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# Fuzzy rating scale-based questionnaires and their statistical analysis

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**Abstract**—The fuzzy rating method has been introduced in psychometric studies as a tool allowing to capture and accurately reflect the diversity, subjectivity and imprecision inherent to human responses to many questionnaires. The lack of statistical techniques to analyze in depth these responses has been for years an important barrier. At present, this barrier is being overcome thanks to new statistical techniques which are appearing. In this way, the information from fuzzy rating method-based responses can be suitably explored and exploited. This paper aims to formally endorse some of the main statistical benefits of using the free-response format fuzzy rating scale-based questionnaires instead of using the closed-response format involving fuzzy linguistic representations.

**Index Terms**—fuzzy numbers, fuzzy linguistic representation, fuzzy rating method, questionnaires, random fuzzy sets, statistical analysis of fuzzy data.

## I. INTRODUCTION

QUESTIONNAIRES play a major role in many scientific studies, especially in those related to social sciences. Evaluation, rating, judgment, perception, etc. are typical in human social lives, and the corresponding data are routinely collected as responses to some questionnaires. Questionnaires were first considered by Galton (see, for instance, [1]) in connection with human communities. They mean a valuable research tool constituted of a series of questions which are posed to gather information from respondents, and they are usually designed for statistical analysis.

Respondents answer each question in a format which in most cases is closed; more concretely, the respondent should choose an answer from a given (frequently small) number of options. Most of these options are either dichotomous, nominal, or ordinal, the well-known Likert scales possibly being the most commonly employed to express the given options. For purposes of analyzing and summarizing the obtained

responses, they are traditionally viewed as values of linguistic variables, and they are often encoded by means of integer numbers, in spite of the many concerns associated with such an encoding.

This closed format questionnaire is very popular in practice, because of the ease to conduct surveys involving them, independently of both, the framework the surveys are conducted in and the background of respondents. For most of these questionnaires, the meaning of the answers does not need to be explained. However, many criticisms have been brought against (see, for instance, Jamieson [2] and Carriffo and Perla [3]).

One of the most common concerns relates to the fact that response labels are often assumed to be ordered, and the difference or intensity of feeling/perception between two 'consecutive' values is supposed to be constant, as they are in the integer encoding. However, such consecutive values do not really reflect equal differences. Another crucial concern is that the descriptive and inferential statistics which can be developed with the responses from one of these questionnaires are quite limited, even in case the responses are encoded in terms of integer numbers. This leads to the need to develop new ways to analyze them.

Another weak point is that choosing among a prefixed set of labels or values can become difficult, whereas choosing a label/value in between two of them make respondents feeling much more comfortably. To overcome this drawback, an alternative approach which has been considered is that of an open format associated with a continuous numerical scale: the so-called *visual analogue scale*. This is a scale which can be used in questionnaires, and in accordance with which respondents specify their rating by indicating a position along a continuous line between two end-points (i.e., by choosing a point within a given bounded interval). The visual analogue scale was described for the first time by Hayes and Patterson [4], but it took a long time to be used in questionnaires (see Aitken [5]). Advantages of the visual analogue scale-based questionnaires, either using paper-and-pencil or computer/web tools, have been discussed from different perspectives (see, for instance, Gerich [6], Reips and Funke [7], Funke and Reips [8]).

Irrespective of the preferences of users, which usually relate to the ease-to-fill, from a statistical viewpoint it is not at all debatable that data sets from visual analogue scale-based questionnaires involve a much higher diversity and subjectivity than the closed format ones. Consequently, in case implications from the statistical analysis of the responses are not very relevant, the ease-to-apply and treat may be in favour

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## Factors that Affect Effective Planning Skills of the Teacher in the Classrooms

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### Abstract

The main aim of this article is to examine the factors that affect planning skills of the teacher in the classrooms. These factors are: organizing the classroom and the teaching materials; effective implementation of lesson plans; and time management. This phenomenon is handled starting from the students' perceptions of the high schools in Tirana, Durrës and Elbasan. The approach of this study was quantitative and sample extraction is carried out through the stages sampling technique. For the data collection a Likert scale was used, with a Cronbach alpha coefficient reported, .77, .75, .62, and .65. Through the use of advanced statistical analysis there was identified a model which predicts that intervention in some variables such as, the organizing of the classroom and the teaching materials, effective implementation of lesson plans and time management improves the effective planning skills of the teacher. Results showed that there exists a positive relationship between teacher's effective planning skills and other variables, which are organizing the classrooms and the teaching material, effective implementation of lesson plans and time managements.  $F(3,634) = 573.630, p = .000, adjusted R^2 = .672$ .

**Keywords:** Teaching, planning skills, organizing the classrooms

### 1. Introduction

Classrooms with more structure have been shown to promote more appropriate academic and social behaviors, as well as greater task involvement, friendlier peer interactions, more helpful behaviors, more attentive behavior, and less aggression (Simonsen et al, 2008). Regardless of the amount of control teachers have over what and how they teach, in order to design and implement effective lessons, every teacher should have a: system for writing daily lesson plans that is easily managed, long range plan and focused vision, method for obtaining and organizing new teaching ideas, and plan for reflection on teaching strategies and making improvements (Powell, 2009, p. 250)

Research highlights the importance of pupils always being aware of the purpose of the content of lessons, and it also shows that effective learning occurs where teachers clearly explain the objectives of the lesson at the outset, and refer to these throughout the lesson to maintain focus (Brophy & Good, 1990 in Sammons et al, 1995). According to Brophy and Good, these objectives should be related to previous study and to things of personal relevance of the pupils.

### 2. Literature Review

#### 2.1 Effective planning skills

Good teachers are flexible and respond creatively to what happens in the classroom, but they also need to have thought ahead, to have a destination which they want their students to reach, and some idea of how they are going to get there, and a plan helps to remind teachers what they intended to do (Harmer, 2007, p. 156). Creating and implementing a productive learning environment requires careful planning. According to Emmer and Evertson (2009), classroom management begins long before the students come into the classroom. Effective teachers plan their classroom management before the school year begins, and know what tasks they will need to undertake at the beginning and throughout the year (Simonsen et al, 2008).

Stronge, (2014) states that teachers should consistently plan using state and local school district curricula and





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