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ORIGINAL ARTICLE

Identifying Cognitive Weaknesses in Students Learning through Bloom's Taxonomy

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ABSTRACT

In the present time, universities, education regulators, and teachers are involved in many discussions on how to best prepare engineers for future jobs in the industry. This has led to the development of many approaches to teaching methodologies to better impart theoretical and practical knowledge to students to equip them with skills for their future. A very popular approach in this regard is the use of Blooms Taxonomy which describes three areas of learning, Cognitive, Affective and Psychomotor. The Cognitive area that concerns the recognition of information, skills, and concepts for the development of knowledge and abilities, the Affective domain which deals with the emotional growth and feelings and the Psychomotor domain which tends to the development of physical skills. The use of online tools to teach courses in various disciplines has gained popularity in the past decade. This paper traces IICT student's evaluation utilizing Bloom's Taxonomy. Test questions are given and arranged by the Noteworthy Bloom's Taxonomy levels.

Keywords: Bloom's taxonomy, Cognitive Domain, IICT students' assessment

Author`s Contribution
[1] Data analysis, interpretation and manuscript writing, Active participation in data collection
[2] Conception, synthesis, planning of research and manuscript writing
[3] Interpretation and discussion

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INTRODUCTION

The Bloom's taxonomy is grouping framework created in 1956 by training analyst Benjamin bloom to order scholarly abilities and conduct vital to learning.1 Bloom characterized six levels of psychological space: knowledge comprehension, application, analysis, synthesis, and evaluation. Levels have appeared in Bloom's Taxonomy progressive system show in Fig1a. Initially created as a strategy for ordering instructive objectives for understudy execution assessment, Androson and his team modified Bloom's Taxonomy in 20012 as Fig 1b. Bloom's taxonomy has been connected to the training space of software engineering for course plan and assessment [3], organizing appraisals [4] and comparing the cognitive difficulty level of computer science courses.[5] the scientific classification is extensively used in any known instruction field. It is as yet acknowledged and ended up being effective in helping to prepare practices and lessons. This paper familiarizes a

way to deal with enhancing IICT Engineering appraisals utilizing Bloom's Taxonomy.

Fig 1a. Bloom's taxonomy[1]

Fig.1b.Modified Bloom's taxonomy2

The pyramid is outlined in such a way the lowest level is the easiest level of recognition while the highest level is the most dynamic and complex level of cognitive skill. A detailed description of all levels is given in methodology section. Other research work in6 that concentrated on indicating assessable learning destinations in software engineering. They trust that their concept of coordinating Bloom's Taxonomy with information technology engineering curricular had made their staff correspondence more viable and office's evaluation program more grounded. Their work is really an augmentation to7 which concentrated particularly on human-PC collaboration curricular rules.

Assessing student capabilities in engineering studies requires observation of student performance in the specific analytical assignment, to use the end of term written assignments in this regards toper form this is a non-trivial task. These assignments /tests may fall short on testing the student on all conceptual requirements of his field. By just taking lectures and conduct final semester exam cannot help us to know standard and level of a student. In this research, we have made online web application based on Bloom's Taxonomy for Outcome-Based Education (OBE) system. Students will get comprehensive learning to identify their cognitive weakness and give the feedback to teachers. Teachers get help from the students' feedback for improving the pedagogical design.

This paper is sorted out as segment two about related work, segment three about methodology, section four gives information about tools and technology, segment 5 related about admin authorities in the system (online tool) and last two segments six and seven about results and conclusion respectively.

LITERATURE REVIEW

In[8] describe Bloom's Taxonomy as a metacognitive framework for the student-centered management class also suggested uses of the taxonomy. The In9 researcher developed Blooming Biology Tool, BBT to assist Biology Faculty, Blooming Tool could be utilized to guide and improve teaching and designed questions at higher cognitive skill levels. The In10 author describes Bloom's taxonomy is broadly used as a classification scheme to determine different levels of cognitive competencies. The study is clear that it is effective assessment method to test on a variety of cognitive levels.

The In[11] researcher developed Blooming Anatomy Tool (BAT). This gives train particular rules to Blooming anatomy multiple-choice questions (MCQs) result of this study shows that the blooming anatomy tool can be helpful in education and their research in the anatomical sciences to help in adjusting eyewitness judgment on Bloom ordered levels and enhance consistency.

In[12] this paper additionally portrays distinctive strategies in which Bloom's Taxonomy can be associated and examinations the precision of each of those procedures helpful to perceive whether a given inquiry is memory based or application based. The basic purpose of this paper is to display the utilization of Bloom's Taxonomy to survey a given entry and the utilization of gauge models over that assessing. This paper depicts the technique to utilize the past indications of an understudy and the inquiry paper substance to arrange the inquiry paper to a particular level using the requested gauges of the Cognitive territory and the use of straight backslide to envision the.5

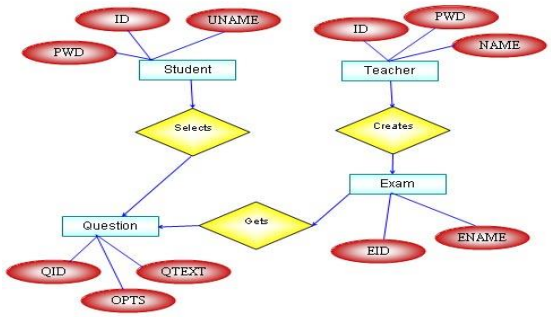

Figure 2. Flowchart of research methodology

RESEARCH METHODOLOGY

In this paper, we have selected fifty (50) students of the second-year class. In this teaching methodology, each of the 50 students was given a login identity to authenticate themselves on to the server of the online tests. Multiple choice questions (MCQs) were conducted for assessment of students. Questions arranged by the modified Bloom's scientific classification. Figure 2, shows the flow chart of research methodology which was used in this paper.

These following questions give a case of this procedure at every level.

A. Remember Level based on Q1

Remembers characterized as 'recovering important learning from long-haul memory' (Anderson et al. 2001). In the revised taxonomy, this class incorporates perceiving and reviewing. (i.e., List the arithmetic operators in increasing order of precedence?).

B. Understand Level based on Q2

In this article, context refers to the students' capacity to comprehend and repeat or depict a learned idea utilizing their own particular words or explanation. i.e., predict the result of code given below?

```
for ($i=1; $i<=1;$i++)
{
        echo $i++;
        echo $i;
  }
```

C. Apply Level based on Q3

Apply is characterized as 'doing or utilizing a strategy in a given circumstance'. In the reexamined scientific categorization, this class incorporates Executing and Implementing (i.e., Show that expression: (i) 4 * 2 / 2 % 3 and (ii) 40/2 * 5 % 3).

D. Analyze Level based on Q4

Analyzes characterized as 'connecting and draw ideas into its constituent parts and deciding how the parts identify with each other and to a general structure or reason' In the modified taxonomy, this class incorporates Differentiating, Arranging, and Attributing.

i.e., Can you distinguish between echo and print?

E. Evaluate Level based on Q5

Evaluate can be defined as 'making judgments in light of criteria and measures'. In the modified scientific categorization, this classification incorporates Checking and Critiquing. i.e., Judge the value of $K?

F. Create Level based on Q6

Create can be defined as 'assembling components to frame an intelligent or utilitarian entire; redesigning components into another example or structure'. In the updated scientific classification, this classification incorporates Generating, Planning, and Producing.

i.e., Design a program code that gives result 1-2-3-4-5-6-7-8-9-10 in one line.

Tools and Techniques

PHP (PHP remains for Hypertext Preprocessor is a recursive acronym) it is broadly used open source and server-side scripting programming language which is developed to build a various number of simple and rapid web applications development which can be run and operated on Linux, Windows operating systems. PHP is easy, dominant and object-oriented.

PHP code can be effectively inserted into HTML files as well as having interface capability and its license is free of cost. Furthermore, JQuery and AJAX are also used as helping tools with HTML and PHP to make web applications interesting and interactive and dynamic.

Administrative Authorities

When admin is first logged into the system, He is redirected to the main page. From there he can perform his authorities. One of the authorities given to the admin can make create an exam, prepare questions, manage subjects manage users, results, admin can Update own Profile, and also see everything which is available at admin panel and shown on Fig3.

A. View Edit Update Delete and Status

The admin of this system has an authority to View Update and Delete any User registering himself on the system and admin approving him as a No. of User The admin will have to add View Update and Delete Name, Email, City, contact, Action (whom it will belong), First Name, Last Name, Email, Password, Mobile Number, City, Address and PIN code shown on Fig4.

Fig.3. Admin Panel

User Authorities

Be when the user is first logged into the system, He is redirected to the main page. From there he can perform his authorities. Like edit profile, take the test, view result as shown in Fig5.

Fig.4. View, edit, update delete status

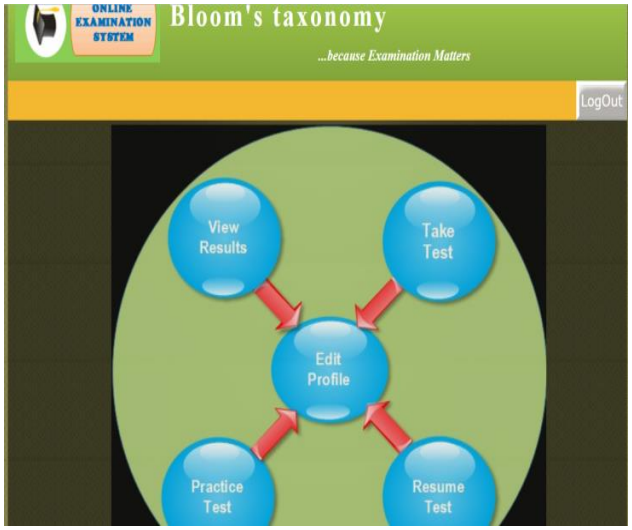

Fig.5. User profile

RESULTS AND DISCUSSION

All the students were asked to complete the quiz, In one particular case, Only 8 students were able to complete the quiz within the given time period as shown fig6.

Attempted Students

Student Name	Email-ID	Obtained Marks	Result(%)
aqsa	1601-bsse001@isra.edu.pk	4	66.666666666667 %
asra	1601-bsse002@isra.edu.pk	5	83.333333333333 %
faziela	1601-bsse003@isra.edu.pk	3	50 %
maha	1601-bsse005@isra.edu.pk	6	100 %
miral	1601-bsse006@isra.edu.pk	3	50 %
romesha	1601-bsse007@isra.edu.pk	3	50 %
haseeb	1601-bsse18@isra.edu.pk	5	83.333333333333 %
fariz	1601-bsse17@isra.edu.pk	4	66.666666666667 %
rahim	1601-bsse26@isra.edu.pk	6	100 %
miaria	1601-bsse31@isra.edu.pk	5	83.333333333333 %
muzamil	1601-bsse25@isra.edu.pk	2	33.333333333333 %
arif	1601-bsse15@isra.edu.pk	3	50 %
ahmed	1601-bsse14@isra.edu.pk	4	66.666666666667 %
awais	1601-bsse039@isra.edu.pk	4	66.666666666667 %
yousaf	1601-bstc007@isra.edu.pk	1	16.666666666667 %

Fig.6. Results

Level	No: Student got level	Percentage% of student got level
1	50	100
2	43	86
3	27	54
4	20	40
5	15	30
6	8	16

Table 1: percentage of students

Table I shows the level and number of students who get percentage according to levels. In this regard after the test students were pointed to material that would aid their understanding if they answered incorrectly.

The Number of students answering questions corresponding to different cognitive levels in given time (after the lecture)

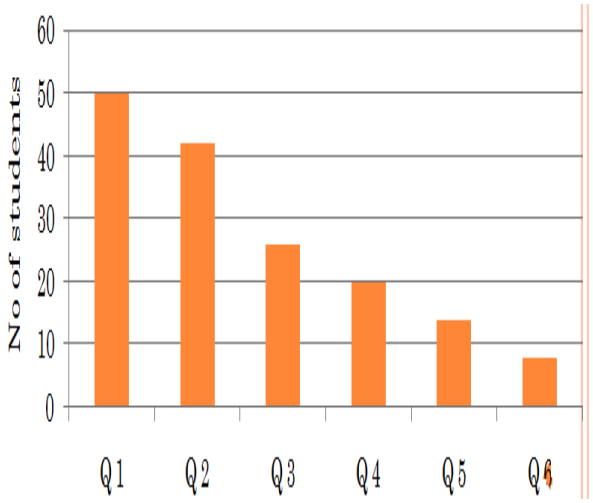

Fig.7. Results in graph

The Fig 7. illustrates the 50 students have attempted a quiz contains six questions according to six levels of blooming taxonomy, the bar chart clearly shows that all students have attempted Question number one correctly, and just eight students were able to attempt question number 8 correctly. Less than 30 students were able to attempt correct answer to question number 3, 4,5respectively after the lecture.

Every submitted paper should be reviewed by at least two reviewers. The decision to accept or reject a paper is made by the editor; the recommendations of the referees are advisory only. Undecipherable English is a valid reason for rejection. Authors of rejected papers may revise and resubmit as regular papers, whereupon they will be reviewed by two new referees.

CONCLUSION

Currently, colleges, instruction controllers and instructors are engaged in much exchange on the best way to best get ready engineers for future occupations in the business. We have exhibited an online web application based on Bloom's taxonomy in information technology education, from this portal we have found the level of each student and identified weaknesses of each student according to levels of blooms taxonomy. This will also help for instructors in making their query (questions) and improve pedagogical design for students'. It also guides students' knowledge level & skills by learning outcomes abstract as the conclusion.

REFERENCES

1. Bloom, B. S., Engelhart , M. D., Furst, E. J., Hill, W. H.,& Krathwohl, D. R. (1956). Taxonomy of educational objectives, handbook I: The cognitive domain (Vol. 19, p. 56). New York: David McKay Co Inc.
2. Anderson, L. W., Krathwohl, D. R., Airasian, P., Cruikshank, K., Mayer, R., Pintrich, P., & Wittrock, M. (2001). A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy. New York. Longman Publishing
3. .Artz, AF, & Armour-Thomas, E.(1992). Development of a cognitive-metacognitive framework for protocol analysis of mathematical problem solving in small groups. Cognition and Instruction, 9(2), 137-175.
4. Scott, T. (2003). Bloom's taxonomy applied to testing in computer science classes. Journal of Computing Sciences in Colleges, 19(1), 267-274.
5. Lister, R., & Leaney, J. (2003). Introductory programming, criterion-referencing, and bloom. ACM SIGCSE Bulletin, 35 (1), 143-147.
6. Oliver, D., Dobele, T., Greber, M., & Roberts, T. (2004, January). This course has a Bloom Rating of 3.9. In Proceedings of the Sixth Australasian Conference on Computing Education-Volume 30 (pp. 227-231). Australian Computer Society, Inc...
7. Starr, C. W., Manaris, B., & Stalvey, R. H. (2008). Bloom's taxonomy revisited: specifying assessable learning objectives in computer science. ACM SIGCSE Bulletin, 40(1), 261-265.
8. Manaris, B., & McCauley, R. (2004, October). Incorporating HCI into the undergraduate curriculum: Bloom's taxonomy meets the CC'01 curricular guidelines. In Frontiers in Education, 2004. FIE 2004. 34th Annual (pp. T2H-10). IEEE.
9. Athanassiou, N., McNett, J. M., & Harvey, C. (2003). Critical thinking in the management classroom: Bloom's taxonomy as a learning tool. Journal of Management Education, 27(5), 533-555.
10. Crowe, A., Dirks, C., & Wenderoth, M. P. (2008). Biology in bloom: implementing Bloom's taxonomy to enhance student

learning in biology. CBE-Life Sciences Education, 7(4), 368-381
11. De Bruyn, E., Mostert, E., & Van Schoor, A. (2011, September). Computer-based testing-the ideal tool to assess on the different levels of Bloom's taxonomy. In Interactive Collaborative Learning (ICL), 2011 14th International Conference on (pp. 444-449). IEEE
12. Thompson, A. R., & O'Loughlin, V. D. (2015). The Blooming Anatomy Tool (BAT): A discipline-specific rubric for utilizing Bloom's taxonomy in the design and evaluation of assessments in the anatomical sciences. Anatomical sciences education, 8(6), 493-501
13. Bhargav H S, Application of Blooms Taxonomy in day-to-day Examinations IEEE(2016)
14. Chowdhry, B. S. (2013). Successful transformation of ICT graduate program: A role model for developing countries. Wireless personal communications, 69(3), 1013-1023.