dreptele de ecuații  $2x + y - 1 = 0$  și  $2x + y - 7 = 0$  sunt paralele.*

The word "paralele" can be identified as a key one in the text and we realize that parallelism of given lines is to be proved. Thus, besides capability of recognizing a key word, a student must be quite competent in the subject matter in order to recognize that these two equations present lines in a plane.

Nevertheless, there are some more complex situations as in the following assignment:

*Se aruncă o monedă. Să se descrie această experiență cu ajutorul unei variabile aleatoare;*

Although a student can recognize a word "variable" it is not sufficient for him to find out what is required in this assignment. Such an assignment (no matter how simple it is) is impossible to be solved without having a knowledge on fundamentals of Romanian language.

Sometimes, however, a student can face an assignment like the one below:

*Să se calculeze:*

$$\int_{\gamma} y dx + z dy + x dz \text{ unde } \gamma: \begin{cases} x = a \cos t \\ y = a \sin t, t \in [0, 2\pi]. \\ z = bt \end{cases}$$

The text of the assignment is minimal and a student who can solve line integrals can solve it no matter whether he understands Romanian or not. But for a student who cannot solve line integrals the text will make no changes in understanding and alleviating a problem.

If we suppose to have a student quite competent in mathematics can we assert that such a student needs only a good dictionary of a foreign language in order to successfully understand and solve mathematical assignments written in that foreign language? And what about the situation of a student not having a dictionary?

The answer to these questions can be given through the following cases:

- If the assignment is given with a minimum verbal text, but with an abundant use of mathematical signs and symbols, the assignment will possibly be understandable to a student even without the use of dictionary.
- If the assignment is partially presented by a verbal text, whereas the rest of it is presented by mathematical signs and symbols, the dictionary could help a student to figure out the assignment requirements, often via key words. However, mistakes in understanding are possible.
- If the assignment is written without any mathematical symbols it is quite possible that even dictionary could not be sufficient for understanding of the assignment, because more elaborated knowledge on grammatical rules of the language in question is necessary.

### **3. CONCLUSION**

The stated examples show the significance of foreign language teaching at technical faculties even in the case of mathematics – the subject which, due to its own language of communication, seems much more linguistically independent than other ones. This is especially important in the cases when linguistic component in mathematical assignment prevails.

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