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Connecting Cultural Knowledge with Western-Based School Science: Experiences of Marginalized Students

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Abstract

This study focuses on interactive, creative, collaborative, and inclusive science teaching environments both in school and at home to create and extend multicultural science knowledge based on the experience of culturally marginalized students toward science learning. This case study explored the knowledge construction system of students. Two culturally and economically marginalized students of a public secondary school located at Gorkha Municipality were purposively selected. To collect information in-depth interview was taken with two students jointly, and classroom teaching activities were observed and noted in the diary. The transcription of interviews and field notes taken from the classroom observation were coded, categorized and three global themes were identified. Based on global themes, the data were analyzed according to the view of participants compared to the culturally relevant pedagogy and cultural theories. The selected students were not satisfied with their teacher's teaching strategies. The study found that culturally relevant science teaching is mainly affected by pedagogical, environmental, and strategic problems. Teachers and the school culture are seen as the main problem in implementing and braiding culturally relevant science teaching in the multicultural classroom. Science teacher is found to fail to link modern science teaching with community knowledge of culturally and economically marginalized students. Underestimating the other cultural students' participation and teachers' voices in science teaching is the limitation of this study.

Keywords: culturally relevant pedagogy, marginalized students, multicultural education, participatory learning

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Introduction

Nepal is a multicultural, multi-ethnic, multilingual, and socially diversified country. It is a tapestry of 125 castes, ethnic groups and languages (Khanal, 2017). It has about 26.5 million people who speak more than 123 languages (Central Bureau of Statistics [CBS], 2012). The diversity of human cultures, the wealth of languages, ideas, beliefs, customs, tools, artistic works, rituals, and other expressions collectively represent the social reality of any country (Gay, 2013). He showed accurate and comprehensive portrayals of ethnically and racially diverse groups and their experiences in various subject matter curricula. In this context, Khanal (2017) critiques that mainstream school culture is different from the culture at home and in the community. Nevertheless, he further added cultural discrepancies between home and school are evident in most countries around the globe, including developing countries such as Nepal, as well as developed countries such as the United States and the United Kingdom. In our context also ethno experiences of students of different marginalized groups are being unable to address the mainstream western schooling system. In Nepal, the number of ethnic groups and indigenous nationalities are rooted Khas–Arya culture and dominated by Hinduism. About multicultural and multi ethical society, Gay (2013) added that teaching cultural diversity helps students acquire more accurate knowledge about the lives, cultures, contributions, experiences, and challenges of different ethnic and racial groups. However, in Nepal, traditional teacher-centered teaching is practiced in a multi-cultural classroom without realizing the students' socio-cultural and ethnic identity, their learning capacity, and pre-knowledge.

Literature Review

In the following literature review section, we discussed the teachers' management, their training in cultural knowledge and professional development practice and contextual teaching of science and empowerment of science teaching through the culturally relevant pedagogy.

School Organization and Teachers' Management in Nepal

The school structure of Nepal was the primary level (grade 1-5), lower secondary level (grade 6-8), secondary level (Grade 9-10) and higher secondary level (grade 11-12). After the implementation of the School Sector Reform Program (SSRP) 2016/17- 2022-23, the school education system in Nepal is now structured Basic level (grade 1-8) and secondary level (grade 9-12) under the Ministry of Education (Ministry of Education [MoE], 2016). There are two types of school systems in Nepal. One is a community school completely governed by a run with Government's subsidies and public partnership. Another is institutional schools

(also called boarding schools) which are administered through the personal as well as a collective effort of individuals, in which financial sovereignty consists within the school investors (ADB, 2017). There are Madrasas, Gumbas, Gurukulas and Missionary schools which are conducted by religious groups applying both government and religious curricula. In community schools, Education Rules (the second amendment 2002) mentioned the student-teacher ratio (STR) 50 for terai, 45 for hills and 40 for mountain regions; however, it is challenging to implement due to political blockage (ADB, 2017). Permanent teachers are recruited by the Teacher Service Commission (TSC) which works under the Ministry of Education Science and Technology (MoEST). At present, fulfilling the criteria and decision made by the concerned teacher selection committee, the local government can also select the teachers who have a teaching license as a minimum requirement. But institutional school and religious schools can select the teachers in personal contact as well as public advertisement in local and national media. Generally, community schools follow the government curriculum but boarding and religious schools follow a government as well as a religious curriculum to fulfill their purposes. The SSRP mentioned that the teachers' qualifications for the Basic and secondary level should be a minimum Bachelor's Degree and Master's Degree respectively with a teaching license. However, TSC is not doing so. While selecting primary, lower secondary and secondary level teachers, it selects teachers having the qualification of only 10+2 or proficiency certificate level (PCL) for the Basic level and selects teachers having the qualification of Bachelor's level for secondary level (i.e., Grade 9-10) who have a teaching license in the respective level. Nepal Government and TSC have challenges in recruiting teachers having the required qualifications at different levels. Up to now, the secondary level (i.e., Grade 11-12) teachers are mostly on a contract basis and their job security and professional development are insecure. In institutional schools, the teachers are recruited based on financial negotiation. Mostly rich schools pay high salaries and recruit comparatively qualified teachers, but financially weak institutional schools cannot provide high salaries and recruit mainly low-quality teachers without considering qualifications and teaching licenses. But, in government policy, there is no place for such types of discrimination.

School Level Teachers' Professional Development Practice in Nepal

Teachers' professional development is the process of developing and improving knowledge and skills related to teaching and learning to build competencies both in pre-service and in-service teachers. The teachers' professional development in Nepal is classified into two categories a) in-service teachers training b) pre-service teachers training. Pre-service teacher training was conducted mostly by Tribhuvan University, Faculty of Education as semester-wise conventional as well as

Open and Distance Learning Mode Master's programme, and regular mode of one-year B. Ed, four-year B. Ed. and two-years M. Ed. programme. Now the pre-service teacher-training program is conducted by Kathmandu University, Nepal Sanskrit University, Midwestern University and Western University. Students learn both pedagogies and content in pre-service teacher training but they lack the knowledge of multicultural classroom teaching as recommended by Sustainable Development Goal (MoEST, 2076 BS). Moreover, the pedagogical knowledge gained at the university level is not fully implemented in classroom teaching.

In-service teacher training is highly encouraged in Nepal and government data says that 88.7 percent of secondary level teachers and 97.2 percent of primary level teachers got professional teacher training till 2017, however, its effectiveness in classroom practices are seen as very poor. Mostly in-service teacher training is conducted through the National Centre of Educational Development (NCED) as a part of the Teachers Professional Development (TPD) programme (Koirala et al., 2020), short-term refresher training and other workshops at Resource Centres (RCs) and Educational Training Centres (ETCs) for the Basic and Secondary level teachers respectively (ADB, 2017). These training programs are conducted for quality enhancement in school education, but these professional pieces of training are nominally transformative to enhance the quality of school education. Mostly these pieces of training are conducted only once which are being failed to support teaching in the multicultural classroom by connecting modern knowledge with learners' previous cultural knowledge. In present days, TSC selects teachers from different ethical, cultural, geographical, economically and linguistically marginalized groups following the reservation (quota) system and recommends the selected teachers' list to the local governments for their recruitment at schools. But, they are posted based on vacancies of schools at the local level. The authorities send the selected teachers irrespective of their cultural backgrounds to any schools where the marginalized students are studying. Thus, the present teacher management system in Nepal is found problematic to address the cultural issues in multicultural classroom scenarios which have become a barrier to uplift the achievement of marginalized and Dalit students compared to the students from the Brahmin/Chhetry community.

Contextual Teaching for School Success

Our long teaching experiences in different schools having different cultural and ethnic diversify enlighten that teaching is guided by the traditional behavioristic way and students rarely get the opportunity to construct knowledge themselves (Kalu et al., 2015). Generally, teachers from Khas-Arya communities are teaching at socio-culturally and linguistically diverse classrooms without addressing their learning capacity. They have little knowledge on how to manage the diverse

classroom, how to provide the opportunity to different minorities group, and which teaching techniques are appropriate to create a learning environment in the classroom through which students get the learning opportunity (Barajas, 2015; Rosa & Orey, 2010). Our long teaching experience indicates that students are usually physically present in the classroom, they seem to listen to the teacher's lecture and do assignments copying the book, but they are not giving interest in their teachers' teaching. Ultimately, it pushed towards bad school results and school drop-out as well. Krasnoff (2016) states that "there is extensive evidence from achievement test scores, grade promotion rates, graduation rates, and other common indicators of school success that students from culturally and linguistically diverse backgrounds experience poorer educational outcomes than their peers" (p. 1). He further states that culturally relevant examples have positive effects on the academic achievement of racially, ethnically, culturally, and linguistically diverse students, but our teaching scenario of school is not found so. In most cases, teachers fail to understand students' language, their pre-experience, ethno knowledge, and cultural identities and also, feel uncomfortable delivering the knowledge according to their needs which ultimately turn out to be a catalyst to destruct the success of students at the school level education.

Focusing on ethno cultural knowledge, Gay (2013) added that "using the cultural knowledge, prior experiences, frames of reference, and performance styles of ethnically diverse students to make learning encounters more relevant to and effective for them" (p. 50). To do so, the teacher should be pedagogically sound and knowledgeable to manage the classroom providing equal opportunity. Similarly, they should have such knowledge that when students will be interested in learning, and such learning will be efficient in student's daily life as well as will be helpful to solve their day to day problems. But, as school and university teachers, we have bitter experiences of teaching in the different culturally diverse classrooms without addressing their learning capacity. We hardly tried to find out why students are not interested in my teaching, how can I increase their learning performance, and how to do school-level science teaching linking with their daily Ethno-knowledge.

Empowerment of Students through Culturally Relevant Science Teaching

We have got the in-service teacher training and attended different workshops specifically designed to reduce bias, increase cultural competence, and prepare teachers to more equitably lead their future classrooms; but, traditional cultural hegemony is still experienced in our teaching-learning reflecting the view of Hangen (2007) that "Hindu from the hills have dominated the state since its inception in the late eighteenth century and that has created political, economic and social disadvantages for others" (p. 2).

Different ethnic and indigenous nationalities' movements helped to secure the cultural diversity and ethnicity legitimately (Barajas, 2015; Hangen, 2007) which have supported students' academic success, enhanced networking and contact and competence with their primary cultural heritages. They have also helped to learn how to critique, challenge, and transform inequities, injustices, oppressions, exploitations, power, and privilege. However, classroom transformation has not been found effective to address minority students' voices. In this line, Rosa and Orey (2010) added six critical elements of culturally relevant education for the academic achievement of students are:

recognition and use of Native language, the implementation of a pedagogy that uses traditional cultural characteristics, the application of teaching strategies and curriculum that are congruent with traditional culture and traditional ways of knowing, strong Native community participation in education, and knowledge and use of political mores of the community. (p. 24)

Therefore, here our concerns are, firstly, how to culturally diversified teachers and students organize and manipulate their classroom pedagogically for better teaching and learning respectively. Secondly, how it cultivates cooperation, collaboration, reciprocity, and mutual responsibility for learning among students, and between students and teachers (Barajas, 2015; Gay, 2013). Thirdly, how teachers encourage students to become active learners who regulate their won learning through reflection and evaluation (Krasnoff, 2016). To empower ethnically diverse students, the key objectives of science teaching in the twenty-first century should be to cultivate their cultural integrity, individual abilities, and academic success (Barajas 2015; Hangen, 2007).

Here, our concerns are how our teachers can do this in our classroom practices and teachers and their teaching become more inclusive and how students think and learn academic content linking their Ethno knowledge (Cooper & Matthews, 2005). Pedagogical practices and social relations with students should not only acknowledge content competence but should also reflect the strengths of who students are and where they come from. The teaching paradigm is also shifted toward the development of cultural strength, intellectual capabilities, and culturally responsive science teaching and learning for marginalized students (Rosa & Orey, 2010; Wenzel, 2017). However, our school science learning context is not seen as mentioned in the above literature to link with the cultural context.

Considering the above scenario, here our concern in this study is to find out how is the perception of culturally marginalized students toward science teacher's teaching, how they have experienced the betterment of their science learning in

the diversified classroom, and how to link their Ethno/community knowledge with modern science learning practice through which they feel easier to learn science.

Theoretical Framing

In this study, we have taken two key theorists, Gloria Ladson-Billings (1995) and Geneva Gay (2002), who have established the foundational tenets of this cultural relevant pedagogy with two important purposes: (1) they provide evidential support that culturally responsive teaching has the potential to improve student achievement, (2) they served as models to help conceptualize a culturally responsive approach to the science program in this study (Garvin, 2015). Like that, another cultural theory will also be used to analyze the data connecting with cultural reality.

Culturally Relevant Pedagogy (CRP)

In this paper, we preferred the theory of culturally relevant pedagogy [CRP] because this theory is seen as suitable for studying culturally diverse students and teachers to motivate towards teaching-learning and also acknowledge how to teach and provide the knowledge in a culturally diverse classroom, and how to involve the marginalized students in science learning activities. The concept of CRP was, first, introduced by Gloria Ladson-Billings (1995). She invokes new teaching which is field-based practices to involve the culturally, ethnically, socially, politically and linguistically oppressed group. She stresses that teaching can better match the home and community cultures of students of color who have previously not had academic success in schools. She further states that “a science curriculum should (a) allow multiple points of entry, (b) allow for thinking about structures through recognizing networks, and (c) allow the development of identities and relationships centered on a desire for change” (p. 1113).

Culturally relevant pedagogy as the theoretical framework suggests culture as an invaluable asset to students in their educational process and learning achievement (Ladson-Billings, 1995). Laughter and Adams (2012) also agree with this statement and add how CRP requires that teachers attend to students’ academic needs, not merely make them feel good. In science teaching also students should get the chance to participate and choose academic excellence and demonstrate understanding. If the home environment is incorporated into school, students are likely to experience more academic success (Ladson-Billings, 1995, 2014) which shows the roles of culturally relevant pedagogy for better student achievement. In this vein, Gay (2002, 2010) added that culturally relevant education/pedagogy was developed out of concern for the serious academic achievement gap experienced by low-income students, students of color, and students from linguistically and culturally diverse environment which helps to provide the knowledge according to the need and interest of students of

culturally diverse students. The government of Nepal has focused on multicultural classroom teaching, however, our previous experiences show that our teachers are not seen as trained much in the use of culturally relevant science teaching. They theoretically may know how to manage classrooms to address students from minority groups, but practically they are reluctant to show a willingness to use the appropriate methods for the emancipation of these culturally diverse students in multicultural classrooms. Therefore, the CRP is realized as more relevant and used as a theoretical lens to understand students' experiences and teachers' science teaching, especially in Nepalese classroom practices.

Cultural Theory

Another theory that we preferred for our study was the cultural theory. The cultural theory focuses on the preservation of forests, land, water resources, and sacred groves. It focuses on the cultural values, customs, beliefs, and values of human society in a relational way (Held, 2019). For example, Hindu worship *Tulasi, Peepal* is a symbol of Lord Vishnu. Like that land is worshipped chanting mantra; *Bhupatayeswaha, Bhuvanapatayeswaha, Bhutanampatayeswaha* (Mishra, 2061 B.S). Similarly, the earth is called the mother because it provides food, shelter, and clothes. Both in Hindu and Buddhist cultures cutting a young tree is a *sin*. Thus, Hindu and Buddhist people make their own spiritual rules to protect the different valuable plants and animals found around them and nature.

Moreover, people from different ethnic backgrounds have knowledge of the language, history, religion, custom, medicine, social structure, farming, horticulture, and fissioning. These are different according to their cultural norms and values. Similarly, cultural theory helps genetic manipulation of crops and farm animals for a long time in the cultural group (Edgar & Sedgwick, 2008). These norms and values help to protect the cultural environment and cultural heritage of different religious groups linked with school science. Hence, this cultural theory is seen as appropriate in the multicultural and multi-religious context of Nepal to braid (McGregor et al., 2018) the cultural/community knowledge with school science teaching.

Methods and Procedures

The following section deals with the study design, population, participants of the study. Similarly, this section deals with data collection procedure and the analysis techniques used in the study.

Study Design and Sample

In this study, we employed a qualitative case study design (Creswell, 2007, 2012; Yin, 2003) which focuses on a school and two student cases studying there,

by gathering data through the collection of stories of science learning experiences, observing classroom interaction and discussing the meaning of those experiences for individuals understanding. The participants of this study were Dhurba Ashami (Pseudonym) and Pooja Shrestha (Pseudonym) who were studying science in grade ten at Ratna Laxmi Secondary School in district headquarter of Gorkha. Dhurba Ashami belongs Dalit group (i.e., a socially and culturally marginalized group in Nepal). His parents are only literate; however, they were careful about their children's academic excellence. His father was a foreign employer for a long time ago. Pooja Shrestha belongs Newari community (i.e., an indigenous [Janajati] group of Nepal). Her parents are also only literate. They have no fixed income sources and are dependent only on agriculture.

Our purpose in this study was to explore the culturally and economically marginalized students' opinions and experiences about science learning activities in a multicultural classroom where the teacher is different from than student's mother tongue and cultural background. To fulfill our objectives, we selected a secondary school in Gorkha Municipality purposively as suggested by Creswell (2007, 2012) and Yin (2016). While doing so, we preferred the school which was already been visited several time formally and informally by the first author (the first author is the data collector) and the first author has the knowledge of school science teachers who teaches at that school. Then, we selected two culturally and economically marginalized students as a participant for our study.

Data Collection Procedure and Analysis

First of all, the first author entered the school and met the school head teacher and other teaching staff where some teachers were checking students' homework and most of the teachers were in the classrooms. The concern of the study was to know how culturally and economically marginalized students experience their teacher's teaching science and to understand how teachers from culturally different backgrounds treat the economically and ethnically marginalized students during their classroom teaching. To fulfill the above objective, the first author took permission and support from the head teacher and selected Dhurba Ashami and Pooja Shrestha as participants purposively to support our study. The head teacher briefly introduced them to my purpose and encouraged them to provide the required information without any hesitation.

After that, the first author called both students separately and started discussing informally and introduced each other. Then, he explained the purpose of the interview in detail and requested each of them to provide all the experiences they got with their science teacher's teaching. Keeping the idea of 'pseudonym' and 'anonymity' during data collection proffered by Creswell and Poth (2018) in mind,

while eliciting the data, the first author assured them that their name would not be published without their permission and that pseudonyms would be used to save their anonymity. After a long discussion, he won their confidence and trust during the data collection procedures and developed the ‘reciprocity’ (Cohen et al., 2018) to protect them from harm in the research process and got permission to record their interviews. Then, he conducted forty-five minutes of in-depth interviews in a separate room of their school in pairs and audio recorded. The second interview was taken after two days for about 30 minutes for further justification of their arguments. After that, the science classroom interaction was conducted with the teacher from the Brahmin community, who had the qualification of a Master’s degree in science education and also had attended professional development training. His class was observed twice in grade 10 in a two days interval and required information was immediately noted in the field note. The classroom interaction was about ‘Acid Bases and Salt’ and ‘Preparation and properties of Carbon-dioxide gas’. The students in the classroom were from different cultural and economic groups; more than sixty percent of students were Dalit and thirty percent were Janajatis in that classroom.

After the data collection procedure was completed, the transcription of a recorded interview was done using a transcript sheet. Then, data collected in the Nepali language was translated into the English language and transcribed to reveal the meaning of the in-depth interview and class observation (Yin, 2016). After that, the translated data was coded. From the codes, seventeen basic themes and from it three main themes were established inductively, and from the global theme, data were analyzed deductively connecting the verbatim of the participants and my arguments as suggested by Creswell (2007) and Merriam (2009). The analysis was done by linking participants’ arguments with the theory of ‘culturally relevant pedagogy’ and ‘cultural theory’ to find out how the practices of multicultural science teaching in a culturally diverse classroom. For the trustworthiness and confidentiality of qualitative data, as discussed by Cohen et al. (2018), the transcribed data were shown to the related students, and the validity and reliability of data were confirmed as suggested by Creswell (2007, 2012) and Cypress (2017). For the triangulation of data, Merriam’s (2009) multi-method investigation was applied by observing the science teacher’s classroom teaching without providing pre-information. From the transcribed open-ended interview and classroom observation, the following themes were established cooperatively with the second author.

Results

The following three recurrent themes were identified in the student’s responses and classroom observation field notes. These are lacking pedagogically participatory teaching, learning culture at home, and linkage with Ethno knowledge.

Lacking Pedagogically Participatory Teaching

Pedagogically participatory teaching is that in which students are fully engaged in learning practice in the classroom connecting their cultural knowledge with their science learning (Ladson Billing, 1995). According to Dhurba, teachers are always the center of learning. Without teachers' initiation, our classroom interaction never becomes interactive and effective. Without teachers' sound pedagogical knowledge and capacity to involve the students in teaching-learning activities, science teaching never addresses our needs. Dhurba was representative of out of sixty percent of Dalit students studying in the science classroom who claimed that his science teachers never involved him including his friends to participate within or outside classroom activities. He added that “ *We are only passive listeners in the classroom. Teachers are used to delivering the content knowledge of science books without listening to our voices. He used to write most of the things on a whiteboard and we used to copy them in our notebooks. He never cares about our voices in science teaching*”. The same claim was expressed by Pooja, too. They are marginalized group students and have learned so much knowledge and skills from their community. However, their teachers never tried to understand their learning skills and abilities. Puja added that “*Our teacher only teaches bookish content without linking our daily knowledge. He used to ask a question for front bench students and only a few students involve actively in classroom interaction*”. But, in my classroom observation, there was a rotation system of students sitting on the bench but talented students tried to sit in front of the classroom, and students who are not active in the classroom had to sit back seats. However, during observation, the first author could not find discrimination in classroom teaching as they mentioned earlier. The teacher was a trained and qualified science teacher, but classroom teaching was dominated by traditional teaching methods and many of the students were inactive in classroom teaching. It seems that the teacher either did not learn about diverse classroom teaching or did not provide interest in his pre-service and in-service teacher training programme about engaging all the students in teaching-learning activities.

Near about twenty-five years of science teaching experience, the first author found that the prescribed science lessons can deliver to students by involving them in teaching-learning activities linked with their daily field activities; however, it was not found in real practice in my observed class. The teacher could teach different topics involving all students in the learning activities considering the socio-cultural knowledge which increases students' curiosity about learning. It confirms, Ladson Billing's statement that if we provide the science knowledge linking with their everyday experience, and involve all the students in teaching-learning activities

without bias, the students' participation in science learning will be increased automatically.

Learning Culture at Home and School

The learning culture means how students were learning in school and at home for their academic success. According to Dhurba, the learning culture of house and school both play a crucial role to explore the experience of learners about science teaching. Khanal (2017) states that classroom teaching is favouritism toward the dominant student and gives extra care and support to brighter students (p. 464), however, science teaching was not found so. The students shared that teachers provide equal opportunity to answer the questions and to discuss in the classroom. But, when the teacher asks some questions, instantly the active students from Brahmin culture respond without leaving enough time relatively than us. Dhurba and Pooja's argument was that if a teacher provides the practical opportunity, our engagement will be increased, but their science teacher was unable to do so. Both students felt that the lecture method, which was used by their teacher daily, is boring in science learning. According to Dhurba, there are no extra activities related to science. He said, "*We have heard about the science fair, exhibition, and field trip but neither school administration, nor subject teacher provides us such types of opportunity. The school conducts field trips only for entertainment, but not for learning purposes.*" Both shared that they hadn't got the opportunity to observe the zoo and science museum till now. If the school takes the initiation of such an opportunity, they would surely get new knowledge and ideas about science and learn new things by observing, analyzing, and sharing themselves from that they could construct the knowledge which can be helpful for further science learning.

Dhurba's home environment also was not appropriate for his science learning. Both father and mother were only literate. Sometimes he used to make local science materials, but his parents restricted his work. According to Khanal (2017), social culture is also a determining factor for learners to get learning opportunities. Mostly, the family role is important for science choosing and learning. About the home environment, Suchlze and Lemmer (2017) stated that "towards science, provide educational resources and experiences in the home directed at stimulating science learning, motivate children to choose science as a school subject, encourage children to consider science in their plans, and promote the choice of science-oriented occupations"(p. 2). The literature indicates that family support is important to involve in science learning, but Dhurba and Pooja's home environments were not so favorable to them. Dhurba's parents help to buy new books and innovative achievements in science, but they did not know what to do, how to do, and how to manage the materials, but Pooja was found inactive in extra activities. So, we

realized that both the home and school environment are important for learning science; but, school plays a crucial role to encourage, motivate, and develop creativity in the students.

In the class observation, there was not a favorable school environment to learn science for the students. There was neither a well-managed laboratory nor a library which are minimum requirements for learning science. In biology learning, field trip plays a crucial role, but they never got the opportunity to go anywhere to learn science. The study found very poor linkage with Ladson Billing's (1995) theory of culturally relevant pedagogy and cultural theory in the Nepalese classroom practice in science.

Linkage with Ethno Knowledge

Students from different cultural and socio-economic backgrounds gather at schools with distinct cultural capital. The students whom we chose had rich Ethno and cultural knowledge and experiences. Dhurba and Pooja stated that their parents prepare local wine at home and they know how to prepare it, what materials are used there, and what material helps for fermentation. Dhurba argues that he knows how to filter the water they collect from rainwater, and how to prepare and use local fertilizers for better crop production. But, his science teacher never tried to link his science teaching to explore their knowledge. He never tried to link textbook knowledge with his daily life knowledge. Let's see the following excerpt:

if our science teacher provides the opportunity to express my experience in the classroom, I will creatively use and link my Ethno knowledge with textbook knowledge (modern science). Similarly, other friends also may have different socio-cultural knowledge, when they share their knowledge, we easily understand their practices and ultimately we easily learn science; but, my teacher never does this. He either does not have such knowledge or he did not have such a motive to link science with our daily knowledge.

Pooja also agreed with Dhurba's argument and said, "*We have so many cultural and spiritual values that carry scientific knowledge but these are not linked with our school science teaching*".

As mentioned by Dhurba and Pooja, the classroom teaching was out of connection with local knowledge; there was no linkage of school science teaching with cultural practices. The bookish knowledge of 'Acid Base and Salt' was taught only linking a few local acids found in the village. In our observation, students' cultural experience with 'Acid Bases and Salts' was not linked to his science teaching.

The study reveals that teachers are almost unable to link the classroom activities with their students' daily life experiences as Edgar and Sedgwick (2008) stated in their cultural theory in which they state that our learning should be relevant to our day-to-day customs, religion, values, and our life relevant example motivate us towards learning. It helps to protect the local plants and animals and provides ecological balance through proper use of resources. So this theory is seen as more relevant in the context of multicultural Nepalese society to link with modern school knowledge (McGregor et al., 2018). But, it is lacking in our school environment.

Discussion

This paper explored the experiences of science learning of the cultural and economically marginalized students. The experiences of Dhurba and Pooja show the present scenario of science learning in the Nepalese context. The school science teaching scenario indicates that, as cultural theory mentions, teachers should have self-motivation to link school science with day-to-day Ethno knowledge of students with creating an appropriate learning environment at school (Seehawer & Breidlid, 2021). Even in the absence of an appropriate science laboratory, science teachers could be able to participate culturally and economically marginalized students towards learning activities by providing the opportunity for discussion, interaction and free learning situations (Koirala, 2021). There is not found epistemologically diverse and pedagogically pluralistic learning situation (Higgins, 2016) in science classrooms considering previous knowledge of the culturally marginalized students.

As discussed earlier, culturally relevant pedagogy provides all students equal learning opportunities, students equally participate in the activities, think critically, ask questions, and respect the views of others (Koirala, 2021). A culturally relevant science teacher should try to involve all the culturally, ethnically, socially, politically, and linguistically oppressed groups. It focuses on how teaching can match better the home and community cultures of students who have previously not had academic success in schools (Goldman et al., 2020, Koirala, 2021). Both participants found being serious to link their day-to-day knowledge with school science, but such type of capacity was not experienced by science teachers. Science teacher could not have seen the braiding of cultural knowledge with school science teaching (McGregor et al., 2018; Seehawer, 2018). Dhurba's view was found positive toward participatory learning but his teacher did not provide an opportunity to be involved in such activities. Dhurba's science teacher was a higher class cast group. His classroom observation seen that he was neither biased towards all of the students; nor had he supported their learning activities as he used only teacher-dominated lecture methods rather than applying student-centered techniques considering the students' previous knowledge. The teaching topic was interesting, although it was unable to capture the students' feelings, "We are studying science in the classroom".

The professional teacher training programme was not seen as favorable for culturally marginalized students for their academic success. Community knowledge plays crucial role in culturally marginalized students' academic success, however, the school learning context was not favored for applying such knowledge (Goldman et al., 2021). The main problem in classroom success is ignoring the cultural knowledge of the scientific community (Ballard et al., 2021). The role of teachers to use transformative pedagogical discourse among the community people and school science teachers is important. By doing so, we can link the epistemic practice of marginalized students with science teaching. This helps connect cultural knowledge with the bookish knowledge about what they practiced, understand, and transfer to the new generation and supports for academic success of culturally marginalized students. In the present day central as well as Palika also can play such a role in connecting science teaching with their cultural knowledge.

Conclusion

From the above discussion, we concluded that culturally marginalized students have the huge cultural knowledge that they have developed from their cultural practice. However, our teachers are not trained and aware of connecting their cultural knowledge in modern classroom teaching. Therefore, we recommend effective teacher training to build the capacity to link modern science with community knowledge by involving all students equally in classroom teaching and playing a role model to involve the culturally and economically marginalized students in classroom activities. We found that trained, culturally conscious professional science teachers only can manage the multicultural, multi-ethnic, multilingual, and economically diverse science classroom by providing appropriate learning opportunities to the cultural students by connecting their previous knowledge with school science teaching. Culturally motivated teachers can braid the cultural knowledge of students with the modern school science curriculum. As selected students' arguments, it was not found in classroom teaching as they should be. So that this study will help to recruit qualified, trained, and culturally motivated science teachers at school.

In this study, only two marginalized students were taken from the Gorkha municipality. Interviews and classroom observations were done only two times without establishing an extended relationship with the students and teachers. If it could increase the involvement of multiple students with multiple interviews and classroom observations, it would have been ideal as appealed by Creswell and Poth (2018). However, we felt that the obtained data and our analysis have provided a strong foreground for a more in-depth examination of trust (see Merriam, 2009) between us and the interviewees for saturation of this study.

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