Equitable Pedagogical Practices in Learning Mathematics at Secondary Schools in Nepal

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Abstract

The central focus of this study is to explore equitable pedagogical practices in learning mathematics in diversified learners' mathematics classrooms. This study focused on investigating the challenges faced by mathematics teachers to conduct equitable pedagogical practices in learning mathematics in mathematics classrooms and exploring the possible ways to promote equitable pedagogical practices in learning mathematics. An interpretive critical theory paradigm was employed for collecting, analysing, and interpreting data in an iterative process. Qualitative narratives were collected through in-depth interviews, focus group discussions (FGD), and classroom observations of which five secondary-level mathematics teachers of Dhading were observed. Through multi-layered theme analysis and interpretation, the study produced five emergent challenges: linguistic issues, classroom diversity, the dominance of banking pedagogy, student absenteeism, school environment, and socioeconomic position. Moreover, the study showed eight different ways to promote equitable pedagogical practices in learning mathematics: providing additional support for marginalized students, using multi-methods of mathematics teaching, promoting peer and group work, individual treatment, motivational counseling, teaching mathematics relating to daily life, promoting collaborative learning and cooperative teaching, and promoting culturally responsive teaching.

Keywords: equitable pedagogy in mathematics, interpretive inquiry, diversity, culturally responsive

Introduction

The study is set to explore the challenges faced by mathematics teachers in implementing equitable pedagogical practices in secondary school mathematics teaching and learning. The material that is currently available falls short of providing a thorough grasp of the unique difficulties faced by mathematics instructors in Neelakantha municipality of Dhading when attempting to apply equitable pedagogical techniques in secondary-level mathematics classes. Furthermore, there is a dearth of research on practical methods for promoting fair behaviors in context-based mathematics learning. By examining and identifying the challenges

faced by mathematics teachers and suggesting ways to improve the use of equitable pedagogical techniques, this study seeks to close this research gap.

Equity in education is commonly understood as a state in which all students have proportionate opportunities to succeed, regardless of their background or abilities. Equity means that students should have equal opportunities to achieve their optimal abilities without being restricted by their community background or dispositional characteristics guided by their needs (Luke, Woods, & Weir, 2013). According to Majzub (2013), equity in education means a condition where students with special needs such as students with Down's syndrome, mental retardation, autistic students, and slow learners should be well integrated into the schools' activities. Students with special abilities can explore them through exposure in school settings. Furthermore, the National Council of Teachers of Mathematics [NCTM] expresses,

> *Educational equity is a core element of classroom activities. All students, regardless of their personal characteristics, backgrounds, or physical challenges, must have opportunities to study and support to learn mathematics. Equity does not mean that every student should receive identical instruction; instead, it demands that reasonable and appropriate accommodations be made as needed to promote access and attainment for all students. (NCTM, 2000)*

Quality education is a fundamental right for every child, and equitable access to quality education is vital for a country's development (United Nations, 2021). In the context of Nepal, a nation characterized by its diverse cultures, languages (Acharya, 2017) and socioeconomic conditions, achieving equity in education, especially in mathematics, presents challenges. The issue of equitable pedagogical practices in learning mathematics is one of the major issues in the context of Nepal. Equitable pedagogical practices in mathematics are those activities that ensure that all students, regardless of their background or abilities, have the opportunity to learn and succeed (NCTM, 2000). Boaler & Staples (2008) revealed that a reform-oriented approach in mathematics teaching among heterogeneous students offered higher achievement. Thus, equitable pedagogical practices are essential in secondary-level mathematics classrooms, where students are at a critical stage of their academic development.

Investing in education is not just about personal gain; it is building the future of Nepal. (Educated citizens fuel economic, social, and cultural progress, laying the foundation for peace, good governance, and prosperity). Education is the backbone of our "Prosperous Nepal, Happy Nepali" vision. The nation's progress is greatly influenced by the standard and equity of education provided to its students (NEP, 2076). Good education prepares students responsible and opens the ways to

lead the nation ahead. Moreover, education means the acquisition of knowledge, understanding, intelligence, conscience, wisdom, and so forth (Rana, 2007). From the mentioned statement, we can infer that education sets the foundation for the overall development of students. Mahatma Gandhi also defined education as an all-round drawing out of the best in child and man's body, mind and spirit (as cited Behera, 2016). Education also has been set as a major goal in the Sustainable Development Goal (SDG) that eases to achieve the broad goals determined by the Millennium Development Goals (United Nations, 2021). The SDG in its fourth goal seeks to ensure "inclusive and equitable quality education and promote lifelong learning opportunities for all". Achieving equal education is the first step on the path to the sustainable development of society, and this is directly related to the fourth SDG proposed in the 2030 Agenda: "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (United Nations, 2017).

According to Luke, Woods, & Weir (2013), civil rights, feminism, and post-colonial education have influenced the definition of equity in education. Equity in education means an equal opportunity for all students to achieve a similar level of academic achievement, psychological development, and social well-being regardless of their socio-economic background (Organization for Economic Cooperation and Development [OECD], 2018) such as class, caste, gender, geography, language, religion, etc. In addition, equitable pedagogical practices in learning mathematics are crucial for fostering the intrinsic and extrinsic power of students to generate productive knowledge, logical thinking power, and computational skills that could improve their lives as highlighted by OECD.

According to NCTM (2000), mathematics educators must pursue equity in the mathematics classroom by challenging the universal belief that only some students are capable of learning mathematics at a high level. The NCTM equity principle encourages teachers to have high expectations and offer worthwhile opportunities for all students while accommodating individual differences and providing strong support for all students. However, the document does not provide specifics for the types of accommodations necessary to support diverse learners, nor does it provide instruction on how to turn inequitable mathematics classrooms into more equitable ones (Matthews, 2003). Nepal is a multicultural country where heterogeneous people reside and students from these concerned groups join classes that demand multicultural education. John Dewey also termed school as a miniature society, which values multicultural settings in school (Dewey, 1907).

Multicultural education is a reform movement designed to change the educational environment so that students from diverse groups in society will experience equal educational opportunities in schools, colleges, and universities. It is built on the premise that some students are victims of discrimination in educational

settings because of their unique cultural characteristics such as ethnicity, race, language, and gender (J. A. Banks, 1997).

On the other hand, traditional banking pedagogy (in Freire's term), which encourages instructors to just transfer knowledge from textbooks to pupils rather than inspiring them to create and rebuild new knowledge (Freire, 2020), has a significant impact on the majority of mathematical classes. Because relying just on the transmission of existing information would not be sufficient to increase the learners' capacity for creativity and constructive problem-solving, this may have presented a higher obstacle in the development of an egalitarian mathematics classroom (Frankenstein, 1983). Students are therefore encouraged to retain mathematical information without truly comprehending a mathematical concept. Furthermore, pedagogy for teaching and learning mathematics has been taken for granted, with math instructors acting as subject-matter experts and knowledge providers and students acting as passive recipients (Tutak et al., 2011). If this approach is adopted, students' and instructors' creative abilities do not develop as the curriculum anticipates. The phenomenon that this needed inventive learning in a mathematics classroom further discouraged the pupils.

Due to time constraints, limited resources, and ineffective facilitators (Law & Miura, 2015), students in mathematics classes find themselves compelled to memorise formulas, an approach deemed unsuitable for meaningful learning. Additionally, a significant number of mathematics educators prioritise instructional strategies focused on examination-centric viewpoints, which approach destroying mathematics quality education (Yadav, Kumar, Nadia, & Yadav, 2024). Consequently, students are unable to engage with mathematics in a meaningful and productive manner. To align mathematics education with contemporary needs, programs for teaching and learning mathematics should strive to transform the existing pedagogy into a more innovative and suitable form. The adoption of equitable pedagogical practices in mathematics teaching is an emerging concern, offering a crucial avenue for transformative teaching and learning.

Objectives

The specific objectives of this study were as follows:

To explore the challenges faced by mathematics teachers to conduct equitable pedagogical practices in mathematics learning in the secondary-level classroom.

To explore the possible ways to promote equitable pedagogical practices in mathematics classrooms.

Research Methodology

This study allowed for multiple perspectives on reality and was influenced by the researcher's belief that reality is shaped by context and social factors. The qualitative research design was used to explore challenges and possible ways for equitable pedagogical practices in learning mathematics in secondary-level schools. The researcher has chosen the critical theory research paradigm, and narrative inquiry methods, particularly qualitative interviewing of five mathematics teachers (three teachers from a community school including one female, and two teachers from a private school including one from the Terai region), the in-depth interviews were taken for data collection three times to saturate the data, Focus Group Discussion (FGD), and classroom observations, were employed as the principal methods of data collection in this research. The researcher ran the FGD (separately for community and private school teachers), interviewed and observed the classroom of five secondary-level mathematics teachers to learn about their experiences and practices in teaching diverse mathematics classrooms of Neelakantha municipality of Dhading district. According to Yin (2011), purposeful sampling is the selection of participants or sources of data to be used in the study, based on their anticipated richness and significance of data by the research question (as cited in Gentles, et al., 2015).

The FGD was carried out once with all teachers informed the research of how they experienced equitable pedagogical practices in teaching mathematics at the secondary level. For the qualitative interviewing, the researcher prepared interview guidelines focusing particularly on teaching pedagogy, student engagement, imagination, and desire for mathematics learning. The interviews with teachers were all conducted in semi- or unstructured settings. In this study, the researcher analyzed the views of five mathematics teachers of secondary-level schools.

Participants were selected based on their experience and academic qualifications. All participants had at least 5 years of teaching experience at the secondary level, and all except Teachers B and E had completed Master's degree in mathematics. The researcher also inquired about participants' knowledge of equitable pedagogical practices in mathematics teaching and only selected those with good knowledge in this area.

Throughout the development of this paper, the researcher referred to the teachers from a community school as ‘Teacher A’, ‘Teacher B’, and ‘Teacher E’. The others were from a private school located in the Dhading district, which the researcher referred to as ‘Teacher C’ and ‘Teacher D’ throughout the rest of this paper.

For the classroom observation (two times), the researcher also prepared guidelines and engaged himself fully in the mathematics classroom of five teachers. The researcher visited the selected schools, took consent from the school administration, and built up a good rapport with the informants. The researcher

managed field notes when the researcher participated in classroom observation, interviews, and FGD. Along with these methods, the researcher also requested that all teacher participants provide their daily lesson plan for further information about their teaching-learning activities in the mathematics classroom.

During the focused interview, FGD, and classroom observation, the researcher tried to maintain the natural environment, so the researcher did not use any recording device and the researcher took field notes. Instead, the researcher wrote a descriptive account of teacher experiences and student activities within 24 hours of conversations and classroom observations, which included all the events, examples, and anecdotes associated with teachers' experiences with some direct quotes significant to this study. In writing those accounts, the researcher was aware of the possibility of understating or overstating teachers' voices and activities, so I endeavored to 'bracket' my perception and understanding of equitable pedagogical practices in mathematics teaching.

The researcher transcribed the raw data from all sources (interviews, observation, and FGD) into Nepali, and translated it myself into English. The researcher coded focusing especially on mathematics curriculum, learning theories, teachers' practices in mathematics classrooms, and students' engagement and interaction with mathematics teachers in their classrooms. Here, interaction meant their understanding, experience, engagement, and behavior in the mathematics classroom. With the help of codes, the researcher derived general themes modifying time and again to cover all information.

Results and Findings

The five central themes that emerged from the analysis of data are- linguistic problems, classroom diversity, the supremacy of banking pedagogy, the absenteeism of students, and the school environment. This section presents the core findings and insights generated out of them.

Linguistic Problem

Language and education are closely connected as all instruction is conveyed through language (Botes & Mji, 2010). Language is viewed as both a prerequisite for thought and a conveyor of thought, thereby impacting the degree to which a child's intelligence is realized. Language and education (Wyse, Hayward, Higgins, & Livingston, 2017) are interrelated because all teaching is given through the medium of language. Language is considered to be both a precondition for thought and a bearer of thought and therefore influences the extent to which a child's intelligence is actualized. In the Nepalese context, linguistic diversity is a complex issue (Turin, 2007). Through the process of interpersonal and intrapersonal communication, each person learns and develops their innate power (Vygotsky, 1997). In mathematics

classrooms, students from minority ethnic groups like Tamang, Kumal, and Gurung have faced great challenges in communicating with students and teachers from other cultural groups due to language problems. In this context, one of the teacher participants 'Teacher A' from the Chhetri community mentioned:

> *Students from the Tamang community struggle to learn mathematics in Nepali, so they speak their language and whisper to each other when they don't understand the instructions. This shows that they are unable to cover the lesson, and their unusual behavior may be a sign of frustration or anxiety. We should also teach them in English medium too' but the language barrier is preventing them from learning mathematics effectively. As a result, they are unable to understand mathematical problems and solutions, even in Nepali language.*

In a similar vein, another teacher participant in this study 'Teacher D' from the Terai region remarked:

> *The conversation between me and the students also created problems in mathematics teaching due to my mother tongue, its tone that was different from the students' mother tongue. For the first time, I asked my students, "Do you feel difficulties in Mathematics teaching-learning because of the language used by me?"...class was silent... In response, one of the students expressed her feelings, "Since Kumal language is my mother tongue. I feel Kumal language easier than English and Nepali. I feel comfortable reading in Kumar then only in Nepali and lastly in English.*

In addition, another teacher participant in this study 'Teacher B' from the female group stated:

> *It is difficult to explain all the subjects in students' mother tongue. We do not have that capacity and we lack training opportunities too. Due to the difficulty in understanding mathematics in the Nepali language, many students often fail in mathematics and science subjects as Nepali is not their mother tongue.*

This account illustrates that students from minority backgrounds faced a big challenge to understand mathematics in a meaningful way. Each minority student is linguistically subordinate and subjugated by the marginalized status of their mother tongue (Khanal, 2017). Students were found less engaging in class due to their less confidence and linguistic problem. As a result, students are unable to get success both in linguistic subjects and mathematics. In mathematics verbal problem class, students from both minority groups and middle class families felt uneasy to grasp concept if presentations are made in English.

Despite the constitutional requirement and governmental steps to guarantee a child's right to receive a fundamental education in their mother language, including

the curriculum and medium of teaching, this is not occurring (Regmi, 2021). According to the United Nations Children's Fund [UNICEF] (2018), there are over two million children in Nepal who cannot speak Nepali. As a result, they are unable to learn in school in a meaningful way as the majority of schools adopt the Nepali language as a medium of instruction. The narration articulated above provides me an insight that a language other than the mother tongue has created a challenge for students who are from culturally different communities. Ethnicity and home language have a greater influence on the student's achievement in mathematics (Poudel, 2018) that proves language as a great challenging issue in equitable mathematics classroom teaching. The researcher found from the mathematics classroom that students weren't raising unclear questions openly to teachers. , Ethnic group students felt difficulty in learning mathematics meaningfully.

Classroom Diversity

In the mathematics classroom of the study area, students were in diverse in cognitive level, socio-economic status, mother tongue, cultural background, and needs and interests. According to (Panthi & Belbase, 2017), some gender issues affecting mathematics education in Nepal include differential attainment between genders, with female students having less interest in studying mathematics beyond school. Additionally, social barriers are preventing many girls from attending school, and the mathematics classroom is often male-dominated (Panthi & Belbase, 2017). Social justice issues include inequity and not getting equal access to teaching and learning in the mathematics classroom where some students are found discriminated based on their ethnic background or economic status. To address the diversity of cognitive level, Lev Vygotsky emphasized aligning learning activities with a student's developmental stage, introducing the concept of the 'Zone of Proximal Development (ZPD),' which denotes the gap between a child's current developmental level and the higher potential level achievable with adult guidance and assistance (Elliott et al., 2000). Engaging in collaborative learning, equitable pedagogy, co-teaching, and peer teaching proves advantageous as it can bridge the learning gap within the ZPD as proposed by Vygotsky in 1978.

Above mentioned evidences enrich to argue that talented students dominate weak students, students from rich families dominate to poor ones, high-class family students dominate low-class students, and boys dominate girls in everyday classroom activities in mathematics classrooms. These phenomena create challenges for making mathematics classrooms equitable.

In this context, one of the teacher participants ‘Teacher E’ of this study opined, “In our school students come from diverse economic families ranging from poor to rich in economic status”. Similarly, another teacher participant ‘Teacher B’ stated:

> Many working-class students in our school do not have access to basic school supplies, such as mathematics textbooks, copies, and pens. This makes it difficult for them to complete their homework and classwork, which puts them at a disadvantage in mathematics. Some students also have to work at home, which takes away from their study time. Additionally, some students come from families that are struggling financially and may not have enough food to eat. This can make it difficult for them to focus on their studies. The combination of these challenges can make it difficult for working-class students to succeed in school.

Both of the participants raised the issue of classroom diversity as a more challenging problem in our context to create equitable classroom pedagogical practices. Regarding classroom diversity in cognitive level and its effects on learning mathematics, the researcher saw in mathematics classroom observation that talented students rapidly solve the problem when the teacher taught whereas weak students cannot solve yet if mixed-level students are taught in class. Weak students were found copying solutions to the problems already solved by talented students. Researcher also realized that when students are unable to understand the problems, they are interested in copying from others rather than asking teachers and peers. This is a great challenging issue in the mathematics classroom for promoting the level of all students. Therefore, classroom diversity is a more challenging issue in creating equitable mathematics classrooms.

Supremacy of Banking Pedagogy

In mathematics classrooms, most of the mathematics teachers have practiced traditional banking pedagogy. In this pedagogical practice, according to Acat and Dönmez (2009) teachers act as knowledge providers and students act as knowledge receivers, in which information transforms from teacher to students through a one-way communication system that is the lecture method. Compared with a teacher-centric approach learner engagement is anticipated to enhance advanced cognitive skills, knowledge acquisition, and academic success (Geletu & Mekonnen, 2019). This encourages profound comprehension as opposed to the superficial coverage method of learning. In this context, Freire pointed out that traditional mathematics teachers always want to fill the students' minds as a container (Tutak et al., 2011). It refers to students as the passive receivers; there is no space for flourishing creativity in the minds of students. So from a critical perspective (A perspective that involves analyzing and evaluating information, ideas, or situations with a discerning and questioning mindset, often challenging established norms and seeking a deeper understanding of underlying power dynamics), banking pedagogy hinders the thinking capacity of students.

When the researcher observed all the participants' classrooms, the researcher

found that they spent almost all their time telling themselves and writing the solutions on the board. They were unable to provide time to run creative activities among students. The following classroom observation of teacher 'A' shows the domination of lecture methods in the mathematics classroom.

> *The teacher started a new topic on trigonometry, covering compound angles and their applications, as well as multiple angles. He had a fixed plan and controlled the class completely, filling the students' minds with knowledge. The students sat like statues, passively observing him. He wrote the chapter heading and subheadings on the board, then instructed the students to turn to a specific page and start on example number one. The students complied, and the teacher wrote the question on the board. He then began to solve the problem aloud, explaining the process as he went. When he finished, he turned to the students and asked, "Did you understand?" They all said yes, but in reality, they were confused about the process and the concept. One student dared to ask a question, but the teacher cut him off and shouted at him, "Don't you know even this simple thing?" He continued to scold the students, so no one else dared to ask any questions later." (Classroom observation transcription)*

From the above classroom observation transcription, we can say that teachers gave more priority to the lecture method in mathematics classrooms since they spent most of the time giving lectures rather than motivating students to solve given assignments. In this regard, one of the teacher participants 'Teacher D' stated:

> *In our school, most mathematics teachers are highly focused on solving textbooks and practice book-related problems rather than practicing and building concepts with the help of concrete materials.*

In a similar vein, another teacher participant 'Teacher E' said "Our mathematics teaching system is exam-oriented rather than learning by doing activities. Due to the limited time, we are unable to connect the mathematics content with everyday life and local context".

Moreover, in the classroom observation of 'Teacher C', found that

> *The teacher taught a mathematics problem, gave students time to solve it, and then gave another problem. One-quarter of the students were still working on the first problem, but the teacher didn't give them attention because they were weak students. This shows that teachers are not always putting teacher training into practice, and weak students are left behind.*

This statement also focused on the supremacy of banking teaching pedagogy. These are the great challenges for making our students active participants in posing problems, active involvement in fruitful discussion, and meaningful learning.

Absenteeism of students

It seems that students' irregularity is another significant problem in mathematics classrooms for implementing equitable teaching pedagogy. The teacher participant 'Teacher A' expressed:

> *We teachers teach the essential subject matter of mathematics to the students. Students, who are absent in the class and cannot understand the important topic due to the lack of prior knowledge, they feel difficulty in learning. The students are afraid of asking questions to us, especially the weak ones. During class time, some students go to visit different places inside and outside of the school premises and do not return to class on time.*

In this regard, another teacher participant 'Teacher C' remarked, "We have limited time and a lengthy course of mathematics, so I am compelled to run my course to another topic as I have to complete the course on time. As a result of missing classes, most of the students are weak in mathematics though I am taking fine from absent students.

According to Gutstein (2007), implementing questioning pedagogy and developing a supportive and caring environment in the classroom may reduce students' absenteeism. Absenteeism has been considered critical factor for low student motivation, poor achievement, and school dropout (Chaves-Barboza et al., 2019). So student irregularity is a great challenge for equitable mathematics classrooms.

School Environment

The environment is considered a supplementary aspect of heredity. School environment refers to the psycho-social climate (Narad & Abdullah, 2016) of the school as perceived by the students, and encompasses both the socio-psychological and physical dimensions. It can play an active role in promoting the all-round development of children, and a healthy environment in the school helps the child make social adjustments. Satisfaction of the child with the behavior of class, teachers, head of the institution, teaching methods, timetable, and co-curricular activities influence his academic performance and the adjustment in life and society. The study conducted by (Lawrence & Vimala, 2012) revealed that there was a significant difference in academic achievement between students based on the medium of instruction and the locality of the school. Additionally, the study found that urban students had a better school environment than rural students. A good environment includes two important aspects; the first is the physical environment and the second is the psychological environment. The physical facilities in schools play important roles in learners' achievement and both in equity and quality in school. The presence of the provision of good infrastructure of physical facilities such as good school buildings, adequate furniture in classrooms, availability of drinking water, toilets, especially

for girls, and other facilities affect the process of quality schooling, enrollment of students, and performance of student achievement in mathematics. It also helps to create a good school environment. The focus of improvement is to enhance the quality of the classroom by creating and improving space for all students and the health situation of students. John Dewey emphasized the need for adapting school methods and materials to better align with contemporary social needs, expressing concern that schools were not adequately enabling children to learn in a way consistent with their home environments (Dewey, 1899). Thus improvement creates a healthy safe and conducive physical environment to foster effective learning. The researcher asked the mathematics teacher, "How is your school environment and classroom environment?" Then the participants 'teachers A and D' remarked:

> *Our school has a good physical environment, with a playground, a garden, and a canteen. It is located in a peaceful and pollution-free area. However, we lack essential facilities such as a computer lab, e-library, mathematics lab, and teaching materials. This has led to a poor classroom environment for mathematics classes, and students are not performing well in this subject. We need to address these issues as soon as possible to improve student achievement in mathematics.*

In this regard, 'teacher B' also mentioned, "There are not sufficient teaching materials no doubt but teachers are not using few materials that we have. We have no math library and math lab".

From the above view, the researcher came to know that there are lack of sufficient school buildings, a library with reference books, a mathematics lab for practical sessions, and parent participation fostering students' homely environment. Moreover, the researcher realized that negative thinking of teachers, students, and parents about the government school also has affected the less effective teaching-learning environment at school, which directly results in low achievement of mathematics students.

After scrutinizing perspectives from all participants, observing classroom instruction, and reflecting on firsthand experiences in mathematics classrooms at the school level, the researcher has identified primary obstacles encountered by mathematics educators in establishing an inclusive classroom atmosphere. These challenges include prioritizing exam-centric teaching approaches, inadequately structured project assignments, misalignment between curriculum content and real-world applications, socioeconomic disparities among students, dynamics within peer discussions, and the quality of teacher-student relationships.

The aforementioned challenges have raised great barriers to promoting equitable pedagogical practices in mathematics classrooms. Therefore, we have

to address these challenges to transform the existing situation in the mathematics classroom, which is essential for equitable pedagogical practices in the mathematics classroom.

By analyzing the verbal data captured from participants as well as from classroom observation, and by reviewing related literature, I was able to find possible ways for promoting equitable pedagogical practices in the mathematics classroom, that are, providing additional support for marginalized students, use of multi-methods of mathematics teaching, promoting peer and group work, individual treatment, motivational counseling, teaching mathematics relating with daily life, promoting collaborative learning and co-operative teaching and promoting culturally responsive teaching.

Discussion

The analysis and observation of mathematics classes among teacher participants reveal notable inequities. One such instance is when a teacher chooses not to cover certain lessons, deeming them time-consuming. Equity principles emphasize providing students access to challenging mathematics content both inside and outside the classroom, challenging the notion that certain topics are too difficult for revision.

Structured group work for collaborative learning was not present in any of the schools, mainly due to teachers' concerns about varying levels of student abilities in the classrooms. The study emphasizes the beneficial effects of collaboration on students' comprehension and encourages teachers to work together to devise effective strategies for its implementation. In this regard, Acharya (2017) contends that within collaborative learning environments, students experience greater autonomy to openly communicate their challenges, successes, and uncertainties, thereby enhancing their capacity to grasp mathematical concepts. Participants in this study were moderately familiar with equitable pedagogical practices but lacked intensive focus on their implementation in mathematics classrooms.

Boaler explains that during the inception of mathematics reform movements, the underlying concept was centered on utilizing open-ended problems. These problems aimed to encourage students to select and integrate various methods while engaging in discussions about diverse solution approaches with their peers, fostering enriching learning experiences (Boaler, 2000). Boaler further, suggested that teachers collaborate to develop effective strategies for implementing group work and collaborative learning in mathematics classrooms.

This study envisioned researcher all participants of this study are less or more familiar with the approaches and strategies of equitable pedagogical practices

in the mathematics classroom. However, they have not given an intensive focus on the implementation of the strategies for maintaining equity in a mathematics classroom. Therefore, there remains to practice these approaches and strategies in the actual classroom activities to bring a drastic change in the existing situation of the mathematics classroom.

The research emphasizes the importance of transforming theoretical knowledge into practical implementation to instigate substantial changes. While teachers express interest in open methodologies and collaborative practices, the rigid adherence to a predefined curriculum poses a challenge, impeding the incorporation of innovative techniques. Conventional teaching approaches, geared towards rapid topic coverage for year-end assessments, contribute to monotony and a decline in student motivation. In this vein, (Kalsoom, Kalsoom, & Mallick, 2020) conclude that the traditional banking model of education places the teacher as the exclusive holder of knowledge, with students in a passive recipient role. Conversely, critical pedagogy seeks to liberate learners by encouraging critical thinking, fostering a collaborative learning process that values both teachers and students, emphasizing dialogue and challenging the hierarchical dynamics found in banking education. This research suggests that adopting creative and inclusive approaches can enhance both student motivation and academic performance.

Overcoming obstacles to establishing equity in mathematics classrooms requires collaborative efforts among students, teachers, and parents. Mathematics teachers must commit to their profession and act as change agents to transform classrooms into equitable learning environments. This collaborative approach is seen as instrumental in promoting equity and gradually improving the overall quality of education in mathematics.

Conclusion

The researcher set out to explore the challenges faced by mathematics teachers to conduct equitable pedagogical practices in mathematics learning in secondary-level classrooms.

The major challenges that emerged include equity practices in the classroom. This study found that the major challenges to implementing equitable pedagogical practices in mathematics classrooms are: linguistic problems, classroom diversity, the supremacy of banking pedagogy, absenteeism of students, school environment and socioeconomic status, non-participatory teaching/learning practices, lack of multicultural competency among teachers, and following mono-cultural practices in multicultural mathematics classrooms.

Teachers were concerned about only students' seating arrangement in class and group division but did not notice active participation, dialogue, and engagement in

mathematics and equity in results.

Schools are highly diversified according to age, geographical region, caste, religion, economic status, family relationships, and child labor. To create interest in mathematics, teaching and learning activities should be linked with the student's daily life but the curriculum and education system as well as classroom practices are exam-oriented.

Despite the allocation of 25 marks in the practical exam, the teacher gives these marks to students without justification. This culture is also responsible for not enrollment of students in further study. From this above discussion, there would be a lack of adequate knowledge about the equity and equality provision and limited knowledge and skills to adopt in the classroom.

This shows the need for professional development of teachers to incorporate the equity and equality provision in classroom teaching. Teachers seem concerned about equity in access but very limited concerns about equity in achievement. Culturally responsive teaching, differentiated instruction, collaborative learning, assessment, and teacher professional development are all important strategies that can be used to promote equity in the classroom.

The second objective of the study was to explore the possible ways to promote equitable pedagogical practices in mathematics classrooms. The study also identified several possible ways to promote equitable pedagogical practices in mathematics classrooms including: engaging students in the classroom by providing additional support for marginalized students, using multi-methods of mathematics teaching, promoting peer and group work, individual assistance, classroom ecosystem, motivational counseling, teaching mathematics relating to daily life, promoting collaborative learning and cooperative teaching, promoting culturally responsive teaching, encouraging students to participate in the learning process, implementing equity pedagogy in the mathematics classroom, and teaching mathematics through dialogical approaches.

Promoting equitable pedagogical practices in learning mathematics at secondary schools is crucial for ensuring that all students have access to high-quality education.

This research has shown that inequitable pedagogical practices can hurt students' learning and achievement in mathematics. By implementing these strategies, teachers can create a more inclusive and supportive learning environment that meets the needs of all students.

The study also recommends the implementation of professional development programs that address equity in teaching mathematics at various levels. This can also be supported by the development of appropriate teaching and learning materials

in preservice teacher training. This study further recommends research in basic-level mathematics teaching. This will give a better understanding of equity issues in teaching mathematics.

References

Acat, B., & Dönmez, İ. (2009). To compare student centred education and teacher centred education in primary science and technology lesson in terms of learning environments. *Procedia-Social and Behavioral Sciences, 1*(1), 1805-1809.

Acharya, B. R. (2017). Factors affecting difficulties in learning mathematics by mathematics learners. *International Journal of Elementary Education, 6*(2), 8-15.

Aslan Tutak, F., Bondy, E., & Adams, T. L. (2011). Critical pedagogy for critical mathematics education. *International Journal of Mathematical Education in Science and Technology, 42*(1), 65-74.

Banks, J. A. (1997). *Educating Citizens in a Multicultural Society. Multicultural Education Series.* Teachers College Press, 1234 Amsterdam Avenue, New York, NY 10027 (paperback: ISBN-0-8077-3631-7; clothbound: ISBN-0-8077-3632-5).

Behera, H. (2016). Educational philosophy of Mahatma Gandhi with special reference to curriculum basic education. *International Education & Research Journal, 2*(1), 112-115.

Boaler, J. (2000). Mathematics from another world: Traditional communities and the alienation of learners. *The Journal of Mathematical Behavior, 18*(4), 379-397.

Boaler, J., & Staples, M. (2008). Creating mathematical futures through an equitable teaching approach: The case of Railside School. *Teachers College Record, 110*(3), 608-645.

Botes, H., & Mji, A. (2010). Language diversity in the mathematics classroom: Does a learner companion make a difference?. *South African Journal of Education, 30*(1), 123-138.

Chaves-Barboza, E., Marín-Marín, J. A., Sarmento-dos-Santos, A. P., & Trujillo-Torrres, J. M. (2019). Student absenteeism in mathematics lessons: Social variables in the PGS of Namibe. *Education Sciences, 9*(2), 130.

Dewey, J. (1899). The School and Society. Chicago: The University of Chicago Press. (pp. 30-50).

Dewey, J. (1907). The school and social progress. *The school and society,* 19-44.

Elliott, S. N., Kratochwill, T. R., Cook, J. L. and Travers, J. F. (2000). Educational Psychology: effective teaching, effective learning. New York: McGraw – Hill. (pp. 1-69, 114-155, 200-330).

Frankenstein, M. (1983). Critical mathematics education: An application of Paulo Freire's epistemology. *Journal of Education,* 315-339.

Freire, P. (2020). Pedagogy of the oppressed. *In Toward a sociology of education* (pp. 374-386): Routledge.

Geletu, G. M., & Mekonnen, A. (2019). Practicum as the Center of Teachers' Education Curriculum: Its Implications for Quality of Teachers' Professionalism in Selected Colleges of Teachers Education. *Journal of Humanities and Social Science (IOSR-JHSS), 24*(02), 40-51.

Gentles, S. J., Charles, C., Ploeg, J., & McKibbon, K. A. (2015). Sampling in qualitative research: Insights from an overview of the methods literature. *The qualitative report, 20*(11), 1772-1789.

Gutstein, E. (2007). "And that's just how it starts": Teaching mathematics and developing student agency. *Teachers College Record, 109*(2), 420-448.

Kalsoom, S., Kalsoom, N., & Mallick, R. J. (2020). From banking model to critical pedagogy. *UMT Education Review, 3*(1), 25-44.

Khanal, P. (2017). Falling prey to the dominant culture? Demystifying symbolic violence against ethnic minority students in Nepal. *Pedagogy, Culture & Society, 25*(3), 457-467.

Law, H. F. E., & Miura, U. (2015). *Transforming teaching and learning in Asia and the Pacific: studies from seven countries.* UNESCO Bangkok Office.

Lawrence, A. S., & Vimala, A. (2012). School Environment and Academic Achievement of Standard IX Students. *Online Submission, 2*(3), 210-215.

Luke, A., Woods, A., & Weir, K. (2013). Curriculum design, equity and the technical form of the curriculum. *Curriculum, syllabus design and equity: A primer and model,* 6-39.

Majzub, R. M. (2013). Teacher trainees' self-evaluation during teaching practicum. *Procedia-Social and Behavioral Sciences,* 102, 195-203.

Majzub, R.M. (2013). Critical Issues in Preschool Education in Malaysia. In Recent Advances in Educational Technologies

Matthews, B. (2003). Improving Science and Emotional Development (The ISED project): *concerning citizenship, emotional literacy, science and equity.*

Goldsmiths, University of London.

Narad, A., & Abdullah, B. (2016). Academic performance of senior secondary school students: Influence of parental encouragement and school environment. *Rupkatha Journal on Interdisciplinary Studies in Humanities, 8*(2), 12-19.

National Educational Policy, (2076). The Government of Nepal

NCTM (2000). *Principles and standards for school mathematics.* Reston, VA: NCTM.

Organization for Economic Co-operation and Development (OECD). (2018). The future of education and skills: Education 2030. *OECD Education Working Papers.*

Panthi, R. K., & Belbase, S. (2017). Teaching and learning issues in mathematics in the context of Nepal.

Poudel, L.N. (2018). National assessment of student achievement 2017: *Key features and implication towards improving quality of school education*. Kathmandu: Bengketes publication.

Rana, S.P. (2007). *Foundation of education*. Kathmandu: Vidyarthi Publications.

Regmi, D. R. (2021). Developing and implementing mother-tongue education policy in minority speech communities in Nepal: issues and challenges. *Studies in ELT and Applied Linguistics, 1*(1), 29-57.

Turin, M. (2007). *Linguistic diversity and the preservation of endangered languages: A case study from Nepal.* International Centre for Integrated Mountain Development (ICIMOD).

United Nations Children's Fund. (2018). *UNICEF Nepal education programs (2018-2022)*

United Nations. *General Assembly of United Nations Work of the Statistical Commission Pertaining to the 2030 Agenda for Sustainable Development;* United Nations: New York, NY, USA, 2017; Volume 71.

United Nations (2021). *Sustainable development goals*

Vygotsky, L. (1997). *Educational psychology.(R. Silverman, Trans.). Florida: St. In: Lucie Press.*

Wyse, D., Hayward, L., Higgins, S., & Livingston, K. (2017). Language and education. *The Curriculum Journal, 28*(4), 443-445.

Yadav, D. K., Kumar, S., Nadia, L., & Yadav, A. B. (2024). Role of multiplicity

in examination oriented teaching destroying mathematics quality education. *Journal of Mathematics and Science Teacher, 4*(1).

Yin, R. K. (2011). Qualitative Research from Start to Finish. New York, NY, USA: The Guilford Press.

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