

Pedagogy for the Future in the Context of Nepal: An Exploration with Critical Mathematics Education

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Abstract

Critical mathematics education undermines the neutrality of mathematics teaching and learning; it confronts societal barriers and suppression, social justice, and opens up new pathways for students to participate in social and political life. This paper intends to analyze critical mathematics education and how it can be used as a tool to create a bright future for mathematics in Nepal by altering teaching pedagogy and applying it to practice. For this study, the search engine Google, Google scholar, Eric, and ProQuest were used. Three major themes were explored: thoughts of teachers towards critical mathematics education, mathematics education in relation to society, and technology-based teaching. To discuss the result content analysis on the themes were used. This study finds that optimistic attitude, innovation of teachers, and the use of critical pedagogy appear to be too responsible for the bright future of mathematics. To attain the objectives, our teachers must be enthusiastic, knowledgeable about information and technology, and critical and reflective.

Keywords: Critical mathematics education, critical pedagogy, social transformation, empowerment

Introduction

Nepal is a developing country with frequent political instability (Bhattarai, 2016), thus it still takes a lot of effort to tackle the obstacles of social transformation. To address this pressing issue, mathematics is a great tool for addressing social, political, and economic goals and restrictions (Dorier & Maass, 2020). As a result, mathematics can be employed to bring about positive change. Nepal is a multicultural and multiethnic nation where individuals are influenced by their sociopolitical environment, religious practices, civilization, information and technology, economic standing, and educational practices (Kandel, 2020; Sherpa, 2019).

Transformation cannot happen overnight because it is a continuous process however it takes time for its reform (Termeer et al., 2017). Mathematics teachers have struggled to hear pupils' voices however they cannot

catch the voice of students (David W Stinson et al., 2007). Mathematics teachers still using traditional methods in their classroom instruction (Panthi & Belbase, 2017). Mathematics teachers verbally claiming that their teaching method is led by critical pedagogies however, in practice they are almost using "chalk and talk" methods in their instructional practices (Plessis, 2016; Tarling & Ng'ambi, 2016).

Digitalization in higher education is not a new concept; it has been around for a while (Adhikari et al., 2022). However, in the context of Nepal, many teachers and students are still unfriendly towards the use of digital resources in their instructional practices (Belbase et al., 2022; Joshi, D, 2017; Joshi, 2016; Joshi et al., 2023; Joshi, Khanal, et al., 2022; Joshi & Rawal, 2021; Khanal, Joshi, Adhikari, & Khanal, 2022; Khanal, Joshi, Adhikari, Khadka, et al., 2022; Sangroula, 2022) however they are good in digital

awareness (Khanal et al., 2021). The National ICT Policy 2015 highlighted ICT literacy, e-learning, and ICT integration in classroom activities, as well as ICT-based teacher training (MoICT, 2015); though, technical resources are not available in every school (Joshi, 2017). Our students are still unfamiliar with technological equipment; instead, they rely on the whiteboard. Many students are experiencing power and internet outages. They don't have access to information technology (Joshi, D, 2017; Joshi, 2016; Joshi et al., 2019; Joshi, Neupane, et al., 2021; Joshi, Singh, et al., 2021). Only the students of urban areas have access to digital resources (Joshi, D, 2017). Critical mathematics instruction is effective way to change the vision of society. Critical mathematics is defined as mathematics that deals with power dynamics (Gutstein, 2003). It claims that critical pedagogy can help students to obtain knowledge and understanding of mathematics. It is a tool for empowering our students to construct and reconstruct understandings of social institutions and traditions, as well as to promote innovation for more just and equitable social and political reform (Skovsmose & Borba, 2006).

In these contexts, this study presents an inquiry into critical mathematics education and how this can help as a tool to make a bright future for mathematics in the context of Nepal through reforming the teaching-learning process and application to practices. To contextualize the writing, mathematics education's connection with social consciousness about mathematics and the concept of democracy has been briefly explored. This study takes a more comprehensive approach and seeks to deal with some questions as follows: (a) what are the practices of critical mathematics education? (b) How mathematics teacher can apply that kind of educational system

in Nepali context? (c) Are policymakers and mathematics teachers concerned on improvement of mathematics? (d) Are policymakers and mathematics teachers developing a child-friendly environment in their classrooms?

Critical Pedagogy

Critical pedagogy is an educational method that focuses on transformation. Further, Kincheloe (2018) agreed that transformational power relations are repressive and lead to human oppression, despite attempts to humanize and empower learners. Critical pedagogy is a means of 'doing' learning and teaching rather than a set of ideas (Canagarajah, 2004). This description places critical pedagogy squarely in the classroom, prompting us to consider how teachers engage with students and how students behave with one another while managing institutional and cultural norms (Wachob, 2009). However, it has been criticized that it focuses on the macro level system, without a model for classroom implementation, and being abstract (Abraham, 2014). Despite these critics, Abraham (2014) claims that critical pedagogy still has the ability to empower persons in the field of education to raise their awareness of injustice in their society and to participate in its transformation.

Critical theory is relevant to the concept of a just society where people have power over their political, economic, and cultural life. Critical theory thinkers argue that these goals can only be met by emancipating oppressed people, empowering them, and allowing them to improve their living situations (Aliakbari & Faraji, 2011). According to Vandrick (1994), Critical Pedagogy's fundamental purpose is to emancipate and empower all persons, regardless of gender, class, and color (Reynaud, 2020). Gadotti (1994) explained that Freire is particularly interested in teaching as a means

of changing the structure of a repressive society. According to Kanpol (1998), critical pedagogy is based on the concept that every citizen deserves an education, which entails the instructor comprehending the educational framework that would not allow education to occur.

Critical pedagogy is responsible for a basic theory whose application varies depending on the situation because instruction must be responsive to learners' realities and experiences (Esmonde & Booker, 2016). The interaction between the instructor and the learner is how students build meaning about the reality and how to make it a better place for everybody (Tutak et al., 2011). The teacher encourages students to question but does not push their opinions on them (Stinson et al., 2007). Importantly, the teacher's responsibility is not to save the students but to empower them to combat injustice in their reality. However, if a student does not choose to modify the society norm, a teacher cannot compel that student to do so. Forcing students to engage in critical thinking and action runs counter to the essence of critical pedagogy, which aims to raise critical consciousness in the face of dominance over how people think and live (Tutak et al., 2011).

Critical Mathematics Education

Mathematics education is the means of empowerment and suppression (Skovsmose, 2014). It is a way of inclusion, but it also serves as a means of exclusion and discrimination. John Volmink wrote that "Mathematics is not only an impenetrable mystery to many, but has also, more than any other subject, been cast in the role as an 'objective' judge, to decide who in the society 'can' and who 'cannot' (Skovsmose, n.d.). It, therefore, serves as the gatekeeper to participation in the decision-making processes of society. Denying some people access to mathematics

is a predetermined way of determining "who will go ahead and who will fall behind" (Volmink, 1994, pp. 51–52). Critical mathematics education focuses on classroom life to the extent that communication between instructor and students might reflect power dynamics. Further, it can be used to discover and analyze essential characteristics of society, both globally and in the context of students' local environment. Because culture and conflicts generate fundamental problems regarding discrimination, mathematics must provide a solution to inequities (Avcı, 2019). There is a variety of literature about critical mathematics that describes how it plays a socio-political role and how it helps maintain social order by producing 'smart' and 'rational' citizens.

According to Skovsmose and Borba (1997), mathematics education is the path to the establishment of a certain ideology. Dowling (1998) developed an alternative curriculum for various groups of students and emphasized the importance of mathematics, as well as writing achievement, to demonstrate how it might provide chances for many groups of students. From it we can say mathematics is the language that can interact with society about social stratification, however, it can serve to empower students. To promote empowerment, in a South African setting, Vithal (2003) describes the role of mathematics education for empowerment is significant. Also, D'Ambrosio (2011) explored ethno mathematic studies on what empowerment might signify in different cultural settings. Based on these references, we can conclude that critical mathematics education is also helpful in empowerment our students. Within its principles, critical mathematics education can serve as a means of democratic conversation between teachers and students, acting as facilitators to rethink

and re-construct educational mathematics activities (Phillipson, n.d.). Especially, principles are related to the target issues of political agency applied in society after examining mathematics education (Freitas, 2008). Further, Freire (1970/1998) as cited in Freitas (2008) emphasized a critical pedagogy that was grounded in the “present, existential, concrete situation” that is the milestone for teaching with the lived experiences of students which accumulated all emotional and ethical bonds to the conditions in which they struggled for voice and equity.

Methodology

Descriptive qualitative research design was used in the research. Secondary sources of data like journal articles, books, and reports were used in the research. Google, Google scholar, Eric, and Proquest for searching the relevant documents by using different keywords like critical mathematics education, critical pedagogy, future of mathematics, Nepal, mathematics instruction, digital pedagogy, ICT in mathematics instruction, and ICT in learning. The results were drawn based on three major themes as Thoughts of teachers towards critical mathematics education, mathematics education in relation to society, and technology-based teaching. Content analysis was major technique to find the results based on the research questions.

Results

Thoughts of teachers towards Critical Mathematics Education

The thoughts of teachers towards mathematics education play a vital role in mathematics teaching-learning activities. Before entering this profession, the teacher must understand the significance of mathematics education in society. Skovsmose and Borba (1997) argue that mathematics education is critical to developing the ideology

of certainty. The words and language used in mathematics are tough to understand, but teachers' optimistic attitude makes it easier for students to think.

Freitas (2008) emphasized that if the teacher has a positive attitude, he or she may contextualize any problem by connecting it to real-life situations, making mathematics more fascinating and pleasurable. It also alleviates pupils' hesitancy and ambiguity in asking queries. To make teaching-learning activities interesting and effective, we must promote our local resources, positive attitude, and belief which we have which create our future in mathematics. It is possible with critical pedagogy which also provides social justice (Stinson et al., 2007). Critical pedagogy promotes both teachers and students to grasp the interwoven relationship between ideology, power, and culture, while rejecting claims to universal foundations for truth and culture, as well as claims to objectivity (Morrel, 2013; Stinson et al., 2012). The critical teacher recognizes their responsibility to prepare the student for more than just the profession. She or he gives people the ability to modify their civilization. It is also expected of such a teacher to be willing to learn their instructs (Rexhepi & Torres, 2011). For getting such results, teacher should be familiar with culture, ethnicity and creativity, an expert should be critical and the researcher should be reflective. These organic intellectuals (Rexhepi & Torres, 2011) train their pupils/students to be more than merely agents of change who reject injustice. They can prepare them as agents of change and reform society (Fischman & McLaren, 2005).

Technology based Teaching

Learning can take place at any time and in any location (Cheng, 2015). There is no boundary for learning by the cause of

digital resources. Furthermore, learning is no longer limited to classroom settings, owing in great part to the learning curves brought about by technological developments and industries such as entrepreneurship (Joshi et al., 2021a). Many technology-based techniques provide significant chances for students to develop content that can be shared in the classroom, between schools, and on online education platforms and Learning Management Systems (Joshi, Adhikari, et al., 2022; Khadka et al., 2022; *Technology-Based Learning Approaches*, n.d.).

The incorporation of technology in mathematics teaching and learning aids in the formation of collaborative work among instructors and students which is related to teachers' professional development (Panthi & Belbase, 2017). According to Skovsmose and Borba (2006), mathematics provides a type of technological independence by utilizing the initial region of hypothetical circumstances. It provides the option for hypothetical reasoning, allowing us to assess a hypothetical scenario's repercussions. Mathematics can assist in the development of justifications as well as false justifications for certain actions (Gurel et al., 2015). Our environment alters when an option is chosen and implemented. When an opportunity is chosen and realized, our surrounding alters. Mathematics becomes a part of reality as a result of technological belief.

Based on these evidences it can be concluded that mathematical functions and critical curriculum should focus on technological integration in the instruction. It must be pertinent to the local environment. It must encompass the health sector, and mathematics must be relevant to our ordinary routine. It makes an essential contribution to the nation's citizenship.

Mathematics Education in Relation to Society

Mathematics is a subject that is the key gate of all subjects; No one disagrees with this statement (Stinson et al., 2007). Due to innovations in information and technology, the world has shrunk to the size of a small global community. Hence, Mathematics is crucial in solving societal problems (Ernest et al., 2016). It is the means to provide the vision to run society and it can struggle for social justice. For this purpose, many researchers and mathematics educators are engaged (E. E. ; Gutstein & Peterson, 2005). To produce good citizens for society, we must promote creativity and help them to fulfill their potential capacity. Hence, our mathematics curriculum should be linked with skills, classes to be run in democratic ways that add opportunities and a golden future for all citizens.

Conclusion

Critical mathematics education aspires to include examples from many cultures or well-known real-life lifestyles in educational hubs. To yet, critical pedagogy in mathematics instruction has not been scientifically utilized in Nepal. Critical mathematics instructors must be critical of themselves as part of a continuous process of critical consciousness. The discipline of mathematics education needs empirical studies and curriculum assistance for educators. The goal of critical mathematics education is to associate cultural diversity and equality efforts with a vital attitude in order to combat prejudices about mathematics and mathematics instruction and to build democratic principles and critical consciousness. More study is needed in the subject of mathematics education in order to use critical pedagogy. Critical pedagogy not only educates citizens but also contributes to a democratic society.

To ensure a favorable impact in mathematics teaching-learning activities, the instructor must be motivated. They cannot progress in mathematics whenever they have full access to educational resources. Schools and the government should develop policies to increase the use of technology in the demonstration of mathematical tasks. If this is not achievable, create new concepts to solve long-term difficulties. In this method, a clear roadmap can be drawn to comprehending mathematics. The Nepalese government should spend the necessary funds to equip all schools with technology tools and train all teachers on how to use them properly.

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