Relationship between Teachers' Utilization of Bloom's Cognitive Taxonomy in Teaching and Students' Academic Performance in Public Secondary Schools in Nandi County, Kenya

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ABSTRACT

There is a widespread concern by stakeholders about the academic performance in public secondary schools in comparison to private schools. The utilization of Bloom's Taxonomy should ideally inculcate improvement in performance. The study therefore endeared to examine the relationship between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and students' academic performance in public secondary schools in Nandi County, Kenya. The objective of the study was to investigate the relationship between the utilization of Bloom's Taxonomy in teaching and academic performance. The study adopted a pragmatic paradigm. This study was based on Bloom's Cognitive Taxonomy. This study utilized a mixed method research approach with an explanatory sequential design. 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 and examination. Data was analyzed using Chi-square. The study revealed a positive relationship between the utilization of the taxonomy in teaching and academic performance ($?^2$ = 25.57 with C = 0.26). The study therefore concluded that, the association between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and academic performance is significant but weak (C = 0.26) and contributes very little (about 6.8%) towards improvement in academic performance. This study recommended that all teachers should utilize Bloom's Taxonomy and maximize all the levels of it in teaching so as to promote an insightful approach to learning and critical thinking experience that will enhance academic performance for the students.

Key words: Relationships, Bloom's Taxonomy, Teaching, academic performance, and public schools.

INTRODUCTION

Bloom's Taxonomy is a multi-tiered sculpt of categorizing thoughts in accordance with the six stages of cognitive taxonomy of difficulty that is remembering, understanding, applying, analyzing, evaluating, and creating. The stages have often been portrayed as a journey of steps all over the years, making many teachers persuade their students to "ascend to advanced level of thinking" (Forehand, 2017). The taxonomy helps teachers describe and differentiate various stages of human cognition; thoughts, knowledge, and understanding. Teachers frequently utilized Bloom's Cognitive Taxonomy to keep informed or steer the setting of appraisals (assessment of learner education), syllabus (units, lessons, projects, and other educational actions), and teaching methods such as questioning strategies (Bloom's Taxonomy, 2014 as cited by Forehand, 2017).

According to research, students' academic success is determined by their thinking and non-thinking traits as well as the sociocultural setting in which the learning process takes place (Lee & Stankov, 2016; Liem &

McInerney, 2018; Liem & Tan, 2019). This demonstrates that student accomplishment is extremely important and should be given top attention in any developing country's short-and long-term goals to be achieved.

Objective

The objective was to investigate the relationship between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and academic performance in public secondary schools in Nandi County.

Hypothesis

The study hypothesized that there was no significant relationship between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and students' academic performance in public secondary schools in Nandi County.

LITERATURE REVIEW

Specific concepts of educator accountability and responsibility are closely tied to policy discourses on teaching quality. Teachers' work is evaluated in terms of value-added metrics, which promise to analyze individual teacher production versus individual child and the whole class test score performance and compensate teachers accordingly, according to the accountability reform paradigm (Berliner, 2014, cited in Singh, Allen , & Rowan, 2019). Teachers' work is being influenced by the market-driven per-formativity agenda of neoliberal education policies, which pits teachers' success against students' achievement on high-stakes standardized national testing. As teachers manage and handle the paradoxical and clashing discourses of this policy terrain, critical policy scholars report high levels of fear, anxiety, sorrow, and loss of hope (Ball, 2016; Clarke, 2013; Singh, 2018). This has forced education stakeholders to take teachers to in-service training so that they improve their mode of teaching, thus improving the academic performance of learners.

Bloom's Taxonomy of Objectives

Bloom's Taxonomy is a classification, according to Atherton (2013), therefore the taxonomy of teaching and education aims is an endeavor within the behavioural paradigm to categorize forms and stages of learning. The three learning domains recognized are cognitive, emotional, and psychomotor, and each is structured as a series of levels or prerequisites. It is claimed that lower levels of taxonomy must be addressed first before moving on to higher levels. Bloom's Taxonomy proposes a means of classifying learning levels in terms of the expected maximum quantity for a specific subject and gives an elementary progressive model for dealing with themes in educational programs. For example, in the cognitive domain, during the preparation of trainees in colleges, tutors may teach comprehending, recalling, and applying but may not concern themselves with analyzing, evaluating, or creating, but comprehensive professional training may be required to include synthesis and evaluation as well.

Affective domain

This is one of Bloom's taxonomies that has received very little attention compared to the cognitive domain. Its main interest is values, or more accurately, concerns about value perception, and it spans the spectrum from simple awareness to the ability to detect implicit values through analysis. Attitudes, behaviours, and physical abilities can all be part of learning. Our feelings, emotions, and attitudes are all part of the affective domain (Atherton, 2013, Hoque, 2016, Kin et al., 2021).

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Psycho-Motor Domain

According to Atherton (2013) and Hoque (2016), there have been some efforts to complete the psycho-motor domain because Bloom did not complete it until the 1970s, when it was completed.

One of the fundamental variants, as suggested by Dave (1975) and quoted by Atherton (2013), fits within the growing skills paradigm. Reynolds (1965), as mentioned by Atherton (2013), establishes and emphasizes the importance of imitation in skill acquisition.

The physical encoding of information, movement, and/or activities using the gross and fine muscles for expressing or understanding information or concepts have traditionally been the focus of these types of aims. Natural autonomic responses or reflexes are included in this category. Using and coordinating motor skills is part of the psychomotor domain. Perception, set, directed reaction, mechanism, complicated overt response, adaptability, and genesis are the seven categories under which this is classified (Hoque, 2016).

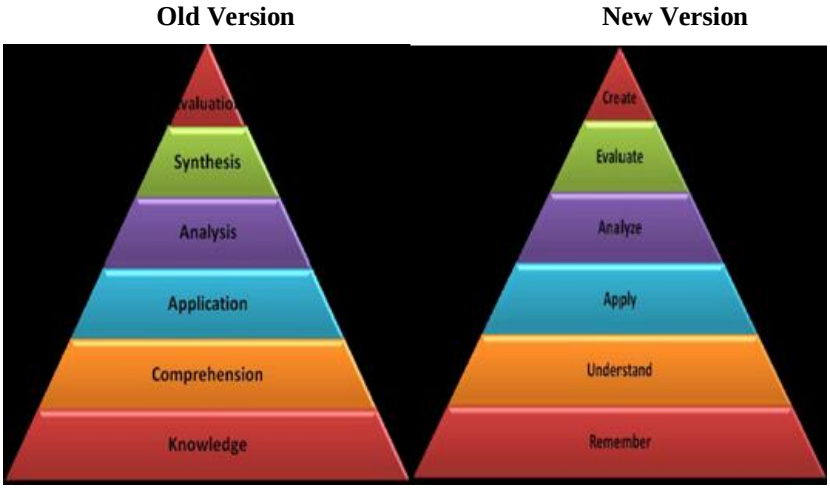
Cognitive Domain

The cognitive domain is the one that is used the most. Bloom's Cognitive Taxonomy is a classification system for claims about what students should understand as a result of learning in a specific educational goal. Six stages were recognized, ranging from the most basic to the most advanced, and from concrete to abstract; a simpler skill or ability must be mastered before moving on to a more advanced skill or ability (Krathwohl, 2002 as cited in Cengiz & Cakir, 2016).

The goal, according to Bloom (1956), as stated by Cakir and Cengiz (2016), is to improve the exchange of beliefs and learning resources among test professionals and those involved in educational research and curriculum creation. Bloom's Cognitive Taxonomy was first published in 1956 and has since been translated into 22 other languages. In educational research, it is still commonly used (Davidson & Baldwin, 2005, as cited in Cengiz & Cakir, 2016). Bloom's Cognitive Taxonomy was revised and republished in the year 2001, using new terms. This was due to adjustments made by a group of cognitive psychologists led by Anderson, a Bloom student. Figure 1 below shows a comparison of the two variants.

Figure 1

Old and New version of Bloom's Cognitive Taxonomy



Bloom's Cognitive Taxonomy: Old Version and New Version (Cengiz & Cakir, 2016)

The key difference between the two types is that six major phases from noun to verb forms have been

switched. For instance, "knowledge" became "remember," and "fully comprehend" became "understand." Another difference is that the old version's synthesis and evaluation levels have been replaced with evaluate and produce levels. As a result, recall, understand, apply, analyze, evaluate, and create are the phases of the revised Bloom's Cognitive Taxonomy. Every level has a verb that symbolizes a cognitive process and a word that describes the expected knowledge. Depending on the situation, each has a purpose, but the ultimate goal must be to reach higher degrees of cognitive development in learning (Cengiz & Cakir, 2016, Kin et al., 2021). It's worth noting that the new top category, which focuses on the ability to generate new knowledge inside the area, marks still another distinction (Wilson, 2016a). In this study, the researcher looked into the link between instructors' use of Bloom's Cognitive Taxonomy in teaching and students' academic achievement.

Utilization of Bloom's Taxonomy in Teaching

Teaching is described as a series of planned and organized activities carried out under the direction of teachers in a controlled environment with the goal of providing effective learning for the individual (Orhaner & Tunç, 2003; Ta?pinar, 2005 as referenced in Öztürk, 2021). Teachers are the most important component in achieving rational teaching in an environment that includes students, teachers, subjects, objectives, methods, and equipment. Teachers must also be familiar with their pupils and subjects, develop objectives, and plan the teaching location in order for these components to work together (Orhaner & Tunç, 2003; Riedler & Eryaman, 2016 in Öztürk, 2021). When a teacher is able to identify what he or she wants to accomplish during the teaching process, it is possible to create meaningful teaching. This not only makes it easier to achieve goals when they are well defined, but it also makes it easier for students to achieve higher levels of cognitive development because they know exactly what is expected of them during and after the teaching process because instructional objectives are clearly defined and structured (Sobral, 2021).

Role of Academic Performance for learner and society

Academic performance is a major worry for educational experts since failure in national exams signifies doom for students, whose lives become unpredictable and depressing. Academic performance impacts whether students will attend university or other tertiary institutions after high school. As a result, a student's life is shaped by their academic success on national exams. As a result, secondary school administrators in Kenya are under pressure to improve students' marks on the Kenya Certificate of Secondary Education (KCSE) (Nyagosia,Waweru & Njuguna, 2013). Edmonds (1981), Scheerens and Bosker (1997), Lezotte, Skaife and Holstead (2002), Kirk and Jones (2004), and Daggett (2005), all cited in Nyagosia, Waweru, and Njuguna (2013), have shown that successful schools have distinct characteristics and processes that enable all students to achieve high levels of learning.

Teachers assess learning by identifying specific goals and objectives for each subject or class, carefully gauging the amount to which these expected outcomes are met, and determining the degree to which learning occurs (Raty et al., 2006, cited from Gichuhi, 2014). Teachers are also obliged to clarify the role of assessment in making instructional and pedagogical decisions when conducting assessments in the classroom (Danielson, 2008; Stake, 2004, as cited from Gichuhi, 2014). It is possible for teachers to become engrossed in their work and lose sight of the precise aim of a particular assessment aspect, according to Rust (2002), as stated by Gichuhi (2014). There's a chance that the goal won't be met, or that they'll ignore another type of evaluation that would be more suited. In addition, according to Rust (2002, as referenced in Iron & Elkington, 2021), teachers assess students for a variety of reasons, including motivating, creating learning opportunities, providing feedback, grading, and as a quality assurance process (both internal and external systems).

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METHODOLOGY

This study used a pragmatic philosophical approach to the world. The starting point for research is that the researcher has to develop study schedules anchored in participants' familiarities to ensure the practicability and relevance of the study (Kelly & Cordeiro, 2020). A mixed method research technique was used in this study, which combined quantitative and qualitative strategies. The research scientist used a mixed method approach because it provides rich insights into the relationship between teachers' use of Bloom's Cognitive Taxonomy in teaching and students' academic performance that cannot be fully understood by using only qualitative or quantitative methods because it can integrate and synergize multiple data sources, which aids researchers in studying and seeking a broad view of the study by allowing researchers to view the data from multiple perspectives (Poth & Munce, 2020; Shorten & Smith, 2017). Explanatory sequential design was adopted where the researcher gathered and evaluated quantitative data, which was followed by a qualitative phase based on the quantitative findings in order to expand on the first phase's quantitative findings (Dawadi, Shrestha & Giri, 2021). After generating a summary and interpretations of the quantitative data, the researcher analyzed the qualitative data, then integrated the findings, and ultimately came to a conclusion based on the findings (Creswell & Plano, 2018). 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. A follow-up explanation model was considered to purposively select 60 teachers from 360 teachers to collect data for the qualitative phase. Three instruments were used to collect data that is the teachers' questionnaire and document analysis, that is, examination papers and students' academic performance for collecting quantitative data, and an observant's performance checklist for collecting qualitative data from lesson observation. Data was analyzed using means and Chi-square as per the objectives and hypotheses of the study.

RESULTS AND DISCUSSIONS

The researcher used form three end-of-year examinations, which were standardized before being analyzed. The Chi square was utilized to analyze the relationship between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and academic performance in public secondary schools in Nandi County by testing the null hypothesis below. The hypothesis was rejected when the calculated value was greater than the critical value and accepted when the critical value was greater than the calculated value.

H_{O1}: There is no significant relationship between utilization of Bloom's Cognitive Taxonomy in teaching and students' academic performance in Public Secondary schools in Nandi County.

The respondents were asked to indicate whether they utilize Bloom's Cognitive Taxonomy in teaching, and the results in Table 1 below were obtained. These results were further analyzed using Chi square and the results achieved were as follows: $?^2 = 25.57$, $p = 0.008$, $N = 355$ and degree of freedom (df) = 11 at a significant level of 0.05 and the contingency coefficient, C equals to 0.26. This showed that there was a significant relationship between teachers' utilization of Bloom's Cognitive Taxonomy and academic performance. The association between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and academic performance is significant but weak (C = 0.26). The utilization of Bloom's Cognitive Taxonomy in teaching contributes very little (about 6.8%) towards improvement in academic performance.

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**

However, when the results in Table 2 below were utilized to test the significance of teachers' utilization of Bloom's Cognitive Taxonomy in teaching and students' academic performance, the results were ?2 = 159.589, degree of freedom, df = 10, at a significance level of five percent. The table value of $?^2$ for 10 degrees of freedom at the 0.05 level of significance is 18.307. The results show that the calculated value of $?^2$ is much higher than the table value, and hence the result of the research does not support the hypothesis. Thus, the relationship between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and students' academic performance is significant but weak (C = 0.31). The utilization of Bloom's Cognitive Taxonomy in teaching contributes very little (about 8.15%) towards the improvement of students' academic performance.

Table 2

Relationship between Bloom's Cognitive Taxonomy in Teaching and Academic performance

Levels of Bloom's Cognitive Taxonomy	Academic performance							
	Below average		Average		Above average		Total	
	F	%	F	%	F	%	F	%
Remembering	75	21	105	30	175	49	355	100
Understanding	51	14	115	32	189	53	355	100
Applying	55	15	123	35	177	50	355	100
Analyzing	132	37	99	28	124	35	355	100
Evaluating	52	15	168	47	135	38	355	100
Creating	70	20	188	53	97	27	355	100
Total	435	20	798	38	897	42	2130	

The overall results indicate that 20% of the students scored below average, 38% scored average, and 42% scored above average when teachers utilized Bloom's Cognitive Taxonomy in teaching. This shows that most of the students (80% scored average and above) perform well when Bloom's Cognitive Taxonomy was utilized in teaching. Furthermore, the results in Table 2 indicate that the association between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and students' academic performance is significant ($?^2$ = 159.598, degree of freedom = 10, at a significance level of 0.05) but weak since the contingency coefficient (C) equals to 0.31. Hence, teachers' utilization of Bloom's Cognitive Taxonomy in teaching contributes very little (about 8.15%) towards improvement in academic performance. These results were similar to those of a study by Morton and Colbert-Getz (2017) who argued that there was a small difference in academic performance at a higher ordered level but no difference at a low-order level when Bloom's Cognitive Taxonomy is used in teaching.

The findings of this study were also similar to those of Malik's (2019) article, which compared the current teaching and learning approach of an introductory programming (IP) course with Bloom's taxonomy's six categories, where the assurance of learning (AOL) process was incorporated in the Introductory Programming course to assess students' learning outcomes on the basis of achiever (high, medium, and low) and performance (very good, good enough, and not good enough) categories. The findings revealed that the IP course's existing teaching and learning approach handled all six Bloom's taxonomy areas. The majority of pupils (63%) are in the middle achiever category. Furthermore, half of all learners' learning results fall into the "not good enough" group.

CONCLUSION AND RECOMMENDATIONS

The findings showed that the association between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and students' academic performance in public secondary schools was significant but weak. The utilization of Bloom's Cognitive in teaching contributed very little (about 8.15 percent) towards improvement in academic performance. Generally, the utilization of Bloom's Cognitive Taxonomy in various subjects under study was balanced or high, which means there was a high relationship between teachers' utilization of Bloom's Cognitive Taxonomy in teaching and academic performance in public secondary schools. Thus, all teachers teaching selected subjects should utilize Bloom's Cognitive Taxonomy equally and avoid concentrating on the lower levels of Bloom's Cognitive Taxonomy in teaching and instead maximize all the levels that is remembering, understanding, applying, analyzing, evaluating, and creating when teaching their learners in public secondary schools so that it promotes a deep approach to teaching and critical thinking experience that would enable their learners to master the content very well.

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