Students' Perceptions and Interpretations of Democratic Practices in Mathematics Classroom

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Abstract: This study aimed to find out students' perceptions and interpretations of democratic practices in mathematics classrooms. A quantitative research strategy based on the positivist paradigm was used. In Kathmandu district's 20 public secondary schools, 200 respondents in the ninth grade—100 boys and 100 girls—were randomly selected for the sample. Data collection was carried out using a self-created questionnaire that had 25 statements and five Likert-type response alternatives. The self-developed questionnaire's validity was verified by the opinions of experts, and reliability was established by the Cronbach's alpha, 0.82. I prepared four factors according to loading components. The results of the research showed that teachers should use democratic practices to engage students in the learning process and prepare them for the needs of democratic values in classroom practices.

Key Keywords: *Democratic Practices, Factor Analysis, Reliability, Positivism, Sampling*

Introduction

Democratic classroom practices refer to educational approaches that promote student participation and collaboration within classroom teaching (Oven & Lynch, 2020). Individuals who are engaged, critical thinkers, problem solvers, and have a strong sense of justice are necessary for democracy in the classroom. Individuals who pursue education become more capable of participating in society and meeting its demands. Human rights, freedom, equality, and justice—the fundamental tenets of democracy—are all part of the social, cultural, and political framework that education plays (Ahmad et al., 2015). The task of developing such dynamic and active students for society rests with educational industries through democratic educational practices. Akbar and Murtaza (2019) defined democratic values in this context as fairness, openness to voice, regard for existence, equity, collaboration, kindness, diligence, accountability, peace, seeking efficiency, and regard for diversity. Individuals learn democratic principles by experiencing and practicing them in their personal and social lives, which are taught in the name of democracy. Schools are critical to the continuation of structured and

formal educational activities (Turabic & Gun, 2016). Inside and outside the classroom, the mathematics teacher creates platforms for students' freedoms and duties for implementing democratic values.

Teachers emphasize a student-centered approach to learning to foster democratic culture in the classroom and to offer students chances for expression, respect for variety, and engagement (Kocoska, 2009). Moreover, Kocoska (2009) says that a democratic classroom means a free expression of students' thinking without any hesitation and learning from the mistakes. In this sense, teachers' democratic views and attitudes toward democratic practices are more essential now in a global context than ever before. Teachers give students with opportunity to meet democratic standards such as critical thinking, possibilities of curiosity of students in active participation, autonomy in opinion and engagement, respect for variety, equality, and tolerance during democratic practices in the classroom (Sentuk & Oyman, 2014). In school teaching, democratic classroom administration is essential. Because students pay more attention to their teachers' activities and are more open to classroom methods.

The impact of elementary-level classroom activities and experiences lasts longer. Furthermore, Carr (2006) sees the democratic classroom as a place where teachers meet the needs of their students, their participation is valued, and their rights are protected in a safe and dynamic learning environment. A democratic environment in the classroom allows students to freely express their views and solve problems, which favorably influences students' opinions and behaviors toward democracy. According to Daher (2012), democratic practices—both explanatory and participatory—help to develop a democratic culture in the classroom.

Classrooms are communities in which students spend their time engaging in learning activities. During their time in the classroom, students' specific choices, needs, abilities, and educational goals are prioritized. According to Tammi (2013), teachers acquire democratic classroom teaching in order to practice democratic ideals and foster desired behaviors in young learners in the context of a democratic classroom atmosphere. There is no uniformity in teaching and learning activities in terms of teaching-learning materials, teachers' quality, school management systems in Nepali schools (Chapagain, 2021). The government creates curriculum, designs textbooks, recruits trained teachers, and holds teacher training workshops to prepare them for the demands of well academic classroom performance, yet the end results are less than ideal (NASA, 2015; Subedi, 2003). Students are keen witnesses of their teachers' demonstrations of democratic values in the classroom. This research focuses on explaining students' perceptions and interpretations of 9^{th}-grade maths students regarding their teachers' democratic practices in classrooms working in secondary schools of the Kathmandu district.

Research Methodology

The emphasis of teaching in our math classes is on student performance and achievement. The public in the community, educators, and education experts in particular used to exclusively focus on the students; however, in this research, I tried to determine whether math class teaching is democratic from the viewpoint of the students. The current study sought to discover secondary school students' outlooks and interpretations of teacher's democratic methods in the classroom. The study is quantitative in character and is grounded in the positivist worldview. The survey was carried out to collect information from respondents. All 9th-grade students were included in the study's population in Kathmandu Valley. Respondents were chosen using a random sampling procedure in both schools and students. The sample included 200 ninth-grade students from the Kathmandu district's 20 public secondary schools, 100 boys and 100 girls. A self-created questionnaire with 25 statements on the basis of Literature and fiv- point Likert-type response choices was used to collect data. The self-developed questionnaire's validity was verified by the opinions of experts, and I used the Delphi technique to make validity of the statements and reliability was established by computing the self-developed questionnaire's Cronbach's alpha score, which came out to be 0.82.

Results and Discussion

In this section, firstly, I visited the head teachers and mathematics subject teachers of the sample schools. I explained the objectives of my study to them. Mathematics subject teachers helped mecollect the data from the sample students. After that, I classified the collected data according to their characteristics. Additionally, I tabulated the classified data and calculated the reliability of the survey of questionnaire by using Cronbach's alpha, which is given below.

Table: 1 *Reliability Statistics*

	Reliability Statistics		
Category	Cronbach's alpha	No of items	Sample Size
Respondents	0.82	25	200

Similarly, I examined the internal reliability coefficient the entire questionnaire with Cronbach alpha 0. 82. I constructed four factors by using Principal Components Analysis. In this context, eight items were loaded in the first component named as *Fair Teaching,* its Cronbach's alpha was 0. 79. The range of the value of factor loading of this component was from 0.778 to 0.574 (greater than 0.3). Next, six items were loaded in the second component named as *Encouraging*

Open Discussion, and its Cronbach alpha was 0.727 and ranged from 0.753 to 0.576. Likewise, six items were loaded in the third component named as *Respecting Diversity*. Its Cronbach alpha was 0.701, that ranged from 0.728 to 0.421. The last component named as *Transparent* and its Cronbach alpha value was 0.601 that ranged from 0.782 to 0.317. The scree plot was observed and identified four potential number of components from four distinct elbows with eigenvalues greater than one.

First of all, I computed descriptive statistics (mean and standard deviation) and used One–sample t-test to find the significance for each item of the components. I performed Null Hypothesis test by taking neutral value (Test Value= 3) to examine if the students' view had any significant different in terms of democracy in the mathematics classroom: perceptions and interpretations.

Descriptive statistics, such as mean and standard deviation, were computed for each of the four components and they were compared with the neutral `value (test value= 3) from the five points Likert-scales. One- sample t-test was applied to examine the differences of means if they were significant or not at the 0.05 level of significance. The highest rated component was *Transparent* (Mean=4.852, SD= 0.4929 and $p<0.05$). The difference between the sample means and ideal mean was significant ($p<0.05$). The lowest rated component was *Encouraging Open Discussion* (Mean=3.1714, SD= 0.7961 and $p< 0.05$). The difference between sample means and ideal mean was 0.1714 which was not significant ($p>0.05$). The remaining two components were also rated higher than neutral value (test value= 3) (Table 2).I have shown factor-wise components in the following Table 2.

Table 2. *Factor wise values of components*

Components	N	Mean	S.D.	M.D	t-Value	Sig	Upper	Lower
Fair Teaching,	200	4.155	0.55705	1.155	14.661	0.000	0.9967	1.313
Encouraging Open Discussion	200	3.1714	0.79618	0.1714	1.522	0.134	-0.548	0.3977
Respecting Diversity.	200	3.245	0.56013	0.245	3.093	0.003	0.0858	0.4042
Transparent	200	3.79	0.184	.160	13.23	0.000	-.18	.50

Fair Teaching

The Cronbach alpha of this factor (*Fair Teaching,*) was 0.849, which was reliable because its value was greater than 0.6. This factor included eight items and the high rated average value

was 4.36 related to the item fair teaching behavior of the teacher makes accountable in teaching and lowest value was 4.00 related to the item monotonous behavior of the teachers give less opportunities for learning mathematics. The average value of this factor was 4.155 and its standard deviation was 0.557. The average value of this factor was greater than neutral value (test value=3). Fair teaching was the practice of providing equitable opportunity and assistance for all students to learn and succeed. It entails treating students with dignity and respect, acknowledging and appreciating their different backgrounds and experiences, and providing a secure and inclusive learning environment. The participant's opinion in all items were significant at the level of significance 0.05 ($p< 0.05$) (See Table 3).

Table 3. *Descriptive statistics and one- sample t-test for the components in Fair Teaching*

One Sample Statistics (Test Value =3)								
							95% Confidence Interval of the Difference	
Items	N	Mean	S.D.	Mean Difference	t-value	Sig. (Two-tailed)	Upper	Lower
FT3	200	4.14	.639	1.140	12.611	.000	.96	1.32
FT10	200	4.18	.720	1.180	11.594	.000	.98	1.38
FT20	200	4.00	1.050	1.000	6.736	.000	.70	1.30
FT21	200	4.36	.827	1.360	11.627	.000	1.12	1.60
FT25	200	4.12	.718	1.120	11.026	.000	.92	1.32
FT22	200	4.12	.773	1.120	10.245	.000	.90	1.34
FT2	200	4.32	.713	1.320	13.099	.000	1.12	1.52
FT4	200	4.00	.881	1.000	8.030	.000	.75	1.25
Factor1	200	4.1550	.55705	1.15500	14.661	.000	.9967	1.3133

Encouraging Open Discussion

The reliability value for the view on *Encouraging Open Discussion* was 0.827 which was in the acceptable range (>0.06). Six items were loaded in this factor. The highest rated value was 3.68 and the lowest rated value was 2.42, whose corresponding standard deviations were 0.913 and 1.214, respectively. The mean difference of the lowest rated item was -0.58, so respondents disagreed about 'the accountable teacher does not involve in encouraging in open discussion.' The average rated value of this factor was 3.171 and its standard deviation was 0.796. The participant responses to the items related to the change of belief was necessary for democratic teacher increases responsibility in teaching. There was no significant difference in the item

'educational policy helps in teaching profession', 'teacher has increased quality by providing feedback', 'reward and punishment system helps in motivation', 'government policies require to upgrade the quality', and 'The government applies good evaluation policy to focus the encouraging the students for learning.' All the rated values were greater than average value (test value=3) for these items. Encouraging open discussion is an important feature of good teaching, especially when it comes to promote critical thinking, active involvement, and collaborative learning among students. It means participants agreed about these statements. Likewise, there was significant difference in items 'teacher should not change the beliefs about the student's background in teaching' at level of significance at 0.05 (0.05<P) (See Table 4).

Table *4*. Descriptive statistics and one sample t-test for the component in *Encouraging Open Discussion*

One Sample Statistics (Test Value =3)								
							95% Confidence Interval of the Difference	
Items	N	Mean	S.D.	M.D.	t-Value	Sig. (Two tailed)	Upper	Lower
E11	200	3.20	0.990	.200	1.429	.159	-.08	.48
E12	200	3.28	1.107	.280	1.788	.080	-.03	.59
E13	200	3.68	0.913	.680	5.264	.000	.42	.94
E16	200	3.18	1.304	.180	.976	.334	-.19	.55
E17	200	3.18	1.240	.180	1.026	.310	-.17	.53
E19	200	3.26	1.139	.260	1.613	.113	-.06	.58
Factor2	200	3.1714	0.796	.17143	1.522	.134	-.0548	.3977

Respecting Diversity.

The reliability coefficient of Cronbach alpha was 0.701 for the component 'Respecting Diversity', which was significant because it was greater than 0.6 among the loaded six items. The highest rated value was 4.72 and participants viewed that students and teachers' 'friendly classroom helps upgrade the quality of the students in the mathematics classroom,' and lowest rated value was 2.14 which reflected that there was no need to practice for respecting students background, i.e. they disagreed on this item. The participant's responses to the items related transitory position of teachers neglect their duty and practices, stability has no effect on accountability and permanency has no effect on norms and value over the students' performance were not significant at the 0.05 level of significance. Respecting student diversity

was an essential component of successful teaching because it acknowledges and values the diverse backgrounds, experiences, perspectives, and identities that each student contributes to the classroom. Additionally, participant's responses to the items 'student's friendly classroom upgrade the quality of the students', 'respecting diversity helps to minimize the dropout rate', and 'monitoring also increases the students' involvement in their classroom studies', were significant at the 0.05 level of significance (P<0.05) (See Table 5).

Table 5. *Descriptive statistics and one sample t-test for the components in Respecting Diversity*

One Sample Statistics (Test Value =3)								
							95% Confidence Interval of the Difference	
Items	N	Mean	S.D.	M.D.	t-Value	Sig. (Two tailed)	Upper	Lower
RD1	200	4.72	.454	1.720	26.815	.000	1.59	1.85
RD5	200	2.14	1.010	-.860	-6.019	.000	-1.15	-.57
RD6	200	3.88	.849	.880	7.333	.000	.64	1.12
RD8	200	2.34	1.136	-.660	-4.109	.000	-.98	-.34
RD14	200	3.22	1.148	.220	1.355	.182	-.11	.55
RD18	200	4.02	.869	1.020	8.302	.000	.77	1.27
Factor3	200	3.2450	.56013	.24500	3.093	.003	.0858	.4042

Transparent

The reliability coefficient for the component 'Transparent' with Cronbach's alpha = 0.601 was significant because it was greater than 0.6 among the five items. All the rated values were more than neutral value (test value= 3). Remaining five statements were combined in this factor. The highest rated item "communicating clear expectations about the student's assignment and assessment" had average value of 4.54 and the lowest rated item "providing timely feedback" had average value of 3.16. The participants highly agreed over the statement 'offering opportunities for revision increases accountability of the teacher.' The respondents agreed to the items 'fair grading policies creates student's friendly classroom', 'teacher's engagement in collaborative dialogue make democratic classroom', 'teacher give the value equally to the low achiever and high achiever', and 'consistent evaluation in teaching', all of these were significant at the 0.05 level of significance (P<0.05). The average rated value was 3.79 and its standard deviation wss 0.184 for the component 'Transparent.' However, there was no

significant difference over the statement 'encouraging the students for self-reflection in teaching', indicates a poor democratic practice in the classroom at the 0.05 level of significance (P<0.05) (See Table 6).

Table 6. *Descriptive statistics and one sample t-test for the components in Transparent*

One Sample Statistics (Test Value =3)								
							95% Confidence Interval of the Difference	
Items	N	Mean	S.D.	M.D.	t-Value	Sig. (Two tailed)	Upper	Lower
T1	200	4.54	.762	1.540	14.299	.000	1.32	1.76
T5	200	4.00	.639	1.000	11.068	.000	.82	1.18
T7	200	4.16	.817	1.160	10.038	.000	.93	1.39
T15	200	3.16	1.184	.160	.955	.344	-.18	.50
T23	200	3.03	0.44	0.03	10.167	0.00	.076	1.891
Factor 4	200	3.79	0.184	.160	13.23	0.000	-.18	.50

Discussions

The present study analyzed the participant's responses to the teacher's democratic behavior in mathematics classroom practices. I had taken responses from the student's side over the statements. In this context, I have prepared four components. *Fair Teaching, Encouraging Open Discussion, Respecting Diversity, and Being Transparent.* The classroom is a place where students and teachers interrelate with each other throughout the instruction process. Teachers provide opportunities for the student's freedom of expression, participation, and respect for others. As an interpretation, the teacher's norms and values are the fundamental foundation of the teaching and learning process.

Fair teaching strategies help students from diverse racial, ethnic, and cultural groups. The fair teaching concept is based on actions taken in the classroom as well as the cultural values and beliefs that inform teachers' beliefs. The fairness teaching model covers building on prior knowledge, having high expectations of diverse students, knowing students well, culturally responsive pedagogical skills, critical consciousness, sharing of power, and multiple kinds of knowledge (Seda, 2008). Democratic teachers apply the fairness instruction to promote all students equally. The dimension of teaching has multiple levels. So, the accountability of the teachers may play a major role in the success of teaching and learning activities and

effectiveness of the classroom practices. Regarding this, participants also emphasize that fairness teaching involves modifying instructional practices in order to facilitate student achievement. Dooley (2003) viewed that fairness in teaching is the fundamental premise of a teacher's duty to provide equal access according to the student's pace.

In this context, the result of this study showed that overall, the sample students agreed with the statements referred to as fairness teaching. The participants also seem to be careful about democratic classroom practices.

Teachers need to emphasize encouraging open discussion to increase student's beliefs and attitudes, which are also important for improving classroom practices. Democratic teachers shape student's learning environments as well as teachers' behavior, which influences students' motivation and achievement. Classroom environment and educational policy are the main supporters of democratic classroom practices. The continuous assessment system encourages teachers to promote a democratic culture. Anderson and Anderson (2015) also emphasized the high stakes of the performance test and portfolio assessment. High-stakes test results motivate the school staff, teachers, and students. Its main aim was classroom reform through academic standards and performance standards. Likewise, the democratic classroom presentation has concerned teachers, increasing their liability in the classroom.

Although teachers have multiple burdens in the teaching field, like quality teaching, regular assignment checking, taking exams on a regular schedule, and taking responsibility for the student's achievement, Working and feeling safe and comfortable at work can ensure continuity and productivity. All but a few of the teachers want no threats from higher authorities. Regarding this, encouraging open discussion is associated with teacher effectiveness, which ultimately affects student achievement (Shephard & Brown, 2016). Teachers are social beings with various desires to be fulfilled, and failure to satisfy such needs leads to frustration (Shin & Shim, 2021). In this context, the result of this study revealed that the duty of the teacher is to make a student-friendly classroom and minimize the dropout rate of the students. Hence, this discussion contributes to explain view of student satisfaction which help for the teacher's teaching activities, and improve students' performance.

Respecting the diversity of students' in a mathematics classroom entail acknowledging and valuing all students' diverse experiences, skills, and learning styles. A democratic teaching approach involves groups of students participate in classroom activities working together to solve any mathematical problem while completing a task. Respecting diversity is based on building consensus through cooperation between teachers and students groups. Regarding this, Shulman and Shulman (2004) state that respecting diversity reflects teacher's behaviors and

student's duties to achieve the classroom goals. It draws the student's attention during the learning process. Respecting the diversity process is especially helpful in motivating students. In this context, the result of this study revealed that teachers create a friendly classroom. Respecting diversity helps minimize the gap between high achievers and low achievers and respects the student's voice.

In a democratic environment, the teacher guides students to practice through multiple instructions, multiple ways, and multiple times. Moreover, Singh (2010) focused on how teachers and parent's encouragement and support affect their students' attitudes, desires, and achievement. The teacher encourages student's regularity in the classroom. In this context, the result of this study exposed the fact that democratic teachers need to provide learning opportunities for students at their own pace.

Teachers' interactions with students can make the classroom more welcoming and democratic. The teacher should care about the student's motives and behavior before teaching. Student's activities and engagement in particular ideas support both learning and the creation of classroom practices (Stang- Rabrig et al., 2022). In this context, the teacher needs to be transparent with the students. This study revealed that participants mostly responded with significant differences at a 0.05 level of confidence in transparent statements, except for one.

Teaching techniques are a determining factor in student learning, but teaching is the most difficult task. Teaching strategies are varied based on the curriculum, content, and context. A method is a systematic way of presenting the subject matter in the class, being aware of the psychological and physical needs of the students (Tammi, 2013). Teacher's dominant teaching methods do not make the democratic classroom culture independent. The teachers' job is not to solve problems for students but to enable them to solve problems themselves. Regarding this, Tan et al. (2015) says that good teaching is good explanation in a democratic way. It means teachers have to show capacity to explain critically about the subject matter. Teachers shape the school climate, ethos, and culture directly and indirectly. In this context, teachers need to use inductive teaching methods (student-centered teaching methods). A democratic classroom, in general, encourages active learning, critical thinking, and cooperation while also improving students' social and emotional abilities. It prepares them for the challenges of the real world, where they will need to collaborate, think critically, and actively contribute in their

communities, so we concluded that the teacher-centered method is a democratic classroom practice.

Conclusions

The democratic values and answerability of mathematics teachers are necessary factors due to the fulfillment of responsibility in classroom practices in a democratic way. A teacher is required to provide a description for their classroom instruction through *Fair Teaching, Encouraging Open Discussion, Respecting Diversity, and Transparent.* The teaching professions have overturned through the conceptions and capacities of the teachers. In this context, the democratic values and responsibilities of teachers are increasingly tied to academic performance. The teacher has an unseen power to overturn the students' hidden capacities in the classroom, so the quality of students' outcomes is directly dependent on the teachers. The democratic values of the teachers help to increase ability, improve self-management, gain greater capacity for reflection, and improve the relationship between teachers and students. Democratic norms among the teachers empower the teachers to make changes in their professional practices.

From the above results and analysis, I concluded that the respondents agreed that democratic teachers needed to practice fair teaching in the classroom. They revealed that democratic teachers evaluate their students without bias. Educational policy has helped the teacher to be democratic, and the Ministry of Education has increased teachers' quality through providing short- and long-term training to preserve democracy in the classroom. Respondents showed their position as almost neutral, specifically a temporary position of teaching job neglecting the teaching position. A reward and punishment system, as well as regular monitoring, promote a democratic atmosphere in classroom practices. The views of the respondent were that democratic teachers create a student-friendly classroom, manage the classroom environment, engage collaborative practices, and treat all students equally. Democratic teachers can impact student's positive thinking and care for their discipline. Before beginning to teach, the teacher should consider the student's level, background, and classroom environment. If in classroom teaching the teacher speaks almost all the time and students listen as passive learners, then the classroom practices become teacher dominance.

From the view of respondents, democratic teacher encourages the students to promote supportive context for sustainable relationships in classroom practices. From the viewpoint of

the students, democratic classroom practices in mathematics instruction entail fostering a welcoming and interactive learning environment where students may voice their opinions, work together, and have fruitful mathematical debates. These methods seek to give students more control over their learning, develop their capacity for critical thought, and promote a deeper comprehension of mathematical ideas. Students are given a priority list of questions to ask, analyze, and defend. Overall, from the viewpoint of the students, democratic classroom practices in mathematics teaching stress active involvement, cooperation, critical thinking, and a sense of ownership, resulting in a more engaging and empowering learning environment.

Pedagogical Implications

My study helps the educational planner develop educational policies by focusing teachers' democratic cultures, teachers' motivation, rewards, and punishment on the basis of students' performance. This study also helps the curriculum designer select appropriate teaching methods and evaluation procedures. This study also helps the government make policies for classroom practices that cover fair teaching, encouraging open discussion, respecting diversity, and transparent practices by the teachers.

Further Ares of Research

This research focuses on the democratic values (practices) and answerability of mathematics teachers. It draws a little bit of attention from teachers in classroom practices to be democratic through students' perception. Furthermore, the area of research will be expanded by including the teachers' side as well in classroom learning. Additionally, this study emphases in particular on the democratic classroom mathematics instruction that students get. How well is the student's comprehension coming along? How democratic math classroom teaching has been in practice. There has been an effort to strengthen the foundation of that research by adding a few bricks. Not only this, the researcher will take a large number of samples and apply different analytical methods to examine **democracy in the mathematics classroom: perceptions and interpretations**. Another area for further research can be defined by adding a comparative dimension to study.

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