BLOOM'S TAXONOMY OF EDUCATION OBJECTIVES IN WRITING INSTRUCTIONAL OBJECTIVE FOR SCIENCES SUBJECT AT SECONDARY SCHOOL LEVEL: A CASE STUDY OF SINDH

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ABSTRACT

The purpose of this mixed method study was to assess and examine the objectives of Bloom's taxonomy, its usage and importance at secondary level while teaching the sciences subject in the Sindh. The population of this study was 508 teachers of science and 50 headmasters. One questionnaire and an interview protocol were used to collect the data through stratified random sampling technique for this study. A statistical tool was used for Hypotheses testing and interpretation of data. The tabulated data show a considerable difference was found in teachers' understanding of Blooms taxonomy and its proper usage in sciences subject at secondary level. The qualitative findings highlighted that teacher teaches science subjects and apply exam-oriented strategy without touching the Bloom's taxonomy's application. The findings of the study also revealed that teachers did not enjoy while teaching the sciences subject in the classroom learning. Majority of teacher teaches science subjects in traditional way .They do not apply student-centered and motivational techniques and appropriate assessment mechanism while teaching sciences subject. The result of the study revealed that the total 83% teachers are failing to use first three levels of Bloom's taxonomy namely knowledge, comprehension and application while teaching science subjects. Only 08% teacher use last three levels of bloom's application namely, analyze synthesis and evaluation. The researcher strongly recommended applications of Bloom's taxonomy and its objectives are necessary for science teachers at secondary level to teach science subject effectively in order to develop the students' concepts rather than make them able to choose rote method of learning. Moreover, it is also recommended that teachers should develop their interest in science subjects and apply latest teaching methodology while teaching science. The administration, teaching training institutes and head masters should strictly monitor them that at what extent they successfully use the Bloom's application in the classroom learning.

Keywords: Blooms Application, Teachers' Intention, Headmaster Role, Teaching Mechanism

INTRODUCTION

Objectives and activity became purposeful if it is carried out effectively, for effective implementation, planning the task is essential. Planning can be done on the basis of goal, aims and the objectives of the activity (Sonika, 2012).

Objectives are an integral part of most lesson plans employed by effective teachers. They are the focus of the instruction and describe what the

learner should be able to know and do as a result of a lesson or course of study. Some educators refer to instructional objectives as performance objectives. Whereas others call them behavioral objectives.

In any case most people agree that instructional objectives should be stated in specific terms so what they can be measured and assessed. A good instructional objective must describe a learning outcome that says what the student will able to do know or believe as the result of instruction it is customary to think instructional objectives in three aspects cognitive, affective and psychomotor. These terms come from the work of Benjamin bloom and others who developed taxonomy of educational objectives: Cognitive objectives deal with the intellectual abilities, knowledge, concepts and understanding, affective objectives include the feelings, interests, attitudes and appreciation that may result from instruction, and the psychomotor domain includes objectives that stress motor development, muscular coordination and physical skill. Traditionally cognitive objectives have received far more attention over the years from the affective or psychomotor objectives, the cognitive area becomes fertile ground for writing instructional objectives that stress performance in science knowledge and conceptual understanding.

BACKGROUND OF THE STUDY

Teaching and learning are correlated terms both depends on one another. Teaching is nothing without learning. Every teacher tries level best for students' learning. Every teacher uses various methods and techniques to make teaching effective and useful.

What a teacher obtains as instructional output in the teaching- learning process are nothing but some type of behavioral changes in the pupils that may be expected as a result of the instruction related with a particular lesson, unit or subunit of the subject. Instructional objectives are thus nothing but description of the pupil's terminal behavioral expected out of the ongoing class room instruction (Mangal, S. K. and Mangal Uma). Teaching and learning both depend on these instructional objectives. This practice employed by effective teachers develops the teaching learning process and helps to describe what extent the learner should be able to know and do as the result of a lesson, a unit or course of study.

Objectives suggest line of action for anything that any one wants to perform or undertake. Teaching and learning are connected with each other Teaching is meaningless act without learning, basically the result of teaching is learning and result of learning occur when the behavior of students is changed or modified. Objectives produce baseline for reshaping of the behavior.

What should be aims and objective of teaching learning process or education process? It is thought provoking question and crucial issue; for the answer of this question and solution college teachers assembled in America. This concept of taxonomy in education was initiated in 1948 a meeting of American psychological association in Boston. After 1948 many meetings were held and 1953 a threefold division of the educational objectives: cognitive, affective and psychomotor, was developed by Professor P.S. Bloom and his associates. These three divisions are called domains (Sonika, 2012). Bloom's taxonomy has been used by teachers far more than fifty years and this is clears testimony to the fact that many educators have found it valuable, one of its attractions has been its simplicity. The structure is relativity easy to understand and apply in most learning areas, because the taxonomy was designed to provide a language for talking about objectives; it is easily applied to the formation of outcomes.

Bloom taxonomy can be used as a teacher tool to help balance assessment and evaluation questions in the class. Readinesses to act include mental, physical and emotional sets - these three sets are dispositions that predetermine a response to different situations. Bloom's taxonomy refers to a classification of the different objectives that teachers set for the students. It divides educational objectives into three domains cognitive, affective and psychomotor. Within the domains learning at the lower levels is dependent on having attainted pre requisite knowledge and skill at lower level.

Bloom developed the taxonomy of cognitive objective by quantitative expressions and different types of thinking; more-ever this system has been developed to identify the types of learning expected from the student. In addition, the wide array of learning outcomes that must be included in any given instructional area.

OBJECTIVES OF THE STUDY

- To investigate the usage of Bloom's taxonomy's objectives in lesson planning while teaching science subjects at secondary level.
- To evaluate the importance of Bloom's taxonomy's objectives for student learning at secondary level.
- To find out teachers acceptance of Bloom's taxonomy's objectives to check their subject base knowledge at secondary level.
- To find out relationship between Bloom's taxonomy's and teachers instructional objectives at secondary school.

RESEARCH QUESTIONS

Q No.1: To what extent are teachers of science aware about subject based knowledge in term of Bloom's Taxonomy at secondary level?

Q No.2: To what extent is there direct relationship between Bloom's taxonomy and in writing instructional objectives for science subjects at secondary level?

Q No.3: Are Bloom's taxonomy's objectives measurable and testable for science teachers at secondary school level?

Q No.4: Does Bloom's taxonomy enhance useful learning at secondary school level?

Q No.5: Is Bloom's taxonomy helpful in promoting the ability of problem solving and creativity among science students at secondary school level?

RESEARCH HYPOTHESES

- There is no difference between teachers of science subject-based knowledge about Bloom's taxonomy of educational objectives at secondary school level.
- There is direct relationship between Bloom's taxonomy of educational objectives with writing instructional objectives of teachers of science at secondary school level.
- Bloom's taxonomy's practice is measurable and testable for teachers of science at secondary school level.
- There is direct relationship between effective learning and Bloom's taxonomy of educational objectives at secondary school level.
- Bloom's taxonomy of educational objectives is helpful in promoting the ability of problem solving and creativity among science student at secondary school level.

POPULATION OF THE STUDY

This is case study which consists of Sindh province. Administratively it is distributed in 05 divisions and 29 districts. There as 1710 government secondary schools situated in Sind. This study focused on the teachers they teach science subjects like biology, chemistry, physics and general science. Usually Sind in terms of population is distributed Urban and Rural areas, on that fact researcher distributed the whole population in two parts, one part is Urban and the other is Rural - 60% urban and 40% rural.

DISCUSSION

Researcher always tries to discover real facts that are hidden by the world, so he develops a problem and start planning to find it. To formulate hypothesis investigator analyses the whole situation. This will provide the path for starting work in sequence, gathering data is very important for testing hypothesis in research, to get results it is very necessary to analyses

the data. According to Kulbir Singh Sidhu, analysis of data means studying that inherent facts or meaning.

The data was analyzed by using mean and Chi-Square. The means is usually considered more important average in the interpretation of data obtained by using questionnaire and Chi-Square for the testing hypothesis. Chi-square test is a test of independence. The idea that one variable is not affected by related to another variable.

RESPONSE

Item No.1 What do you know about Bloom's taxonomy of educational objectives?

Fifty head masters interviewed were divided in their opinion about the Bloom's taxonomy of educational objectives. Twenty head masters believed that they had poor knowledge regarding the Bloom's taxonomy of educational objectives. They always found them lacking while using Bloom's taxonomy's application in the classroom learning.

Eighteen head masters replied that they had listened and read about Bloom's taxonomy, but never used in the classroom learning. Twelve head masters responded positively and used the Bloom's taxonomy but even they know the importance of Bloom's taxonomy of educational objectives. They achieved fruitful result in their class while using the Bloom's taxonomy of educational objectives.

Item No.2 What do you know about instructional objectives?

Response

In response to this question sixteen headmasters replied that it's very difficult for them to understand the instructional objectives, they focus on content rather than instructional objectives. Twelve headmasters responded positively that they know the instructional objectives and frequently they used this in their class room learning. Another group of headmasters were not happy because of their poor educational background and knowledge about the instructional objectives

Item No.3 To what extent Bloom's taxonomy is helpful to set instructional objectives?

Response

In response to this question majority of headmasters was agreed with researcher that Bloom's taxonomy is helpful for teacher to set proper objectives for teaching learning process. Twenty seven head masters agreed that teachers must be aware of the importance and uses of Bloom's taxonomy of educational objectives, eight headmasters did not agree with the researcher. They think that Bloom's taxonomy of educational objectives does not help in the class room learning. They accept a teacher faces many issues and meets the different types of the learner. Fifteen headmasters were using

Bloom's taxonomy of educational objectives with their own personal experience while teaching in class room, they neither support nor oppose the Bloom's taxonomy of educational objectives they believe that there should be learning any way, learner should set advantages in this regard.

Item No. 4 To what extent teachers use written lesson plan for teaching science?

Response

In this response to the question forty headmasters agreed with the researcher, that they think lesson plan is basically a road map to set the learning outcomes for the teaching learning process .In the science subject lesson plan help student to unlock their critical and scientific base of mind so teacher should adopt lesson plan for effective learning.

Ten headmasters had different opinion. They understand that science subject can be taught without lesson planning because they are partially based and time consuming.

Item No.5 To what extend the teachers are able to write instructional objectives properly?

Response

Opinion of headmasters was divided into two ways. Thirty headmasters were supporting to the researcher and twenty were against the researcher. The first group believes that the teachers of science are able to recognize, identify and write instructional objectives properly, they know their importance but another group of twenty headmasters think the teachers of science are not able to write instructional objectives due to their poor knowledge about the instructional objectives. They believe that our teachers of science must learn and understand the importance of instructional objectives; therefore, they need in-service training for them to update their importance in this regard

Item No.6 is your teachers of science have appropriate knowledge of Bloom's taxonomy of educational objectives?

Response

Out of fifty seven, only ten headmasters tell that teachers of science have appropriate knowledge of Bloom's taxonomy of educational objectives due to professional education and training, seventeen headmasters agreed that teachers of science have partial knowledge of Bloom's taxonomy of educational objectives and twenty three headmasters responded that their teachers of science are not aware about the Bloom's taxonomy of educational objectives; although most of teachers of science are professional degree holders.

Most of headmasters are on the same page that professional education for teachers should have quality so performance of university's faculty of education, colleges of education and elementary college of education should

enhance standard of teacher education. They also demanded refresher courses for teachers of science particularly in the area of instructional objectives.

Item No.7 How much do teachers use Bloom's taxonomy in developing instructional objectives for sciences subject?

Response

In responses to this question, thirty five headmasters admitted that the teachers of science do not use Bloom's taxonomy for developing instructional objectives due to lake of knowledge about the Bloom's taxonomy; ten headmasters the teachers of science consider Bloom's taxonomy of educational objectives for development of instructional objectives. Five claims that the Bloom's taxonomy provides foundation to teachers of science for developing instructional objectives for the lesson planning. Overall, majority of headmasters accept teachers of science are not using Bloom's taxonomy of instructional objectives.

Item No.8 How do the Bloom's taxonomy oriented instructional objectives help teachers of science to frame lesson plan effectively?

Response

Fifteen headmasters agreed that Bloom' s taxonomy of educational objectives are useful and fruitful for effective lesson planning because instructional objectives provide base line for lesson planning, in the light of instructional objectives whole lesson plan is prepared. Bloom's taxonomy oriented instructional objectives are clear, understandable and measurable so they provide milestone of learning. Thirty five headmasters gave opinion against their fellows they do not agree Bloom's taxonomy's oriented instructional objectives, help teachers of science in framing lesson plan effectively. They believe others sources are more helpful and useful for effective lesson planning.

Hypothesis-1

There is no difference between teachers of science subject-based knowledge about Bloom's taxonomy of educational objectives at secondary school level.

Responses	**Teachers**	**Total**	**Percentage**
Strongly agree	134+86+107+122+83	532	106.40
Agree	139+95+140+94+117	585	117.00
Un decided	95+114+90+81+104	484	96.80
Strongly disagree	72+122+91+103+110	498	99.60
Disagree	68+91+80+108+94	441	88.20

Step No.1: Null hypothesis and alternative hypothesis:

H_o= There is difference between teachers of science subject-based knowledge about bloom's taxonomy of educational objectives at secondary school level.

H_1= There is no difference between teachers of science, subject based knowledge about bloom's taxonomy of educational objectives at secondary school level.

Step No.2: Level of significance:

X = 0.05

Step No3: Test statistics to be used:

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

	S.A	A	U.D	S.D.A	D.A
Observed Frequency (F_o)	106.40	117.00	96.80	99.60	88.20
Expected Frequency (F_e)	101.60	101.60	101.60	101.60	101.60

The calculation of (F_o- F_e) for each category

4.80 15.40 -4.80 -2.00 -13.40

The calculation of $(F_o - F_e)^2$ for each category

23.04 237.16 23.04 4.00 179.56

The calculation of $\frac{(F_o - F_e)^2}{F_e}$ for each category

X^2 =0.226771653, 2.334251968, 0.226771653, 0.03937007, 1.767322834

The summation of all these $\frac{(F_o - F_e)^2}{F_e}$ will give the Chi–Square

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

X^2 = 0.226771653 + 2.334251968 + 0.226771653 + 0.03937007 + 1.767322834

X^2 = 4.594488186

Chi – Square = 4.594488186

Step No4: Critical value and degree of freedom:

Degree of freedom (df) = (r-1) (c-1)

(df) = (5-1) (2-1)

(df)= (4)(1)

(df) = 4

Step No.5: Compare the computed Chi-Square value to the tabulated Chi-Square value:

If computed Chi-Square calculated value is greater than the tabulated value, reject Null hypothesis (H_o) otherwise accept (H_o)

X^2= Cal < Tab

X^2 = 4.594< 9.488

Step No.6: Decision

Hence that the tabulated value of Chi-Square at 4 degree of freedom is 9.488, hence the calculated value of Chi-Square could not reach to a value of 9.488 which is the significant value of Chi-Square to accept the null hypothesis at 0.05 and conclude that there is difference between teachers of science subject based knowledge about bloom's taxonomy of educational objectives at secondary school level.

Hypothesis-2

There is direct relationship between bloom's taxonomy of educational objectives with writing instructional objectives of teachers of science at secondary school level.

Responses	**Teachers**	**Total**	**Percentage**
Strongly agree	125+151+113+129+136	654	130.80
Agree	128+143+122+133+138	664	132.80
Un decided	80+69+101+94+84	428	85.50
Strongly disagree	87+59+107+77+74	404	80.80
Disagree	88+86+65+75+76	390	78.00

Step No.1: Null hypothesis and alternative hypothesis:

H_o= There is no direct relationship between Bloom's taxonomy of educational objectives with writing instructional objectives of teachers of science at secondary school level.

H_1 = There is any direct relationship between Bloom's taxonomy of educational objectives with writing instructional objectives of teachers of science at secondary school level.

Step No.2: Level of significance:

X = 0.05

Step No 3: Test statistics to be used:

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

	S.A	**A**	**U.D**	**S.D.A**	**D.A**
Observed Frequency (F_o)	130.80	132.80	85.50	80.80	78.00
Expected Frequency (F_e)	101.60	101.60	101.60	101.60	101.60

The calculation of $(F_o - F_e)$ for each category
29.20 31.20 -16.60 -20.80 23.60
The calculation of $(F_o - F_e)^2$ for each category
852.64 973.44 275.56 432.64 556.96
The calculation of $\frac{(F_o - F_e)^2}{F_e}$ for each category

X^2 =8.392125984, 9.581102362, 2.712204724, 4.258267716, 5.481889763

The summation of all these $\frac{(F_o - F_e)^2}{F_e}$ will give the Chi–Square

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

X^2 =8.392125984 + 9.581102362 + 2.712204724 + 4.258267716 + 5.481889763
X^2 =30.42559053
Chi – Square = 30.42559053

Step No.4: Critical value and degree of freedom:
Degree of freedom (df) = (r-1) (c-1)
(df) = (5-1) (2-1)
(df) = (4) (1)
(df) = 4

Step No.5: Compare the computed Chi-Square value to the tabulated Chi-Square value:

If computed Chi-Square calculated value is greater than the tabulated value, reject Null hypothesis (H_o) otherwise accept (H_o).
X^2 = Cal > Tab
X^2 = 30.425> 9.488

Step No.6: Decision

Hence that the tabulated value of Chi-Square at 4 degree of freedom is 9.488, hence the calculated value of Chi-Square could not reach to a value of 9.488 which is the significant value of Chi-Square to reject the null hypothesis at 0.05 and conclude that there is no such direct relationship between Bloom's taxonomy of educational objectives with writing instructional objectives of teachers of science at secondary school level.

Hypothesis-3

Bloom's taxonomy's practice is measurable and testable for teachers of science at secondary school level.

Responses	Teachers	Total	Percentage
Strongly agree	142+119+116+106+98+108	689	114.83
Agree	138+131+128+97+107+129	730	121.66
Un decided	79+91+82+113+112+83	560	93.33
Strongly disagree	65+83+89+102+87+101	527	87.33
Disagree	84+84+93+90+104+87	542	19.33

Step No.1: Null hypothesis and alternative hypothesis:

H_o= Bloom's taxonomy's practice is not measurable and testable for teachers of science at secondary school level.

H_1 = Bloom's taxonomy's practice is measurable and testable for teachers of science at secondary school level.

Step No.2: Level of significance:

X = 0.05

Step No 3: Test statistics to be used:

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

	S.A	A	U.D	S.D.A	D.A
Observed Frequency (F_o)	114.83	121.66	93.33	87.83	90.33
Expected Frequency (F_e)	101.60	101.60	101.60	101.60	101.60

The calculation of $(F_o - F_e)$ for each category

13.23 20.06 -8.27 -13.77 -11.27

The calculation of $(F_o - F_e)^2$ for each category

175.0329 402.4036 68.3929 189.6129 127.0129

The calculation of $\frac{(F_o - F_e)^2}{F_e}$ for each category

X^2 =1.722764763, 3.960665354, 0.673158464, 1.8662687, 1.250126968

The summation of all these $\frac{(F_o - F_e)^2}{F_e}$ will give the Chi–Square

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

X^2 =1.722764763 + 3.960665354 + 0.673158464 + 1.8662687 + 1.250126968

X^2 =9.472984249

Chi – Square = 9.472984249

Step No.4: Critical value and degree of freedom:

Degree of freedom (df) = (r-1) (c-1)

(df) = (5-1) (2-1)

(df) = (4) (1)

(df) = 4

Step No.5: Compare the computed Chi-Square value to the tabulated Chi-Square value:

If computed Chi-Square calculated value is greater than the tabulated value, reject Null hypothesis (H_o) otherwise accept (H_o).

X^2 = Cal < Tab

X^2 = 9.472< 9.488

Step No.6: Decision

Hence that the tabulated value of Chi-Square at 4 degree of freedom is 9.488, hence the calculated value of Chi-Square could not reach to a value of 9.488 which is the significant value of Chi-Square to accept the null hypothesis at 0.05 and conclude that Bloom's taxonomy's practice is not measurable and testable for teachers of science at secondary school level.

Hypothesis-4

There is direct relationship between effective learning and Bloom's taxonomy of educational objectives at secondary school level.

Responses	**Teachers**	**Total**	**Percentage**
Strongly agree	130+127+93+97+138+129	714	119.00
Agree	137+137+97+103+125+118	717	119.50
Un decided	88+76+86+94+87+97	528	88.00
Strongly disagree	79+70+127+111+81+78	546	91.00
Disagree	74+98+105+103+77+86	543	90.50

Step No.1: Null hypothesis and alternative hypothesis:

H_o= There is no any direct relationship between effective learning and Bloom's taxonomy of educational objectives at secondary school level.

H_1 = There is direct relationship between effective learning and Bloom's taxonomy of educational objectives at secondary school level.

Step No.2: Level of significance:

X = 0.05

Step No 3: Test statistics to be used:

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

	S.A	**A**	**U.D**	**S.D.A**	**D.A**
Observed Frequency (F_o)	119.00	119.50	88.00	91.00	90.50
Expected Frequency (F_e)	101.60	101.60	101.60	101.60	101.60

The calculation of (F_o - F_e) for each category

17.40 17.90 -13.60 -10.60 -11.10

The calculation of $(F_o - F_e)^2$ for each category
302.76 320.41 184.96 112.36 123.21

The calculation of $\frac{(F_o - F_e)^2}{F_e}$ for each category

X^2 =2.979921259, 3.153641732, 1.82047244, 1.105905511, 1.21269685

The summation of all these $\frac{(F_o - F_e)^2}{F_e}$ will give the Chi–Square

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

X^2 =2.979921259 + 3.153641732 + 1.82047244 + 1.105905511 + 1.21269685

X^2 =10.27263779

Chi – Square = 10.27263779

Step No.4: Critical value and degree of freedom:

Degree of freedom (df) = (r-1) (c-1)
(df) = (5-1) (2-1)
(df) = (4) (1)
(df) = 4

Step No.5: Compare the computed Chi-Square value to the tabulated Chi-Square value:

If computed Chi-Square calculated value is greater than the tabulated value, reject Null hypothesis (H_o) otherwise accept (H_o)

X^2 = Cal > Tab
X^2 = 10.272> 9.488

Step No.6: Decision

Hence that the tabulated value of Chi-Square at 4 degree of freedom is 9.488, hence the calculated value of Chi-Square is greater to a value of 9.488 which is the significant value of Chi-Square to reject the null hypothesis at 0.05 and conclude that there is direct relationship between effective learning and Bloom's taxonomy of educational objectives at secondary school level.

Hypothesis-5

Bloom's taxonomy of educational objectives is helpful in promoting the ability of problem solving and creativity among science students at secondary school level.

Responses	**Teachers**	**Total**	**Percentage**
Strongly agree	98+89+83+85+120+102	577	96.16
Agree	113+117+117+113+135+95	690	115.00
Un decided	77+98+104+108+92+108	587	97.83
Strongly disagree	101+125+110+100+97+96	629	104.83
Disagree	119+79+94+102+64+107	565	94.16

Step No.1: Null hypothesis and alternative hypothesis:

H_o= Bloom's taxonomy of educational objectives is not helpful in promoting the ability of problem solving and creativity among science students at secondary school level.

H_1 = Bloom's taxonomy of educational objectives is helpful in promoting the ability of problem solving and creativity among science students at secondary school level.

Step No.2: Level of significance:

X = 0.05

Step No 3: Test statistics to be used:

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

	S.A	A	U.D	S.D.A	D.A
Observed Frequency (F_o)	96.16	115.00	97.83	104.83	94.16
Expected Frequency (F_e)	101.60	101.60	101.60	101.60	101.60

The calculation of $(F_o - F_e)$ for each category

-5.44 13.40 -3.77 -3.23 -6.77

The calculation of $(F_o - F_e)^2$ for each category

29.5936179.56 14.212910.432945.8329

The calculation of $\frac{(F_o - F_e)^2}{F_e}$ for each category

X^2 =0.29127559**,** 1.767322834, 0.13989.748, 0.10286.23, 0.45111122

The summation of all these $\frac{(F_o - F_e)^2}{F_e}$ will give the Chi–Square

$$X^2 = \Sigma \frac{(F_o - F_e)^2}{F_e}$$

X^2 =0.29127559 + 1.767322834 + 0.13989.748 + 0.10286.23 + 0.45111122

X^2 =2.752460622

Chi – Square = 2.752460622

Step No.4: Critical value and degree of freedom:

Degree of freedom (df) = (r-1) (c-1)
(df) = (5-1) (2-1)
(df) = (4) (1)
(df) = 4

Step No.5: Compare the computed Chi-Square value to the tabulated Chi-Square value:

If computed Chi-Square calculated value is greater than the tabulated value, reject Null hypothesis (H_o) otherwise accept (H_o)

X^2 = Cal < Tab

X^2 = 2.752< 9.488

Step No 6: Decision:

Hence that the tabulated value of Chi-Square at 4 degree of freedom is 9.488, hence the calculated value of Chi-Square could not reach to a value of 9.488 which is the significant value of Chi-Square to accept the null hypothesis at 0.05 and conclude that Bloom's taxonomy of educational objectives is not helpful in promoting the ability of problem solving and creativity among science students at secondary school level.

FINDING FROM HEADMASTERS INTERVIEWS

Eight questions were used by the researcher for the headmasters after the qualitative interpretation of the responses collected from findings. It is concluded that government schools have some knowledge about Bloom's taxonomy of educational objectives but they are not fully clear about the Bloom's taxonomy.

Headmasters of government secondary school have knowledge about the instructional objectives; they admitted about lack of knowledge about that domain.

Headmasters of government secondary schools believe that Bloom's taxonomy helps to set instructional objectives. They admitted more information is necessary for clear understanding of Bloom's Taxonomy and instructional objectives. Although headmasters of government secondary schools realize the significance of written lesson planning for systematic, organized and useful teaching but they admitted it is bitter fact that our teachers do not plan their teaching in written, they only focus on oral lesson planning.

Majority of government secondary school headmasters cannot write instructional objectives properly due to their lack of knowledge and understanding about instructional knowledge. Majority of headmasters accept this fact that our teachers of science in government secondary schools have no knowledge of Bloom's taxonomy of educational objectives appropriately. Although majority of teachers of science have professional qualification, the teachers of science have poor knowledge about the Bloom's taxonomy of educational objectives. It is also found that overall government secondary school headmasters admitted clearly that their teachers do not use Bloom's taxonomy of educational objectives in the development of instructional objectives. Researcher find out that teachers do not use Bloom's taxonomy of educational objectives in the development of instructional objectives for sciences subject.

Majority of government school headmasters think that Bloom's taxonomy's oriented instructional objectives do not help teachers of science when they frame lesson plan. Moreover, headmasters do not believe that Bloom's taxonomy oriented objectives are helpful in lesson planning.

CONCLUSION

Bloom's taxonomy of educational objectives is more than sixty year old but still it is considered as important for education theory and practice in our Sindh province. Its significance seems clear from its usage in the development of curriculum, preparation of intended learning and evaluation outcomes. Construction of tests, Bloom's taxonomy has huge place in teachers' education as well as process of education.

In government secondary schools most of teachers, particularly teachers of science are professionally qualified but it is very strange situation that majority of headmasters are weak in subject based knowledge about Bloom's taxonomy. Very few faculty members of government secondary school teachers are aware about the Bloom's taxonomy of educational objectives properly. Majority headmasters accepted that they and their faculty members have not proper knowledge and understanding about the instructional objectives.

Trainers prepare them for teaching process but without determining the instructional objectives data shows that majority of government secondary headmasters and teachers of science are not clear about the instructional objectives and they feel difficulty about them. The results of the study indicate that the majority teachers of science are failing to use first three levels of Bloom's taxonomy of educational objectives namely knowledge, comprehension and application while teaching sciences subjects. Few teachers of science use last three levels of Bloom's taxonomy of educational objectives, namely, analysis, synthesis and evaluation.

Bloom's taxonomy of educational objectives is necessary for science teachers at secondary level to teach sciences subject effectively in order to develop the student's concept rather than make them able to choose rote method of learning.

RECOMMENDATIONS

This research assesses and evaluates the knowledge, understanding and application of the Bloom's taxonomy by teachers in sciences subject at government secondary schools of Sindh and the importance of instructional objectives in lesson plans and teaching learning process.

1. Bloom's taxonomy of educational objectives is valuable, it should be included thoroughly in syllabus of all B.Ed. formats.
2. Teacher's training is essential for teachers professional development and educational authorities are advised to conduct training programs for the teachers on regular basis and the off campus, evening, weekly and distance education programs of teachers education should improve their quality of teaching and learning process along with enforcing all the conditions.

3. Written lesson planning stimulates teacher for effective useful and fruitful teaching, it is recommend that daily written lesson planning for teaching any subject should be compulsory at secondary school level.
4. Instructional objectives provide path for lesson planning and all the teachers should be able to understand instructional objectives properly and write accurately for this purpose. The authorities should arrange workshops and induction training for teachers, especially for teachers of science to improve their skill of writing instructional objectives positively.
5. All the teaching activities must resolve the entire lesson plan. Teacher's lesson plan record must be maintained proper.

REFERENCES

Aggarval, J.C., (2006). Essentials of Educational Technology: Teaching learning, Innovations in Education, Vikas Publishing, New Dehli.

Ametha, P., (2008). Methods of teaching Biological Science, Neelkamal, Hyderabad.

Bolte, C., Holbrook, J., Mamlok-Naaman, R., & Rauch, F. (2014). Science Teachers' Continuous Professional Development in Eurupe. Klagenfurt: University of Klagenfurt .

Daniel, P., Shepardson (2001). Assessment in Science: A Guide to Professional Development and Class Room Practice, Kluwer Academic Publisher.

Das R.C., (2000). Teaching of Chemistry, Sterling Publishers, New Dehli.

Das, R.C., (1996). *Science teaching in schools* (2nd ed.), Sterling Publishers, New Dehli.

Davar Monika (2012). Teaching of science PHI learning Pvt. Ltd.

Din, D. M. (2015). Book Review Inspiring the Secondary Curriculum with Techonogy: Let the Students do the Work. *Turkish Online Journal of Distance Education* (TOJDE), 233-237.

Easton, P. (2014). Sustaining Literaacy in Africa. Paris: UNESCO.

Faubion, J. D. (1998). Aesthetics, Method, and Epistemology. New York: The New Press .

Iiyoshi, T., & Kumar, M. V. (2008). Opening Up Education. London: The MIT Press.

Indira Gandhi National Open University (2000). Teaching of science, instructional planning and evaluation in science. IGNOU publication, New Dehli.

Joyce, B., & Weil, M. (2003). Models of Teaching. New Delhi: Prentice Hall of India Pvt.

Kaufman, J. C., & Baer, J. (2006). Creativity and Reason in Cognitive Development. Cambridge: Cambridge University Press.

Kolzow, D. R. (2014). Leading From Within: Building Organization Leadership Capacity.

Lewis, C. W., & Gilman, S. C. (2005). The Ethics Challenge in Public Service . San Francisco : John Wiley & Sons, Inc.

Louis, K. S., Leithwood, K., Wahstrom, K. L., & Anderson, S. E. (2010). Learning from Leadership: Investing the Links to Improved Student Learning. Minnesota: University of Minnesota.

Major, J. S., Brownfeld, D. S., & Lightfoot, D. J. (2005). Learning with Professionals. Washington: Department of Defence, U.S.

Mangal S.K. & Mangal Uma (2014). Essentials of Educational Technology, PHI Learning Pvt. Ltd.

Mangal S.K. Mangal Shubhra (2013). Research Methodology in Behavioural Sciences, PHI Learning Pvt. Ltd.

Mangal, S.K. (2005). *Teaching of Physical Sciences*. Arya Book Depot, New Dehli.

Margaret Kernan, P. D. (2007). Play as a Context for Early Learning and Development. *National Council for Curriculm and Assessment*, NCCA, 25-28.

Martin, C., Oshner, A., & Squire, K. (2012). Proceedings Game + Learning + Society Conference . ETC Press .

Matsuura, K. (2009). Investing in Cultural Diversity and Intercultural Dialogue. UNESCO.

Millon, T. (2004). Personality Disorders in Modern Life. New Jersey: John Wiley & Sons, Inc.

Mintz, S. (n.d.). The Fundamentals of Collage and University Teaching . Columbia : Columbia University .

Models of Teaching . (n.d.).

Moore, A. (2003). Teaching and Learning. London and New York: Routledge Flamer.

Neves, C. M. (2009). Lesson for Tomorrow . Smithsonian : Smithsonian Institution.

New Testament (2014). Salt Lake City, Utah: The Church of Jesus Christ of Latter-day Saints.

Northedge, A. (2007). The Good Study Guide. Milton Keynes: The Open University .

Pont, B., Nusche, D., & Hopkins, D. (2008). Improving School Leadership. *Organisation for Economic Co-operation and Development* (OECD).

Porta, D. D., & Keating, M. (2008). Approaches and Methodolgoy the Social Sciences. Cambridge: Cambridge University Press.

Rajan Sanika (2012). Methodology of Teaching Science, Dorling Kindersley (India) Pvt. Ltd.

Rushby, N. (2013). The Future of Learning Technology: Some Tentatsive Predictiions. *International Forum of Educational Technology & Society* , 59-62.

Siddiqui. N.N. and Siddiqui M.N., (n.d.). *Teaching of Science, Today and Tomorrow* (5th rev. ed.) Doaba House, Dehli.

Sinding, M. (2003, June). The Mind's Kinds: Cognitive rhetoric, Literary Genre and Menippean Satire, pp.51-60.

Skill Sets, Characteristics and Values for the Human Performance Technologist. (1999). International Society for Performance Improvement.

Smelser, H. H. (1992). Social Change and Modernity. Oxford: University of California Press.

Stolovitch, H. D., Keeps, E. J., & Rodrige, D. (1999). Skill Sets, Characteristics and Values for the Human Performance Technologist. International Society for Performance Improvement.

Studeies, T.U.C. (2017). The Scince of Consciousness. California.

Swain, S.K., Pradhan, C., and Khatai, P.K., Educational (2009). *Measurement, Statistics and Guidance* (2nd ed.) Kalyani, Publishers, Ludhiana.

Tait, K. (2009). Reflectiong on How to Optimize Tertiary Student Learning Through the Use of Work Based Learning Within Inclusive Education Courses. *International Journal of Teaching and Learning in Higher Education*, 193-196.

Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2007). Teacher Professional Learning and Development. Wellington: Ministry of Education, Wellington, New Zealand.

Tremblay, K., Lalancette, D., & Roseveare, D. (2012). Assessment of Higher Education Learning outcomes. OECD Publication.

Trends in Higher Education Marketing, Enrollment, and Technology (2016). *Hanover Research* (HR).

Vey, D. L. (2017). A Learning Environment for a Sustainable Future. pp.3-7.

Webster, R., & Stolz, S. (2013). Measuring up in Education. Melbourne: Philosophy of Education Society of Austraila (PESA).