Forging the Future: Pioneering Approaches in Business, Management and Economics Engineering to Overcome Emerging Global Challenges - 2024

https://doi.org/10.24867/FUTURE-BME-2024-029 Original scientific paper

CHALLENGES IN TEACHING MATHEMATICS AND STATISTICS IN MODERN TIMES

Aleksandar Takači[1] *[0009-0008-4279-8010], Gordana Stankov*[2] *[0009-0003-4399-4447]*

Abstract
The goal of the paper is to study the influence of different input factors, such as the results of pre-test and attitudes, on students as- sessments in learning mathematicsand statistics. The attitudes to mathematics and students environment is described with fuzzy numbers. Fuzzy theory, package is used to predict the score.positive and negative aspects.

Key words: *learning teaching, mathematics, statistics, fuyyz.*

1. Introduction

In the references (Shmigirilova & Ryvova, 2021) and (Stenmark & Kerr, 1991) concerning mathematical education the most important is educational assessment. The process of mathematics assessment is usually measured with terms, knowledge, skills, and so on. But in the process of teaching and learning mathematics the attitudes and beliefs towards mathematics and corresponding teaching tools and teaching materials of learners are also very important. For the teachers working at the University the most important is the studentsassessment. The students' motivation, learning styles, learning outcomes, and satisfaction in achieving good results are all very welcome during the learning process. In order to measure such attitudes and beliefs it is appropriate to use fuzzy set theory.

In this paper the Fuzzy theory is applied for the purpose of mathematics assessments. The students' data are gathered and analyzed. First, the Fuzzy ToolBox of the software package MathLab is applied to build a fuzzy decision making system in order to obtain prescribed scores and to compare it with the real final scores. Starting from data of 176 students the data for 44 students are presented. Similar thing was done by Gökmen et al. 2010.

The obtained results of data represent the contributes both to the application of fuzzy decision making system and to students' assessment. In the future the authors are supposed to apply obtained fuzzy decision making system to predict

[1] Faculty of Technology, University of Novi Sad, Serbia, sasatakaci@gmail.com
[2] Subotica Tech College of Applied Sciences, Serbia, gordana@vts.su.ac.rs

students scores at the beginning of the course in order to motivate students to work appropriate in their learning process.

Using Fuzzy set theory it can be concluded, in didactic point view that besides the knowledge expressed by the results od pre-test, the mention at- titudes and reliefs contributes to the students assessments.

In the second section we present the well known basic notion about Fuzzy logic, necessary for understanding the whole research. In the third section we presented the given data. In the fourth section we analyzed the influence of given data to the students' assessment.

1.1 Basic Notions and methods

Fuzzy set theory was introduced by Zadeh (1965) A good overview of fuzzy sets and operations with them is given in Klement, Mesiar, and Pap(2000). In the meantime, fuzzy set theory has been applied in different fields in order to model uncertanty, imprecision and vagueness. The most common application of fuzzy set theory is fuzzy control. Many devices in our homes (heaters, air-conditioners, video cameras...) use fuzzy control in order to save energy or generally improve their functionality.

Fuzzy control is actually a generalization of classical expert systems. Ex- pert systems are based on IF-THEN rules i.e.
If x is A then y is B.

The reasoning of expert systems is based on classical logic. Fuzzy control systems are based on fuzzy logic and in fuzzy control the A and B are fuzzy sets. Usually fuzzy control systems have many inputs and one output. Fuzzy system consists of many IF-THEN from which the output value is predicted based on the input value.

In this paper fuzzy systems will be used to predict student test scores from different student characteristics.

We had started our research with 202 students, but we finished with 176 first year sciences students at the Faculty of Sciences, University of Novi Sad. We lost 26 students, that be treated as a common number getting out their studies in different cases. Let us remark that all student were very motivated to take part in our research.

At the first lecture of our course the students got the pre-test consisting of 10 mathematical tasks, and 6 points was maximum for each task.

Besides the usual measuring of students' mathematical knowledge and skills (pre-test), the authors were interested in students' attitudes and be- liefs of mathematics, in particular of using teaching materials, computers for learning. These input factors are consider, by authors, as relevant ones for assessment in the learning process of the compulsory mathematical contends in our course.

Together with the pre-test the students had to answer the questionnaire about the following attitudes and beliefs: to mathematics in general, to computer, to teaching mathematics and to Geogebra.

In this paper the fuzzy theory is used to represent and examine the influence of the students' attitudes and beliefs, on their mathematical assessment. It is known

that the big problem in learning mathematics are negative attitude, even fear of mathematics, caused by failures in the past, and therefore the authors emphasize it as an important factor for the motivation for learning mathematics. (denoted by 1) or dislike (denoted by 0) mathematicians.

The authors consider that the use of package GeoGebra is very useful for understanding mathematical contents, because they have a lot of experiences in teaching and learning mathematics by using computers. The dynamic ge- ometry package GeoGebra was used, as the teaching tool, on lectures dur- ing the mentioned course: Mathematics for science students. Therefore the students' opinions about the use of computers, in particular GeoGebra are examined.

In the third column of Table 1., Table 2, and Table 3, denoted by AC the student were asked about their using computer. They were asked to choose one of the following sentences:

I have used computer for learning very often (denoted by 5);

I have used computer for learning sometimes (denoted by 4);

I have used computer for correspondences and (or) games very often (denoted by 3);

I have used computer for correspondences and (or) games sometimes (denoted by 2)

I have never used the computer (denoted by 1).

In the fifth column Table 1., Table 2, and Table 3, denoted by AG the students were asked about their using dynamic geometry programme package GeoGebra. If ones has ever used it and consider it useful then to mark with

3. If ones has never used it, but would like to use it for learning mathematics then to mark with 2. If ones has never used it and does not want to do it then to mark with 1.

Also, the ability of learning by using written teaching materials (official books and other materials) is crucial for successful learning mathematics.

Based on the inputs which were student attitude towards mathematics, student GPA and pre test scores a fuzzy controller was created using the MatLab fuzzy toolbox.

2. Results

The fuzzy contoller had an average prediction error of 4%. Only in the case of 5% students it predicted wrongly the students exam mark. In only 1 extreme case it missed the mark by 3. The following chart shows the predicted and the real result on the test of randomly selected 31 students.

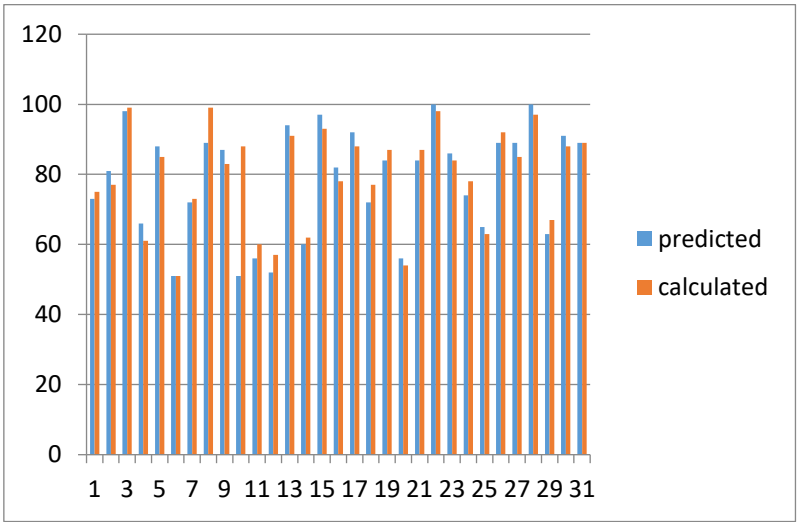

Figure 1. Predicted and obtained student marks

3. Discussion

The authors consider that the possibility of predicting the students' marks at the beginning of our mathematical course can be useful for the students to get real picture of their possible mathematical assessment, and it can be an additional external factor of motivation for them to plan their learning of mathematics and is to continue with research working with more different students.

4. Conclusions

The science students are very interested to understand and learn math-ematics, and to get good marks, whereas the successfulness of their studies depends on it. The goal of our research is to contribute to students' better assessment, i.e., to help students to overcome difficulties in learning math- ematics and to enable them better marks. Therefore, besides the results of pre-test, the influence of chosen factors (attitude to mathematics, teaching materials and tools) are important to be considered. The influence of the considered attitudes are significant factors for learning process (expressed as better remarks) in mathematics.

Acknowledgments

The authors gratefully acknowledge the financial support of the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (Grant No. 451-03-47/2023-01/200125)

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