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Students' Cognitive Development in Basic Level Schools in Nepal: Provisions and Practices

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Abstract

This study explores the current status of basic-level students' cognitive learning and examines how school education provisions are functioning to facilitate perceptive education. The study was conducted by adopting a mixed-method research design, including a quantitative survey and a qualitative case study for data generation from six schools in four districts across the country. With a small research grant support from UNESCO Nepal, this research was conducted under the Centre for Educational Research, Innovation and Development (CERID) to provide a new and innovative concept to learning from different aspects ranging from knowing to creating. Students' achievement at six levels of cognitive development was evaluated based on a questionnaire containing items from the revised Bloom's taxonomy of educational objectives. Classroom practices were systematically observed, and the main events and activities were recorded. The study revealed that the students performed better in remembering and showed lower performance at creating level. Classroom pedagogies were found dominantly lecture-based and concentrated around the acquisition of knowledge from the textbook. Besides, teachers were found not preparing the lesson plan, nor were they taking classes in a planned way. There was no plan, program, or practice regarding cognitive teaching-learning for addressing the specific potentials, weaknesses, and aptitudes of students at the basic level of education in Nepal.

Keywords: *Classroom practices, cognitive learning, basic level school*

Introduction

Education is meant to facilitate learning - thereby enriching an individual's knowledge, skills, experience, values, and beliefs. Cognitive development is an important aspect of learning (Crowe et al., 2008; Shepard, 2019). Cognition is concerned with knowing and thinking, which encompasses remembrance, care, and awareness (Elliott et al., 2000; Lövdén et al., 2020). For Ashman and Conway (1997), cognition involves awareness, judgment, and understanding of emotions. They suggested it is better to consider the process and understand the way students attempt a task and reach the solution. Cognitive psychology distinguishes knowledge as declarative (knowing about something i.e. factual and conceptual); procedural (knowing about how to do something); and conditional (knowing about when to apply declarative or procedural knowledge). The classroom process plays a pivotal role in encouraging school children in creating (Bolden & DeLuca, 2022). Classroom activities should encourage students to think for themselves and find support for their points of view.

Article 13 of the UN emphasizes education as a basic human right. The Education for All (EFA) movement started in 1990 and led by UNESCO has successfully brought about changes in many countries, including Nepal, to address the need for providing access to primary education for all. Today most primary school-aged children in Nepal are enrolled in schools, whereby the net enrolment ratio (NER) is over 95%. The challenge for school education in the country is to ensure that the students get a quality education.

Education is meant to facilitate learning, thereby enriching an individual's knowledge, skill, values, beliefs, and habits. Learning encompasses reminiscence, kindness, and sensitivity. (Gomez Zaccarelli et al., 2018). Cognitive psychology distinguishes knowledge as declarative (knowing about something factual and conceptual); procedural (knowing about how to do something); and conditional (knowing about when to apply declarative or procedural knowledge). Learners were classified as having one or two distinct concept-building approaches. Three types of cognitive learning, viz. declarative, procedural, and conditional, are usually embraced in the Nepalese school curriculum using Bloom's taxonomy of the cognitive domain. It emphasizes the translation of curriculum objectives in the lesson during teaching-learning and also assesses informative as well as summative manners.

The main problem of school education in Nepal is focusing only on teaching rather than on learning. Learning cannot take place without the learner's active participation in the learning process (Ghahremani et al., 2022). There is a scope and need for investigating how the provisions of school education are functioning towards facilitating learning. In this paper, we propose that students' differences in concept building can be evaluated using different aspects of revised Bloom's taxonomy of educational objectives.

Research Methodology

Six schools from four districts across the country were selected. There were altogether 238 students comprising 131 from community schools and 107 from institutional schools. In total, 132 boys and 106 girls were sampled for performance evaluation. The study used a cross-sectional design and utilized mixed-method research involving the quantitative survey and qualitative case study methods for data collection and analysis. Test items were developed from the grade five curriculum (Curriculum Development Centre [CDC], 2005) based on the revised Bloom's taxonomy covering all levels of cognitive learning – remembering, understanding, applying, analyzing, evaluating, and creating. The test was made reliable and valid by pilot testing and cross-checks by subject experts. QUAN-qual data were taken from a survey questionnaire in-depth interviews with teachers of the basic level, the students of the same level, and observation of classroom teaching-learning was also carried out. Classroom teaching-learning practices of the sampled school were observed for identifying the emphasis on the cognitive development of the students.

Observation of Teaching Learning

Classroom teaching-learning practices of grade five teachers were observed based on the prepared guidelines. Two observations were conducted –the first was on the day of the school visit, which was an unannounced observation; and the next observation was announced as the subject teacher was informed about it. The school students' knowledge level, process skills, and attitudes, and the effect of gender and residence of the students on their knowledge level of process skills and their attitudes (Zeidan & Jayosi, 2015) were tested. The researchers recorded all the important aspects of the sampled schools and observed the physical as well as the instructional conditions of the schools. Recorded data from the schools were evaluated after school time; pertinent observations were highlighted, and the question mark was put in for further elaboration or clarification. The visit-revisit method was used to obtain in-depth information from the sampled schools.

Study Approach

Table 1: Study Approach

Objectives	Tools	Expected outcomes
Objective 1: Study the current status of children's cognitive learning in schools in grade 5.	• Customized test with specified cognitive level items (about 3 items for each of the 6 levels of close and open questions)	• Identification of achievement of students across the cognitive levels
	• Follow-up interaction with sampled students (2 low-achievement, 2 mid-level, and 2 high-level achievement students)	• Description of the thinking process of students in attempting an item/task as exemplars
Objective 2: Study how school education provisions function in facilitating cognitive learning.	• Classroom observation to find out how cognitive thinking is promoted in teaching-learning (2-3 classes of the sampled teachers observed)	• Description of the teaching-learning process – regarding in what way it is promoting cognitive thinking • Identify the hindering or facilitating aspects in the teaching-learning practice for the promotion of higher-order thinking
	• Follow-up interaction with teachers to find out their planning and approaches in the development of different levels of cognitive thinking in the students	• Narrate teacher perception and practices in their emphasis on the cognitive development of students (based on the curriculum)

Result and Discussion

Students' Achievements at Different Levels of Cognitive Domain

In total, 238 students, 107 from institutional and 131 from community schools were tested for measuring their cognitive achievements in grade five by utilizing the test. The scores obtained were analyzed and interpreted using different statistical tools.

Table 2*: Frequency distribution of total sampled students in the range of scores on achievement tests at six levels of Bloom's taxonomy (revised version)*

Test Score	Remembering (%)	Understanding (%)	Applying (%)	Analyzing (%)	Evaluating (%)	Creating (%)
0-20	54 (22.7)	166 (69.7)	83 (34.9)	70 (29.4)	58 (24.4)	221 (92.9)
21-30	67 (28.2)		50 (21.0)	50 (21.0)	57(23.9)	16 (6.7)
31-40	-	49 (20.6)	41 (17.2)	46 (19.3)	95 (39.9)	1 (0.4)

41-50	69 (29.0)	22 (9.2)	46 (19.3)	26 (10.9)	17 (7.1)	-
51-60	-		11 (4.6)	23 (9.7)	11 (4.6)	-
61-70	-	1 (0.4)	5 (2.1)	15 (6.3)	-	-
71-80	34 (14.3)	-	1 (0.4)	6 (2.5)	-	-
81-90	-	-	1 (0.4)	2 (0.8)	-	-
91-100	14 (5.9)	-	-	-	-	-

The frequency distribution and percentage (in brackets) of students in different categorical ranges of scores for the six levels of the cognitive domain were up to 100 percent.

The data indicates a higher proportion of student's (>50%) scores lie below 31 out of 100 at all six levels of the cognitive domain. A larger range of scores was visible in the remembering level, while in creating a level, 99.6% of students' scores were from 0 to 30.

At the remembering level, 5.9% of students' scores were recorded from 91 to 100, whereas only 0.8% and 3.3% of students scored above 70 in the application and analysis levels respectively. At the level of evaluation, no students scored above 60. Similarly, at the creation level, 92.9% of students scored between 0-20 and no students scored above 40. It was remarkable that 27.3%, 7.6%, and 25.2% of students didn't respond correctly to any of the questions in understanding, applying, and creating levels, respectively.

The mean percentage score achieved by grade six students was 39.59 % and that for grade eight students at 29.62% (Education Review Office [ERO], 2013). Another study conducted among grade five students by the Ministry of (Education Science and Technology (MOEST), 1999) found a mean percentage score of 45.56%. The findings of this study showed that the student's achievement level varies for different levels of the cognitive domain. The highest proportion of students obtained better scores at the remembering level and very low at creating level. Another study conducted by ERO, (2013) found that students are weak in creating types of problems.

After the test was administered, the students' achievements were analyzed statistically and interpreted - descriptively to present the students' cognitive ability at different levels of the cognitive domain.

Students' achievement by taxonomic categories

Table 3: *Institutional and community school-wise mean achievement of the grade five students in six taxonomic categories of the cognitive domain*

School Type	**Mean Scores**					
	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Community	35	18	30	28	31	7
Institutional	43	20	26	36	30	9
Total	38	19	28	32	30	8

Table 3 presents the students' achievements in the six taxonomic categories, in terms of mean percentage that is, 38 in remembering, 19 in understanding, 28 in applying, 32 in analyzing, 30 in evaluating, and 8 in answering creating. Comparing students' performance in terms of community and institutional schools, the students of institutional schools have scored higher in remembering, analyzing, and creating than community school students in remembering, understanding, analyzing, and creating, whereas the students of community schools scored higher than those of institutional schools in applying and evaluating. Overall, of all the six cognitive areas, the students scored highest at the level of remembering and lowest at the level of creating. However, having relatively higher marks at the remembering level, total students' mean scores for both types of schools were below 45, which is not a satisfactory score in performance evaluation.

The General Linear Model (GLM) procedure using SPSS for Windows was used, for instance, to investigate how grade five children educated in community schools differed from those educated at institutional schools in the six different cognitive abilities. Using ANOVA, his study examined how the two distinct groups differed in terms of a linear combination of the six measures.

Table 4: *Descriptive Statistics and Test of Subjects Effects for Different Cognitive Levels and Types of Schools*

Cognitive areas (Dependent variable)	Schools Type	Mean Score (maximum 100 for each)	Standard Deviation	Type III Sum of Squares	Df1	Df2	Mean Square	F	Sig.	Partial Eta Squared
Remembering	Public	34.5	27.1	3751.8	1	236	3751.8	4.52	.04	.02
	Private	42.5	30.8							
Understanding	Public	17.6	15.8	477.6	1	236	477.6	1.98	.16	.01
	Private	20.4	15.2							
Applying	Public	30.3	17.6	1277.2	1	236	1277.2	4.41	.04	.02
	Private	25.6	16.3							
Analyzing	Public	28.2	18.5	3946.9	1	236	3946.9	11.49	.00	.05
	Private	36.4	18.6							
Evaluating	Public	30.7	13.0	61.1	1	236	61.1	.40	.53	.00
	Private	29.7	11.4							
Creating	Public	7.2	7.1	295.6	1	236	295.6	5.59	.02	.02
	Private	9.4	7.5							

'Wilk's Lambda test' at the alpha level of 0.05 indicates that the multivariate effect is statistically significant for the cognitive ability test, Wilk's $\Lambda = 0.87$, $F(6, 231) = 5.66$, $p (=0.00) < .001$, multivariate $\eta^2 = 0.13$. This significant F (=5.66) indicates significant differences in terms of a linear combination among the types of schools selected for the study. The multivariate $\eta^2 = 0.13$ indicates that 13% of the multivariate variance of the dependent variables is associated with the group factor.

Table 4 illustrates the F, p, and η^2 values for different cognitive levels. For the remembering level, F= 4.52, p = 0.04 and η^2 = 0.2; for the understanding level, F= 1.98, p = 0.16 and η^2 = 0.01; for the applying level, F= 4.41, p = 0.04 and η^2 = 0.02; for the analysing level, F= 11.45, p = 0.00 and η^2 = 0.05; for the evaluating level, F= 0.40, p = 0.53 and η^2 = 0.00; and for the creating level, F= 5.59, p = 0.02 and η^2 = 0.02. It presents that the p-value for remembering, applying, analysing, and creating is less than α = 0.05 indicating the significant difference in the community and institutional school students' cognitive achievement. A big significant gap in achievement was found at the analysing level. Institutional school students achieved significantly higher scores than community school students in remembering, analysing, and creating levels. On the other hand, community school students achieved significantly higher than institutional school students in application-level tests. The P-value for understanding and evaluating levels was found to be greater than α = 0.05, showing that community and institutional school students' achievement at these levels does not differ significantly.

Sex-based achievements at different levels of the cognitive domain

Overall, 238 students, 132 male, and 107 female students achievements were analyzed using different statistical tools to find their performance at different levels of the cognitive domain in Bloom's taxonomy (revised).

Table 5: *Sex-based analysis of the mean achievement of grade five students at different levels of revised Bloom's taxonomy*

Gender	Mean Scores					
	Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Male	43	18	29	35	29	8
Female	32	19	28	28	32	9
Total	38	19	28	32	30	8

Table 5 elaborates on the mean scores of male students' remembering, applying, and analyzing levels were relatively higher in comparison with that of female students. The mean scores of female students are slightly higher in understanding, evaluating, and creating levels in comparison with their counterparts. Both sex groups' achievement scores were very low at the creating level, showing that both male and female students were weak at this level relative to other levels of the cognitive domain.

The General Linear Model (GLM) procedure and the ANOVA test were implemented to examine how the two distinct sex groups' achievements differed significantly in a linear combination of the six measures of the cognitive domain.

Table 6: *Descriptive Statistics and Test between Subjects Effects for Different Cognitive Levels (Dependent Variables) and Sex of Students (Independent Variable)*

Cognitive areas (Dependent variable)	Sex	Mean Score (maximum100 for each)	Standard Deviation	Type III Sum of Squares	Df1	Df2	Mean Square	F	Sig.	Partial Eta Squared
Remembering	Male	42.8	30.2	6471.4	1	236	6471.4	7.91	.01	.03
	Female	32.3	26.5							
Understanding	Male	18.4	15.63	48.2	1	236	48.2	.20	.66	.00
	Female	19.3	15.6							

Applying	Male	28.5	18.9	36.1	1	236	36.1	.12	.73	.00
	Female	27.8	14.7							
Analyzing	Male	34.6	18.4	2265.8	1	236	2265.8	6.46	.01	.03
	Female	28.4	19.8							
Evaluating	Male	29.1	11.9	384.3	1	236	384.3	2.57	.11	.01
	Female	31.7	12.7							
Creating	Male	7.7	6.8	57.8	1	236	57.8	1.07	.30	.01
	Female	8.7	8.0							

Wilk's Lambda test' at an alpha level of 0.05 indicates that the multivariate effect is statistically significant for the cognitive ability test, Wilk's Λ = 0.09, F (6, 231) = 388.19, p (=0.00) < .001, multivariate η^2 = 0.91. This significant F (= 388.19) indicates that there were significant differences among male and female students on a linear combination of the dependent variables.

Table 5 illustrates the F, p, and η^2 values for different cognitive levels concerning sex. For the remembering level, F= 7.91, is greatest than other levels with p = 0.01 and η^2 = 0.32. It is noteworthy for the analyzing level that, the F value (0.12) is the lowest among all categories of the cognitive domain and the p-value 0.01 obtained is less than α 0.05, showing a significant difference in mean achievements of the male and female students in the test. The male students with a mean score of 34.6 had better-analyzing capacities than the female students with a mean score of 28.4 in grade five. For other levels, it was found that sex has no significant effect on achievement tests.

Provision of Cognitive Learning in the Curriculum

The objectives of basic education emphasize nationalism, the development of inclusive attitudes, and awareness about human rights (CDC, 2005). Along with these objectives, lower secondary education also emphasizes the development of a positive attitude toward work. Based on the NCF, basic education aims to develop the innate ability of each child through child-centered education (McCormick & Chao, 2018). As regards the cognitive development of the students, the curriculum has a provision for critical and creative thinking, while in terms of the national objectives and the level-wise objectives it mentions basic knowledge and life skills development, communication technology, environment, and health. It also provides developing creative skills in basic level students.

The specific objectives are formulated for each unit. The curriculum also provides guidelines for the assessment along with a test table of specifications. Readiness abilities have noteworthy associations with later student achievements, independent of cognitive readiness, largely due to a limited range of non-cognitive abilities (Zeidan & Jayosi, 2015).

School-level education is viewed as the storage of knowledge, research methodology, and the way of thinking which helps understand natural events and theories. Therefore, the curriculum intends to develop basic scientific knowledge, process skills, scientific attitude, ICT, etc. The suggested teaching-learning process emphasizes critical thinking, categorization, comparing, questioning, eagerness, reasoning, data observation, and similar other process skills. As a rule, these aspects need to take into account: 1) think of some condition or event, 2) deduct the result (Barak & Assal, 2018); develop a hypothesis, 4) conclude, and 5) rethink the conclusion (Lin-Siegler et al., 2016).

Reality of Classroom Practices

The classroom teaching-learning practices in the sampled schools were observed in terms of lesson delivery and teachers' emphasis on the cognitive development of students. A teacher started the class by reviewing the previous lesson and connecting the previously taught topic while another teacher talked about the situation related to the lesson. Three teachers asked about the homework of the previous day and started motivating the students by asking some general knowledge questions and telling jokes for fun. Mostly the teachers were found not to link up what was taught in the previous class but they concentrated on today's lesson. Only one teacher tried to connect to the previous lesson but was not able to make connections properly.

Classes were delivered through a lecture at large. Some teachers went on with explanations and elaboration at the higher level of content. One teacher each from the community and institutional schools was found to use interactive and discussion methods. The remaining ones conducted the class by reading the text, drilling, and memorization. The questions asked by the teachers were found unsystematic regarding their difficulty level and standard. Almost all the teachers did not care about the sequence of the cognitive domain while asking the questions.

Only two teachers were found to use charts, drawings, and real materials whereas the other teachers taught without instructional materials. Most of the teachers did not use any kind of instructional materials except for the textbook. Some teachers did not use the blackboard properly. The classroom practices were found to be focusing on clarifying the concept and doing exercises as suggested by the textbook.

Most of the questions asked in the class were of low levels, mostly demanding for remembering. Some kinds of elaboration, illustration, and explanation were done to enhance students' understanding. Questions relating to applying, analyzing, evaluating, and creating were rare. Two teachers were found asking application-level questions. Teachers asked 'Wh...' and 'yes/no' questions in the class. Probing the answers/responses was not done or not properly done most teachers forced the students who could answer their questions. Many teachers instructed students to write the answers in the students' copybooks. The questioning and answering style was in a chorus manner and sometimes limited to asking questions and answering individually.

It was praiseworthy that almost all the teachers called the students by their names and were found familiar with their home backgrounds. Most teachers immediately gave positive verbal feedback to the student's responses and work saying 'good', 'very good, 'excellent', 'try again', etc., which would encourage the students to learn to respond and participate in classroom activities. One of the teachers evaluated the students' work but did not give any feedback. Teachers (T1) wrote what the students answered and clarify the correct answer to the question on the board and asked the students to analyze the correctness of the answer(s). If the answer was not satisfactory, teachers provide the correct and suitable answer(s). Assigning and checking homework was more systematic in the institutional schools than in the community schools. Most of the teachers finished the lesson before the allotted time, which might have been because they were being observed. A particular teacher (T2), however, was found to have completed the day class properly in time.

A total of 238 students, 132 boys, and 107 girls' achievements were analyzed in this study. Data obtained from this study shows that the larger range of scores falls in remembering level, 99.6% of students' scores were from 0 to 30. Consistent with this study, Cepni, Ozsevgec and Cerrah, (2004) showed that students' achievement is more in the lower level of understanding. Similarly, Pike, (2000) researched that students had higher levels of involvement and gains in general abilities in the lower level and very less achievement in the higher order. Contrary to these findings, Newton and Newton, (2009) advocated that students developed creativity from lessons if teachers engage them in activities. Studies showed that the student's participation is desirable for higher-order thinking. But in the schools in Nepal, dogmatic lecturing is a common method of teaching. It is, therefore; maximum numbers of students are good at remembering and very less at creative thinking.

Furthermore, it was found that the mean percentage scores of students in the six taxonomic categories were remembering (38%), understanding (19%), applying (28%), analyzing (32%), evaluating (30%), and creating (8%). The P-value for understanding and evaluating levels was found to be greater than $\alpha = 0.05$, showing that community and institutional school students' achievement at these levels does not differ significantly. These results show evidence that the majority of the basic-level students in Nepal develop a lower level of scientific understanding. Very few of them develop creating levels in subjects. These findings of the study are similar to the study done by earlier researchers like Acharya, budhathoki and Bjønness (2022) who found that students develop mind-on (cognitive) activities significantly higher than that hands-on (psychomotor) abilities.

in institutional schools have scored higher in remembering, analyzing, and creating than community school students whereas the students of community schools have scored higher than those of institutional schools in applying and evaluating. Linking this finding, Clavel Vázquez & Wheeler, (2018) found that children learn in different ways at different rates and will achieve different levels of attainment. Furthermore, Flexible instructional arrangements are developed and employed among students in different institutions (Ansari et al., 2019; Edmonds, 2019; Taştan et al., 2018).

Similarly, Acharya, Budhathoki, and Bjønness, (2020) researched that life skills development is necessary by engaging students in activities. Along the same line, Acharya, Budhathoki, Bjønness, and Devkota, (2022) researched that gardening activities in schools help to foster creativity among the students. Such improvements in classroom teaching-learning need to be maintained and continued throughout the country (Joshi, Gnawali, & Dixon, 2018; Shrestha & Harrison, 2019). Furthermore, Oppermann, Brunner, and Anders, (2019) argue that there is a dominance of the concept of assessment of learning.

Conclusion

The student achievements score showed the lower achievement of grade five students at all levels of the cognitive domain. The frequency distribution of marks for different levels varied abruptly. The students scored high in remembering and low in creating items. Institutional school students achieved significantly higher scores than community school students in remembering, analyzing, and creating levels while community school students achieved significantly higher than institutional school students at the application level test. A big significant gap in achievements was found at the analyzing level. Both groups of students performed slightly the same in understanding and evaluating the level test. Overall, the achievements of students in the institutional schools were significantly better in remembering, understanding, and creating while in applying and evaluating community school students scored slightly better. It was associated with the group factor at the analyzing level, the male students performed significantly better than the female students while at the other levels, gender has no significant effect on the achievement test.

Classroom practices emphasized drill learning and intensified memorization of scientific facts, laws, principles, and concepts. No plan, program, or practice regarding teaching-learning targeted at addressing specific potentials, weaknesses, or aptitudes was implemented. Schools were not prepared for teaching-learning taking into account the six domains of cognitive learning. Most of the head teachers were not aware of the domains of Bloom's taxonomy.

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