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STEAM Education in Nepal: Status, Opportunities, Challenges and Future Perspectives for Nurturing 21st Century Learners

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Abstract

STEAM Education is an innovative approach to learning that integrates science, technology, engineering, arts/humanities, and mathematics. STEAM education is gaining popularity these days in the educational field as one of the alternative modes of nurturing students to produce critical and creative human citizens. STEAM approaches have been in practice in Nepal since 2014. In this article, we explored the status, opportunities, challenges, and future perspectives of STEAM education for nurturing 21st-century learners. Likewise, STEAM approaches have been implemented by different organizations in Nepal based on the integrated curriculum of the basic schools of Nepal. The newly developed basic school curriculum at the school and the programs run by the Kathmandu University School of Education are the foundation of STEAM Education. This argumentative article subscribed to the conceptual framework of co-generative inquiry in writing, as articulated by Luitel and Taylor (2007), to foster innovative educational insights aligned to the status, opportunities, challenges, and future perspectives of STEAM education. The article highlights opportunities at different levels: innovation in pedagogy, art-integrated learning, integrated projects, and responsible citizens. At the same time, several challenges, starting from the mindset of people, the footprint of conventional pedagogical approaches, and the influence of positivist ideas in the curriculum and assessment system on the overall culture of education, also got the room for discussion, offering the future perspectives of STEAM education. This argumentative article aims to critically analyze the present situation and envisage possible ways to carry on. In doing so, the argumentation was made from the perspective of transformative STEAM Education and transformative learning. This article is useful for teachers, teacher educators, researchers, and policymakers who aim to understand the present status of STEAM Education in Nepal and aim to advocate from their own places for the betterment of the education system of Nepal.

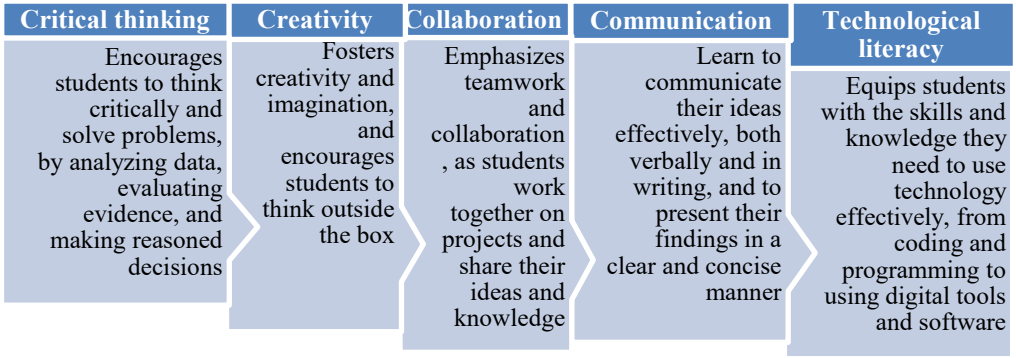
Keywords: STEAM Education, opportunities, challenges, future perspectives, pedagogical approaches

Introduction

STEAM education is an educational approach that integrates science, technology, engineering, arts/humanities, and mathematics teaching. This interdisciplinary approach aims to provide students with a comprehensive understanding of the world around them by connecting theoretical knowledge to practical applications. With this motto, in Nepal, this educational approach seems to be pop up everywhere—policies and practices of the local, provincial, and central government. The universities (especially Kathmandu University) have been taking several initiatives to promote STEAM Education. NGOs and INGOs working in the education field are likely to take the initiative to strengthen the notion of STEAM education through STEAM-related training and workshops. STEAM education is based on the belief that these five disciplines—science, technology, engineering, arts/humanities, and mathematics are interconnected and can be taught in an integrated way to the students at the school to university level. It is believed that by learning in this way, students are encouraged to think creatively, critically, and innovatively and develop problem-solving and collaboration skills to tackle this 21st century (Dahal, 2022).

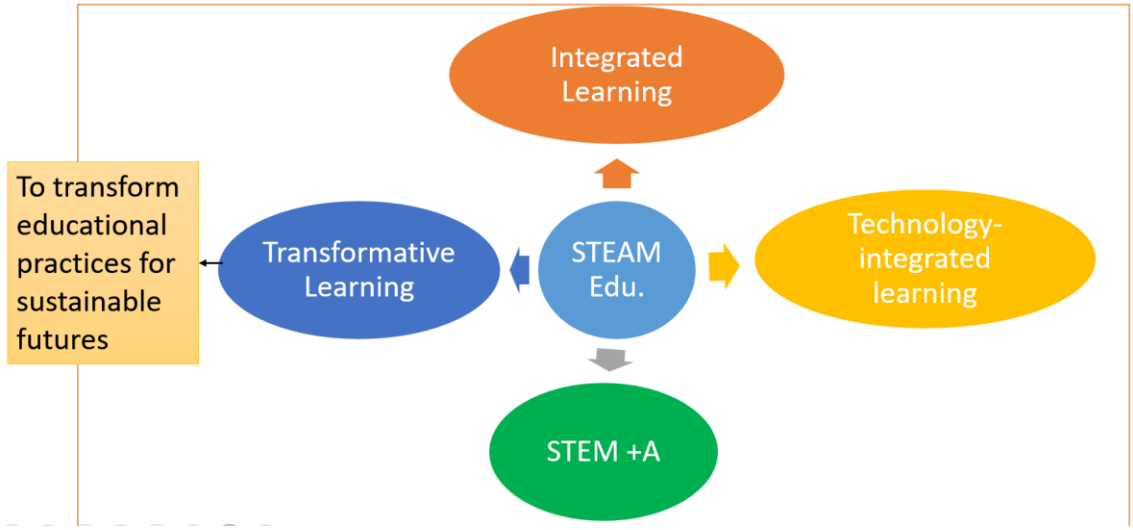
Likewise, in STEAM education, students—schools to university level—often engage in hands-on, project-based learning experiences, where they apply their knowledge and skills to solve their daily problems. These problems shall be at the individual and/or societal levels. So far, as per our experiences as university faculties, researchers, educational leaders, and trainers, this approach encourages students to be active learners and develop a deep understanding of STEAM concepts in the real world. So, STEAM education looks to prepare students for the demands of the 21st-century workforce, where knowledge and skills in these areas are increasingly in demand. Figure 1 shows the skills that STEAM education aims to develop.

Figure 1: Skills STEAM education aims to develop



With the above aims, as shown in Figure 1, STEAM education is becoming increasingly popular in Nepali schools as educators recognize the importance of preparing students for a rapidly changing world (Belbase et al., 2022; Dahal, 2022). STEAM education helps students develop a wide range of skills essential for success in the 21st century by integrating the teaching of science, technology, engineering, arts, and mathematics. Figure 2 below shows the different lenses of STEAM education.

Figure 2: Different lenses of STEAM education

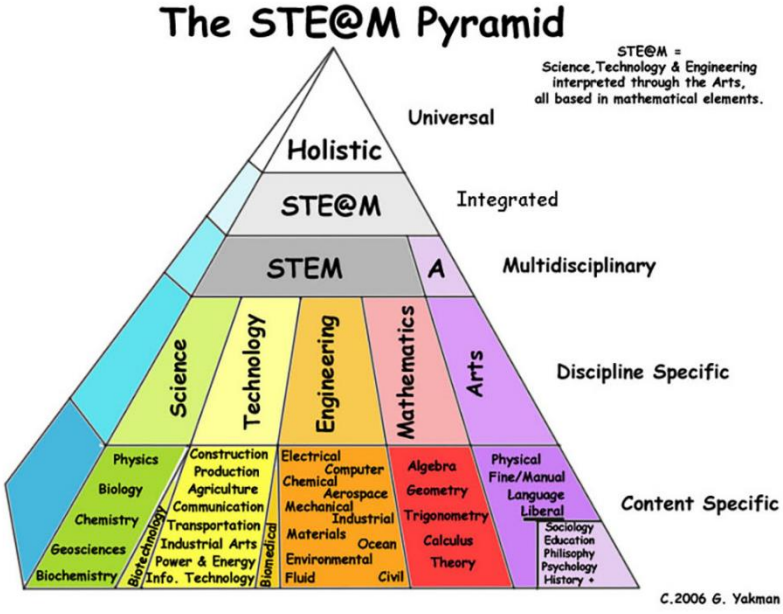


STEAM education is a holistic approach to teaching that seeks to prepare students for success in a rapidly changing world. In Nepal, STEAM education is viewed, among others, as integrated learning, technology-integrated learning, or just added A to STEM. However, we educators are advocating that STEAM education is transformative learning (Mezirow, 2000, 2003) to transform educational practices for sustainable learning by integrating the teaching of science, technology, engineering, arts/humanities, and mathematics to develop the skills. These skills are needed for students to succeed in a wide range of fields, from engineering and computer science to design, the arts, and beyond.

Likewise, the concept of STEAM education emerged in the early 2000s as educators and policymakers began to recognize the need to prepare students for a rapidly changing world that was increasingly driven by technology and innovation. Initially, the focus was on STEM education, which emphasized the importance of science,

technology, engineering, and mathematics. However, educators soon realized that the arts/humanities were also a critical component of a well-rounded education and played an important role in fostering creativity (Luitel et al., 2022), innovation, and critical thinking. In 2006, Georgette Yakman, a science teacher in the United States, first proposed the concept of the STEAM education pyramid, which added the arts to the STEM framework. See more in Figure 3.

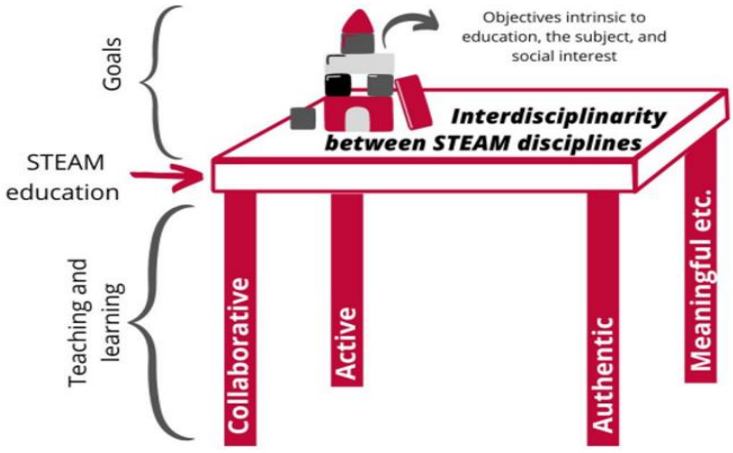
Figure 3: STEAM Pyramid



(Source: Yakman, 2006)

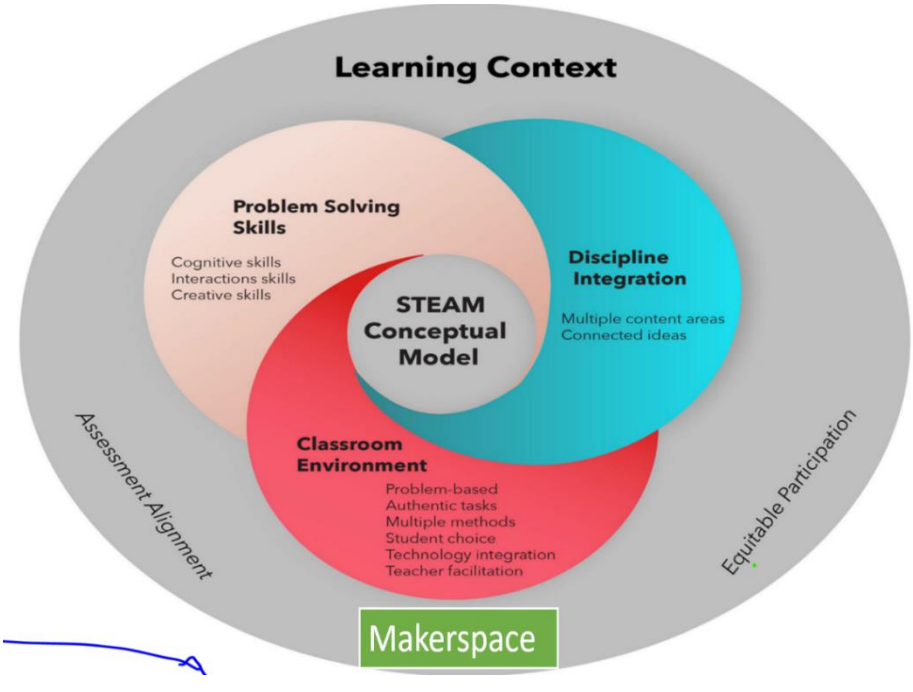
The idea quickly gained momentum, and educators worldwide began to embrace the STEAM approach to provide students with a more comprehensive and interdisciplinary education. Since then, the STEAM movement has continued to grow, with schools and universities worldwide adopting the approach and incorporating it into their curricula, pedagogy, and assessment. Today, many organizations, programs, and initiatives in Nepal are dedicated to promoting STEAM education, and the approach has become a key focus of education policy in many countries (Lamichhane, 2021). Figures 3 and 4 show the Conceptual framework of STEAM Education and Makerspace pedagogy in STEAM education.

Figure 3: Conceptual framework of STEAM Education



(Source: Rodrigues-Silva & Alsina, 2023)

Figure 4: Makerspace pedagogy in STEAM education



(Source: Quigley et al., 2017)

In Nepal, there has been a growing interest in STEAM education in recent years as educators and policymakers recognize the importance of preparing students for a rapidly changing world (Shrestha et al., 2022). While there is still much work to be done to fully integrate STEAM education into the national curriculum, several initiatives and organizations are working to promote STEAM education in Nepal. The Robotics Association of Nepal (RAN) was established to promote, educate, explore, and compete in the field of robotics, which has provided an outstanding platform in science, technology, and robotics for students and enthusiasts all over the country (http://higrc.org/main/page.php?mnu_uid=946&). RAN has been dedicated to promoting the teaching and learning of robotics and other STEM subjects in Nepali schools. The association organizes workshops, competitions, and other events aimed at encouraging students to develop their skills and knowledge in STEAM-related areas. At the governmental level, the Ministry of Education, Science, and Technology has also recognized the importance of STEAM education and has begun to incorporate elements of the approach into the national curriculum. While STEAM education is still in its early stages in Nepal, there are signs that the approach is gaining momentum and that it has the potential to play an important role in shaping the future of education in the country.

All the above, this article explores how we practice interdisciplinary pedagogies of STEAM education in Nepal, especially in school education. Though, STEM and STEAM emerged in the 90s in the USA as ways to address complex and global issues with interdisciplinary approaches. STEM and STEAM also include important knowledge areas like technology and engineering that were often missing from school education. Many countries, such as the USA, Korea, Spain, and Nepal, have adopted STEM or STEAM in their curriculums in various ways (Dahal, 2022). In Nepal, the CDC has developed an integrated curriculum for grades 1-3 (CDC, 2018) aiming to enhance STEAM education in Nepal. However, STEM and STEAM are not without criticism and epistemological differences. Some researchers argue that adding arts and humanities to STEM dilutes the focus on technical areas. Others contend that excluding arts and humanities from STEM narrows the curriculum and privileges technical areas (Rodrigues-Silva & Alsina, 2023; Quigley et al., 2017). STEAM education also reflects current educational research and practice trends, such as socio-constructivism, active learning, collaboration, authenticity, and meaning. However, there is a lack of clarity about what constitutes STEAM education and what distinguishes it from other educational approaches. Some studies propose frameworks for STEAM (Rodrigues-

Silva & Alsina, 2023; Quigley et al., 2017; Yakman, 2006), but they are often specific to certain settings, methodologies, and contexts.

In this article, we delve into the history, epistemology, and divergences of STEAM education. In addition to these inquiries, this article seeks to explore the current state of STEAM Education in Nepal, its potential for growth and development, and how it is being applied in schools. We delve into the challenges encountered in the implementation of STEAM education and its impact on students' learning outcomes. Furthermore, we investigate how STEAM education can enhance Nepal's overall educational landscape, highlighting the future perspectives of STEAM education for nurturing 21st-century learners.

Co-generative Inquiry as Methodology

This argumentative article is grounded in the available literature and the authors' experiences from various workshops, seminars, and teacher professional development sessions. The methodology employed draws upon the conceptual framework of writing as a co-generative inquiry, as proposed by Luitel and Taylor (2007). In accordance with this framework, we, as co-authors, engaged in a collaborative process, drafting different sections of the article based on our experiences and engaging in dialogues to foster the creation of shared spaces for knowledge development. Establishing an intersubjective space involved articulating our initial subjective perspectives, with the aim of developing more advanced subjectivities by incorporating input from co-authors in the form of comments, critiques, and questions.

The concept of writing as a co-generative inquiry has been integrated into a collaborative process, encompassing both individual and external influences. According to the Buddhist philosopher Nagarjuna, the concept of self is seen as a phenomenon that emerges in a mutually dependent manner with others. In this context, the "self" of all co-authors is understood through the lens of intertextuality, recognizing that texts are not entirely self-contained and exclusively individual constructs. We, as individuals, are also social constructs within a context. All co-authors belong to the same department, sharing common values and perspectives while maintaining our freedom and scholarship.

Status of STEAM Education in Nepal

Nepal is currently undergoing a comprehensive initiative to enhance the quality of school education by reforming curricula, textbooks, and education policy. The aim is

to foster a more integrated approach to education (Stohlmann et al., 2012) at the early basic level while promoting project-based and practical learning activities at the secondary level (CDC, 2019). Though the curricular framework directly does not refer to the idea of STEAM education, these educational approaches' underlying principles and objectives have been seen in relevant publications (Belbase, 2019; Belbase et al., 2022; CDC, 2019; Shrestha et al., 2022).

Belbase (2019) reviewed several documents on STEAM Education initiatives in Nepal and argued from different lenses. The Ministry of Education, Science, and Technology has partnered with the Robotics Association of Nepal, Nepal Academy of Science and Technology, BeeCreative, Karkhana, and Nepal Innovation Lab to conduct STEAM challenges named as *Bhawisya 2017* (Belbase, 2019). According to a report by the Kathmandu Post in 2018, a total of 180 school teams took part in the challenge program, showcasing demonstrations and models connected to STEAM. The establishment of partnerships between governmental and non-governmental organizations has created a novel opportunity to advance STEAM education in Nepal. This initiative seeks to foster the growth of creativity, imagination, innovation, scientific reasoning, and problem-solving abilities, transcending the conventional approach of teaching and learning subjects such as mathematics, science, and the arts (Kathmandu Post, 2018). The availability of challenge programs is primarily confined to the capital city of Kathmandu. Nevertheless, the effective execution of *Bhawisya 2017* showcases a dedication and potential for integrating STEAM efforts within schools in Nepal. In this program, much focus was given to making different prototypes using different science and engineering-related concepts.

Further, Kathmandu University School of Education (KUSOED) initiated the implementation of a formal STEAM education program in February 2019, offering an MPhil and PhD in STEAM Education under the Department of STEAM Education. The primary objective of this program is to equip graduates with the ability to select research topics encompassing mathematics, science, technology, engineering, and the arts/humanities while emphasizing an integrated approach. The curriculum emphasizes the acquisition of information, skills, and attitudes necessary for developing research designs in the field of STEAM. It aims to foster an understanding of problems and concerns that arise at the local, regional, and international levels (KUSOED, 2019). The program provides a selection of courses that are focused on STEAM education, including lenses of STEAM Education, curricula in STEAM education, reflective

practice in STEAM education, and teaching and learning in STEAM education. In addition to the M Phil and PhD program, the department initiated one year MEd in STEAM, one-year PGDE in STEAM Education and two-year MEd in STEAM education in 2020, 2022, and 2024 with different short courses on STEAM education by CPEC at KUSOED, respectively. Launching MEds and PGDE program aims to develop skillful teachers and teacher educators of the school level.

The STEAM education program at KUSOED offers scholars a framework consisting of four lenses: autobiographical, pedagogical, socio-political, and philosophical (KUSOED, 2019). These lenses enable scholars to analyze and understand the various roles and perspectives related to potential societal challenges in the domains of economics, environment, and sustainable development (KUSOED, 2018). Individuals cultivate ethical, attentive, and resilient research and development abilities by engaging in reflective practice through several interconnected epistemological approaches. The acquisition and use of such information and skills necessitate a well-designed and comprehensive curriculum that facilitates the integration of theoretical concepts with practical experiences, allowing for mutual enrichment and informed decision-making. So, curricula of this nature have the potential to yield positive outcomes when implemented within a pedagogical framework that embraces eclectic inquiry-based approaches to thinking and practice. Therefore, these courses on STEAM education offered at KUSOED aim to impart theoretical, philosophical, pedagogical, and practical knowledge, as well as skills, attitudes, and scholarly habits of mind for change and sustainability.

Opportunities of STEAM Education in Nepal

Even though the concept of STEAM appeared in Nepal around a decade ago, the conceptualization and concretization of STEAM have been happening in recent years. There are also opportunities for STEAM Education in Nepal for the improvement of the school as a whole; STEAM education is also viewed as an innovative pedagogy to be applied in the school; STEAM education is also providing an opportunity for new and blooming researchers a topic to research; STEAM education is also viewed as one of the progressive approaches of teaching and learning, considering the students at the center. Thus, in this section, we will explore the opportunities of STEAM education.

The “chalk and talk” method of teaching is visible in many classrooms in Nepal. In such situation, STEAM approach can be considered as one of the innovative

pedagogies in Nepal. STEAM education is not only the progressive approach to teaching and learning, but it also provides students with the opportunity to build on prior knowledge, work around big ideas or concepts, involve working on the interrelatedness of concepts and progress, engage in knowledge construction through social discourse (Stohlman et al., 2012). Integrating different subjects has just begun in schools in Nepal in the form of project work as CDC has been provided spaces for project work as a part of internal evaluation. STEAM education also allows teachers to focus on big ideas and make connections or interrelate it with different subjects (Stohlman et al., 2012).

STEAM education focuses on the development of 4Cs namely: creativity, communication, collaboration, and critical thinking. With STEM, the focus was mainly on the core subjects, namely Science, Technology, Engineering and Mathematics. However, with STEAM education and content knowledge, art integration provides opportunities for students to focus on 21st-century skills, and creativity and imaginative skills are the core of Arts. Furthermore, with the focus on "A", teaching moves beyond teaching for assessment, which limits hands-on activities in class and more memorization of facts and information for passing the assessments.

More so, STEAM education is a progressive approach to teaching in which the students are involved not only in learning but also being involved in active learning. Thus, STEAM education allows teachers to make their classes more progressive by making students active learners. STEAM Education is also called a constructivist learning approach (Trisna et al., 2022). When the students are involved in active learning, being creative and critical, communicating and collaborating with peers, they construct their own knowledge. Hence, by being involved in experiential learning, teachers can create a constructive learning environment for the students.

Besides these, STEAM education also provides growth opportunities for the teachers because implementing STEAM is challenging in itself, where the onset of STEAM Education has just grounded its root, and the branches of STEAM are in spreading condition. This also means growing opportunities for teachers as they need professional development (Rajbanshi et al., 2020) to be able to use STEAM pedagogy meaningfully in their classrooms and grow as professional teachers.

Furthermore, STEAM education encompasses the technology part. To be able to use technology efficiently in the classroom, two components need to be balanced: access and competence. Access to technology is as important as using technology as an instructional delivery tool, learning tool, and knowledge construction tool, for which

teachers need to be competent and believe that technology brings change in students' learning (Rajbanshi, 2017). Thus, STEAM education allows teachers to be competent in using technology as a pedagogical tool in the classroom. The STEAM approach to education creates multiple opportunities as it develops skills such as creativity, innovation, problem-solving, and professional development (Junior & Sousa, 2023). Among many, the five opportunities are vital for school improvement.

First, STEAM has become an area of research as many teachers who teach or aspire to teach from early childhood development (ECD) to higher education like to take university courses on STEAM education and STEAM-based pedagogy. Second, schools use STEAM as a signature pedagogy (Shulman, 2005) or an innovative pedagogy to foster the learning of the students and teachers. STEAM approach not only supports teachers in transferring knowledge to students but also supports engaging students in active learning. Beyond that, teachers can foster core values through the STEAM approach. Besides many schools that seek alternative and innovative pedagogy, STEAM has become one of them. Third, many school leaders and teachers see possibilities for transformative professional development. As a policy document recently intervened with the STEAM approach, this created opportunities for many teachers, teacher leaders, educators, and trainers to learn, practice and develop professionally. Fourth, STEAM-based project work development and implementation by STEAM professionals supports effective implementation of current curricula. With the recent change in the formative assessment system of basic level curriculum, teachers design STEAM-based interdisciplinary projects, implement and assess. Components of problem-based, inquiry-based and arts-based makes STEAM-based projects easy to understand, implement and further develop other creative projects connecting to community-based projects by the teachers who have a passion for continuous professional development.

Finally, STEAM education fosters university-school-community partnerships. Many schools envision their schools as STEAM-based schools through STEAM-based projects. STEAM-based education supports the learning of students, teachers, teacher leaders, educators and parents, including community members, through effective implementation of curricula, development of creative projects, strengthening school culture, and enhancing professional values of teachers. As a result, universities, schools, and communities come together to enhance the learning of the students, teachers, teacher leaders, and educators. Collective initiation of fostering the learning of students supports the enhancement of quality education.

Challenges of STEAM Education in Nepal

STEAM education can be understood as an educational worldview and approach. As an educational worldview, STEAM education is a framework that guides research and practice in the field of STEAM Education. As an educational approach, STEAM Education focuses on designing and implementing curriculum, pedagogy and assessment in classroom situations. In these two understandings of STEAM education, education in Nepal poses many challenges in designing and implementing curriculum, pedagogy and assessment in the classroom contexts.

The first and foremost challenge is carrying out the research study in Nepali school education from the perspectives of STEAM Education as a worldview. Though few local-level governments (such as Kamalamai Municipality, Sindhuli) incorporated STEAM Education, mentioning its promotion and implementation in school education up to Grade 12, very few research studies have been carried out on its implementation. Nevertheless, a few private institutions, including Kathmandu University, have continuously conducted research studies for about a decade. Though grades 1-3 curricula are designed based on the multidisciplinary and interdisciplinary approaches of integration (CDC, 2019) that miss transdisciplinary curriculum integration, there are still discipline-based curricula from Grades 4-12. Therefore, the implementation of STEAM education faces a serious challenge at the policy level, which requires a wide range of research studies.

Within the worldview of STEAM Education, we come across the challenges of curriculum, pedagogy, and assessment approaches. STEAM education as an approach mainly focuses on curriculum as a continuous process (school curriculum including lesson plans, project plans, material development, classroom management), innovative pedagogies (inquiry-based, integrated, problem-solving, project-based, etc.), and authentic assessment (summative and formative). However, a discipline-based curriculum has encouraged teachers to maintain the status quo of conventional pedagogical approaches and remain within the comfort zone of summative assessment. Not only teachers, other school stakeholders such as school administration, parents, students and community people entertain school education that prepares students for achieving good marks/grades/percentage. Such status quo in educational practices have become a major challenge for implementing STEAM Education in school education in Nepal.

Moreover, school education in Nepal needs radical reform from the basic level to Grade 12, and reform does not take at once as it's a continuous process. In this regard, the stakeholders at the policy level need to take initiation, which seems almost impossible because of the unstable government in Nepal. Although the recent discipline-based curriculum reform has not directly advocated STEAM Education, the curriculum, pedagogical and assessment approaches have incorporated the STEAM components in all Grades 1-12 curricula. However, such reform has put forward many challenges in school curriculum, pedagogy, and assessment. Schools face challenges in designing and implementing curriculum, innovative pedagogies and authentic assessment practices.

Most importantly, disciplinary egocentrism (Connor et al., 2015) has become a major challenge for teachers, school stakeholders, and policymakers. To some extent, different governmental bodies such as the Curriculum Development Centre (CDC), Centre for Education and Human Resource Development (CEHRD), Education Review Office (ERO), etc. under the Ministry of Education, Science and Technology (MoEST) have taken the lead to reform curriculum, pedagogy, and assessment. Even though governmental bodies have been conducting various teacher education programs such as Teacher Professional Development (TPD), Training of Trainers (TOT), seminars, workshops, etc., the school stakeholders are not in a position to implement the knowledge and skills in classroom situations. Many research studies such as Belbase (2019), Belbase et al. (2022) and Shrestha et al. (2022) show that there are many factors that hinder the implementation such as disciplinary egocentrism, poor infrastructures, poor electricity and internet facilities, poor technological facilities, stakeholders' low-level consciousness and literacy, weak monitoring, etc.

Specifically, STEAM education in Nepal has been facing challenges due to its five acronyms – Science (S), Technology (T), Engineering (E), the Arts (A), and Mathematics (M). Many think there are five disciplines (subjects) that should be given major focus in school education by integrating two or more subjects. Nevertheless, many have still not developed the awareness, knowledge, and skills to implement STEAM Education as an approach. Therefore, there is a serious challenge of raising awareness, knowledge and skills of STEAM Education among the school stakeholders that the five acronyms represent on only five subjects and their content integration rather they are about inquiry learning (Science), local and modern technological skills (Technology), design thinking (Engineering), creativity and imagination (the Arts) and computational thinking (Mathematics), and among them, one or more approaches can be

implemented in school education through integrated approaches (multidisciplinary, interdisciplinary and transdisciplinary).

Above all, curriculum, pedagogy, and assessment in Nepali education landscape are the major disempowering forces that have been challenging in implementing STEAM Education in Nepal. Yet, the curriculum, pedagogy and assessment are culturally decontextualized, thereby subordinating and/or neglecting culturally contextualized education in Nepal. Moreover, there are much evidence of successful implementation of STEAM Education as a worldview and approach in school education in Nepal (Shrestha et al., 2022). The Department of STEAM Education and Continuing and Professional Education Centre (CPEC), Katmandu University School of Education, have successfully implemented STEAM Education as a worldview and approach to school education nationwide through various trainings, workshops and short courses. This evidence shows that despite having many challenges, it is possible to implement STEAM Education in Nepali School Education.

When designing and implementing STEAM education, curriculum, pedagogy, and assessment development and implementation are the major facts that influence the success and applicability of the program. Reform in these aspects to bring quality changes in education is a great challenge because it must alter and transform the conventional education system and practices such as curriculum, pedagogy, and assessment. However, deep-rooted conventional education practices challenge implementing and establishing integrated STEAM education in Nepal. One root reason is the reform in policy and lack of educational policy. If we evaluate the government's concern on this agenda, there is no strong reform in the policy, although the government kept implementing integrated/STEM education in grades 1-3, which is an invaluable step. Nevertheless, policy development in implementing STEAM education in other higher levels cannot be seen. One more example is that the national education policy is silent in the integration of technology in education. Technology integration is crucial and works as a pedagogical approach to innovate teaching-learning practices as per the needs of 21st-century education.

The conventional curriculum practice is the major challenge as the foundation of our education system solely depends upon the subject-centric, discipline-based, content-oriented, exam-driven, etc. curriculum structures. This curriculum emphasizes the role of education in the reproduction of human resources under the curriculum as subject matter, cultural reproduction, etc. This prioritizes the responsibility of teachers to master

subject or discipline-based content knowledge, educational institutions to run activities in a compartmentalized classroom setting, students to master subject specific skills, and society to prepare children for a specific domain. Due to this, there is a problem that students mostly struggle to recognize and understand the relationship among subjects or disciplines, real-world applications of contents in real life and the world of work, and education system fails to inculcate the essential 21st century skills among students. The traditional model of curriculum has not been reviewed, updated as per the changes in the world, contextualized, and it is not practical to capture the diverse aspirations and needs of the learners and society. The STEAM-based curriculum demands an integrated model (i.e., multidisciplinary, interdisciplinary, and transdisciplinary) which views knowledge, skills, and values as holistic concepts and students must learn them by associating (not separating) the contents and context and engaging them in inquiry-based, project-based, and problem-based learning environments.

Next is our pedagogical practices, which challenge the implementation of STEAM education in Nepal. Influenced by a one-size-fits-all approach to pedagogy, the disposition is that teacher-centered methodologies are prevalent and culturally accepted. The dominant mode of teaching and learning in Nepal is still teacher-centered, lecture-based, and rote-learning-oriented, which generally devalues the potentiality of students in the construction of knowledge and the effect of culture/context in education. The role of teacher's practices remains unchanged throughout the year to finish content before the final evaluation. It seems that the major factor is the lack of required knowledge and skills of innovative pedagogies such as project-based, inquiry-based, problem-based, technology-integrated, etc.. STEAM education as a pedagogical approach requires teachers to practice this innovative approach to integrate subjects, disciplines, and curriculum individually or collaboratively to emphasize a holistic learning environment. These innovative pedagogies foster student-centered, collaborative, creative, and reflective learning practices by emphasizing integrated ways of learning.

In line with the conventional pedagogical practices, the assessment system of Nepal is another challenge for implementing STEAM Education in Nepal. The summative and standardized tests, which are not mostly aligned with the curriculum objectives, learning outcomes, students' diverse needs and abilities, are the dominant assessment practice that often evaluates students' quantitative development in the contents of specific subjects or disciplines. The assessment system does not capture the complex, multidimensional, and dynamic nature of students' learning, which is mostly

holistic. However, the assessment system in STEAM education requires innovative methods such as continuous assessment system (Formative), authentic, performance-based, project-based, etc., which address the complex structures of student learning. These methods prioritize the use of continuous feedback-loop to improve students' learning, authentic and reflective tasks to connect learning with life and previously learned concepts and experiences. These keep the continuous track of students' learning status and encourage them for improvement. In addition, these assess the holistic development of students in learning.

Another great challenge in the implementation of STEAM education is the availability of resources for practicing integrated curriculum and pedagogical approaches. The resources include physical and human resources. The conventional practices of education in Nepal are dominant under the prescribed textbooks, limited physical resources, and unprepared human resources. Due to the poor infrastructure and unavailability of advanced technology, educational practices are unable to practice advanced innovation in education, such as the use of robots and robotics, virtual and augmented realities, etc. Although the innovation can be practiced using locally available resources, the problem is the unpreparedness of human resources such as curriculum developers, educationists, teachers, and other educational stakeholders. There needs to be proper management to upskill all these bodies so that they function properly and practice holistic and integrated education in Nepal. For example, the lack of sufficient teacher professional development support to teachers is directly linked with the poor performance of teachers to facilitate students in a constructivist learning environment. Teachers need sufficient professional growth support to upgrade their knowledge and skills and innovate their pedagogical practices. So, STEAM education demands a concrete plan of quality resources (both physical and human) to implement holistic or integrated ways of educating children.

Final Remarks

STEAM education has the potential to fulfill the promise of progressive education such as John Dewey and Paulo Freire, who foresaw education as moving toward a student-centered model in which students are engaged and central to knowledge production (Luitel, 2020). Thus, the discourse around STEAM education is gaining momentum in Nepal. This is largely due to the efforts of universities, government bodies, and non-profit and private institutions, which have played a crucial

role in advancing STEAM-related activities. There are numerous opportunities on the horizon, including curriculum revision and a greater focus on integrated learning methods. However, several challenges have also emerged, such as the prevailing disciplinary mindset, resource constraints, and the need to institutionalize new practices. For the successful implementation of the STEAM approach in education, it's crucial that all stakeholders engage in meaningful dialogue and act at the grassroots level with future perspectives of STEAM education while nurturing 21st-century learners.

In conclusion, this article explored the need for innovative educational insights by aligning with the current status, opportunities, challenges, and future perspectives of STEAM education. It highlights opportunities for pedagogical innovation, art-integrated learning, integrated projects, and the cultivation of responsible citizens. Concurrently, it addresses challenges such as entrenched mindsets, conventional pedagogical footprints, and the influence of positivist ideas in the curriculum and assessment systems. This argumentative article critically analyzes the present situation and envisions potential pathways for the future of STEAM education in/for Nepal.

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