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# Teachers' Utilization of Bloom's Cognitive Taxonomy in Teaching in Public Secondary Schools in Nandi County, Kenya

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**Abstract:** The academic performance of public secondary schools in comparison to private schools is a subject of great concern among stakeholders. The ideal outcome of using Bloom's Taxonomy is to encourage performance improvement. So, the goal of the study was to ascertain how students' academic achievement in public secondary schools in Nandi County, Kenya, was related to how teachers utilized Bloom's Cognitive Taxonomy in their instruction and assessment. The objective of the study was to determine teachers' utilization of Bloom's Cognitive Taxonomy in teaching in public secondary schools. A pragmatic paradigm was used in the investigation. Bloom's Cognitive Taxonomy served as the study's foundation. With an explanatory sequential design, this study used a mixed method research methodology. The research population consisted of 2055 teachers from 137 public secondary schools. The sample size was 360 teachers from 30 county schools. 30 county schools were selected using simple random sampling, from which 12 Form 3 teachers teaching 6 selected subjects were identified. Lesson observation, questionnaires, and document analysis were used to collect data from teaching. Data was analyzed using frequencies, and means. According to the findings, 58% of the teachers utilized Bloom's Cognitive Taxonomy while they were teaching. During class observation, the following percentages were used to teach using Bloom's Cognitive Taxonomy: remembering 30%, understanding 29%, applying 16%, analyzing 10%, evaluating 8.0%, and creating 6.0%. The study came to the conclusion that teachers did utilize Bloom's Cognitive Taxonomy in their lessons, though the percentages between the researcher's observation and the participants' responses varied greatly, suggesting that most teachers do not fully utilize it. This study recommended that all teachers make full utilization of Bloom's Taxonomy in their instruction in order to encourage students' critical thinking skills and an analytical approach to learning, which will improve their retention of the material.

**Key words:** Bloom's Taxonomy, Teaching, and public schools.

## I. Introduction

The Bloom's Revised Cognitive Taxonomy is a multi-tiered system for classifying ideas in accordance with the six phases of cognitive taxonomy of difficulty: remembering, understanding, applying, analyzing, evaluating, and creating. Over the years, the phases have frequently been portrayed as a series of steps, leading many instructors to encourage their students to "ascend to higher level of thinking" (Forehand, 2017). The taxonomy aids educators in describing and separating different phases of human cognition, including ideas, information, and comprehension. According to Forehand (2017) in Bloom's Taxonomy (2014), teachers frequently used Bloom's Revised Cognitive Taxonomy to inform or direct the setting of appraisals (examination and further assessment of learner education), syllabus (units, lessons, projects, and other educational actions), and teaching strategies like questioning.

However according Nkhoma et al. (2017), the Bloom's Cognitive Taxonomy offers a framework that teachers can utilize to ensure that they are delivering intellectual skillfulness like applying, analyzing, evaluating, and creating in their educational actions and evaluation (Jideani and Jideani, 2012 as cited by Nkhoma et al, 2017). The cognitive developments that bring about the critical idea are linked totally to a subject theme, class content, and reflection (Hamilton & Klebba, 2011 as cited in Nkhoma et al, 2017). Inquest into most excellent performances designed for mounting educational goals, actions, and evaluations using Bloom's Cognitive Taxonomy, still requires more assessment to inform teacher's utilization of Bloom's Cognitive Taxonomy in county public secondary schools in Nandi County, Kenya.

In accordance with Armstrong (2016), Bloom's Cognitive Taxonomy aids tutors in the following ways: foremost, it assists teachers to establish educational objectives that are essential during an instructive exchange as a result instructors and learners equally comprehend the rationale of that exchange. Secondly, teachers can gain from using scaffolds to sort out goals since putting in order goals assists teachers to make clear goals for themselves and for scholars. Finally, but not least containing an organized set of aims assists instructors to prepare, and carrying out suitable teaching, designing legitimate evaluation tasks, and policies, and making sure that teaching and evaluation are associated with the goals.

### Objective

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The objective was to determine teachers' utilization of Bloom's Cognitive Taxonomy in teaching in public secondary schools in Nandi County.

## II. Literature Review

A literature review, according to Creswell and Creswell (2018), provides a framework for identifying the value of research as well as a baseline against which results can be compared to other findings. Taxonomies are created to provide a framework for organizing a sequence of events along a common structure. Based on their underlying grammatical structure and origin, languages can be classed as English, Germanic, Romantic, and so on. Bloom's Cognitive Taxonomy of objectives gives teachers a place to start when creating course teaching objectives. There are a variety of reasons why a teacher might desire to employ Bloom's Cognitive Taxonomy in the classroom (Anderson, Krathwohl & Bloom, 2001, as cited in Kin et al., 2021; Zapalska et al., 2018). It can be used primarily to improve one's comprehension of the educational process. Teachers can see and understand how lower-level abilities lead to higher-order thinking, such as retaining data and comprehending past difficulties, which helps a student to apply their knowledge to comparable challenges. This knowledge can aid in the prioritization of material and the arrangement of lessons in order to maximize class time. Lower-level abilities (for example, memorizing factual knowledge) can be developed before higher-level skills (for example, relationship analysis) are taught (Anderson, Krathwohl & Bloom, 2001, as cited in Wei & Ou, 2019).

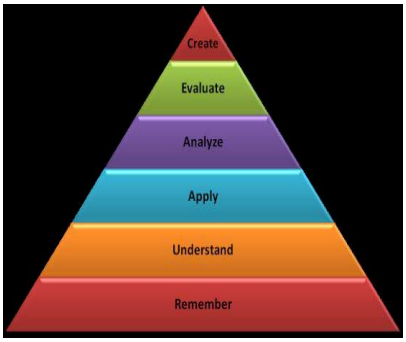
### Bloom's Taxonomy of objectives

Bloom's Revised Cognitive Taxonomy (1956 in Agarwal, 2019) is the sole method of defining educational objectives and offering a cluster for recognizing diverse classroom questions and thoughts that has been proven to be beneficial. This taxonomy is divided into six levels: remembering, understanding, applying, analyzing, creating, and evaluating, with verbs used to establish questions and objectives for teaching and assessment at each level. Teachers who are knowledgeable can frame questions for each student to engage them in different types of thinking processes. The many forms of questions might be related to a learner's intellectual talents and demands. There are two types of set questions: closed-ended and open-ended. Divergent or open-ended questions urge a full or comprehensive response, whereas convergent (closed-ended) inquiries necessitate a short or limited response. Bloom's Taxonomy has a distinct advantage over all other methods of exam design in that it allows for both convergent and divergent inquiry. To foster active engagement and motivate learner participation in teaching and learning, a qualified teacher might construct closed or divergent questions. However, Tritapoe (2010 in Bibi, Butt, & Reba, 2020) stated that there is a lack of passion and drive for students in a number of classrooms when the instructor is active in teaching the topic, and the main rationale was that the teachers lack skill in questioning.

### Cognitive Domain

The one that is most frequently employed is the Bloom's Revised cognitive domain. A classification method called Bloom's Cognitive Taxonomy is used to categorize statements about what students should grasp as a result of learning in a certain educational goal. Six levels were identified, from the most fundamental to the most sophisticated and from concrete to abstract; a more basic skill or talent must be learned before progressing to a more sophisticated skill or ability. As a result, it provides a means of facilitating the exchange of test items among members of various educational institutions in order to construct banks of things that all measure the same educational goal (Krathwohl, 2002 as cited in Cengiz & Cakir, 2016). According to Bloom (1956), as stated by Cakir and Cengiz (2016), the objective is to enhance the flow of ideas and learning materials between test-takers and those involved in educational research and curriculum development. The 1956 original of Bloom's Cognitive Taxonomy has now been translated into 22 more languages. It is still widely employed in educational research (Davidson & Baldwin, 2005, as cited in Cengiz & Cakir, 2016).

Figure 1 Bloom's Revised Cognitive Taxonomy



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Bloom's Revised Cognitive Taxonomy (Cengiz & Cakir, 2016)

In 2001, new terms were added to the revised and republished version of Bloom's Cognitive Taxonomy. This resulted from changes made by a team of cognitive psychologists under the direction of Anderson, a Bloom student as shown in Figure 1 above.

**Utilization of Bloom's Revised Cognitive Taxonomy in Teaching**

According to Orhaner & Tunç (2003) and Taşpinar (2005), who are both cited in Öztürk (2021) teaching is defined as a sequence of pre-planned and coordinated activities carried out under the supervision of teachers in a supervised setting with the aim of facilitating effective learning for the individual. In a setting with students, teachers, subjects, objectives, methods, and equipment, teachers are the most crucial element in establishing logical teaching. To make these elements work together, teachers must also be knowledgeable about their students' subjects and learning styles, set goals, and organize the teaching environment (Orhaner & Tunç, 2003; Riedler & Eryaman, 2016 in Öztürk, 2021). It is possible to create meaningful teaching when a teacher is able to pinpoint what he or she wants to achieve during the teaching process. When objectives are clearly stated and structured, this not only makes it easier to accomplish goals but also makes it easier for students to develop cognitively at higher levels since they are aware of exactly what is expected of them both during and after the teaching process (Sobral, 2021).

Policies that address teaching quality are strongly related to specific notions of educator accountability and responsibility. According to the accountability reform paradigm, teachers' performance is assessed using value-added metrics, which claim to compare individual instructors' output to that of each student and the achievement of the entire class on a test and reward teachers appropriately (Berliner, 2014, cited in Singh, Allen, & Rowan, 2019). The market-driven per-formativity objective of neoliberal education policies, which contrasts teachers' success with students' performance on high-stakes standardized national testing, has an impact on teachers' work. Critical policy scholars note that teachers experience high degrees of fear, worry, grief, and hopelessness as they navigate the contradictory and conflicting discourses of this policy terrain (Ball, 2016; Clarke, 2013; Singh, 2018). This has compelled those involved in education to send instructors to in-service training in order to help them improve their methods of instruction, which in turn has helped students' academic achievement.

Furthermore, according to Scully (2017), there have been recurrent requests for the establishment of both curriculum and assessment models that prioritize higher-order thinking rather than simply recall of information throughout schooling, certification, and licensure. Bloom's Taxonomy of educational objectives, which outlines six increasingly mental processes in which a learner might engage, is associated to higher-order thinking.

**III. Methodology**

This study approached the world with a pragmatic philosophical perspective. As a first step in conducting research, the researcher must create study schedules based on participant preferences in order to guarantee the study's applicability and relevance (Kelly & Cordeiro, 2020). In this study, a mixed-methods approach that combines quantitative and qualitative techniques was applied. A mixed method approach was used by the research scientist because it offers rich insights into how teachers use Bloom's Revised Cognitive Taxonomy in their instruction that cannot be fully understood by using only qualitative or quantitative methods. It can also integrate and synergize multiple data sources, which helps researchers study and seek a broad view of the study by allowing researchers to view the data from multiple perspectives (Poth & Munce, 2020; Shorten & Smith, 2017).

Quantitative research, as per Mohajan (2020), is a phenomena in which numerically stable precise data is collected and analyzed using mathematically based methodologies, particularly statistics that ask who, what, when, where, how much, how many, and how questions. Quantitative research, on the other hand, is original research in which the researcher chooses what to explore, asks a precise, narrow topic, obtains quantifiable data from participants, analyzes these numbers with statistics, and conducts the investigation in an unbiased, objective manner (Creswell, 2011 in Mohajan, 2020). As an outcome, a quantitative research approach was chosen for the investigation.

Qualitative research, according to Hennink, Hutter, and Bailey (2020), is a method that allows researchers to examine people's practices in depth using a specific set of research methods such as in-depth interviews, focus group discussions, observation, document analysis, visual methods, and life history. The ability to detect issues from the perspective of study participants and understand the meanings and interpretations they assign to behavior, events, or objects is a distinguishing aspect of qualitative research. Qualitative researchers, on the other hand, examine individuals in their natural contexts to see how the context of their life, such as the social, economic, cultural, or physical milieu in which they live, influences their experiences and behaviors. For this reason, the researcher used lesson observations and document analysis; examination papers and students' academic records to gain a better understanding of the teachers' utilization of Bloom's Cognitive Taxonomy in teaching in Nandi County's public secondary schools.

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Explanatory sequential design was used, where the researcher collected and assessed quantitative data, then conducted a qualitative phase based on the quantitative findings to further explore the quantitative findings from the first phase (Dawadi, Shrestha & Giri, 2021). The researcher first produced a summary and interpretations of the quantitative data, followed by an analysis of the qualitative data, integrated the results, and finally arrived at a conclusion based on the results (Creswell & Plano, 2018). 2055 instructors from 137 public secondary schools made up the study's sample. There were 360 teachers in the sample, drawn from 30 county schools. Simple random sampling was used to choose 30 county schools, and 12 Form 3 teachers who were teaching six chosen subjects were found there. 60 teachers were purposefully chosen from a pool of 360 teachers to gather information for the qualitative phase using a follow-up explanation technique. The instructors' questionnaire for gathering quantitative data and an observer's performance checklist for gathering qualitative data through lesson observation were the two instruments utilized to gather the data. Means, and frequencies were used to analyze the data.

## IV. Results and Discussions

The research objective was to determine teachers' utilization of Bloom's Revised Cognitive Taxonomy in teaching in county public secondary schools in Nandi County, Kenya. To accomplish this, two teachers in each of the six teaching subjects in each of the 30 county public secondary schools were given questionnaires to fill out, of which 355 questionnaires were returned. In addition, one lesson observation was carried out per subject in each of the six selected teaching subjects in each school. The study deliberated at the general utilization of Bloom's Revised Cognitive Taxonomy by teachers as well as an analysis of the utilization per each level of the taxonomy. The results are as presented below.

### Teachers' Utilization of Bloom's Revised Cognitive Taxonomy in Teaching

Generally, as shown in Table 1, 58% of the teachers utilized Bloom's Revised Cognitive Taxonomy in teaching and 42% did not utilize it. This showed that teachers utilized Bloom's Cognitive Taxonomy in their teaching in their classes. The percentages for each subject illustrate that Christian Religious Education utilized Bloom's Revised Cognitive Taxonomy the most in teaching, with 80%, followed by Chemistry (68%), Computer Studies (60%), English (55%), Business Studies (50%), and Mathematics, which was the least to utilized Bloom's Revised Cognitive Taxonomy in teaching, with 37%. These findings supported the findings of Hess, Jones, Carlock, and Walkup (2009, referenced by Karuguti, Phillips, and Barr, 2017), who claimed that using Bloom's Revised Cognitive Taxonomy aided tutors in creating lessons that worked and developed thinking abilities over a wide spectrum of cognitive complexity. Fetogang (2016) argued that teaching and assessing learners using Bloom's Revised Cognitive Taxonomy does not favour any particular subject and helps to determine the quality of cognitive skills and academic performance attained.

Table 1 *Teachers' Utilization of Bloom's Cognitive Taxonomy in Teaching*

| Subjects | Yes | | No | | Total | |
|---|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | Frequency | % |
| Mathematics | 22 | 37 | 38 | 63 | 60 | 100 |
| Chemistry | 41 | 68 | 19 | 32 | 60 | 100 |
| English | 33 | 55 | 27 | 45 | 60 | 100 |
| C. R. E | 48 | 80 | 12 | 20 | 60 | 100 |
| Business studies | 30 | 50 | 30 | 50 | 60 | 100 |
| Computer studies | 33 | 60 | 22 | 40 | 55 | 100 |
| **Total** | **207** | **58** | **148** | **42** | **355** | **100** |

### Teachers' Utilization of Different Levels of Bloom's Cognitive Taxonomy

Bloom's Revised Cognitive Taxonomy consists of the following six levels: remembering, understanding, applying, analyzing, evaluating, and creating. The first level is called remembering, and it requires students to recall previous information. The second level refers to understanding, which requires a student to state a problem or an idea in its own words. The third level of the taxonomy is applying, which needs the student to apply concepts to a new problem that embodies those concepts in a different way than originally presented. The fourth level of the taxonomy is analyzing, which requires students in Mathematics, Chemistry, English, Christian Religious Education (C.R.E.), Business studies, and Computer studies to break down material into its component parts and determine how they fit together. The fifth level of Bloom's Revised Cognitive Taxonomy is evaluating, which entails the student having to critique an idea in the selected subject understudy. Finally, creating is the sixth level of taxonomy, which is

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defined as the ability of the student to reorganize parts of knowledge into a different form or develop a new theory to explain some set of facts.

Zareian et al. (2015) said that Bloom's Revised Cognitive Taxonomy can be an effective criterion to assess learning activities and align teaching materials with the cognitive learning domains such as remembering, understanding, applying, analyzing, evaluating, and creating. Hence, teachers were requested to indicate their level of agreement or disagreement with regard to the utilization of different levels of Bloom's Revised Cognitive Taxonomy in teaching. The results were as shown in Table 2.

The results in Table 2 show that secondary school teachers generally strongly agreed (BCTI = 4.6) that they required students to remember what had been taught. However, only the chemistry teachers agreed (BCTI = 4.3) that they required students to remember the content taught. It also shows that at the understanding level, the secondary school teachers agreed (BCTI = 4.2) that they expected students to interpret information in their own words. However, English teachers strongly agreed (BCTI = 4.6) that students should interpret information in their own words. It was further found that secondary school teachers agreed (BCTI = 3.8) that they required students to utilize the knowledge taught to apply it in new situations. Teachers for all subjects agreed, except for computer studies, who were undecided (BCTI = 3.3) on requiring students to apply knowledge to new situations.

Table 2 Teachers' utilization of different levels of Bloom's Revised Cognitive Taxonomy's in Teaching

| BLOOM'S COGNITIVE TAXONOMY INDEX, BCTI | | | | | | | |
|---|---|---|---|---|---|---|---|
| Levels of Bloom's Cognitive Taxonomy / Subjects | Remembering | Understanding | Applying | Analysing | Evaluating | Creation | Average |
| Mathematics | 4.6 | 3.8 | 3.8 | 3.3 | 2.9 | 2.6 | **3.50** |
| Chemistry | 4.3 | 4.2 | 3.7 | 3.0 | 2.8 | 2.7 | **3.45** |
| English | 4.5 | 4.6 | 4.2 | 3.0 | 2.8 | 2.5 | **3.60** |
| C. R. E. | 4.8 | 4.4 | 4.1 | 3.2 | 3.2 | 2.7 | **3.73** |
| Business | 4.6 | 4.1 | 3.8 | 3.0 | 2.8 | 2.8 | **3.52** |
| Computer | 4.7 | 4.1 | 3.3 | 3.2 | 2.9 | 2.8 | **3.50** |
| **Total BCTI** | **4.6** | **4.2** | **3.8** | **3.1** | **2.8** | **2.7** | **3.55** |
| **Percentage** | **77** | **70** | **63** | **52** | **47** | **45** | **59** |

Additionally, from the results in Table 2, it was deduced that secondary school teachers for all the six subjects were generally undecided ($2.7 \trianglelefteq BCTI \trianglerighteq 3.1$) on the utilization of Bloom's Cognitive Taxonomy at the level of analyzing, evaluating, and creating. However, it was evidently clear that during teaching, teachers concentrated mainly on the lower levels of Bloom's Revised Cognitive Taxonomy since they scored high in terms of rating, with remembering scoring a Bloom's Cognitive Taxonomy Index, BCTI = 4.6, followed by understanding with 4.2 and applying 3.8, while the higher levels were not utilized mostly because they scored low in rating, as follows: analyzing scoring a Bloom's Cognitive Taxonomy Index, BCTI = 3.1, evaluating 2.8, and creating the least with a BCTI = 2.7, as shown in Table 7. These results translated to an overall Bloom's Cognitive Taxonomy Index of 3.55, which shows that the secondary school teachers generally agreed (BCTI = 3.55) that they utilized Bloom's Cognitive Taxonomy in teaching.

The use of Bloom's Revised Cognitive Taxonomy in the classroom has a substantial influence on teaching. For instance, according to Armstrong (2016), using Bloom's Revised Cognitive Taxonomy in the classroom is critical for producing an instructional dialogue in which both teachers and students grasp the aim of the conversation. Teachers benefit from utilizing Bloom's Revised Cognitive Taxonomy to organize teaching goals because classifying objectives helps them and their students define their goals.

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Teachers may plan and deliver appropriate instruction, devise legitimate assessment tasks and procedures, and verify that instruction and assessment are aligned with the objectives with the support of an organized set of objectives.

**Utilization of Verbs at Different Levels of Bloom's Cognitive Taxonomy in Teaching**

Further, teachers were asked to indicate how often they utilize verbs at different levels of Bloom's Revised Cognitive Taxonomy in teaching and the following were the results of their responses. The results in Table 3 indicate that, on the aggregate scale, secondary school teachers often utilize terms focusing on remembering (BCTI = 4.2) and understanding (BCTI = 4.3) in teaching. However, in terms of subjects, Mathematics, Chemistry, Christian Religious Studies (C.R.E.) and Computer studies often ($3.5 \leq$ BCTI $\geq 4.1$) utilize terms focusing on understanding, while English and Business studies teachers very often ($4.5 \leq$BCTI$\geq 5.0$) utilize terms at the understanding level in teaching.

Moreover, Table 3 indicates that secondary school teachers rarely utilize terms at the level of applying (BCTI = 3.4), analyzing (BCTI = 2.9), evaluating (BCTI = 3.4) and creating (BCTI = 3.1) in teaching. When specific subjects are considered, only the Mathematics (BCTI = 3.3) and Computer studies (BCTI = 2.8) rarely utilized the terms, focusing on application, while the teachers for other subjects often ($3.5 \leq$ BCTI $\leq 4.5$) utilized the terms at this level. Furthermore, English, Christian Religious Education (C.R.E), and Business Studies teachers frequently used terms at the evaluating level to teach ($3.5 \leq$ BCTI $\leq$ 4.4), whereas Mathematics, Chemistry, and Computer Studies teachers rarely ($2.5 \leq$ BCTI $\leq 3.4$) used terms at this level to teach. Generally, secondary school teachers rarely (BCTI = 3.1) utilize terms at creating level in teaching, as shown in Table 3.

Table 3 shows that teachers teach using the lower level of Bloom's Revised Cognitive Taxonomy for example from Table 3 remembering, understanding and applying scored a value between $3.4 \leq$ BCTI $\geq 4.3$ that they utilize Bloom's Revised Cognitive Taxonomy in teaching their learners. However, the higher level of Bloom's Revised Cognitive Taxonomy scored low responses in teaching for instance analyzing (BCTI =2.9), evaluating (BCTI = 3.4) and creating scored a BCTI of 3.1 which implied that they rarely utilize analysis, evaluation and creation in teaching. On aggregate the results in Table 8 showed that teachers oftenly (BCTI = 3.6) utilized Bloom's Revised Cognitive Taxonomy in teaching. This finding was inagreement with Setiyana and Muna, (2019)

Table 3 Utilization of Verbs at Different Levels of Bloom's Cognitive Taxonomy in Teaching

| BLOOM'S COGNITIVE TAXONOMY INDEX, BCTI | | | | | | | |
|---|---|---|---|---|---|---|---|
| Levels of Bloom's Cognitive Taxonomy / Subjects | Remembering | Understanding | Applying | Analyzing | Evaluating | Creation | Average |
| Mathematics | 3.5 | 3.9 | 3.3 | 2.8 | 3.3 | 2.9 | **2.73** |
| Chemistry | 3.9 | 4.2 | 3.5 | 3.0 | 3.2 | 3.2 | **3.50** |
| English | 4.3 | 4.9 | 3.8 | 2.7 | 3.7 | 3.2 | **3.77** |
| C. R. E. | 4.5 | 4.1 | 3.6 | 2.8 | 3.5 | 3.4 | **3.60** |
| Business studies | 4.9 | 4.6 | 3.5 | 3.3 | 3.5 | 3.1 | **3.82** |
| Computer studies | 3.9 | 3.5 | 2.8 | 3.1 | 3.0 | 2.8 | **3.18** |
| **Total BCTI** | **4.2** | **4.3** | **3.4** | **2.9** | **3.4** | **3.1** | **3.6** |
| **Percentage** | **70** | **72** | **57** | **48** | **57** | **52** | **60** |

who noted that the utilization of Bloom's Revised Cognitive Taxonomy in exam items and teaching was still prone to the utilization of lower lever order thinking which then manifests in the poor skilled thinking ability in students. This was supported by Alshare (2018) and Tuzlukova and Singh (2018) who said that to make students to think beyond the lower level of Bloom's Taxonomy in

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teaching and academics performance is still an area of concern amongst theorists and teachers, especially in this era of increased automation and digitization of traditional knowledge-based career fields. This is because employers in the 21st century are yearning for graduates who can think critically and solve problems.

**Utilization of Different Levels of Bloom's Cognitive Taxonomy During Lesson Observation**

In addition, the researcher observed and documented 60 lesson observations in the performance checklist to verify the utilization of different levels of Bloom's Revised Cognitive Taxonomy in teaching. The findings of the analysis derived from the checklist are shown in Table 4.

Table 4 shows that in all subjects, namely Mathematics, Chemistry, English, Christian Religious Education, Business studies, and Computer studies, Bloom's Revised Cognitive Taxonomy was utilized in teaching, as shown by the frequencies and percentages of each level. The results for specific subjects were as follows: in Mathematics' lesson observation, the percentages were as follows: remembering indicated 29%, understanding 17%, applying 24%, analyzing nine percent, evaluating twelve percent, and creating eight percent. This demonstrated that during Mathematics lessons, teaching was in the lower levels of Bloom's Revised Cognitive Taxonomy that is, remembering, understanding, and applying, and few lessons were in the higher order, that is, analyzing, evaluating, and creating. This result agrees with Karaali (2011 as cited in Meke, Wutsqa, & Alfi, 2018); among the questions and tasks he assigned to his students, he found that the majority of the teaching and questions were at the lower level of Bloom's Cognitive Taxonomy, and a few questions and teaching were at the higher level of Bloom's Cognitive Taxonomy. He argued that if Mathematics tutors do not find ways of using the highest level of Bloom's Revised Cognitive Taxonomy, then the claim for the centrality of Mathematics to the intellectual development of students may seem less justified. Instructors in mathematics education at both the secondary and post-secondary levels can improve students' critical thinking skills by (i) using instructional strategies that actively engage students in the learning process rather than relying on lectures and rote memorization, (ii) focusing instruction on the process of learning rather than solely on the content, and (iii) using assessment techniques that provide students with an intellectual challenge rather than memory routinization (Peter, 2012 as cited in Widana, Parwata, Parmithi, Jayantika, Sukendra, & Sumandya, 2018).

On the other hand, in Chemistry lessons, the percentages were as follows: remembering 30%, understanding 32%, applying 14%, analyzing 12 percent, evaluating eight percent, and creating six percent. This revealed that the majority of Chemistry lessons were in the lower levels of Bloom's Revised Cognitive Taxonomy, which are remembering, understanding, and applying, with only a few lessons in the higher order category, which is analyzing, evaluating, and creating. Yang, Zhang, Lu, and Ma (2012 as cited by Wang, Wang, Cai, Su, Ding, & Xu, 2021) urged instructors to utilize approaches that nurture the development of higher-order cognitive skills to connect concepts and apply the knowledge gained to new contexts during teaching and learning of Chemistry in the classroom.

Moreover, in English, it shows that 33% of lessons were on remembering, 27% were on understanding, 15% were on applying, 11% were on analyzing, eight percent were on evaluating, and five percent of teaching were on creating, as shown in Table 9. This showed that the bulk of the teaching was in the lower order of Bloom's Revised Cognitive Taxonomy that is remembering, understanding, and applying, and few teaching lessons were in the higher order, that is analyzing, evaluating, and creating. According to Kamlasi (2018), remembering taxonomy resulted in 22 items, or 44 percent of the total. Taxonomy presented two items, accounting for 4% of the total. The use of taxonomy yielded 21 entries, or 42% of the total. Five items were discovered at the analytical level, accounting for 10% of the total. As a result, because neither the evaluating nor the creating levels had any items, the evaluation and creation levels were not used to ask the students in the English test. Teachers should use Bloom's Revised Cognitive Taxonomy in teaching across all levels, according to the findings of this study. Other studies have found that teachers ask "remember" questions more frequently than "think provoking" questions. If learners and adults are to tackle challenges that necessitate reflective decision-making, higher levels of thinking are required (Mutay, 2012 as cited by Kamlasi, 2018; Setyowati, Heriyawati, & Kuswahono, 2020).

Further, in Christian Religious Education teaching lessons, the responses showed that 33% of teaching lessons were on remembering, 36% were on understanding, nine percent were on applying, 12 percent were on analyzing, five percent were on evaluating, and six percent were on creating, as shown in Table 4. Furthermore, in Business studies' teaching lessons, the scores were as follows: As shown in Table 4, 27% of the lesson observations were on remembering, 32% were on understanding, 16 percent were on applying, and both analyzing and evaluating had nine percent, while seven percent of the lessons observed were on creating. Also, the feedback for lesson observation during teaching in Computer Studies was as follows: remembering 34%, understanding 29%, applying 14%, analyzing nine percent, evaluating and creating seven percent.

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Table 4 Utilization of different levels of Bloom's Cognitive Taxonomy during lesson observation

| Levels of Bloom's Cognitive Taxonomy / Subjects | | Mathematics | Chemistry | English | C. R. E. | Business | Computer | Total |
|---|---|---|---|---|---|---|---|---|
| Remembering | Frequency | 91 | 78 | 65 | 86 | 71 | 66 | 457 |
| | % | 29 | 30 | 33 | 33 | 27 | 34 | 30.0 |
| Understanding | Frequency | 54 | 96 | 52 | 95 | 85 | 57 | 439 |
| | % | 17 | 33 | 27 | 36 | 32 | 29 | 29 |
| Applying | Frequency | 76 | 41 | 30 | 24 | 43 | 28 | 242 |
| | % | 24 | 14 | 15 | 9 | 16 | 14 | 16 |
| Analyzing | Frequency | 29 | 35 | 22 | 31 | 24 | 18 | 159 |
| | % | 9 | 12 | 11 | 12 | 9 | 9 | 10.0 |
| Evaluating | Frequency | 37 | 22 | 16 | 13 | 25 | 14 | 127 |
| | % | 12 | 8 | 8 | 5 | 9 | 7 | 8.0 |
| Creating | Frequency | 24 | 17 | 10 | 15 | 19 | 13 | 98 |
| | % | 8 | 6 | 5 | 6 | 7 | 7 | 6.0 |
| Total | Frequency | 311 | 289 | 195 | 264 | 267 | 196 | 1522 |
| | % | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

However, in conclusion as indicated in Table 4, the overall percentages for using Bloom's Revised Cognitive Taxonomy in teaching during lesson observation were as follows: remembering 30%, understanding 29%, applying 16%, analyzing 10%, evaluation scored 8.0 percent , and creating scored 6.0 percent. This demonstrates that the greater part of the teaching was at the lower level of Bloom's Revised Cognitive Taxonomy that is, remembering, understanding, and applying, and a small number of teaching was at the higher order, that is, analyzing, evaluating, and creating. This was in agreement with Setiyana and Muna (2019), who stated that the utilization of Bloom's Revised Cognitive Taxonomy in the classroom still leads to the use of lower-order thinking, which manifests it in students' weak skilled thinking capacity.

The summary of this objective shows that the results obtained from the researcher's observation, as shown in Table 4, and the results obtained from participants' perspective, as shown in Table 2 and 3 shows that teachers utilized Bloom's Revised Cognitive Taxonomy in teaching though the level of percentages differed greatly. For example, in table 2, each level of Bloom's Revised Cognitive Taxonomy participants' response were: remembering scored 77%, understanding scored 70%, applying scored 63%, analyzing scored 52%, evaluation scored 47%, and creation scored 45% which was higher than the researcher's observation where remembering scored 30%, understanding scored 29%, applying scored 16%, analyzing scored 10%, evaluation scored 8 percent and creation scored 6 percent.

The findings of this study matched those of Folasayo (2021), who found that teachers were lacking in their use of Bloom's Revised Cognitive Taxonomy of educational objectives in both lesson planning and presentation. It was revealed that in their class delivery, all of the teachers utilized in the study focused solely on the knowledge component of the taxonomy and only partially considered comprehension verbs. Despite the teachers' comprehension of what Bloom's Revised Cognitive Taxonomy comprises, other levels

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of Bloom's Revised Cognitive Taxonomy were mostly ignored. This suggests that the students produced by these educators may not be as productive as skillfully upright as they could be. The findings were consistent with those of Rupani (2011), Kolb (2014), and Irfan and Shelina (2016) as stated by Folasayo (2021), all of whom agreed that courses provided without proper incorporation of Bloom's taxonomy of educational objectives will make learning difficult and ineffective.

## V. Conclusion and Recommendations

The results demonstrated that teachers used Bloom's Revised Cognitive Taxonomy when instructing students in their classes. The results from the researcher's observation and the participants' perspective both indicated that teachers used Bloom's Revised Cognitive Taxonomy in their lessons, but the percentages were significantly different because the participants' responses were higher than the researcher's observation. This means that nearly all teachers do not practically fully utilize Bloom's Revised Cognitive Taxonomy in their lessons. Thus, all instructors in the public secondary school in Nandi County, Kenya who teach Mathematics, English, Christian Religious Education, Chemistry, Business studies, and Computer studies make equal utilization of Bloom's Revised Cognitive Taxonomy and avoid focusing on its lower levels in their instruction. Instead, they maximize all of the levels, including remembering, understanding, applying, analyzing, evaluating, and creating so that it promotes a deep approach to teaching and critical thinking experience.

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