Chapter 13
New Software for Assessing Learning Skills in Education According to Models Based on Soft Sets, Grey Numbers, and Neutrosophic Numbers

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ABSTRACT

One of the components of the educational teaching process is evaluation. The teacher evaluates the students at different moments of the course, to control that they adequately comply with the general and specific objectives that are proposed in the curriculum. This chapter describes a software called "Students' Skills Evaluator 1.0," designed by the authors, to evaluate the skills of a group of students according to two models; one that hybridizes soft sets with grey numbers, and the other uses neutrosophic numbers, where the students are assessed according to Bloom's Taxonomy method. The software is friendly for the target users who usually are not specialists in computer sciences; in addition, the teachers evaluate their students based on mathematical models that are rigorous and easy to use.

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INTRODUCTION

One of the stages in the educational process is the assessment of students at any level of education. With the evaluation, the teacher determines if the student reached the partial or general objectives of the content taught up to that moment. One of the difficulties that arise at this stage is to determine if the assessment will be based on either a quantitative or a qualitative scale.

Each of them has its advantages and disadvantages. In the case of the qualitative scale, there are difficult to perform arithmetic operations with it. Nevertheless, the advantage we have is that usually it is preferred by teachers because it allows them more accuracy in capturing the complexity contained in the teaching process. The complexity of the teaching process is due to it comprises numerous components from different students' dimensions, like psychological, sociological, pedagogical, among others. Teachers know that a good grade is not made from the sum of numerical points but from the holistic and qualitative measurement of each student.

Another difficulty that the teacher confronts when evaluating is that due to the complexity of this task, there may be doubts about whether the grade given is the most appropriate, and there is uncertainty in the prediction of whether the student will use adequately in the future what he or she has learned. In addition, the teacher may have doubts about the student's learning, when he or she shows ups and downs in his or her performance or other similar situations that are very common within the teaching and learning process.

If the teacher wishes to take all these complexities into account when making decisions to evaluate each of their students, then there is no doubt that he or she needs to resort to mathematical tools that are based on theories that, if put into practice, would demand the performing of calculations that can only be carried out efficiently using a computer program.

The models on which these calculations are based should combine the advantages listed below:

1. It must be based on a rigorous evaluative pedagogical model, which has been proven to be effective in practice and with a recognized theoretical basis.
2. It must be based on mathematical models of proven effectiveness for decision-making in environments of uncertainty and indeterminacy.
3. The educator must feel satisfied with the evaluation provided by the models described above. In other words, the model must be able to provide the teacher with a sufficiently adequate measurement scale that takes into account the uncertainty and indeterminacy of evaluations, so that the teacher can effectively and efficiently capture the assessment that he or she considers most appropriate for the student.
4. The educator must feel satisfied with the final result of the aggregation of the given notes.
5. The model must be versatile enough to handle at least two evaluative situations when the input data is different.

The first aspect agreed by the authors to satisfy all these aspects is to base the pedagogical model on the Bloom's taxonomy for learning (M. Voskoglou, Broumi, & Smarandache, 2022; M. G. Voskoglou, 2022a). This method is based on measuring six skills of students in their learning, they are, "Knowing-Remembering", "Organizing-Understanding", "Applying", "Analyzing", "Generating-Evaluating", and "Integrating-Creating"; additionally, an evaluation of "Overall Performance" is included.