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Evaluation of the presentation skills of the pre-service teachers via fuzzy logic

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ABSTRACT

The main purpose of this study is the presentation skills evaluation of pre-service teachers via fuzzy logic. There are two different groups in this study. The first one consists of 14 instructors serving in the Computer Education and Instructional Technology (CEIT) Department of Firat University (FU). This group has supplied expert view in ranking the importance of the matters in the Presentation Evaluation Scale (PES) and in forming the rule base that sets ground for the operation of fuzzy logic mechanism. The second group consists of 41 juniors having the Operating Systems and Applications Course in the CEIT Department of FU. The students in this group make a presentation associated with the units of this course, PES are applied on them and the study is conducted by the data obtained from this scale. Frequencies and percentages and Wilcoxon test is used to analyze the data sets. It is found that there is a significant difference between the PES obtained student scores and those scores that passes through fuzzy logic mechanism. The scores of some students have decreased, those of some have increased while there is no significant change in some of them.

1. Introduction

Assessment and evaluation are two complementary concepts in education process. Assessment is having data in a systematic way. It is for following a program's or course's success to learn if students get necessary information from that program or course. Assessment is about learning, teaching and results. It gives information about improving learning and teaching. Assessment is an interactive process between students and faculty. It informs faculty how well their students are learning the lesson. Evaluation is an opinion of teacher or educational researcher about whether the program has reached its purposes. Evaluation concentrates on grades and may reflect other classroom parts apart from course content and mastery level. These could include discussion, cooperation, attendance, and verbal ability (Enerson et al, 1995; Biggs, 2011).

An assessment and evaluation mechanism is performed at the end of every education process that is planned and executed. Assessing and evaluating the success of a student and deciding on whether he is successful according to the results of a couple of exams has been a conventional perception but this perception is abandoned gradually recently. An assessment and evaluation process is needed not only to assess the student behaviors whether they meet the education objectives, but also to identify to what extent they actualize these earnings in their lives (Aslanoğlu & Kutlu, 2003). Multiple evaluation methods should be used for an efficient evaluation (Fry, 1990; Orsmond, Merry, & Reiling, 2000). Conventional evaluation methods such as multiple choice tests, short answer tests, written exams etc. are mainly used to come to a conclusion, while alternative evaluation techniques such as open-book exams, projects, dramas, performance evaluation are more for demonstrating students' active learning. In addition, emerging methods such as self-evaluation, peer evaluation and portfolio evaluation has become important and been used in literature recently (İzci, Göktaş, Şad, 2014). In this context, having the students perform group studies, projects, homework and present their workshop is very common now.

Presentation of a subject to audiences is an essential capability both in business life and in education environment. The ability to make an impressive presentation should be given to the students of an education faculty who will be the teachers of the future. The instructors in an education faculty should feel the enhancement of presentation skills of students among their main duties (Aldağ & Gürpınar, 2007). The assessment of the presentation skill of a pre-service teacher whether it meets the desired objectives via

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alternative evaluation techniques has become more of an issue.

Magin and Helmore (2001) have proposed that considering the presentation performance of a single teacher in evaluation is insufficient and unreliable. Although the consideration of multiple teachers' performances in evaluation seems more reliable, participation of many teachers into this evaluation process is not easy in practice. An artificial intelligence system should be created by the views of different experts in order to assure the objectivity of the assessment and evaluation process. So, the process will be more reliable. Artificial intelligence applications of daily life such as computer games, image and fingerprint scanners are common in healthcare, transportation, security, education etc. Artificial intelligent applications in education are identified as expert systems which is a branch of the knowledge based systems. The expert systems term can be thought as a kind of software that handles the workload of an expert on behalf of him in a complex environment (Önder, 2003).

A lot of researcher and writers have researched and discussed about various applications in the field of education. Writers have been working on the comprehensive scanning literatures in order to let the importance of the artificial intelligence technologies in the field of education be understood and improve the quality in the related field. In this context, the related studies matched in literatures have been submitted and the theoretical structure related to the artifical intelligence and the fuzzy logic has been given in the sections of 1.2 and 1.3.

Fuzzy Group Decision Support System (FGDSS) is a design and implementation approach which has been proposed by Baba, Bakanay, and Cin (2009a). Their aim is to measure the technical knowledge and performance of project presentation of graduate students. The respondents were composed of 15 graduate students who were participating "Sensors and Applied Technique" course in the Institute for Graduate Studies in Pure and Applied Sciences of Electronics and Computer Education Department at Marmara University. Five main criteria are identified to assess the technical knowledge and the pedagogical aptitude of students. There are two sources to assess the performance of a student. One of them is the lecturer's observation and the other is the views of the classmates. The feedback is provided and the efficiency of the approach is tested via a post-questionnaire which is composed of open ended questions.

Saleh and Kim (2009) have proposed a fuzzy system which evaluates the answers of the students. In this method, the difficulty, importance and complexity of the questions are considered and fuzzification, fuzzy inference and defuzzification are used in the evaluation of questionnaires. Since the proposed system is comprehensible, objective and implementation easy, it enables a reasonable and fair evaluation of students' achievements.

Baba, Kuşçu, and Han (2009b) have developed the user-friendly FGDSS software which can be used in multi-purpose decision making processes. The main and sub criteria and the weights of them can be identified for assessment according to multiple decision makers via the software. The software which enables the researcher to use two different fuzzy inference methods has been used to assess the performance of research assistants in Technical Education Faculty at Marmara University.

Bai and Chen (2008) have presented a new method to evaluate the students' learning achievement. This new method uses fuzzy membership functions and fuzzy rules to evaluate the difficulty, importance and complexity level of the students' answers scripts and it also enables the decision maker to distinguish the ranking order of the students with the same score.

A new method to evaluate the students' learning achievement is presented by Chen and Li (2011). In this method, the weights of the attributes as "accuracy rate, time rate, difficulty, complexity, answer cost, importance" can be generated automatically by the fuzzy reasoning capability and the students' learning achievement can be assessed meticulously via the proposed method.

Mezyk and Unold (2011) have introduced the accuracy boosting method for the extension of novel induction by using Artificial Immune System methods. Fuzzy partition learning is the basic notion of the accuracy boosting. When the performance of the proposed approach is compared to the traditional classifier schemes such as C4.5, Naïve Bayes, Meta End, JRip, and Hyper Pipes, the classification accuracy (i.e. performance) of former is significantly higher than the latter.

Since the answers in the survey represent the personal views of a participant, it should be evaluated objectively in order not to manipulate the raw data. Fuzzy theory is a marvelous tool for modeling the kind of uncertainty associated with vagueness, with imprecision, and/or with a lack of information regarding a particular element of the problem at hand (Ross, 2013; Vandewaetere, Desmet, & Clarebout, 2011). Ingoley and Bakal (2012) have combined various methods to improve the classical statistics of the teaching assessment. They have used the fuzzy logic (FL) to solve the Student Learning Achievement Evaluation problem.

When the total automated scoring is not possible, the remarks of evaluators on the Student Academic Performance Evaluation may be significantly different from each other. The problem may be due to the uncertainty of evaluator or the insufficiency of the traditional single-value based scoring. The aforementioned differences can be reduced by the fuzzy set theory based evaluation methods. Johanyak (2009) has conducted a survey on three different fuzzy inference based student scoring methods after he identified the criteria set for the evaluation and comparison.

The goals of education can be determined effectively only when the learning process of the students is evaluated correctly. Many fuzzy inference methods have been introduced for the evaluation of students' learning progress recently. For instance, Goodarzi and Amiri (2009) have proposed a new fuzzy inference system for the evaluation of learning process in which difficulty, importance and complexity of a question is determined by fuzzification, fuzzy inference and defuzzification. Since the proposed system is simple, comprehensible and easy to implement, it provides a novel solution to the students' learning progress evaluation.

Wang and Chen (2008) have used the fuzzy arithmetic operations for the evaluation of high school teachers' performances. They have used fuzzy numbers to denote the fuzzy grades. The fuzzy weights of the criteria are generated from the opinions of the evaluators. They have evaluated the performance of high school teachers flexibly and practically by using the simplified fuzzy number arithmetic operations to calculate the average of fuzzy numbers.

Malpe and Bhatia (2012) have proposed a new method for the evaluation of students' learning achievement by generating the weights of the attributes such as "accuracy rate, time rate, difficulty, complexity, answer cost, importance" via fuzzy reasoning capability. In this method, the fairness of the adjustment in each inference is ensured by the normalization of the adjustment quantity. By this way, they have obtained more consistent and reasonable results and evaluated the answer sheets flexibly and intelligently.

Wang and Chen (2006) have proposed a new method for the evaluation of students' answer scripts using the fuzzy numbers associated with the degrees of confidence. Triangular fuzzy numbers associated with the degrees of confidence between zero and one are used to express the satisfaction levels of the students' answer scripts. The total grade of each student is calculated by the arithmetic operations on the α-cuts of fuzzy numbers, where α is between 0 and 1. The proposed method can evaluate the students'