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Relating Teachers' Questioning Techniques with Students' Learning within the Context of Bloom's Taxonomy

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This study aimed at investigating the questioning practices of teachers in public sector universities of Khyber Pakhtunkhwa. Using proportional allocation to population, 24 teachers were selected from Peshawar, Kohat, D.I.Khan, Mansehra, Dir, Malakand, and Swat as a sample through cluster random sampling. To achieve the objectives of the study, the instrument "Observation Guide using Bloom's Taxonomy" was used, and teachers' questions were recorded on the observation guide, in addition to an audio recording. The questions were then categorized under six categories of Bloom's taxonomy: knowledge, comprehension, application, analysis, synthesis and evaluation. The findings have drawn out that teachers' questioning methods centered on the convergent, knowledge and comprehension types. Teachers infrequently asked questions at the analysis, synthesis and evaluation levels. It is recommended that higher-order thought-provoking questions need to be asked more frequently in the classrooms. It is also acknowledged that promoting students to use these higher-level thinking skills is important but this could only be achieved if teachers are effective enough to use a classificatory scheme such as Bloom's taxonomy.

Keywords: bloom's taxonomy, convergent, divergent, higher and lower order questions, questioning, tertiary level,

The educational process is often based on the practice of inquiry, which is usually dependent upon formulating questions (Kerry, 2002). From the time period of Socrates, the relationship between teaching and questioning approaches have been considered as quite important learning exercises; therefore, an effective teacher must always know how to ask effective questions. Investigators have observed that throughout a teaching profession, a common teacher asks approximately millions of questions; however, posing numerous questions does not show teachers'

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2. Dr. Naeem Butt reviewed the article and has contributed in structuring and streamlining the paper
3. Dr. Amjad Reba worked on proofreading and references

skills in asking suitable questions (Cooper, 2013), and this is important as Sahlberg and Boce (2010) asserted that teachers' questions have a powerful impact over the nature of classroom discussion. Certainly, studies indicate that classroom questions play a vital role in classroom learning; therefore, educators are required to learn the important skill of asking improved questions (Pagliaro, 2011).

Teacher's questions play pivotal role in promoting students' sense of inquest, extract and spring distinct thoughts open their ideas and make them highly critical and determined in their lives. Learners produce their knowledge and reasoning skills when presented to the appropriate collection of questions, so it is very much necessary for educators to judge their prevailing skill of questioning (Stewart, 2011).

Literature Review

Questions are channels for thoughts and teacher questioning promotes students' level of learning (Walsh & Sattes, 2005). This implies that questioning is an indispensable and compact learning mechanism for educators-even for the most qualified and skilled, need to acquire this ability. Combining this complexity, it is recognized that various types of questions are appropriate for different types of instructional approaches (Pagliaro, 2011). Therefore, skillful questioning techniques are considered to be one of the important indications of a successful teacher and what more these teachers need to do is to match the questions to students' ability and the adopted pedagogy. Below-average students could therefore require a range of questions to reach to the true responses.

Effective questioning has distinct features assisting multiple purposes and generates types of thinking processes. Teachers' questions can be of various types (from a common factual recall of information to more complicated cognitive processing), which facilitate different thought processes in the students. Teachers will often rely upon asking factual questions but this does not promote an effective learning environment (Cooper, 2013). The effective use of various levels of questions is; therefore, a particularly great skill for educators to acquire.

So many terminologies and taxonomies are used to explain several types of questions. Bloom's Taxonomy (1956) has been acknowledged as a useful means of classifying educational objectives and for providing a typology for identifying different classroom questions and thinking. This taxonomy consists of six levels (knowledge, comprehension, application, analysis, synthesis and evaluation) and each level need a distinct kind of outlook. Competent teachers can frame questions for each to connect students in diverse types of reasoning processes. The capabilities and needs of individual students can be related to the different types of questions. One of the key features of Bloom's approach is the distinction made between convergent and divergent questioning. Questions may also be of close and open-ended, close or narrow questions promote a particular or restricted response whereas broad questions promote a more extensive or comprehensive response. The expert teacher can construct questions that are closed (convergent) or broad or leading (divergent). Close-ended convergent questions are those which restrict students' answers to single or very limited responses, essentially based upon recall of factual knowledge (Borich, 2000).

According to Dumteeb (2009) in Thailand the questioning techniques used by English language educators are used to develop students' active participation in the classroom and their reasoning power. To collect the data, multiple approaches consisting of observations of the classrooms, questionnaires, interviews both focused grouped and individual and document analysis were applied. The educators employed six kinds of questions in the classrooms: knowledge, comprehension, application, and analysis, synthesis, and evaluation questions. The highest number of

questions was asked in the knowledge category. The knowledge questions dominance was generated by the focus, the lesson purposes and the environment of the classroom. In this study all the questions investigated, knowledge questions extracted the highest number of answers from the students. Students reacted to knowledge questions more because these questions do not need the complete time of the students, energy, vocabulary and grammatical knowledge in declaring their answers.

Tritapoe (2010) reported that in several classrooms when the teacher is involved in teaching the content there is a lack of enthusiasm and motivation for students. The actual reason was due to the teachers lacking skill in questioning. Teachers often directed questions that were declamatory and procedural. It was also noted that inadequate time was presented to the students for them to respond after the questions were asked.

The vast majority of questions that teachers ask students are short-answer and convergent (Blosser, 2000) resulting in a 1-2 word response from students and do not encourage creative or innovative thinking. These types of questions are however still very useful as they are sufficient for assessing students' knowledge about facts and form a foundation for other cognitive processing (Colburn, 2003). A typical convergent question is 'What is the capital city of Pakistan?' On the contrary, divergent questions may demand students to compare describe facts or thoughts, state or explain connections or solve problems (Hunt et al., 2009).

The following example illustrates a divergent question: 'What is the difference between petroleum and plastic?' Such questions arouse broad range answers and have a higher chance of being correct (Borich, 2000), as Clement (2005) noted that such questions are composed to lead students thinking further and therefore provide an opportunity for many possible answers. Although depending upon factual knowledge, innovative responses are encouraged by divergent thinking (Powell, 2010) and might challenge students to predict, hypothesize, or to reach a conclusion. Certain phrases such as 'what if' is well-known to questions organized as divergent (Hunt et al., 2009). Here is an example of a divergent question: 'In one hundred years, how will our society be like?'

This distinction between convergent and divergent has significant classroom implications, and may intelligently be used by the teachers in the classrooms. Moving beyond factual recall is important; if different cognitive processes are to be developed-innovation, problem solving, creative and critical thinking, all depend on more complex thinking. However, the proportion of convergent questions provoked by teachers in the classroom is significantly larger than divergent questions – according to (Borich, 2000) it is approximately 4:1. However, the formulation of divergent questions encouraging thinking beyond factual recall is often difficult but with careful planning this can be overcome (Cruickshank et al., 2009).

Rationale

The interest to conduct this study was sparked due to the very entity of the researchers as university teachers who experience this situation now and then in the real classroom teaching. It was that whether the acts of conversation starters were proper and were educators posed the correct sort of inquiries? Were these inquiries viable to improve the students' accomplishment and build up their basic reasoning? Maybe a few studies have been conducted on this major issue in the classrooms in Pakistan. The general reason for the study was to examine and address basic issues inside the classroom. The focus was to determine the levels of questions by keeping in mind the

levels of Bloom's Taxonomy. The investigation was additionally carried out to investigate higher-order and lower questions and to examine divergent and convergent questions at the Tertiary level.

Objectives

The main objectives of the study are as follows:

1. To investigate divergent and convergent questions at tertiary level.
2. To differentiate the levels of teachers' questions in the context of Bloom's Taxonomy.
3. To analyze lower order questions (Knowledge, Comprehension, application) and higher order questions (Analysis, Synthesis, Evaluation).

Method

Research Design

This is an observational design using descriptive statistical analysis and provides a means of a direct approach to the issue in hand.

Sample

A proportional allocation sample (Walpole, 1968) using cluster random selection was drawn from 3000 teachers in the public sector universities in Khyber Pakhtunkhwa. The districts of Peshawar, Kohat, D.I.Khan, Mansehra, Mardan, Malakand, and Swat comprised samples. At the Bachelor and Masters levels, 24 teachers were selected to be examined while teaching in their classrooms on a range of subjects namely economics, political science, Urdu, English, Islamic studies, education, Pakistan studies, history, psychology, science, social studies, and Islamiyat.

Data collection Instrument

The data is collected through the 'The Instructional Leader's Guide to Informal Classroom Observations' (Zepeda, 2009) after changes that were made in every level of the cognitive field of Bloom's Taxonomy before execution. Further division of each level into sub-categories was done so that the classification of the questions was readily undertaken.

Procedure

The observation sheet was used for the collection of data for observing the 24 lessons over the specified time periods. Through the observation, the principal investigator observed the questions posed by the teachers and the audio recording of the lesson has also been done. The questions were therefore encoded and classified on the observation sheet as knowledge, comprehension, application, analysis, synthesis and evaluation based. Procedural questions (e.g., you have a test today, haven't you?) were not examined but subject content questions were used as data. Examples of the range of questions included the following:

- Name the second highest mountain of the world?
- What is SAARC stand for?
- How is academic writing different from informal writing?
- How Johan Friedrich Herbart contributed in introducing modern teaching method?
- How can community play the role of change agents in school?
- Do you think the use of social media is a good or bad thing for students?

After each classification was added, the entire number of question types was divided by the number of questions; the teachers asked. This data gave a percentage for each question classification.

Results

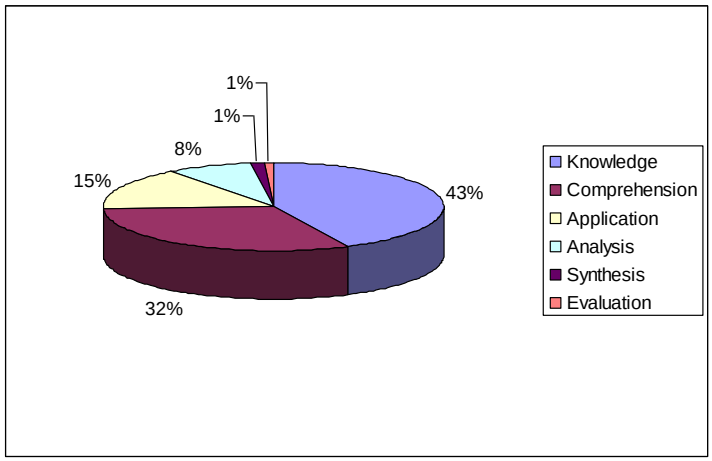
Table 1

Percentages of questions asked in Bloom's categories for each observation

Observation	Observation Time	No. of Questions	knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
1	1:30:00	8	2	1	5	0	0	0
2	1:00:00	12	8	2	1	1	0	0
3	1:00:00	10	4	5	0	1	0	0
4	1:30:00	4	3	1	0	0	0	0
5	3:00:00	3	0	2	0	1	0	0
6	1:30:00	4	2	1	1	0	0	0
7	1:00:00	6	3	1	1	0	1	0
8	1:00:00	4	2	1	1	0	0	0
9	1:30:00	3	2	1	0	0	0	0
10	2:00:00	10	4	2	2	1	0	1
11	1:30:00	2	0	2	0	0	0	0
12	1:30:00	5	1	2	1	1	0	0
13	1:30:00	3	1	0	1	1	0	0
14	3:00:00	2	1	1	0	0	0	0
15	1:30:00	10	6	4	0	0	0	0
16	1:30:00	15	6	7	0	2	0	0
17	2:00:00	5	2	3	0	0	0	0
18	1:30:00	2	1	0	1	0	0	0
19	1:45:00	8	2	4	2	0	0	0
21	1:45:00	6	3	0	1	1	1	0
22	1:45:00	6	3	0	2	1	0	0
23	1:30:00	4	2	0	1	1	0	0
24	3:00:00	4	0	3	1	0	0	0
Total	**38:45:00**	**136**	**58**	**43**	**21**	**11**	**2**	**1**
%			**42.65**	**31.62**	**15.44**	**8.09**	**1.47**	**0.74**

The data presented in table-1 reveals that the total numbers of asked questions are much lower than as was anticipated. It is witnessed that teachers asked questions very infrequently and lecture method was considered the major mode of learning. In the knowledge section, the greatest number of questions is related to knowledge of specifics and terminology, theories and structures, trends and sequences. In the comprehension section majority of the questions raised are related to interpretation and extrapolation; whilst in the application section questions are either related to manipulation or demonstration. The questions posed in the analysis section are mostly related to

analysis of elements and relationship. Few questions were also asked on the synthesis and evaluation level.



Graphic representation of the data in Table-1

Discussion

The study mainly aimed to explore teachers' questions which lead to higher-order thinking in the classroom context. It was determined to focus on the levels of questions keeping in view the Bloom's Taxonomy. The study was also focused on analyzing lower and higher-order questions and to investigate convergent and divergent at the tertiary level.

The results of this study indicate that the sampled teachers in this study do not ask many questions. The researcher noted that mostly, teaching was through lectures and explanation of concepts, which makes it harder to incorporate questioning strategies. Throughout the teachers' lecture only a few questions were asked and most of them were of convergent nature. Most of the questions were either terminologies of certain words or the definitions of some complex concepts. It was likely that the teachers were unaware of Bloom's Taxonomy; therefore, did not have the knowledge about how to formulate questions following all the levels of taxonomy.

Similar to the findings of Tritapoe (2010) it seems that the teachers in this study lacked the ability of asking effective questions that improves the involvement of the class. The knowledge-based questions that were asked at the tertiary level were more dominant as they were followed by comprehension, application, analysis, synthesis and evaluation. These results support the study by Dumteeb (2009) which stated that the predominance of factual questions was observed, no doubt, as a result of the focus, the lesson objectives and the setting of the classroom. Students were more likely to feel comfortable with this approach as it was time economic, demanded less effort and were not so dependent upon vocabulary or grammatical construction.

Although Brown and Wragg (1993) indicated that teachers may be asking hundreds of questions a day, this study indicated that the teachers were asking few questions even in a situation where higher level thinking skills were part of the curriculum. Hastings (2006) observed that a predominance of factual questions was asked during the teaching, .so, even if an emphasis upon higher level skills is expected, there is no reason to believe that this would change the situation in any context.

Overall, it was found that teachers in this study were not asking the range of questions that promote effective cognitive development and little active planning is undertaken to plan questioning. It is likely to unfold that the teachers are not promoting critical thinking through questions as they are more concerned by completing the syllabus.

An important issue, yet to underpin is the context of the study. In traditional societies such as Pakistan, where hierarchy and conformity are normative behaviors, it is probably more problematic to teach (and for students to practice) divergent thinking. Questioning and creative thinking may be challenging for some who have not encountered an environment that is psychologically safe for freedom of such thought.

There are a few potential study limitations. Subjective bias of the researcher could be an issue unless procedures are implemented carefully. Secondly, being a time-consuming approach, researchers' fatigue might impact upon the data collection making the findings questionable. Another potential issue is that; an observer can change the context dynamics being observed and the reliability (and hence validity) of the study can be impacted upon – however, the researchers attempted to be as unbiased as possible. The specific lesson may have been one that emphasized factual (etc.) issues, but in a subsequent session other cognitive processes were encouraged.

Conclusions

It was concluded from the results that teachers in the sampled universities asked few questions during their classroom teaching that were centered upon convergent questions; over-looking critical thinking processes. In addition, of all the questions that were asked by the sampled teachers during the data collection process of the study, lower order and convergent questions were the highest number of responses by the students. Questions at the analysis, synthesis, and evaluation levels were sporadically asked, which could potentially limit the cognitive growth of the students in the sampled classroom.

Recommendations

The following recommendations arise from this study:

1. Professional development for the teachers may be undertaken to promote the importance of Bloom's Taxonomy. Understanding the role of questioning and the range of functions would help teachers to understand the importance of incorporating convergent and divergent thinking activities in the classroom. Beginning teachers need to have this approach incorporated in their teaching repertoire early in their career.
2. The observations revealed that the teachers did not ask many questions. In the classroom it was found that there was a 'no question culture' therefore, teachers need to develop understanding about how learning occurs and value of using student constructions. Learners. In the classroom, stimulating questions needs to be developed to facilitate the range of cognitive processing.
3. Teachers need to be aware of the functions of convergent and divergent thinking. It is recommended that leading and divergent questions may be asked continuously to provoke higher-order thinking skills among the students. Teachers may essentially ask convergent questions while teaching facts, rules, and action sequences and may ask divergent questions for the teaching of concepts, patterns, and abstractions.
4. The importance in planning questioning strategies needs to be accepted by the teachers. If this is done teachers will become more aware of linking the teaching session to the type of questioning to be used.

5. A future research agenda needs to be developed to explore this issue. For example, a qualitative study of the teachers' instructional priorities may provide useful additional data to promote enquiry and interactive learning approaches. An action research study could help teachers to develop more skill in this area.

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