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Original Article

Ways of Enhancing Harmony among Teachers and Students: A Critical Reflection

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Abstract

Ways of enhancing harmony among teachers and students seem to be overlooked areas of research. This study aimed to enhance the pedagogical shift from traditional lecture-based teaching and learning practices toward integrated STEAM approaches among teachers. This is my critical reflective study foreground on my MPhil study, which adapted participatory action research design to enhance teachers' harmony in a private school in Nepal. I adapted reflections, observations, and interactions as data generation methods. The study explored four ways of enhancing harmony among teachers and students: joyful learning, contextualized teaching, ICT-integrated learning, and valuing emotions that contributed to the transformation of teachers' pedagogical practices.

Keywords: *Critical reflection. Harmony. STEAM Pedagogy. Transformation.*

Introduction

I started to work as a mathematics teacher nearly 12—13 years ago at one of the secondary schools in Jhapa (a district in the eastern Terai of Nepal). In my early teaching days, I adhered to the teacher-centered teaching strategies my mathematics teachers taught me. This was primarily due to inadequate knowledge about innovative approaches and strategies that could enhance the teaching and learning of mathematics. At this stage, I came to understand that teaching mathematics in isolation, separating it from life skills, did not cater to the learners' needs and interests. So, educators expect integrated approaches to combine the teaching of life skills with mathematics seamlessly. However, during my tenure as a teacher, I was doing my best to get the desired output from the students, and their achievements were just on the other side of the river. I may not have taken the initiative, or perhaps I was unaware of the fresh challenges in teaching mathematics from the front line, and I simply replicated what I had

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learned. Indeed, only a small percentage of students in my classes achieved excellent marks or grades in mathematics during board exams, with the majority achieving average or lower grades. I discovered that if a teacher or facilitator challenges the status quo in teaching—learning any mathematical issues or statements—students can enhance their skills to yield conceptual understanding and its implications in their real-life situations. Unacquainted with integrated practices in mathematics, I previously believed that a teacher could teach any subject by challenging the one-size-fits-all approach.

After completing my master's study, my beliefs and cultural practices in teaching and learning mathematics underwent a transformation. However, prior to my master's study, classrooms and teaching-learning styles were less focused on collaboration and communication, as most teachers preferred their students to be passive listeners and individual problem solvers. I have observed that mathematics teachers prioritize marks and grades on examinations over their students' critical thinking and creativity. Students acquire mathematical ideas and concepts solely to achieve higher grades on their report cards, and our society tends to value these written documents more than the students' concepts and skills. My reflection on traditional teaching encourages me to think differently. I realized there was a need for integration in teaching and learning. This integration helps improve important 21st-century skills such as creativity, critical thinking, collaboration, and communication (Daugherty, 2013; Quigley et al., 2017) by providing a more well-rounded and engaging educational experience. In response to this reflection, I came across an innovative and progressive approach known as the STEAM approach, which I began incorporating into my regular teaching and learning activities.

The STEAM approach has emerged as a result of incorporating arts into STEM education to improve student learning, foster creativity, and increase their potential for success in the 21st century (Liao, 2016). This approach teaches students to think holistically across multiple disciplines (Sheffield et al., 2018; Yakman & Lee, 2012), promoting a more comprehensive understanding of the subjects and their real-world applications. The integration of multiple perspectives of STEAM education in mathematics learning, such as S-science, can connect learners to nature or the real world, while T-technology can connect them to modern or innovative ideas. E-engineering, on the other hand, enhances students' creativity in designing and developing concrete objects, which can include any type of useable tools such as software, robotics, or local materials. Similarly, A-arts can immerse learners in their cultural context and foster a sense of pride in their own cultural phenomena. M-mathematics refers to mathematical computations in the real-world context. Such pedagogical practices enable the learner to understand the holistic picture of any real-world phenomenon. In this way, STEAM learners not only learn mathematics through this approach but may find themselves in such a learning environment where they can learn how to live and might be able to understand and solve the problems of their context. I found this pedagogical approach as a bridge to fill the gap in the disharmony between me and my students (Dhungana, 2023b).

As far as my experience is concerned, mathematics teachers have been adapting traditional, i.e., lecture-based, teacher-centered methods of teaching in high schools for many years. Conventional or traditional lecture-based, teacher-centered, and linear approaches guide teaching and learning approaches in mathematics education at the secondary level (Shrestha, 2018). At first glance, teaching and learning mathematics using teacher-centered methods may seem sufficient. However, when teachers adopted traditional pedagogy, they were unable to engage students in active learning and achieve the desired learning outcomes. Practicing teacher-centered pedagogies enhanced disharmony among mathematics teachers (Bizimana, 2023). The continuation of traditional methods in mathematics teaching would result in disharmony among teachers and students.

By implementing innovative student-centered pedagogies, educators can foster harmony with their students, leading to meaningful learning and enhanced learning achievement. The purpose of this study was to enhance harmonious teaching and learning experiences among teachers and students by developing the STEAM design approaches.

Harmony and STEAM Pedagogy

Harmony is a living in individual, professional, institutional, and/or socio-cultural value. Living socio-cultural value and harmony enhanced teachers' transformative learning (Dhungana, 2022). Transformative learning is possible by adapting science, technology, engineering, arts, and mathematics (STEAM) pedagogy (Dahal, 2022; Dhungana, 2023b). Enhancing harmony by integrating compartmentalized subjects (science, technology, engineering, arts, and mathematics) through STEAM pedagogy was possible (Dail, 2013). The music and arts of STEAM pedagogy enhanced students' learning achievement through the integration of subjects such as Mathematics and Science (Root-Bernstein, 2003). 21st-century skills (creativity, critical thinking, collaboration, and communication) developed by learning subjects like mathematics and science (Daugherty, 2013; Quigley et. al., 2017). The transformative journey was made possible by adapting STEAM pedagogy that inspired teachers as they coped with challenges (Pant & Luitel, 2020). As a transformative approach, STEAM pedagogy not only connects the disciplines with each other but connects the learners to living life (Manandhar, 2022), a harmonious life. The theme-based learning strategy and amalgamate approach integrate the learners' lives into the conceptual framing of academic language. Designing and implementing STEAM projects and STEAM practices at the secondary level foster harmonious teaching and learning and counter compartmentalized instruction.

Methods

The experiences of my MPhil study (Dhungana, 2023b) formed the basis of this critically reflective study. Informed by the critical paradigm (Taylor et al., 2012), I adapted PAR (Chevalier & Buckles, 2019) as a research design. PAR is a critical and self-reflective research design that bridges the gap between theories and practices. Likewise, PAR is a collaborative and problem-solving design (Chevalier & Buckles, 2019), I collaborated with six secondary-level teachers (Math, Science, English, Computer, Social Studies, and me) who served as primary participants, from a private school in Nepal. We collaborated with the teachers with 9th-grade students, who served as secondary participants in the study. In this study, I focused on our implementation of student-centered STEAM pedagogies.

I gathered and produced data through various methods, including reflections, observations, and interactions. I made sense of data through critical reflection of the study, which adapted the data analysis methods: coding, categorizing, and thematizing (Saldana, 2014). The themes that emerged from this analysis include joyful learning, contextualized teaching, ICTs integrated learning, and valuing emotions in the mathematics classroom, all of which contribute to enhancing harmony between teachers and students.

Joyful Learning

Being a student of mathematics education and working as a mathematics teacher, I never realized the importance of an affective domain in my teaching and learning practices. I made a mathematics-focused intervention, as mathematics was at the center of the STEAM projects. The teachers of four subjects—English, Science, Social Studies, and Computer—worked

together to design the projects for this study. I always perceived mathematics as a pure and abstract subject where a teacher is not even allowed to have proper communication and close relations with students. I believed that I held a superior position in the classroom and that students should accept everything I taught them as sacred knowledge. During my experience as a participant teacher in the PAR intervention, I came to understand the importance of the teacher-student relationship. I realized the power of a smile, a kind word, an honest compliment, and a listening ear toward the students. Listening to their ideas and thoughts also gives them enough courage and strength to take risks in their plans. Joy is vital to learning. The joy of learning is fundamental to maintaining human integrity.

For instance, "*Children are far wiser than we think; we should have trust in them*." I collected this statement from the computer teacher's reflection. His progressive ideas and innovative thinking always motivated us (the remaining participants) to reflect critically on our practices. "*Giving students enough space to share what they have learned and what they can do can cultivate a safe, creative, meaningful, accountable, and joyful learning space, " he* added. Other colleagues also praised his practices in the computer lab. As a participant, I also attended and observed his classes and found them engaging and democratic. He further went on to say, "*Teachers need to act as a caring adult for the students and need to make them feel like their teacher is always there in their need; we need to make them aware of life outside the school and need to shape them for both social and emotional skills*." participant (an English teacher) also added, "*Teachers need to be calm in all situations and thoughtful in their actions*." He furthHe went on to say, "*We need to notice students' struggles and encourage them if they are trying; all students cannot be at the same intellectual level, even though they might be in the same grade; we should not compare them with each other; such activity causes students' humiliation and tendency to develop negative attitudes toward*." In his reflection, a male student made the following observation:

> *Nowadays our teachers teach in a different way. They are using projects to teach and the subjects like Mathematics, Computer, and English are interlinked. This helps us in relating one subject to another. I am enjoying what is happening with us in our classes. Before this, I had not had such a chance to learn different subjects under a single theme. We worked in many groups which not only contributed to this study but helped us to build healthy relationships with each other in our classrooms.*

This shows that students and teachers are enjoying integrated activities. From the reflection of one female student:

> *This way of teaching and learning helps me feel comfortable to clear my doubts. Nowadays all the teachers seem to have changed. I don't know how long it will exist, but they (teachers) are trying to give space and opportunities for our exploration. I am really very happy that our teachers are listening to us. I feel like they are valuing us. I used to feel uncomfortable communicating with my teachers on study matters. The project included here is very different from what we used to practice before. It seems like we are solving one question about Mathematics and studying different subjects. Whatever is going on nowadays is beyond my expectations, but I am enjoying it.*

The students' reflections showed that they enjoyed the integrated approach. A student, a so-called low achiever in Mathematics but a very good basketball player, came and sat next to me at tiffin time and we conversed for a long time. He asked questions like-

"In which grade are you teaching? Are you teaching in colleges also? What is your further plan? Is this your homework? What are you doing nowadays? Does this approach continue even after you are done with your homework?"
I replied and asked, "*But why are you asking all these?*"
He replied;

> "*Sir, nowadays I have just started to enjoy the classes. Previously I used to feel difficulty in most of the subjects and can't enjoy them. But nowadays, the activities have motivated me in the learning process. Sir, now I can solve the problem that we solved at that stage.*

From this conversation, we reflected on our traditional lecture-based approach to teaching and learning practices, which did not foster a friendly, trustworthy, and joyful learning environment. Joy is a spiritual value, and joyful teaching and learning created a harmonious learning space in the Nepali education context (Dhungana, 2023b). Collaborative practices and STEAM pedagogy supported enhanced joyful learning, which created a safe space for students to communicate with teachers and share joys and sorrows. STEAM pedagogy and practice engaged students in experiential learning that made learners realize that mathematics is also a part of our society and life (Manandhar, 2022). Our collaborative and integrated approaches could well connect learning in daily life and practices.

Figure 1: Students' engagement in experiential learning

Contextualized Teaching

As a STEAM scholar at KU and a mathematics educator, I discovered that the STEAM approach linked disciplines and learners' real-world practices to the teaching-learning processes. As a PAR researcher and participant in this study, I and my co-researchers tried to connect the curriculum with the learners' real-life scenarios. I explored diversity in the students and their multicultural perspectives and practices. It was not easy to connect well, but I found that students respect each other's cultures and easily delve into them. I even found that they enjoyed others' cultural practices more than their own. I felt a sense of satisfaction when I observed lively and interactive classrooms, thanks to my integrated approach and the contextualization of ideas and concepts, which were the primary criteria in designing our projects and lesson plans.

As a sample work, while teaching statistics, students surveyed the data from the students of other classes in their respective groups and performed all the statistical calculations. The topic for this project was 'social media.' The students conducted all the statistical work manually on paper copies and in computer Excel files. They also composed essays, letters, and recommendations regarding the benefits and drawbacks of social media in the lives of students, as well as other related topics. For instance, when I approached the teachers in the virtual meeting to connect each idea of our projects to their everyday teaching and learning practices, they were all happy. However, figuring out how to integrate these ideas into projects and lesson plans presented challenges for the teachers and me.

In the earlier stage of the first cycle, I prepared the plans and shared them with my classmates and facilitators, modified the plan according to their suggestions, and finally circulated the plans to my co-researchers. I also incorporated the inputs from the co-researchers (participants) in this study into my plan. We circulated the final plan for implementation to all participants. Given the de-contextual nature of mathematics teaching and learning in this scenario (Luitel, 2013), each of us made a significant contribution by contextualizing our lessons and project plans. This contributed to a shift in teachers' perspectives, as demonstrated below:

"English is connected to practice."
"Social Studies has evolved from society and contextual."
"Mathematics is everywhere in society, and nothing can be separated from Mathematics."
"Everything is science. We cannot separate ourselves from the notion of science"
"It is the technological era. Students learn to use mobile phones and laptops from an early age."

These kinds of expressions of English, social studies, mathematics, science, and computer teachers, respectively, show evidence of contextualization that teachers practiced. We reflected on our de-contextual pedagogical practices and realized that contextualization and then communication of participants' learning could empower participants (Luitel, 2013). Our empowering approaches could strengthen our harmonious relationship with colleagues and students. It would not be easy, as we had to discuss and work out in several meetings to change our perceptions and practices. During those meetings, as knowledgeable other, mentors could share some of their lesson plans and projects they designed.

ICT-Integrated Learning

Initially, the school did not have overhead projectors; later, after gaining insight from this project, the school management decided to have at least one projector in a class. Up until a few years ago, most teachers found it nearly impossible to use technology in teaching and learning. Most of them used technology as a tool in their pedagogical practices. This technological growth is a result of the restrictions imposed on people during the COVID-19 pandemic's lockdown period.

I noticed that the teachers who had difficulty using some applications on their phones taught confidently in virtual classes. I explored some courses online and added knowledge from there. When they got confused, they approached me, and I helped them to solve their ICT-related problems. I witnessed the great paradigm shift in our colleagues' teaching practices from teacher-centered to student-centric approaches with the help of ICT.

"*Sir, I have never used such things*." Before the intervention, an English teacher said, "*I know how to use Zoom on my phone*." "*I can type the questions, but I have no ideas on other kinds of stuff*," argued the mathematics teacher. The social studies teacher shared, "*I have used computers a lot, but honestly, I am not friendly with these sites and applications*."

Figure 2: Students presenting their group works

We faced this situation before implementing our plan within the given context. "*In the case of Nepal, the government and non-government sectors have made a significant initiative in terms of promoting ICT in education and ICT-integrated pedagogy*" (Pant et al., 2020, p. 29). "*Using technology in learning was considered a time pass in school; in the name of ICT, teachers are using their phones to use social media*," a social studies teacher reflected. While this statement may hold true in certain instances, I don't believe it applies universally.

When we found a lack of computer literacy in many participants, we continuously helped and guided them to achieve positive attitudes and develop ICT skills. In doing this, the participating teachers helped each other. The computer teacher and science teacher collaborated and provided insights in guiding the remaining teachers for ICT integrations. We usually carry laptops with us. For instance, it was common for me (Author-1) to play videos on YouTube, use GeoGebra during mathematics sessions, and engage with other related materials. Normally, three teachers - myself, the computer teacher, and the science teacher - would regularly bring laptops to our classes; we would use them occasionally and not always. One of the competency standards of the eight domain framework developed by the government of Nepal (MOE, 2016) is the use of ICTs in teachers' professional lives.

According to UNESCO (2018), the widespread use of ICTs can contribute to the 2030 Agenda for Sustainable Development by serving as a mediator in fostering an inclusive society and bridging the digital divide. The English teacher, who was the least tech-savvy member of our group, expressed his satisfaction, saying, "*Sir, I can now use all the tools you suggested in just one month*." I believe I may explore additional tools if necessary. It shows that the teachers' enhanced ICT integration skills added hope for better learning and skills enhancement.

In line with Dirkx (1997), we argue that transformative learning is "*a process that takes place within the dynamic and paradoxical relationship of self and other*" (p. 83). In general, transformative learning is viewed as a progressive change, especially in the wake of the COVID-19 pandemic, which made it possible in the specific context of Nepal through the integration of ICT and the use of computers. We observed a progressive change in students' learning and teachers' practices (see Figure 2) through the critical self-reflections on pedagogical practices. Use of technologies in education improved the students' competencies in STEAM areas of learning (Bundsgaard, 2019). However, not all learning contexts may fully embrace these changes in pedagogical knowledge, skills, and competence (Illeris, 2014), as some students and teachers may not value the integration of ICT in education.

Valuing Emotions

Emotions refer to the immediate expressions of feelings such as unhappiness or dis-harmonies that students and teachers react to in the learning process. The behaviors and academic treatment of the teachers affected the emotions we valued in the learning process. I believe that harsh punishment policies and the stagnant teaching methods in our schools, particularly in mathematics classes, have more of a training effect than an educational one.

Perhaps traditional pedagogical approaches have stifled creativity and innovative skills. On the other hand, the Nepalese educational framework decontextualizes the curriculum and implements summative assessment as a core evaluation (Pant, 2015; Shrestha, 2018), potentially protecting learners from the uniform flow of their creativity. The math teacher reflected: "*I have a very good command in my classroom; no one can speak and disturb me in my classes, and pin-drop silence makes me very comfortable to deliver my lectures." This shows enhanced calmness or harmonious status*."

But when I read his reflection after the intervention of the first cycle plan, I found a different personality in him:

> *As a secondary-level mathematics teacher, though I had years of experience in different schools in Kathmandu, the concept of STEAM education was completely new to me. The project we did totally amazed me. I was surprised that we can teach subject matters in an integrative form. Before doing this project, though I had been applying the reductionist approach to teaching in other grades, I strongly believed that it is challenging to teach students in a collaborative and activity-oriented way in grades 9 and 10, especially when students are more focused and prepared for the SEE examination. I had never dared to go out of the box. When I first attended the professional development session by Sandip sir, I gained a conceptual understanding of STEAM education and ways to apply it in our classroom. During these 2 weeks, I have felt that the STEAM approach is very effective for secondary-level teaching. Students are learning concepts and demonstrating high levels of energy and involvement in classwork.*

Only after achieving harmony does it seem possible to think creatively. Attaining harmony was not sufficient. In his second reflection, the mathematics teacher noted that students who were previously inactive in class and frequently expressed frustration with the subject are now enjoying their project work. Furthermore, he added, "*Students are interested in learning in class, solving a problem, and understanding the teachers' explanations, depending on emotional factors, which can be affected by the teachers' behaviors, attitudes, and likely the school environment*." This integrated plan of the STEAM approach makes me aware of those perspectives. I have also observed that the emotions of teachers have a significant impact on students' learning.

Another teacher shared, "*Before the training sessions and our regular meetings, I was unaware of these affective aspects of learning*." The nostalgic moment I experienced during the intervention period, witnessed by both students and other teachers, was another achievement of this study, in my view. I found the plan to be an icebreaker for our practices and perceptions. This demonstrates the positive outlook of both students and teachers, with students demonstrating a positive attitude towards their studies and teachers advocating for positive emotions.

When the two of us were in the coordinator's office, we had an informal conversation with the mathematics teacher.

> *I always considered myself a super personality in front of students. I used to believe that being emotionally attached to the students could affect the classroom environment and students' learning. It is good to be strict, rude, and bored as a mathematics teacher in front of students so that they take matters seriously. I was not willing to entertain my students with any of their concerns besides the curriculum matter. I was not even convinced with the notion of this STEAM approach in the beginning. I was just participating with you and in your plan as a colleague. But your workshop and this integrated planning made me curious to know the result of project implication, so I engaged myself in the plan with my full support. Now I realized that the STEAM approach, or this integrated approach, can possibly replace the fear of the students with relief and frustration with success in teaching and learning mathematics, both as a teacher and a student. I can see the curiosity of the students with the result of the projects. Though I am not familiar with all of these, I think our students are already one step ahead of us. They are techno-friendly and learn anything easily from the internet. I am also trying to update myself to some extent. Hahaha.*

This conversation with the mathematics teacher gave me a positive sign about our plan. He added, *"I feel thrilled if I can solve a problem, I feel motivated".* This was the evidence of happiness. Not only that, but participants also began to feel comfortable. For instance, one of the students shared:

> *"Nowadays I feel comfortable speaking with the teachers; they seem quite friendly. I still have difficulty in mathematics but enjoy collecting the data and participating in the group work. I am trying to solve the questions as well. Nowadays, I am learning from Ankit (his friend) in the leisure classes as well, and I can solve a few questions from Mathematics".*

Such expressions of 'comfortable,' 'enjoy,' 'try,' 'learning,' and 'can solve' made sense of the strengths of the transformative STEAM approach. "Drawing on constructivist, critical, social, and arts-based epistemologies to examine reflectively, critically, and imaginatively their lived experiences, revealing the historical and sociocultural framing of their personal lives and professional practices" (Taylor, 2013, p. 2) is what we learned.

We observed a variety of emotions among students in mathematics classrooms. Some students experienced a sense of completion as they solved the problems, and they thoroughly enjoyed every moment in the mathematics classroom. On the other hand, some students experienced fear and developed a negative attitude towards mathematics. In many cases/situations, the problem might be easy to solve, but the students' negative attitude towards mathematics restricts them from attempting it. Because they don't enjoy learning mathematics, they rarely understand what the teacher is trying to explain.

In such a scenario, a teacher must find alternative ways to engage students. We observed that while some students enjoyed their mathematics classes, they were afraid of tests and exams. Despite demonstrating commendable performance in the classroom, they struggled to achieve satisfactory results in tests and exams. Such scenarios also created frustrations in the students' learning process. We found that transformative pedagogical practices can address such emotional domains, and the STEAM approach can effectively address this in our context. Emotions "*are dynamic processes, socially organized and historically constituted*" (Martínez-Sierra & García-González, 2016, p. 18-19). So, to address the emotional domains in any classroom, we need to connect the learning activities to the socio-political aspects, to the historical aspects of the learner, and to create a dynamic classroom learning environment.

As I arrived here, I realized that educational stakeholders are in a harmonious context; students, teachers, and educators engage in a meaningful learning process where they learn 'what,' 'how,' and 'why.' This process is accompanied by students' and teachers' behavior and their emotional response towards a positive learning attitude. Learners' attitudes towards the mathematics subject, esteem in solving mathematical problems, and their positive attitude during classroom engagement with the subject and teacher revolve around the emotions of the learners (Boekaerts, 2007). Classroom cultures mostly dominate emotions (De Corte et al., 2011), and the experience of emotions is both contextual and personal.

Conclusion

The balanced way of joyful learning, contextual teaching, ICT-integrated learning, and valuing emotions in the mathematics classroom enhanced harmony among teachers and students. Sharing smiles, using kind words, providing feedback, and giving listening ears to the students were perquisites for enhancing harmony. Harmonious teachers remained calm in all situations as they could observe students' struggles and then helped to encourage and mentor learners in their meaningful learning. The role of contextualizing curriculum made mathematics classrooms alive and student-centered. This act motivated the students to learn from their own context. Along with students, the teachers enhanced ICT integration (one of the STEAM approach's major components), making teachers feel comfortable, confident, and familiar with applying ICT tools in their pedagogical practices. ICT-integrated learning developed a positive attitude among teachers as they began to listen more to the students. Teachers' attentive listening to the students further contributed to creating student-friendly classes and developing student-teacher relationships (Dahal et al., 2019). This approach enhanced harmony and inspired learners to engage in open exploration during the learning process.

This article was not without challenges (Ulla, 2018), as I encountered issues such as vulnerability while striving to foster harmony between teachers and students. This article could potentially add new insights into the collaborative actions of integrating multiple subject teachers and adapting the STEAM approach to move away from traditional teacher-centered pedagogical practices in similar contexts. This study may be particularly significant to mathematics teachers who aspire to integrate pedagogical transformation. This study can be a resource for PAR practitioners who want to attain, sustain, and promote harmony among co-researchers in diverse contexts.

Limitation of the Study

I developed this article by critically reflecting on my MPhil study, focusing on exploring ways to enhance harmonious teaching and learning experiences among teachers and students. The detailed description can be retrieved from the dissertation (Dhungana, 2023b).

Conflict of Interest

No conflict of interest was reported by the author in the article.

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