

## **A data mining approach for the analysis of undergraduate examination question papers**

**\*A. Brahmana, B. T. G. S. Kumara and A. L. C. J. Liyanage**

*Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Sri Lanka*  
*\*akilabrahmana@gmail.com*

### **Abstract**

Examinations play a major role in the teaching, learning and assessment process. Questions are used to obtain information and assess knowledge and competence of students. Academics who are involved in teaching process in higher education mostly use final examination papers to assess the retention capability and application skills of students. Questions that used to evaluate different cognitive levels of students may be categorized as higher order questions, intermediate order questions and lower order questions. This research work tries to derive a suitable methodology to categorize final examination question papers based on Bloom's Taxonomy. The analysis was performed on computer science related end semester examination papers in the Department of computing and information systems of Sabaragamuwa University of Sri Lanka. Bloom's Taxonomy identifies six levels in the cognitive domain. The study was conducted to check whether examination questions comply with the requirements of Bloom's Taxonomy at various cognitive levels. According to the study the appropriate category of the questions in each examination, the paper was determined. Over 900 questions which obtained from 30 question papers are allocated for the analysis. Natural language processing techniques were used to identify the significant keywords and verbs which are useful in the determination of the suitable cognitive level. A rule based approach was used to determine the level of the question paper in the light of Bloom's Taxonomy. An effective model which enables to determine the level of examination paper can derive as the final outcome.

**Keywords:** Bloom's taxonomy, Data mining, Natural language processing

### **Introduction**

Assessment of student's knowledge using written examinations is known as the most conventional method. It has become a universal method which is used by a large number of educational institutes and universities all over the world. The objective of the teaching and learning process is to measure student's cognitive level that they have achieved from the learning. Written examinations also provide an effective path to determine the extent which student are adopted to learning theory in a given situation (Omar *et al.*, 2012). To evaluate the appropriate knowledge level of specific student group, the examination paper must fulfill various aspects. However, setting up a balanced question paper is still a really hard task for educators. When examination questions are prepared, there should be an appropriate balance between questions which assess the higher levels of learning, intermediate and basic levels of learning. It is difficult to evaluate the level of a question paper during the examination question preparation process. Furthermore, it is difficult to determine the level of each question manually. Without a balanced question paper it is quite difficult to assess the exact knowledge of specific student group.

Examination questions are categorized according to the concepts derived from Bloom's Taxonomy. Education psychologist Benjamin Bloom developed Bloom's Taxonomy in 1956 to categorize intellectual skills, which are significant in the