Mathematics Achievement of Grade Eight Students in Lalitpur District

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ABSTRACT: This study delves into the mathematics achievement of grade eight students of Godavari Nagar Palika in the Lalitpur district. Using a sample of 147 students currently enrolled in grade eight in the schools within the Nagara Palika, the research sought to elucidate the potential correlations between mathematical achievement and variables such as gender, age, ethnicity, religion, school type (private vs. public), parental marital status, and previous math scores. While most variables exhibited no significant influence on mathematics achievement, ethnicity emerged as a variable with notable impact. The study underscores the importance of understanding cultural and ethnic influences on academic performance, with potential implications for curriculum development and teaching methodologies in diverse settings. Variables including gender, age, and school type, showed no significant correlation with mathematical achievement at the $p<0.05$ level. However, ethnicity displayed a significant difference in students' mathematical performance. The research accentuates the importance of considering ethnic backgrounds when evaluating mathematical achievement, indicating a potential avenue for more tailored educational strategies in Lalitpur. Findings suggest educators should be cognizant of cultural and ethnic factors when devising teaching strategies, especially in areas with diverse student populations like Lalitpur.

Introduction

While it's often claimed that mathematics is a fundamental part of human thought and logic, its scope and reach in contemporary times is undoubtedly extensive. From simple daily activities to advanced scientific explorations, mathematical reasoning plays a pivotal role. This domain not only reflects the process of learning but also signifies the epitome of human intellectual capabilities, encapsulating ideas, processes, and reasoning. As a structured form of knowledge, each proposition in mathematics builds logically on previously established propositions or assumptions. The evolution of mathematics mirrors the development of civilizations, marking its importance from early societies to our current technologically driven era. In support of the pivotal role of mathematics in the educational system, Traverse et.al

(1977) observed, “Since the school of ancient Greeks over two thousand years ago, mathematics has been a key subject of the curriculum. The four liberal arts – arithmetic, geometry, astronomy, and music – were fundamentally rooted in mathematical studies.” Moreover, as societies underwent transformation in economic activities, life patterns, and cultural values, the demands of education also evolved. Contemporary mathematics education goes beyond the aesthetic values cherished by early Greek scholars. With the advancements in science and technology, modern curricula prioritize the practical applications and implications of mathematical studies. Several researches have been conducted on mathematical achievements. For instance, a study titled "Mathematics Achievement Based on Gender Among Eight Grade School Students in Jordan" found gender-based variations in performance in certain areas of mathematics (Rabah et.al). Hanna (1986) and CERID (1999) made similar observations in different contexts. Other studies highlighted factors like language, ethnicity, socioeconomic backgrounds, and rural vs. urban settings as influencing mathematical achievements. Considering the diverse socio-cultural landscape of Nepal and the ongoing national curriculum implementations, the present study aims to explore the relevance of the existing mathematics curriculum across different social groups. By focusing on students from varying backgrounds in Lalitpur district, this study seeks to offer insights that might aid curriculum developers, educators, and policymakers.

In contemporary times, the significance and ubiquity of mathematics in human thought and logic are widely acknowledged. Its scope and reach extend far beyond mere abstraction, manifesting themselves in numerous aspects of our daily lives and serving as a cornerstone for advanced scientific explorations. Mathematical reasoning, thus, assumes a pivotal role in shaping our understanding of the world. This intellectual domain not only reflects the process of learning but also represents the epitome of human cognitive capabilities, encapsulating a diverse range of ideas, processes, and forms of reasoning.

At its core, mathematics operates as a structured and interconnected form of knowledge, where each proposition builds logically upon previously established propositions or fundamental assumptions. This intricate web of mathematical concepts and principles has been instrumental in the evolution of civilizations throughout history, marking its enduring importance from the early societies of antiquity to our current technologically driven era.
Historically, mathematics has held a central place in education. As far back as the school of ancient Greeks over two millennia ago, it was considered a key subject in the curriculum. The "four liberal arts" – arithmetic, geometry, astronomy, and music – were fundamentally rooted in mathematical studies, a testament to the foundational role mathematics has played in shaping intellectual pursuits throughout history.

However, as societies have undergone profound transformations in economic activities, life patterns, and cultural values, the demands of education have also evolved. Contemporary mathematics education extends beyond the aesthetic and theoretical values cherished by early Greek scholars. In the face of rapid advancements in science and technology, modern curricula prioritize the practical applications and real-world implications of mathematical studies.

Numerous studies have explored various facets of mathematical achievement and its determinants. For example, a study titled "Mathematics Achievement Based on Gender Among Eighth Grade School Students in Jordan" uncovered gender-based variations in performance in specific areas of mathematics (Rabah and Vello, 2015). Hanna (1986) and CERID (1999)

made similar observations in different educational contexts. Additionally, research has highlighted factors such as language, ethnicity, socioeconomic backgrounds, and rural versus urban settings as influential determinants of mathematical achievement.

Against the backdrop of Nepal's diverse socio-cultural landscape and ongoing national curriculum implementations, this present study aims to delve into the relevance of the existing mathematics curriculum across different social groups. By focusing on students hailing from varying backgrounds within Lalitpur district, our research endeavors to provide valuable insights that may inform curriculum developers, educators, and policymakers as they navigate the ever-evolving terrain of mathematics education. In doing so, we hope to contribute to the ongoing dialogue surrounding mathematics education and its dynamic role in shaping the future of our society.

The liberal arts in the early Greek were studied basically focusing for the aesthetic values. Society changed in its economic activities, life pattern, and cultural value system. But the needs and demands of society also changed. The aim of education is to prepare citizens for the changing reality according to the needs and demand of the existing society and the immediate future society. Consequently, Mathematics education in the 20thcentury is no more limited to aesthetic values only. It puts great emphasis in today's mathematics program to meet the needs and demands of rapidly growing society due to change in science and technology. The study of mathematics occupies a central place in the school programs of all countries.

"A study of sex difference in mathematics achievement of Canadian students of grade eight" students using the data from the second international mathematics study in five areas: Arithmetic, Algebra, Probability, Statistics, Geometry and Measurement. It showed that there was no significant difference in performance of in performance of in performance of boys and girls in the arithmetic, algebra and probability. To measure the performance of geometry and measurements, it was found that the performance of boys was higher than girls (Hanna, 1986). One of the studies aimed at knowing the teaching strategies language teachers use and their effect on students' achievements. The sample consisted of (12) male and female teachers training at institutions for preparing teachers in Nineveh, Iraq. These teachers teach the Arabic language, Kurdish and English for first grade students studying at the institutions. Each of the three teachers belongs to the same institution. In order to achieve the aims of the study, the researchers used Tuckman tool which consists of four pivots (creativity, power, behavior and warmth); each of which consists of (14) items. The study results showed that teachers of Arabic use successful strategies reaching 71%; while teachers of Kurdish reached 61%; whereas teachers of English reached 65% (Ibraheem, A; Abdulfattah, S.;& Humaid, S. 2010).

Another study that aimed at identifying the factors that have effect university students' decision on choosing their own learning strategies. The sample consisted of (75) female and male students of different nationalities studying at Ohio university Oxford list (1990) for teaching strategies was used in the study. The study results showed that students use social and beyond knowledge strategies in a high level, while effective and memory strategies were used less. The results also showed that there are significant differences in choosing and using teaching strategies due to gender, age, and cultural background (Nguyen, & Godswill, 2010)

In a study title "Assessment of learning achievement of lower secondary children (Grade six and eight)", it was concluded that mean achievement score of girls in grade six

mathematics was slightly less than that of boys. Similarly, the mean achievements score of girls in grade eight mathematics was slightly less than that of boys (CERID, 1999).

An international research report about achievement differences between types of school and groups of school concluded that pupils in urban perform on average better than their than counter parts in rural areas. The reasons generally given include the fact that big cities and to a lesson extent mid-sized urban areas have relatively large proportion of high social – economic status families.

Several studies have shown that the achievement in mathematics is affected by language, ethnicity, gender, socio economic condition of the student's families. Thus, the researcher was interested in finding out how far the variables in gender, ethnicity, age, religion, parents living together of separated, rural or urban area of the family are affecting the achievement in mathematics of the grade eight students studying at private and public schools students in Lalitpur district.

The main objective of the study was to find out if there is a variation in mathematics achievement among the eight grade students, regarding gender, age, ethnicity, religion studying in public and private schools situated at rural and urban areas of Godavari Nagarpalika. The result of the study can give the insight to the teacher of the districts to bring some reform in the teaching and learning of mathematics.

Hypothesis of the study

H1 = There is no significant difference the achievement in mathematics between the students of Public and Private School of Lalitpur district (Null Hypothesis).

H2 = There is a significance difference the achievement in mathematics of the student's of Public and Private school of Lalitpur district (Alternative hypothesis).

Methodology

Quantitative research design is used in this study. Online survey method was used for this study. A set of questionnaires consisting of age, gender, ethnicity, religion, marital status of parents, location of schools, and mathematics achievement of students, were prepared and distributed. The questionnaires were distributed to 147 students studying in eight public and private school situated I rural and urban schools of Godavari Municipality in Lalitpur district. SPSS software was used to analyze the data and to test the hypothesis. First, it was calculated the mean and standard deviation of male and female students. For significance it was calculated t-test and ANOVA.

Results and discussion

The data drawn from the 147 students across eight grade students of Godavari Nagar Palika in the academic levels 2021 AD in the Lalitpur district underwent analysis, with variables such as gender, age, geographic location, type of school, parental occupation, and parental education being evaluated against mathematics achievement.

Group Statistics

	Gender of respondents	N	Mean	Std. Deviation	Std. Error Mean
Final score in mathematics	Male	81	65.81	22.709	4.454
	Female	66	54.24	29.976	6.541

From the above, the average mathematics score for male students was higher than that of females. The t-test was employed to examine the differences, given the categorical nature of the independent variable (Nominal scale) against a continuous dependent variable.

t-test for independent two for data analysis. Group is suitable because there is categorical data in dependent (Continuous scale) and independent (Nominal scale) so we use t-test and Cohen's d. Here independent variable for this study= Gender of the respondent and Dependent variable= Final score in mathematics.

Final score in mathematics of male and female students.

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
last score in mathematics	Equal variances assumed	3.841	.056	1.506	45	.139	11.570	7.684	-3.906	27.045
	Equal variances not assumed			1.462	36.555	.152	11.570	7.914	-4.471	27.611

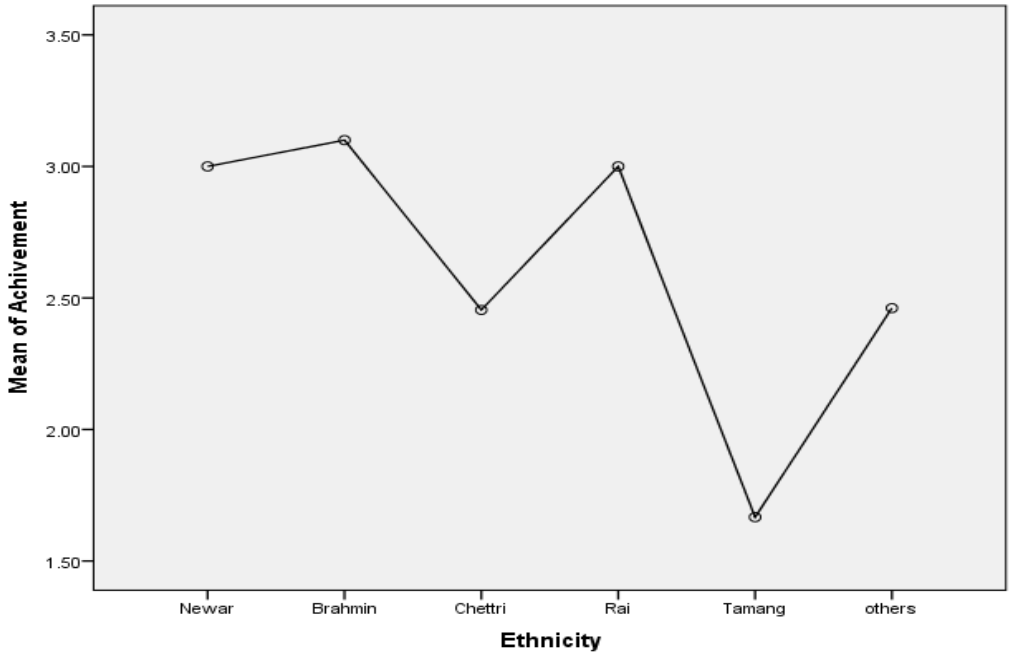
Table 2 shows that the value of Levene's test is 0.056 which is greater than 0.05, this means variance are equal, so we use top value of t-test. The value of significant value of two tiled test is (0.139 > 0.05) at 0.05 significance level and degree of freedom of 45. That means there is no significance difference between the last score in mathematics of male and female students. From the above table we have seen that to compare the significant value P < 0.05 that is .139 > 0.05 and 0.152 > 0.05. We can say that it looks statistically not significant.

Descriptive

Achievement

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		

Newar	19	3.0000	1.26491	.51640	1.6726	4.3274	1.00	4.00
Brahmin	32	3.1000	1.10050	.34801	2.3127	3.8873	1.00	4.00
Chettri	34	2.4545	.68755	.20730	1.9926	2.9164	1.00	3.00
Rai	3	3.0000	.	.	.	.	3.00	3.00
Tamang	19	1.6667	.81650	.33333	.8098	2.5235	1.00	3.00
Others	40	2.4615	.77625	.21529	1.9925	2.9306	1.00	4.00
Total	147	2.5745	.97233	.14183	2.2890	2.8600	1.00	4.00



To compare achievement with ethnicity. It is statistically not significant.

Ethnicity	Frequency	Percent	Cumulative Percent	
Newar	19``	12.8	12.8	12.8
Brahmin	32	21.3	21.3	34
Chhetri	34	23.4	23.4	57.4
Rai	3	2.1	2.1	59.6
Tamang	19	12.8	12.8	72.3
Others	40	27.7	27.7	100
Total	147	100	100	

Coefficient

Model Unstandardized Coefficients Standardized Coefficients t Sig. 95.0% Confidence Interval for B

B Std. Error Beta Lower Bound Upper Bound

1 (Constant) 3.060 .258 11.846 .000 2.540 3.581

Ethnicity -.109 .049 -.313 -2.213 .032 -.209 -.010

a Dependent Variable: Achievement

One Way ANOVA

Achievement

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.298	5	1.860	2.230	.069
Within Groups	34.191	141	.834		
Total	43.489	146			

We can see that the significance value is 0.069 (i.e. P = 0.069) which is greater than 0.05, therefore there is not statistically significance in mean achievement in mathematics between the different cast of respondents.

Group Statistics

	current school	N	Mean	Std. Deviation	Std. Error Mean
Achievement	Public	88	2.4643	.79266	.14980
	Private	59	2.6667	1.18818	.28006

We can see from the table, the mean score of public school and mean score of private school are 2.4643 and 2.6667, respectively. Therefore, the mean score of private school is higher than public school. t-test for independent two group is suitable because there is a categorical data in dependent (Continuous scale) and independent (Nominal scale) so we use t-test and Cohen's d.

Null hypothesis: $m_1 = m_2$ (There is no significant difference between final score in mathematics of public and private school/ they have equal score)

Alternative hypothesis: $m_1 \neq m_2$ (There is significance difference between public school and private school.) (Two tailed test)

Test statistics

Here independent variable for this study= current school, it means public and private school

Dependent variable= achievement in mathematics

From the SPSS Analysis

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Achievement	Equal variances assumed	7.109	.011	-.694	144	.491	-.20238	.29150	-.78986	.38510

	Equal variances not assumed			-.637	26.741	.529	-.20238	.31760	-.85434	.44958

Table shows that the value of Levene's test is 0.011 which is less than 0.05, this means variance are equal, so we use top value of t-test. The significant value of two tiled test is (0.491> 0.05) at 0.05 significance level and degree of freedom of 144. That means there is no significance difference between the achievement in mathematics of public and private school's students. To compare the achievement with Public and private school both significant values are greater than 0.05, it means 0.491 and 0.529. This is not statistically significant.

Group Statistics

	Parents living	N	Mean	Std. Deviation	Std. Error Mean
Achievement	Together	94	2.6333	1.09807	.20048
	Separate	53	2.3750	.61914	.15478

We can see from the table, the mean score of parents living together and mean score of parents living separate are 2.6333 and 2.3750, respectively. Therefore, the mean score parents living together is higher than parents living separate. t-test for independent two group is suitable because there is a categorical data in dependent (Continuous scale) and independent (Nominal scale) so we use t-test and Cohen's d. Here independent variable for this study= parents living together, parents living separate. Dependent variable= achievement in mathematics

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Achievement	Equal variances assumed	8.319	.006	.867	144	.390	.25833	.29780	-.34183	.85850
	Equal variances not assumed			1.020	43.793	.313	.25833	.25328	-.25218	.76885

Table shows that the value of Levene's test is 0.006 which is less than 0.05, this means variance are equal, so we use bottom value of t-test. The significant value of two tiled test is (.390> 0.05) at 0.05 significance level and degree of freedom of 144. That means there is no

significance difference between the achievement in mathematics of parents living together and parents living separate. Because of not significance difference it is not necessary to calculate.

The present study is concerned with the mathematics achievement of all levels of students in Lalitpur district. On the basis of analysis and interpretation of data by comparing the mathematics achievement with gender, age, public and private school, ethnicity, current school, parent living and last score in mathematics, it was found that there is no statistically significant difference except ethnicity.

Conclusion

The study set out to unravel the intricacies between mathematics achievement and various determinants, leveraging a sample of 47 students from Lalitpur's public and private educational realms. Through a meticulous analysis of variables - spanning gender, age, school type, ethnicity, familial background, and past mathematical performances - the study ventured to discern patterns and correlations concerning mathematical prowess.

Contrary to prevalent societal notions, several traditionally considered pivotal variables like gender, age, school type, and family dynamics surprisingly did not manifest any substantial correlation with mathematical achievement. Such unexpected outcomes underscore the imperativeness of adopting empirically rooted, evidence-based approaches in pedagogical strategies, rather than anchoring on conventional wisdom or societal stereotypes.

Amidst these revelations, ethnicity emerged as a significantly influential determinant. The conspicuous role of ethnicity prompts contemplation on the intrinsic cultural values, practices, and social educational norms endemic to certain ethnic clusters. A deeper exploration into the traditions and values of these ethnicities might illuminate methodologies to universalize mathematical teaching, ensuring its efficacy across diverse groups.

Given Lalitpur's rich ethnic tapestry, this discovery accentuates the pressing need for a math curriculum imbued with cultural sensitivity. For educators, this translates into the assimilation of pedagogical techniques resonating with the students' diverse ethnic lineages. Contextualizing mathematical problems within local tales or customs might not only enhance their relatability but also fortify the depth of understanding.

In the contemporary era, where mathematics is intertwined with multifaceted human endeavors, fostering an equitable mathematical proficiency across student demographics is paramount. This study, thus, serves as a beacon for educators, both within Lalitpur and potentially beyond, advocating for a curriculum that seamlessly marries mathematical tenets with the unique ethnic diversities of learners.

Cognizant of the pivotal findings, this research furnishes invaluable insights for educational policymakers. Recognizing the pronounced influence of ethnicity, as evidenced in this study, necessitates the drafting of educational policies that judiciously cater to the multifarious ethnic nuances.

To encapsulate, the research undertaken in Lalitpur has not only shed light on pivotal educational dynamics but also charted a clear trajectory for imminent pedagogical enhancements, especially in the realm of culturally responsive teaching. As we navigate the ever-evolving educational terrains, such in-depth investigations will indubitably serve as pillars, ensuring the efficacious impartation of mathematical knowledge to all.

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