



DEVELOPMENT OF EVALUATION FRAMEWORK USING BLOOM'S TAXONOMY

Kavita S. Oza and Rajanish K. Kamat

Department of Computer Science, Shivaji University, Kolhapur

kso_csd@unishivaji.ac.in, rkk_eIn@unishivaji.ac.in

Abstract:

Most of the learners have different learning skills. Some may be good at remembering, some may be good at analyzing or reasoning or evaluating etc. There is need to find out learning skills of the learners so that teaching learning can be personalized. A pilot study is carried out to analyze students learning behavior based on blooms taxonomy. Students were evaluated by their number attempts to the questionnaire based on blooms learning criteria's. This helped in identifying different learning skills of students which ultimately is an input to the teachers to plan their teaching course and for students to work more on the skills they are lagging behind. This will help in enhancing learning outcomes, as students learning state is constantly changing due to online and offline learning. The paper reports development of an useful framework for judicious evaluation of the holistic capabilities of a learner.

Keywords: Blooms taxonomy, complexity, learning, question set

Introduction

Bloom's taxonomy is a tool to evaluate students at different levels of complexity. It's all six categories help in identifying different learning abilities of a student. It helps in effective communication with students. Designing a question set was not that important before as questions were solely based on describe and explain. But in this era of innovation students need to be evaluated on different levels of difficulty. Designing question set to check students learning ability is a major task as teacher himself/herself has to think from that view. While designing the question inputs can be taken from the peers as well as alumni. Designing and selection of questions plays an important role in classifying students based on their learning abilities.

This work is based on revised blooms taxonomy. It represents cognitive process from remember to create. It starts with Remember as category one with lower complexity questions were student are evaluated based on their recalling and recognizing abilities. Second category is bit higher compared to first i.e. Understand. Here students are judged based on their level of interpretation, summarization, explanation etc. This helps in testing their subject understanding. Third category is Apply which deals with implementation of their subject knowledge. Once the concept is learnt how it can be applied in different domains can be tested here. Forth category is based on Analyze. Using their subject knowledge students should be able to integrate theory with practical. This also deals with students understanding of when to use which procedure. Fifth category is Evaluate. Here students testing ability is judged. For example given a program code student should be able to detect errors in it if any. This is one type of reverse engineering which students should be

able to apply and use. The last category is Create. Here students are tested on basis of new knowledge which they can generate based on existing one. Like they may be asked to design some new framework or model. Whether students have innovative ideas or no is also tested here. In short blooms taxonomy evaluates all the aspects of students learning skills.

This work is a pilot study where students of M.Sc. Computer Science are evaluated based on blooms taxonomy. Here, whether students have given the correct or wrong answer is not tested but whether student is confident enough to attempt a question is taken into account. Based on the results of evaluation concerned teacher can plan the lecture content and mode of delivery. Even students can identify the area where they need to put more efforts.

Literature review

Using Blooms Taxonomy outcomes of learning objectives are classified by dividing the learning into different domains. Here questions and learning outcomes are classified as well as verified using blooms taxonomy [1]. Mapping of blooms taxonomy's different levels to sample solutions of a problem has been carried out by [2]. Ordering of questions based on Blooms taxonomy was carried out by [3]. It showed the difference in the learning of students based on manual and electronic media as well as ordering of questions. Blooms taxonomy is used as tool to teach theory as well as practical courses at engineering programs to check the attainment of cognitive levels of blooms taxonomy [4,5]. Use of blooms taxonomy for tutoring of professional certificate courses was carried out by [6]. It gave good results as students got aware of their learning skills. Revised Blooms taxonomy has been integrated with case based teaching to enhance students learning behavior in business

class [7,8]. Blooms taxonomy has been used to identify gaps in designing question papers of software engineering by [9]. All questions are analyzed based on six categories and findings have shown that most of the question papers are based on first two categories of blooms taxonomy. Students learning behavior was analyzed by checking the wait time between question asked and answered by [10] . Questions were designed based on Blooms taxonomy.

Experimental work

Question set based on blooms taxonomy was prepared with 24 questions of descriptive nature. Question set had six categories as per blooms taxonomy with 4 questions under each category. Question set was based on Design and Analysis course which is offered at M.Sc . Computer Science, Sem- I . 54 Students appeared for the test . Data related to how many and which questions are attempted by students was collected for analysis. This data was preprocessed by making the question attempted as 1 and if not attempted then 0 in the dataset. Dataset consisted of 54 records. Analysis of data was carried out based on six categories of bloom’s taxonomy.

First category is *Remembering* . It checks the by-heart (say it from memory) learning level of students . It was observed that remembering level of students is quite good as almost all students have attempted questions under this category. Following graph gives the details.

As shown in the fig.1 almost all the students have attempted questions 1 to 3 this indicates students are quite comfortable with such type of questions which consist of define, List State etc.Second category is *Understanding*. When some concept is taught in class to what extent they understand the concept is checked at this category. As observed in fig2. Number of attempts to this category questions are slightly lesser than remembering category. On an average 90% students have attempted these questions.

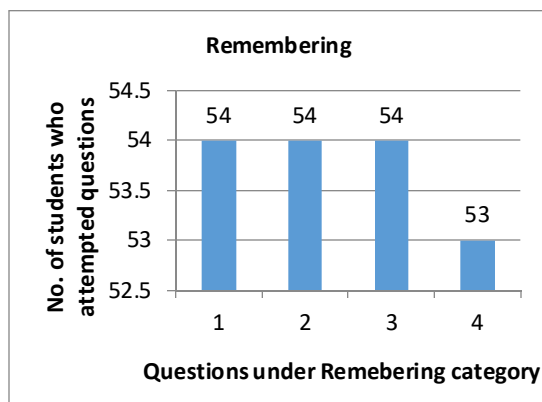


Figure 1. Student response to category-I

Next third and fourth category of revised blooms taxonomy are Applying and Analyzing and results are shown below.

As seen in fig.3 in applying the concepts what students have learnt to compare or generate new knowledge is very poor. Out of 54 students only 5 students attempted question no. 2 which was based on identifying the importance of a particular data structure and giving an example which is better in which situation. This indicates students need to put more efforts on applying their basic concepts to generate more knowledge. As indicated in fig. 4 questions based on analysis have been attempted by good number of students. These questions were based on comparison, uses etc. Here question no. 4 was based on identifying the algorithmic approach. This question as shown in the fig. 4 is attempted by only 19 students out of 54. If the question is twisted in some way then students find it difficult to answer. The last two categories are Evaluating and Creating and results of the same are plotted below. It is observed in fig. 5 students are not very good in evaluating a problem. Question number 2. Was based on calculating time complexity of an algorithm which out of 54 only two students have attempted. This indicates teacher has to focus more on writing efficient algorithms and their importance. Question number 3. In the same category was based on finding out the error in program block.

As the question was bit difficult only 9 students attempted that question. Students need to focus on reengineering process. Creating category questions were based on creating a new knowledge. Questions were like designing a data structure to represent a cell phone which only 5 students have attempted. Question no. two was based on designing a new algorithm using two existing ones. More number of students have attempted question no. 4 which was based on creating a new function to augment a data structure.

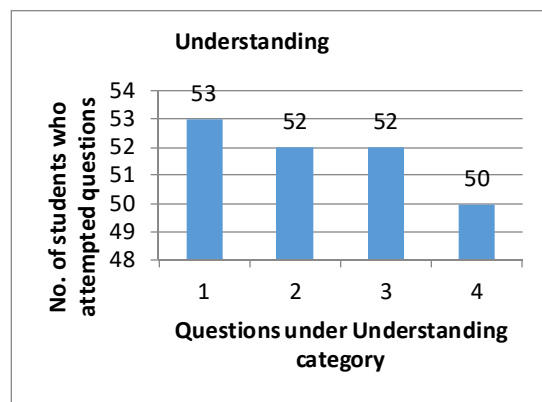


Figure 2. Student response to category-II

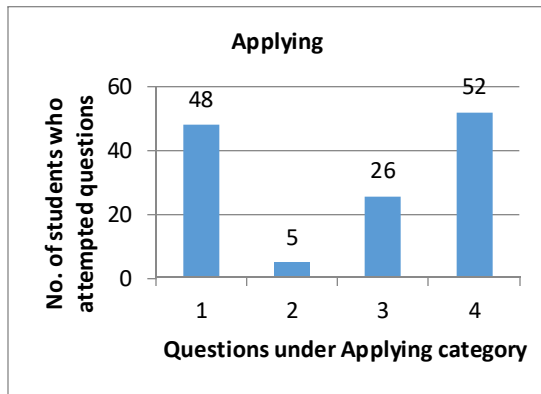


Figure 3. Student response to category-III

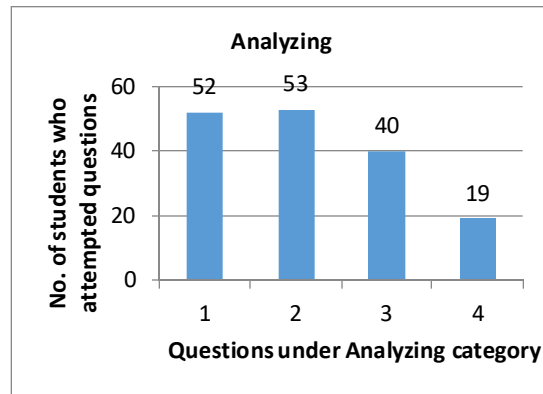


Figure 4. Student response to category-IV

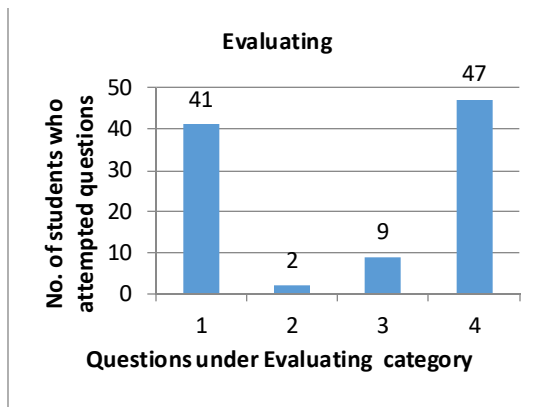


Figure 5. Student response to category-V

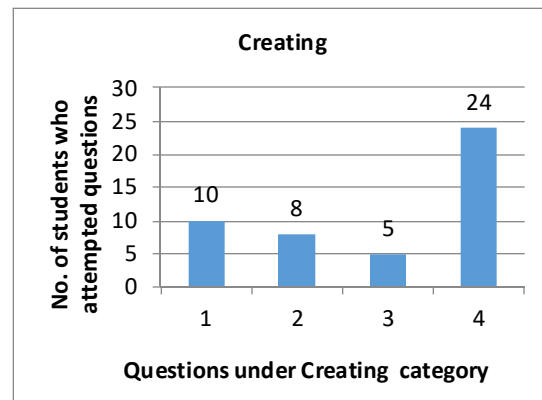


Figure 6. Student response to category-VI

Conclusion

A pilot study was carried out to find the learning abilities of students using blooms taxonomy. The question set was prepared based on all six categories of revised blooms taxonomy. Analysis of study has shown that students are still to migrate from traditional way of learning by by-heart. Role of teacher is important here to inculcate thinking and reasoning ability into students while teaching. One day of teaching should be based on brainstorming session were students will be motivated to apply their subject knowledge to real world problem solutions. This study also helped in identifying the students learning behavior which can help teachers in planning their teacher activity.

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