Chapter 3
An Extended EDAS Based on Multi-Attribute Group Decision Making to Evaluate Mathematics Teachers With Single-Valued Trapezoidal Neutrosophic Numbers

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ABSTRACT

The chapter proposed an extended evaluation based on the distance from average solution (EDAS) method based on single-valued trapezoidal neutrosophic numbers (SVTraNNs) for applying it in education sectors. To explain its concept, a teaching quality evaluation is depicted as a process consisting of a committee of teaching performance assessments and a group of mathematics teachers working at a school. The teaching performance assessments were properly interpreted for appropriate evaluation and given by the committee. The chapter first provides the concepts of SVTraNNs which are generalization of fuzzy numbers and intuitionistic fuzzy numbers. Second, the chapter discusses some SVTraNNs operations and their aggregation operators. Third, the chapter proposes an extended EDAS based on SVTraNNs to handle multi-attribute group decision-making problems. Next, the chapter illustrates a case study of mathematics teaching quality evaluation using the proposed EDAS to select the best teacher. Finally, comparison and sensitive analyses show the capability and effectiveness of the proposed EDAS.

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INTRODUCTION

Schools are groups of people who are organized and governed to pursue common objectives (Sandes, 2013). Schools operate under the management, vision, and supervision of its academic directors. Decisions are constantly being made during the planning, execution, and evaluation of routine work by academic directors. Academic directors must develop a clear vision, align the curriculum, learning, and assessment, and focus on the requirements of the working environment and personnel in order to encourage learning among students (Ahmed & Al-Dhuwaihi, 2020). According to (Kumar & Gautam, 2018), decision-making is the most important component and the main activity in the operation of any business. It is a process to select an option from a variety of alternatives that allows one to advance a chosen course of action. It is also an action that demonstrates how one identifies, considers, and chooses an alternate problem of action to address an issue.

There are many factors contributing to a student's academic performance. They include individual characteristics, family supports, and friendly relations. Some researchers suggest that among the factors that are most related to school are teachers.

Because of the complexity of the surrounding factors, uncertainty, and the boundaries of human perception, it is challenging for policymakers to provide reliable information. How appropriate assessment of teachers is to demonstrate a more feasible and efficient assessment in the factual decision-making system. When making decisions, people frequently use natural language terms like "great," "good," "weak," and "bad" to rate a specific index or item (Bellman & Zadeh, 1970). In order to tackle the assessment challenge, a decision-making approach that converts both qualitative and quantitative information becomes essential.

The theory of fuzzy sets is a powerful instrument for depicting uncertain information. (Zadeh, 1965) first surfaced this theory by expressing natural language terms through a membership function with values between 0 and 1. Later on, (Atanassov, 1986) improved this theory by introducing an Intuitionistic fuzzy set (IFS) where each set element consists of a membership function and a non-membership function, as well as the sum of those two memberships should be in the interval 0 and 1. However, it can simply overcome incomplete and uncertain information but cannot tackle inconsistent and indeterminate information appearing in actual case studies commonly. Hence, (Smarandache, 1998) had a brilliant idea to enhance those two theories by originally initializing a neutrosophic set (NS). This set can elaborate a truth-membership, an indeterminacy-membership, and a falsity-membership of information having uncertain, imprecise, vagueness, and inconsistency. It affected many marvelous researchers applying this set to solve their authentic research cases. such as social science (Irvanizam et al., 2020; Irvanizam & Zi, 2022), medical fields (Abdel-Basset et al., 2019; Zulqarnain et al., 2021; Dhar, 2021), engineering (Ashraf et al., 2020), transportation (Kumar Das, 2020), etc.

In line with the needs of science and engineering, NS theory continues to develop from time to time. One of its developments is to design the single-valued neutrosophic set (SVNS) concept developed by (Wang et al., 2010). This sub-NS has also metamorphosed into several other forms of NS, such as a single-valued trapezoidal neutrosophic set (SVTraNS) introduced by (I. Deli, 2021). In addition, they also developed a single-valued trapezoidal fuzzy neutrosophic number (SVTraFNN), their basic mathematics operations, and some theorems related to SVTraFNN.

The theory of SVTraNS has been continuously elaborated in the sectors of decision-making. Most of them discussed about proposing novel properties, aggregation operators, theorems, and distance measurements. For instance, (I. Deli & Şubaş, 2017b) defined some novel aggregation operators such