Case study

Teacher awareness and adoption of Bloom's taxonomy in Higher Education Institutions in Bhutan: A case study of Gedu College of Business Studies.

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ABSTRACT

Aims: The purpose of this study is to identify the teacher's awareness and adoption of bloom's taxonomy in-class assessment(examination) by teachers of Gedu College of Business Studies (GCBS), Bhutan.
Study design: The descriptive and content analysis was applied.
Place and Duration of Study: Teaching faculty of GCBS and exam question paper for the year June 2020 was studied. The study was conducted between June 2019 and December 2020.
Methodology: The census survey was done with 63 teachers of which 48 responded (38 men, 10 women). The teachers' awareness of Bloom's taxonomy was assessed in terms of knowledge and information received on bloom's taxonomy, and the exam question paper was analyzed to comprehend, how adequately teachers have adopted bloom's taxonomy in the assessment of the student.
Results: Results revealed that all the GCBS teachers are aware of the concepts and the majority think that their understanding of the concepts is good and above (79.2%). Though teachers are aware and familiar with bloom's taxonomy concepts, those concepts were not used accordingly in preparation for the exam paper. The overall marks distributed in six levels of Bloom's taxonomy show that exam paper questions are slightly skewed to the lower level of Bloom's taxonomy.
Conclusion: Without a careful mapping of questions according to Bloom's taxonomy, the examination will not yield the desirable objective of the module.

Keywords: Class assessment; Bloom's taxonomy; GCBS; Exam paper.

1. INTRODUCTION

One of the most important aims of education is the attainment of critical and higher-order thinking skills[1]. Identifying how to encourage, teach, and then assess these skills is an important role of the teacher. There are many types of assessments to measure students' learning curves. However, a written examination is the most common approach used by any higher education institution for students' assessment. The question raised in the examination paper plays an important role in efforts to test the students' overall cognitive level each semester. Furthermore, to make it effective, balancing between lower and higher-level questions is a must [2] [3]. Bloom's introduced the framework called Bloom's taxonomy in the cognitive domain which verifies a student's cognitive quality during the written examination[4]. The framework is structured in a hierarchical order where the lower-level

students are required to know, memorize, repeat, and list information and the higher levels students are required to judge, criticize, resolve and make recommendations[5].

In the case of the Bhutanese education system, the adoption of Bloom's taxonomy in the lower and middle schools is profound, and educators are conscious of the framework. Moreover, it is the mandatory policy for the school teacher to implement Bloom's taxonomy framework in their classroom assessment (exam papers). However, the implementation of this framework is seen very less in higher-level education in Bhutan. Although few institutes like education colleges (Samtse College and Paro College) are familiar with Bloom's framework, many colleges under the Royal University of Bhutan (RUB) are new to this framework.

Presently, RUB is taking initiative in providing training on teaching pedagogy such as Postgraduate Certificate in Higher Education (PgCHE) and 21st-century teaching pedagogy where Bloom's taxonomy is one of the main contents of the program. Though most of the teachers of RUB have undergone this training, there is always a question of the implementation of this framework. Moreover, after casual observation and randomly scanning of a few question papers of GCBS, it was found out that Bloom's taxonomy framework was missing in many question papers. Also, research on the implementation of Bloom's taxonomy in higher education institutes has not been done before in Bhutan.

1.1. Research objective

The objectives of the research are to study the teacher's awareness and adoption of Bloom's taxonomy among RUB educators in classroom assessment (Examination), in the case study of GCBS.

1.2. Research questions

1. What is the level of awareness of Bloom's taxonomy among the teachers of RUB?
2. Is Bloom's taxonomy framework adopted by teachers of RUB while preparing the exam question paper?

2. LITERATURE SURVEY

One of the most important aims of higher education is the attainment of critical or higher-order thinking skills, identifying how to encourage, teach and then assess these skills has become an important role of the teacher [1]. There are many types of assessments to measure students' learning curves. As a general rule, the primary reason why teachers do classroom assessments is to collect information about the performance of their students in the school[6]. When teachers assess learning, they identify specific goals and objectives for each subject or lesson, systematically gauge the extent to which these anticipated outcomes occur, and determine to what degree learning takes place [7]. One of the tools which have been well regarded for classroom assessment of the learners critical thinking is through written tests or examination. UKESSAYS(2016) defines, test or examination as a systematic procedure for observing and describing one or more characteristics of a person with the aid of either a numerical or the category system [8]. The main purpose of the test is: to rank a student; to pass or fail a student; to provide feedback to students and teachers and to assist an institution in establishing quality in their provision of courses[9]. Unfortunately, studies examining the quality of tests commonly used in schools suggest that testing malpractice and inaccurate evaluations are widespread.

Stiggins(1988) found that teacher who has poorly designed the test paper has domination toward the question related to recalling facts and information[10]. Although teaching objectives and activities may seek to develop thinking skills, classroom tests often fail to match these aspirations. This creates a student's development towards memorizing and understanding level only. Thus, the poor-quality assessment that fails to tap and reward higher-order thinking skills will inhibit the development of those skills. Assessment is not just for students; it is for teachers as well. Therefore, teachers are expected to demonstrate some levels of competence in assessing their students. [11] Most teachers were found developing the test questions by merely copying the questions from the back of textbooks without taking into cognizance the purpose and use of the assessment results[12]. There are different assessment techniques, and these must be matched for the purpose and must be conducted using established quality standards. Therefore, one of the frameworks that assure the assessment quality standards is Bloom's taxonomy introduced by Benjamin Bloom in 1956[4].

The Blooms Taxonomy is a hierarchical structure representing six levels of thinking and learning skills that move from the lower level to higher-order skills. It is a skeleton that was constructed to categorize the goals of any curriculum in terms of explicit and implicit cognitive skills and abilities. This taxonomy is regarded as one of the crucial models that contribute to curriculum development in the 21st century[13]. The original Taxonomy was developed by Bloom [4] and was later revised by Anderson and Krathwohl [14]. In literature, most references to Bloom's Taxonomy refer to the Cognitive domain. The objectives dealt with in the Cognitive domain place an emphasis on remembering or recalling information. Cognitive objectives vary from simple recall of material that was learned to highly original and creative ways of combining and synthesizing new ideas and materials[1]. The cognitive domain within this taxonomy is designed to verify a student's cognitive level during a written examination [2]. With the Revised Bloom's Taxonomy, the six domains are classified into remembering in the simple knowledge category, understanding in the knowledge of a process category and the other levels of apply, analyses, evaluate and create at the intellectual level. Like the original Taxonomy, the revision is a hierarchy in the sense that the six major categories of the Cognitive Process dimension differ in their complexity, with remembering being less complex than understanding, which is less complex than applying, and so on. The revision gives much greater weight to teacher usage; the requirement of a strict hierarchy has been relaxed to allow the categories to overlap one another[12]. Table 1 describes the Anderson and Krathwohl(2002) revised cognitive domain of Bloom's taxonomy.

Table 1: The revised Bloom's Taxonomy [14].

Level	Definition	Action verbs
Remembering	Recall of information	List, memorize define, recognize, arrange, relate, label, recall, name, repeat, order.
Understanding	Interpret information in one's own words	classify describe, discuss, explain express, identify, indicate, locate recognize report, restate, review select, sort, tell, translate.

Applying	Use knowledge or generalization in a new situation	Demonstrate, dramatize, apply, choose, employ illustrate interpret operate, prepare practice, schedule, sketch, solve, use.
Analysing	Break down knowledge into parts and show relationships among parts	Discriminate, differentiate, analyze appraise, calculate categorize, compare, contrast, criticize diagram Distinguish, examine, inventory question, experiment, test.
Evaluating	Making judgments based on criteria and standards	Appraise, argue assess, attach, choose, compare, defend, estimate, evaluate, judge, predict, rate, score, select, support, value.
Creating	Bring together parts of knowledge to form a whole and build relationships for new situations	Arrange, assemble, collect, compose, construct, create, design formulate, manage organize, plan, prepare, propose, set up, synthesize.

Normally, academicians who have awareness of Bloom's taxonomy would categories a question according to Bloom's cognitive level. However, not all can identify the cognitive level of a question correctly[15]. This may lead to misclassification of the exam questions and subsequently may fail to meet the examination standard required for the subject. Besides, some academicians also show no significant agreement on how to use Bloom's taxonomy in educating students[16].

Therefore, this study's objective is to find out the RUB teacher's awareness on the six levels of the cognitive objective of Bloom's taxonomy and also, to study, how adequate RUB teachers spread their exam questions to cover the six levels of the cognitive objective of Bloom's taxonomy. To achieve the above objective, the study is going to adopt the following conceptual framework(figure 1).

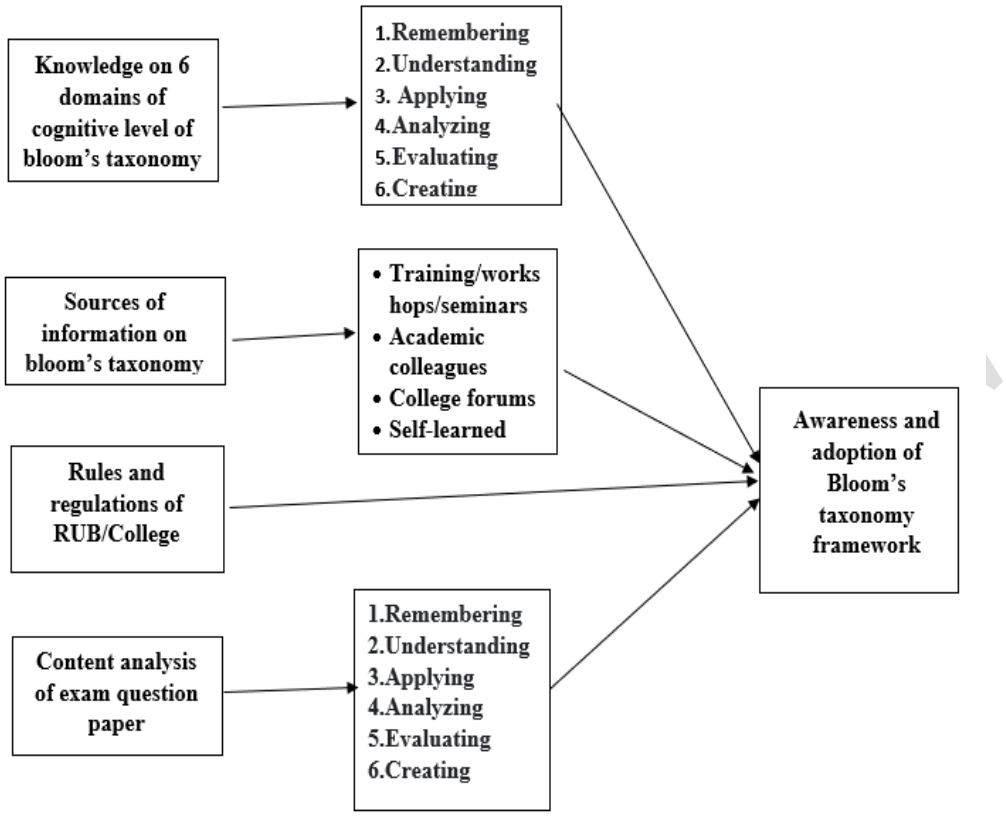


Fig. 1. A framework for teacher awareness and adoption of Bloom's Taxonomy

To study the teachers' awareness of Bloom's taxonomy, the study is going to focus on teacher's; 1) knowledge on six domains of the conative level of Bloom's taxonomy (i.e. Remembering, Understanding, Applying, Analysing, Evaluating and Creating); 2) Sources of Information on Bloom's taxonomy (i.e. Training/workshops/seminars, Academic colleagues, College forums and Self-learned) and 3) Any rules and regulations of RUB/College on the application of Bloom's taxonomy. On the other hand, to study the adoption of Bloom's taxonomy in the RUB, the exam question paper will be analyzed to see, how adequately RUB teachers have spread their exam questions on the six levels of the cognitive objective of Bloom's taxonomy.

3. METHODOLOGY

The study is conducted based on quantitative research. The data was collected by administering questionnaires to teachers of GCBS. A survey questionnaire for this research was developed based on the framework mentioned in the literature review. The framework focus on four dimensions; 1) knowledge on six domains of the cognitive level of Bloom's taxonomy (i.e. Remembering, Understanding, Applying, Analyzing, Evaluating and Creating); 2) Sources of Information on Bloom's taxonomy (i.e. Training/workshops/seminars, Academic colleagues, College forums and Self-learned) and 3) any rules and regulations of RUB/College on the application of Bloom's taxonomy. 4) the content analysis of the exam question paper. A total of 73 question papers were assessed by using criteria used in three different areas; the bloom's taxonomy question and task design wheel [5], general criteria used in developing questions. In this study, it was used to evaluate the management, HRM,

marketing, and accounting subject, ICT blooms taxonomy criteria [18] and Mathematics and Statistic Bloom's Taxonomy criteria[2], as mentioned in annexure 1. The questions were assessed whether they fit closely with the bell-curve distribution.

For this research census survey was done. A total of 70 faculty are listed in GCBS [17], of which 4 of them are in further study and 3 of them resign in recent years. So, a total of 63 faculty were surveyed. Only, 48 responded to the survey.

4. RESULTS AND DISCUSSION

4.1 Demographic analysis

Table 2 shows the descriptive results of 48 lectures of 38 male and 10 female entrepreneurs with ages ranging from 25 to 40 above. The majority of the respondents are aged ranging between 31-35 (50%) and most of them have Master (81.3%) education level qualifications. In terms of the teaching area, the response is from all areas, with the majority from accounting (27.1%) and management (20.8 %). As an experience, most (54.2%) of the faculty had above 10 years of experience and 14.6% with below 2 years of experience.

Table 2. Characteristics of the participants

Characteristic		Frequency	%
Gender	Male	38	79.2
	Female	10	20.8
Age	Below 25	1	2.1
	25-30	5	10.4
	31-35	24	50
	36-40	7	14.6
	Above 40	11	22.9
Education level	Graduate	2	4.2
	Master	40	83.3
	PhD	6	12.5
	Others	0	0
Teaching Area	Management	10	20.8
	Accounting/Finance	13	27.1
	Economic	4	8.3
	Statistics/Maths	7	14.6
	ICT	3	6.3
	Language	6	12.5
	HRM	3	6.3
	Marketing	2	4.2
Nationality	Bhutanese	37	77.1
	Indian	11	22.9
	Other	0	0
Year of Services	2 years and below	7	14.6
	3-5 years	1	2.1
	6-9 years	14	29.2
	above 10 years	26	54.2

4.2 Awareness of blooms taxonomy

To study the awareness level of GCBS faculty, the following question was asked; “Have you heard the concept of bloom taxonomy?”, “I got this concept from”, “I know the 6 domains of blooms taxonomy?”, “I use this concept at the time of preparing” and “the level of understanding on Bloom's taxonomy” as mentioned in table 2.

Table 3. Awareness of GCBS faculty on Bloom taxonomy.

Question	Yes	No
Have you heard the concept of bloom taxonomy?	48	0
I know the 6 domains of Bloom's taxonomy.	48	0
I got this concept from	**Frequency**	**%**
PgCHE/PgDHE	16	33.3
External Training	4	8.3
In-house Training	5	10.4
Friends	4	8.3
Self-learn	4	8.3
More than one sources	15	31.3
I use this concept at the time of preparing		
Exam paper	23	47.9
More than one	25	52.1
The level of understanding on blooms taxonomy		
Excellent	9	18.8
Good	29	60.4
Fair	10	20.8
Poor	0	0

As we can see in table 3, all the respondents are aware of bloom’s taxonomy concepts. The training was the main source for most respondents in knowing the concepts. Of these, PgCHE and PgDHE was the highest (33.3%). There were a good number of respondents (31.3%) who got the chance to learn the concepts from more than one source as mentioned in the table. An interesting fact of the results was, 16.6% of the respondents learn the concepts from friends and by themselves. This indicates, they did not get the proper training on Bloom's taxonomy. Apart from the mentioned sources, the study found that the college examination systems also play the role of giving awareness to faculties. It was found that the program board committees always make sure of developing the examination paper according to Bloom's taxonomy. It is a trend in the college where program leader’s emails the blooms taxonomy guidelines to facilities at the time of exam paper preparation. 47.9% of the respondents use the concepts in preparing exam questions and 52.1 % are using them in other assessments (i.e Assignment and class test) along with the exam paper preparation.

Although all the respondents are aware of the concepts, most of them are not confident enough about the concepts regarding their understanding level. As mentioned in table 4, the

majority of respondents feel that their understanding of concepts is good (60.4%), 18.8% considers it excellent and 20.8 % considers it fair. A good part of the finding is, no one thinks that they have a poor understanding of the concepts. The interesting findings were, no female respondents feel that they have an excellent understanding of Bloom's taxonomy. Out of 10 female respondents, 70% of the respondents think their understanding level is good, and 30% on a fair level. Whereas in male respondents, out of 38 males, 23.7% of respondents think their understanding level is excellent, 57.9% in good and 18.4% are at a fair level. Most of the females who consider their understanding level is fair are those whose working experience is below 2 years, on contrary, males with above 10 years experience are most in fair level.

As it is clear from the above analysis, all the respondents are aware of Bloom's taxonomy concepts and even consider that their understanding of the concepts is at least fair. But to make sure whether they know the concepts or not, the questions were asked to check their knowledge. Table 5 is the result of the respondents on knowledge of the six-level of Bloom's taxonomy. The overall knowledge score of the respondents is 75.7%. The level where the respondent scored least is the “Understanding” level (20.8%) and followed by the “creating” level (64.6%).

Table 4. Crosstab of Gender, experiences, and level of understanding on blooms taxonomy

Year of Services	Gender	The level of understanding of Blooms taxonomy			Total
		Excellent	Good	Fair	
2 years and below	Male	1	3	0	4
	Female	0	1	2	3
3-5 years	Male	0	0	0	0
	Female	0	0	1	1
6-9 years	Male	1	8	1	10
	Female	0	4	0	4
above 10 years	Male	7	11	6	24
	Female	0	2	0	2
Total	Male	9	22	7	38
	Female	0	7	3	10

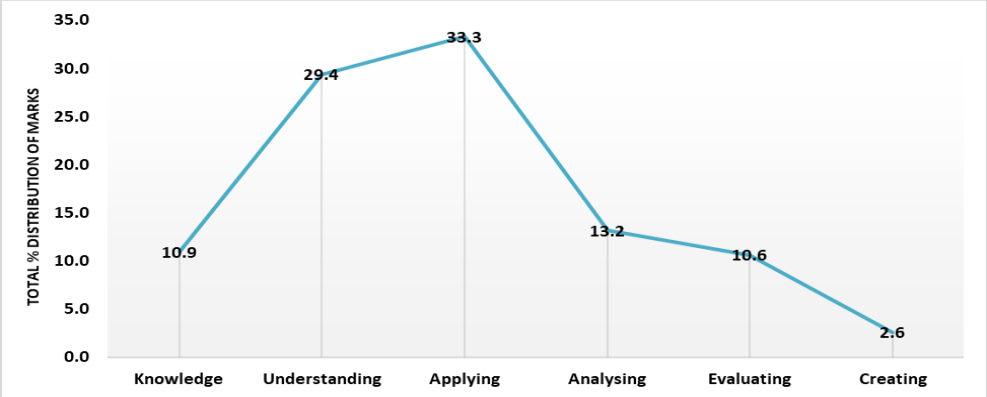
Table 5. Knowledge of blooms taxonomy

Level	Correct answer		Wrong answer	
	Frequency	%	Frequency	%
Remembering	45	93.8	3	6.3
Understanding	10	20.8	38	79.2
Applying	44	91.7	4	8.3
Analyzing	42	87.5	6	12.5

Evaluating	46	95.8	2	4.2
Creating	31	64.6	17	35.5
Total	218	75.7	70	24.3

4.3 Adoption

The overall marks distributed in six levels of Bloom's taxonomy show that exam paper questions are slightly skewed to lower-level Bloom's taxonomy (Figure 2). Stiggins considers that poorly designed exam papers will be more towards the lower level of bloom's taxonomy[10]. The majority of the exam papers were prepared to measure the applying and understanding level. Further, the three least performed modules were selected. The module was: RES301 Research Methods in Business, HRM201 Fundamentals of Human Resource Management, and MGT305 Fundamentals of Corporate Governance (the result performances for the year 2020). The finding was very interesting for each module in terms of marks distribution in six levels of Bloom's taxonomy. No modules have a normal distribution of marks (bell- curve). In the module RES301 (figure 3), the marks are more distributed towards the higher level of Bloom's taxonomy, which can be one reason for more failure of students in this module. The questions are designed more to evaluate the student's creativity and applying level but bell-curve theory states that the question development should be more on the applying and analyzing level. For module HRM201 (figure 4) also shows the same findings, though the curve is slightly normally distributed, but, the distribution of percentage is more towards the higher level. The result for module MGT305 Fundamentals of Corporate Governance was much unique than the other two modules. From figure 5, we can see that the module did not focus on applying and creating level questions. The major marks were divided between evaluation (33.33%) and understanding (31.67%) levels. The percentage of marks distribution shows that questions are more towards the lower level. Even after having the questions in the lower level, and students' performances poorly, then the reason can poor effort from students or strictness of module



teacher.

Fig. 2. Total marks distributed of 75 exam questions in six levels of blooms taxonomy (in %)

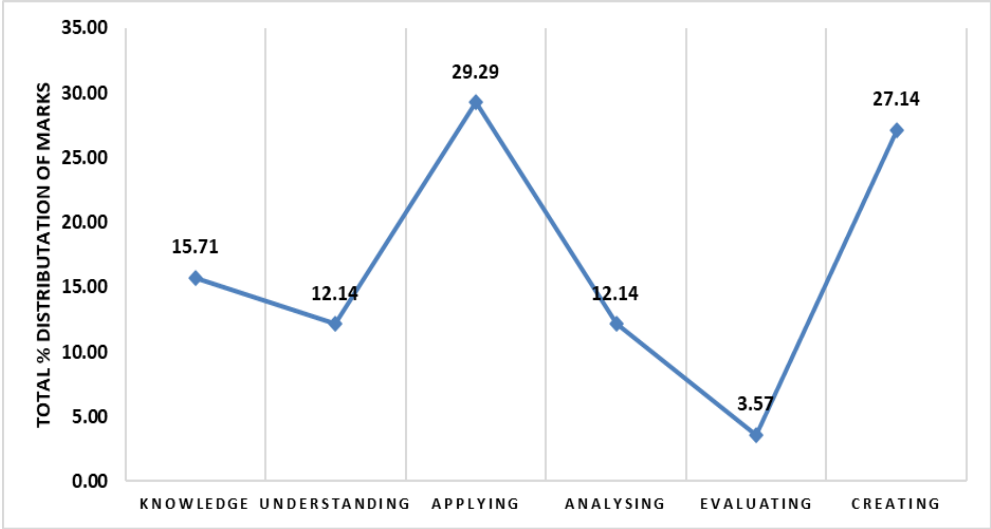


Fig.3. Exam marks distributed of RES301 Research Methods in the Business module in six levels of blooms taxonomy (in %)

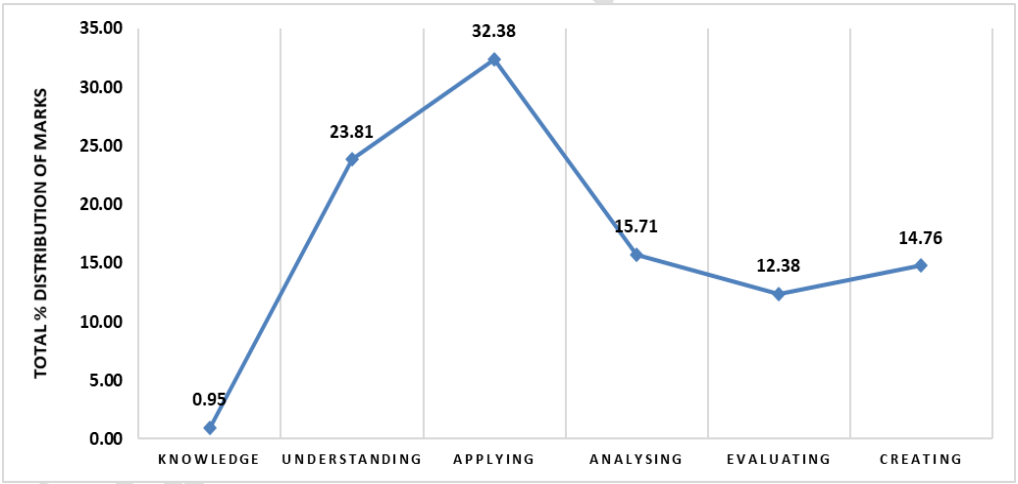


Fig. 4. Exam marks distributed of HRM201 Fundamentals of Human Resource Management in six levels of blooms taxonomy (in %)

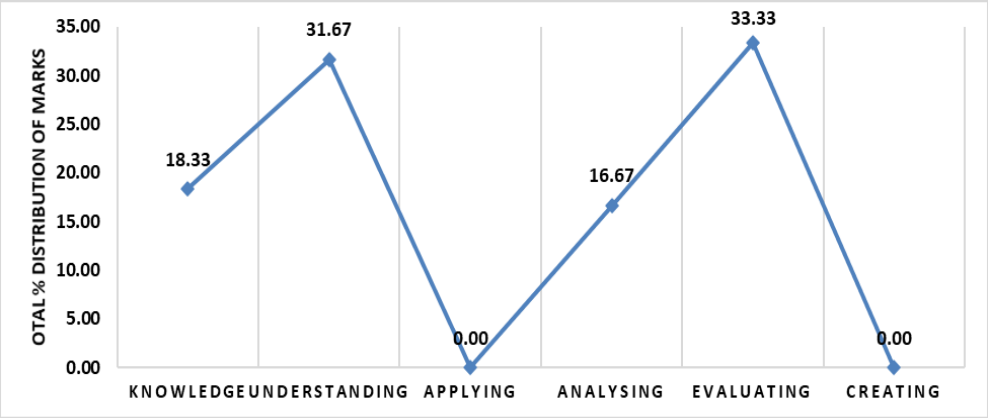


Fig.5. Exam marks distributed of MGT305 Fundamentals of Corporate Governance in six levels of blooms taxonomy (in %)

5. CONCLUSION

The present study was conducted to study the teacher's awareness and adoption of Bloom's taxonomy among RUB educators (in the case of GCBS) in classroom assessment (Examination). The six domains of Bloom's taxonomy were used to assess awareness and adoption. The finding was positive in terms of awareness and knowledge. The study found that GCBS teaching faculties are aware of the concepts and the majority think that their understanding of the concepts is good. Similarly, the knowledge level of the faculties was good, but, those concepts were not used accordingly in preparation for the exam paper.

The overall marks distribution of exam papers shows that the exam papers are more to the lower level of Bloom's taxonomy (figure 1). However, the modules which were performed poorly by students shows that marks are distributed more to the higher levels (figure 2 &3). The previous studies found that in a class, the students' performances on the exam are usually normally distributed (bell-curve), that's why preparing assessment questions should be normally distributed. Stiggins found that teacher who has poorly designed the test paper has domination toward the question related to recalling facts and information[10]. Therefore, without a careful mapping of questions according to Bloom's taxonomy, the examination will not yield the desirable objective of the module.

CONSENT (WHERE EVER APPLICABLE)

Not applicable as it is not medical research

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

Not applicable as it is not medical research

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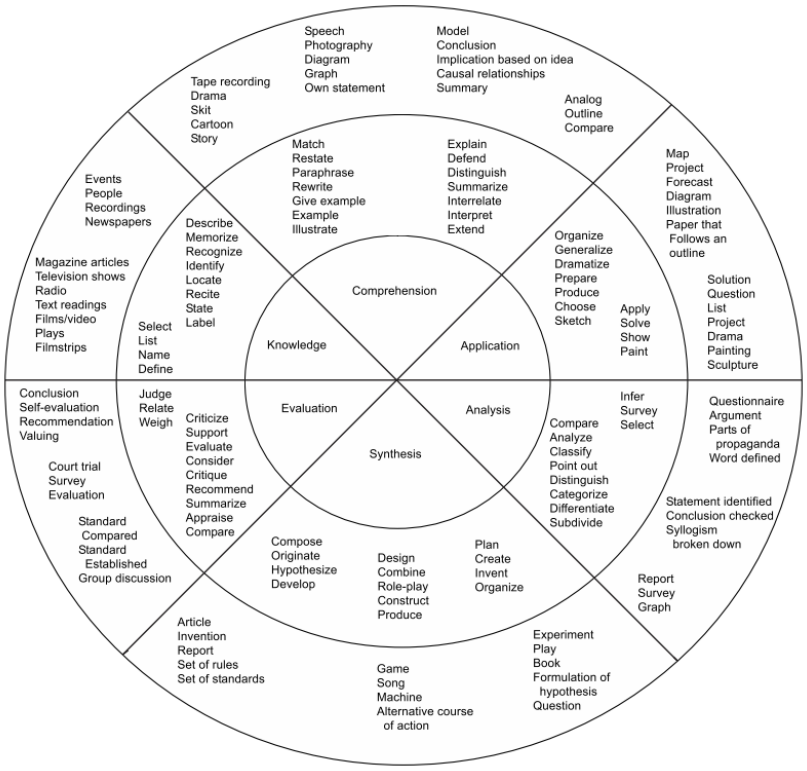
DEFINITIONS, ACRONYMS, ABBREVIATIONS

Gedu College of Business Studies (GCBS)
Postgraduate Certificate in Higher Education (PgCHE)
Postgraduate Diploma in Higher Education(PgDHE)
Royal University of Bhutan (RUB)

APPENDIX

General Bloom's Taxonomy question and task design wheel [5]



ICT Bloom's Taxonomy question and task design [18]

Level	Definition	Example
Knowledge	Remembering (recalling) facts, patterns, setting, and methods	a) List all the nodes in the left subtree of node J. b) Describe the key properties of a binary tree. c) Define a method in JAVA.
Comprehension	Understanding what is being communicated	a) What is the output of the following code segment? b) Explain in words what happens in the following C++ code.
Application	Using previously learned information in new and concrete situations to solve problems that have single or best answers	a) Declare a variable, employees to represent the records of 120 employees. b) b) Modify the given 'for' a loop into the 'while loop.
Analysis	Breaking down informational materials. into their parts so that the hierarchy of ideas is clear	a) Outline how class BookList could be implemented using an array. b) Given the following postfix notation: 12 9 + 9 *5 3 / - =
Creating	Putting together elements and parts to form a whole	a) Write the definition of the function OutputTime if the statements from lines 22 to 34 were to be performed in a function. b) Write a program that prompts the user to input the masses of the bodies and the distance between the bodies. The program then outputs the force between the bodies.
Evaluation	Judging the value of Material and Methods	a) Justify the concept of inheritance and give the sample of code to illustrate your answer.

Mathematics and Statistic Bloom's Taxonomy question and task design[2]

Level	Definition	Example
Knowledge	Remembering (recalling) facts, patterns, setting, and methods	State the formula for the slope of a line
Comprehension	Understanding what is being communicated	A line that is increasing on the interval would have a slope. (a) positive (6) negative (c) zero (d) undefined
Application	Using previously learned information in new and concrete situations to solve problems that have single or best answers	Find the slope of the line tangent to a circle, with the centre (4,5), at the point (1,2).
Analysis	Breaking down informational materials. into their parts so that the hierarchy of ideas is clear	John was given the following data about a line: Line I has an x-intercept of 5 and passes through the point (2, -1). John was then instructed to analyze the data and use it to find the slope of the line. Explain where he went wrong in his analysis: The line will have a slope of-3 since the ^-intercept is 5, which means the line passes through the point (5,0). Now I have two points, and I can apply the formula for the slope of a line. That's how I got -3 for the slope of the line.
Creating	Putting together elements and parts to form a whole	The following data pairs are the speed in miles per hour at which a car is travelling, as related to the gas mileage in miles per gallon (MPH, MPG): (20,24), (30,28), (40,30). Using these three data points, draw three approximate linear models and find the slope of the lines in each case.
Evaluation	Judging the value of Material and Methods	Using your models in the synthesis assessment, select the model that you believe Best represents the slope of the data, and justify your answer