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Research Article

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Assessing the Role of Targeted Policy Measures in Promoting STEM Educational Equity among Secondary School Students in the Chittagong Hill Tracts

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Abstract

Background: *Science, technology, engineering and mathematics (STEM) education is fundamental to sustainable development, but there are significant gaps in these subjects in geographically remote and culturally diverse areas. This study aimed at assessing the effectiveness of policy interventions for STEM equitable education for secondary school students of the Chittagong Hill Tracts (CHT), Bangladesh.*

Methods: *The authors used a cross sectional survey of 261 students from 42 secondary schools in the three CHT districts. Descriptive statistics, chi-square tests, and hierarchical multiple regression were used to identify the effect of policy implementation, socioeconomic conditions, geographical accessibility, language, educational infrastructure, and support systems, on STEM educational equity.*

Findings: *Students exhibited high interest in acquiring STEM knowledge and developed positive career plans, however, financial problems, geographical distance, language barrier in Bangla-medium school education and poor laboratory and digital facilities made it difficult to participate on an equal basis. The perceived policy implementation was the most positive predictor of STEM educational equity, with a regression coefficient of $\beta = 0.31$, $p < 0.001$; however, the socioeconomic and geographical barriers were significant negative predictors ($\beta = -0.28$, $p = 0.002$). Family and peer support was also a positive influence on students' perceptions of equitable STEM learning opportunities.*

Conclusions: *The structural and institutional factors are interdependent and influence the educational equity in STEM in the CHT. Enhancing the implementation of policies at a local level, providing language assistance in the classroom, and improving educational facilities are essential for addressing inequity and creating an inclusive STEM learning environment in underserved communities. The results offer insights for designing STEM education policies that are both equitable and culturally appropriate in Bangladesh and similar multicultural contexts.*

Keywords: *STEM education; educational equity; policy implementation; Indigenous students; Chittagong Hill Tracts.*

Introduction

Science, Technology, Engineering and Math (STEM) education is a key driver of innovation, competitiveness and sustainable development in the twenty first century. The holistic role of STEM Education fosters the development of critical thinking, creativity, collaboration, and problem solving skills, which are critical to solving the more complex challenges in the world today (Kelley & Knowles, 2016; Bybee, 2018). Hence, governments and international bodies have recognized equitable STEM education as a key priority to build a skilled workforce to support knowledge-based economies and reach Sustainable Development Goal 4, which focuses on inclusive and equitable quality education for all (UNESCO, 2022; OECD, 2023).

While the world-wide investments in STEM education have been great, the educational access, participation and achievement of students from geographically remote, socioeconomically disadvantaged, and culturally diverse communities remain high and unequal (Marginson et al., 2020; UNESCO, 2022). Numerous studies have shown that there are several factors, such as poverty, poor school facilities, lack of qualified STEM teachers, poor access to laboratory equipment, lack of access to digital technologies, language barriers and poor provision of teaching materials, that affect education inequality (Toma & Greca, 2018; OECD, 2023). Educational systems often overlook cultural diversity and local knowledge systems in their programs and practices, which can affect participation and success in STEM-related areas of student engagement and achievement, and this is especially true for Indigenous and ethnic minority students (Aikenhead & Michell, 2011; Brayboy et al., 2012). Thus, achieving educational equity goes beyond equal access to school and involves a number of factors supporting learners to achieve comparable educational outcomes regardless of their socioeconomic position, ethnicity or geographical location, including the delivery of appropriate academic support, culturally responsive teaching and equitable learning opportunities (UNESCO, 2022).

In the context of national educational reform and sustainable socio-economic development in Bangladesh, STEM education is emerging as a major issue. The policy documents such as National Education Policy (2010), Primary Education Development Programme (PEDP4) and Vision 2041 highlight the importance of improving science and technology education to build human capital for the industrial modernization and digital transformation of the country (Government of Bangladesh, 2010; Ministry of Primary and Mass Education, 2018). However, the disparities in education are still significant in the geographically remote areas especially in Chittagong Hill Tracts (CHT) where indigenous 11 ethnic majority groups live together and also hill Bengali population. Despite continuous efforts by the Government to enhance educational quality and address the needs of CHT children, the region still faces a range of challenges related to education, such as difficult geographical terrain, poor educational infrastructure, teacher shortages, socioeconomic deprivation, multilingual learning context, and low representation of indigenous languages and cultural knowledge in the national curriculum (Chakma, 2020; Asian Development Bank, 2022). In sum, these factors limit students' engagement, retention, and success in STEM fields with respect to many areas across Bangladesh.

While some work has been done to document educational inequalities in the Chittagong Hill Tracts, most studies have focused on general educational access, enrolment rates, or primary education and not STEM-specific outcomes (Mohsin, 2019; Chakma, 2020). Additionally, there is only a small amount of empirical research on the interacting impacts of socioeconomic status, geographic isolation, cultural/language diversity, curriculum availability, and educational policy implementation on STEM educational equity in secondary schools. Such a gap in knowledge limits the capacity of policy makers to create interventions based on evidence that can help achieve the objective of helping the national policies and policies in STEM education become relevant in the education of marginalized learners.

The present study aims to fill this gap by investigating the effectiveness of specific policy interventions in fostering educational equity in STEM in secondary schools of the Chittagong Hill Tracts of Bangladesh. Employing quantitative survey data gathered from secondary schools throughout the three hill districts, this study explores the relationships between policy implementation, curriculum access, socioeconomic factors, geographical barriers, cultural and linguistic influences, and students' opportunities to learn STEM. This research fills the gap in the current literature on educational inequities in STEM education and provides empirical evidence that can inform culturally responsive, context-specific policy recommendations for inclusive STEM education for the marginalized communities living in one of the most poorly served education systems in South Asia.

Literature Review

STEM Educational Equity: Global Perspectives

Science, technology, engineering and mathematics (STEM) education is seen as a strategic priority in the world, as it plays a pivotal role in fostering innovation, technological advancements, economic competitiveness, and sustainable development. In addition to its scientific learning benefits, STEM education fosters critical thinking, creativity, collaboration, and problem solving that are vital to solving complex social and environmental issues (Kelley & Knowles, 2016; Bybee, 2018). International organizations have thus highlighted the importance of fair and equitable STEM education, which has been deemed a prerequisite for reaching SDG 4, inclusive and quality education for all learners without discrimination based on their socioeconomic or cultural status (UNESCO, 2022; OECD, 2023).

Although significant efforts in STEM have been made, inequities in participation and achievement have continued across many states. Many studies have demonstrated that the students in rural, economically disadvantaged and ethnically diverse backgrounds still endure lower educational outcomes compared to other students, as a result of lack of access to qualified teachers, laboratory facilities, digital technologies and high quality educational resources (Marginson et al., 2020; OECD, 2023). Recent studies thus suggest that as well as equal access to education, educational equity in STEM must also include culturally responsive curricula, pedagogical practices that are inclusive, appropriate institutional support and policies that tackle structural inequities faced by marginalized populations (Aikenhead & Michell, 2011; UNESCO, 2022).

STEM Education and Regional Disparities in Bangladesh

The STEM education has been gradually becoming a national priority in Bangladesh in recent years: the National Education Policy (2010), the Primary Education Development Programme (PEDP4) and Vision 2041 all have been emphasizing on building scientific and technological capacities for sustainable economic growth (Government of Bangladesh, 2010; Ministry of Primary and Mass Education, 2018). While there has been progress in enrolment, infrastructure building and access to education, there are significant differences between regions around education outcomes.

The differences are especially pronounced in the Chittagong Hill Tracts (CHT) which is the most isolated and culturally diverse area in Bangladesh. Several factors have been identified in the past that hinder access to education in CHT, such as difficult topography, lack of proper transportations, lack of qualified teachers, poverty, insufficient lab facilities, and lack of access to digital learning resources (Asian Development Bank, 2022; Chakma, 2020). In addition, although indigenous people are linguistically diverse, the majority of schools teach in Bangla which makes it difficult for students whose native language is not Bangla to follow the instructions. Formal STEM curricula are also not wholly integrated with Indigenous culture, language, and traditional knowledge, further limiting students' engagement and academic achievement (Aikenhead & Michell, 2011; Chakma, 2020).

Socioeconomic, Cultural, and Policy Determinants of STEM Participation

Research increasingly shows that socioeconomic, cultural, institutional and psychological factors interact and have an effect on STEM participation. Household income, parental education level, school resources, teacher quality and students' self-efficacy have been consistently found to be significant factors affecting STEM achievement (Eccles & Wigfield, 2020; OECD, 2023). Likewise, teachers' beliefs, parental desires, gender stereotypes and community perceptions of scientific education are important determinants of students' motivation and educational goals, especially for disadvantaged and ethnic minority students (Wang & Degol, 2017; Marginson et al., 2020).

A number of policy measures have been put in place to mitigate educational inequalities, such as the establishment of scholarship programmes, teacher training, digital classrooms, curriculum change, laboratory modernization and financial aid for disadvantaged students. While many of these efforts have helped to increase educational access, there has been mixed evidence on how well they are achieving equitable STEM learning outcomes, due to the fact that the structural disadvantages, cultural barriers and geographical isolation often persist (UNESCO, 2022; Asian Development Bank, 2022). Recent evidence, therefore, highlights the need to design and create STEM policies that incorporate educational investments, culturally responsive pedagogy, multilingual learning support, engagement with community, and context-specific policy implementation strategies (Bybee, 2018; UNESCO, 2022).

Research Gap

Despite growing scholarly interest in learning inequalities in the Chittagong Hill Tracts, there are still a number of limitations in the current scholarship. Previous studies have mainly been descriptive: the general educational access or enrolment pattern of students in primary school or educational equity in general (Mohsin, 2019; Chakma, 2020). In addition, few studies have quantitatively assessed impact of specific policy interventions and have also explored the role of a combination of socioeconomic, cultural and linguistic diversity, geographic isolation, educational infrastructure, and stakeholders' perceptions on STEM learning opportunities.

Evidence integration is limited, making it difficult for policy-makers to make effective interventions that address the educational realities of marginalised communities. To close this gap, extensive quantitative analyses that can discern the relative effect of policy, socioeconomic, cultural and institutional determinants of STEM educational equity are needed.

Contribution of the Present Study

To fill these gaps in the research, the present study considers the effectiveness of the targeted policy measures to achieving equity in STEM education for secondary school students in the three districts of the Chittagong Hill Tracts, Bangladesh, in a quantitative manner. This research brings together these indicators in a large analytical framework, offering solid empirical evidence to inform culturally responsive educational policies, and adds to the existing international literature on equitable STEM education in marginalized and Indigenous contexts.

Materials and Methods

Study Design and Study Area

In order to explore the effectiveness of specific policy interventions in fostering equity in STEM education for secondary school students in the Chittagong Hill Tracts (CHT), Bangladesh, a cross-sectional quantitative survey design was used. Because a cross-sectional design was suitable to examine the relationship between the variables of policy implementation, socioeconomic conditions, educational resources, and students' STEM learning opportunities within a specific population at a given time, a cross-sectional design was used (Creswell & Creswell, 2018).

The study was carried out in the three administrative districts of Chittagong Hill Tracts (Bandarban, Khagrachari and Rangamati) one of the most geographically isolated and culturally divided region in Bangladesh. It is home to eleven ethnic groups of Indigenous people, along with hill Bengali people, and the topography is mountainous, education facilities are inadequate, various languages are used in education, and educational inequalities are continuing. The data collection took place during the period of October to November 2025, in the 42 government and non-government secondary schools, spread across the three districts.

Study Population and Sampling Procedure

The target population was students of Grade 8-10 from Government and Non-government secondary school located in Chittagong Hill Tracts. A multi-stage stratified sampling procedure was used to provide appropriate representation of schools in each district as well as by major ethnic groups.

The first stage included stratification of schools based on the districts and school types, followed by the proportional selection of participating schools. The second stage involved recruiting eligible students by the help of the teachers by the classroom sampling technique. Informed consent (and informed assent for students under age 18) were sought from students who were regularly enrolled in Grades 8–10.

A total of 300 questionnaires were sent out and 261 questionnaires were returned and used in statistical analysis (response rate 87.0%). The number of samples obtained in the final sample was greater than the minimum sample size calculated by statistical power analysis ($\alpha = 0.05$, statistical power = 0.80, medium effect size) to ensure statistical precision in the execution of the hypotheses (Cohen, 1988).

Questionnaire development and Validation

A structured questionnaire was created after a thorough literature review of STEM education, educational equity, and the implementation of policies (Kelley & Knowles, 2016; UNESCO, 2022). The questionnaire was comprised of 5 conceptual domains of 24 items.

- Interest and learning motivation related to STEM;
- Candidates' English proficiency; and
- Access to education and obstacles to learning;
- Support for learning and institutional support; and
- Implementation of the policy and educational opportunities

The majority of the questions in this questionnaire were scored from 1 (strongly disagree) to 5 (strongly agree).

Content validity was achieved by the evaluation of a panel of experts in areas of STEM education, educational policy, and educational research methodology. The instrument was then subjected to a pilot test with 35 secondary school students from the study area to check the clarity and reliability of the instrument, as well as its feasibility. A few minor changes were made in the light of the feedback received from the participants before the final survey administration. All items of the finalized instrument showed satisfactory internal consistency with an overall Cronbach's alpha coefficient of 0.82 which is considered a good reliability (Cronbach, 1951).

Data Collection Procedure

The questionnaire was completed online via Google Forms within school hours with permission of school authorities. Schools were chosen and trained teachers supervised the administration of the surveys to ensure standardized data collection procedures across schools.

Since multiple Indigenous languages are used in the study area, bilingual teachers offered clarification as needed, ensuring that there was an accurate translation of the questions asked, but not changing the meaning. There was no compelling respondents to participate and they were told the aims of the study before filling out the questionnaire. Fully completed questionnaires were used in the statistical analyses.

Statistical Analysis

IBM SPSS Statistics, Version 27 was used for all of the statistical analysis. The data was checked for completeness, consistency, missing values, and/or potential data entry errors before analysis. The participants' demographic characteristics and responses to the questionnaires were summarized by descriptive statistics such as frequencies, percentages, means and standard deviations.

Independent-samples t-tests and one-way analysis of variance (ANOVA) were used to analyze differences in STEM educational equity indicators across the groups, as applicable. Pearson's chi-square test was used to explore associations between categorical variables.

Multiple linear regression was used to measure the relative contribution of multiple explanatory variables to STEM educational equity. The predictor variables consisted of: Policy implementation, socioeconomic barriers, geographical accessibility, institutional support, curriculum accessibility and cultural and linguistic factors. Before interpreting the model, assumptions of regression (normality of residuals, linearity, homoscedasticity, independence of residuals, and multicollinearity) were examined. A p value of <0.05 (two tailed) was considered statistically significant.

Ethical Considerations

The study has been approved by the appropriate University of Chittagong of the University itself, prior to data collection. School permission slips were also secured with the schools involved. The informed consent was obtained from participants and informed assent from students as per institutional ethical guidelines.

The respondents were explained that participation is voluntary and can withdraw anytime without any consequences. No personally identifiable information was collected and all data were anonymized before starting the analysis so that participants' confidentiality and privacy were protected throughout the research process.

Results

Participant Characteristics

261 questionnaires were completely filled out and analyzed, with an 87% response rate. The age of the participants ranged from 13 to 18 (mean ± SD = 15.2 ± 1.1) and they were enrolled in Grades 8-10 in 42 secondary schools of Chittagong Hill Tracts. The male students made 65.5% of the sample while the female students made 34.5% (**Figure 1**). The majority of the respondents were from Indigenous ethnic communities (89.7%) with the largest proportion from Marma (33.7%), Chakma (29.9%) and Tripura (17.6%) while Bangla-speaking students accounted for 10.3% of the sample (**Figure 2**).

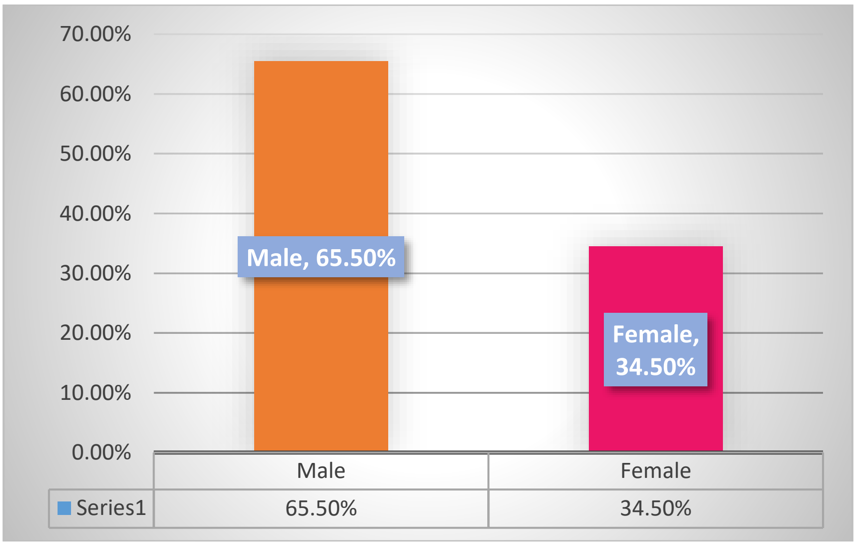

Figure 1: Gender Distribution of the Survey Participants (n=261)

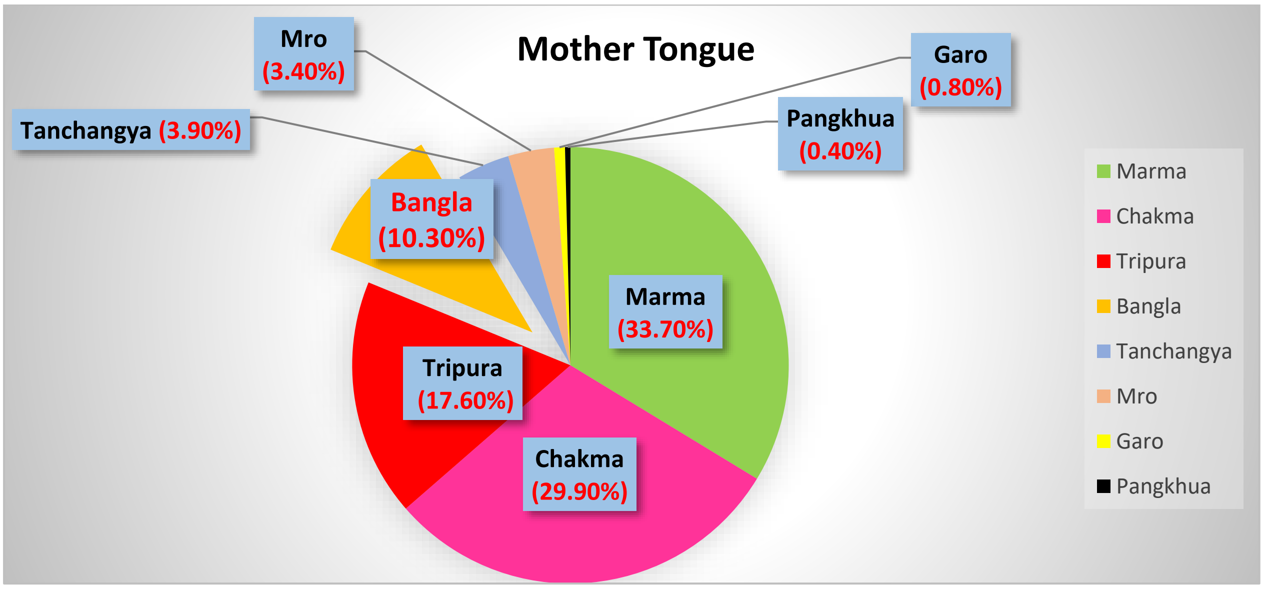

Figure 2: Distribution of Respondents by Mother Tongue (n=261).

Students' Perceptions of STEM Education

Most students had positive attitudes towards STEM education. Overall, 89.3% stated they liked STEM subject areas, 62.0% said they thought STEM education could be useful to their community, and 79.3% said they thought STEM education could be beneficial to future jobs (**Figure 3**). But, students were more positive towards practical and experiential learning; laboratory activity (48.0%) and real life example (35.0%) were the most effective teaching method.

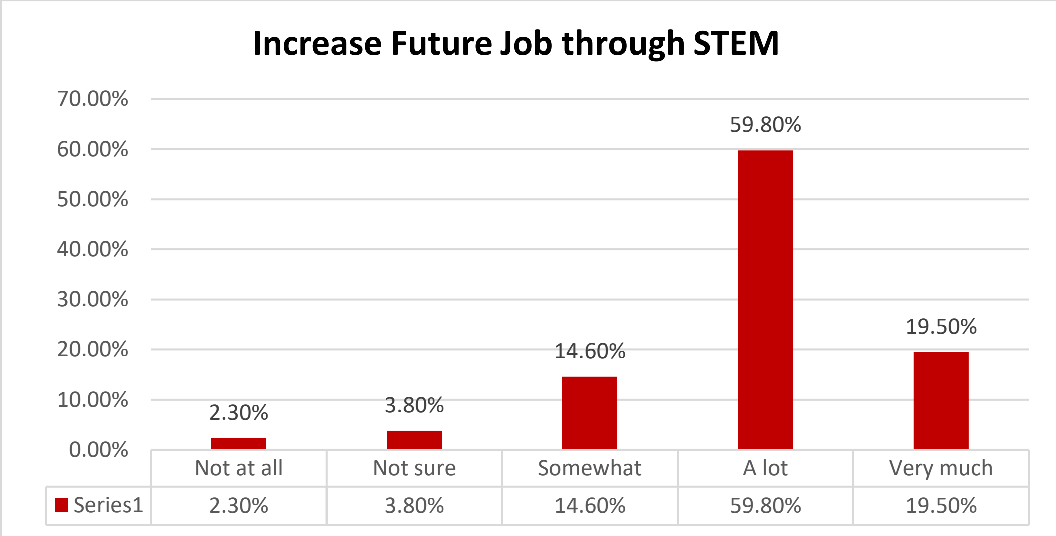

Figure 3: Students' Perception of Future Job Opportunities through STEM (n=261).

Socioeconomic and Educational Barriers

The financial difficulty of their household was mentioned as a significant obstacle to participation in STEM: about 70.0% of respondents indicated that low income of their families often impacted their learning (mean value = 4.0 ± 0.9) (Figure 4). The financial difficulties faced by female students were reported as higher when compared with the male students.

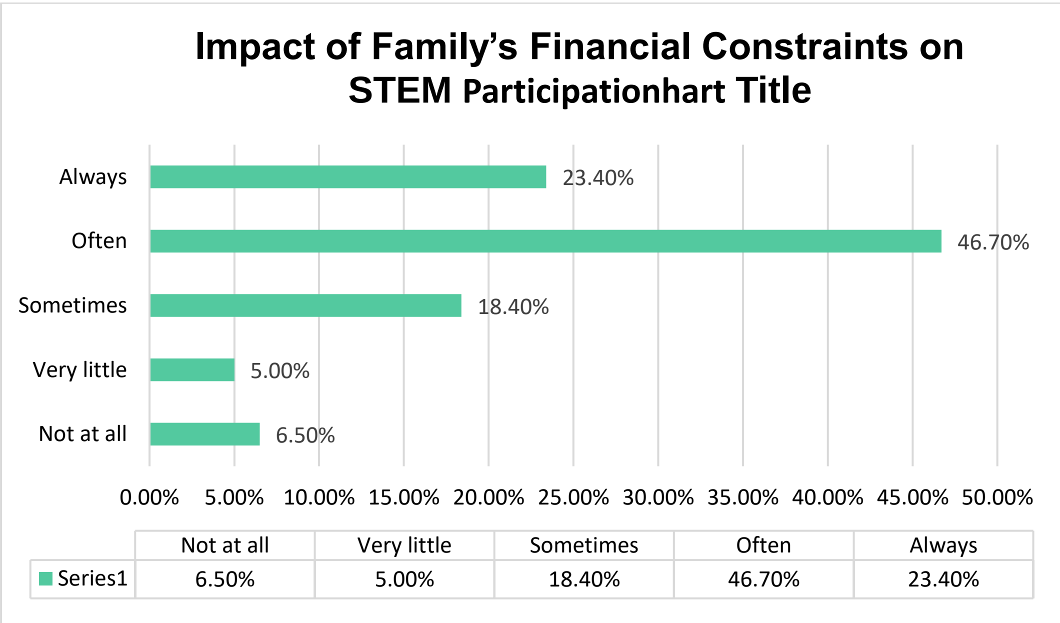

Figure 4: Impact of Family's Financial Constraints on STEM Participation (n=261).

Language was also found to be another important barrier as 71.9% of the students were facing difficulties in comprehending STEM subjects in Bangla and especially among the Indigenous students (Figure 5). There were also geographical barriers that were significant: 69.4% said the hills and transport problems had an adverse impact on regular school attendance (Figure 6).

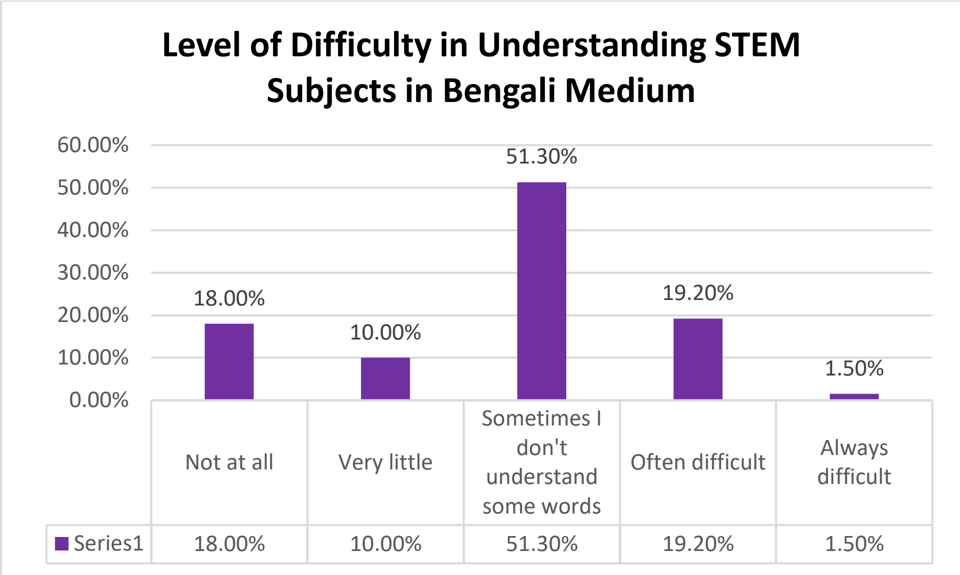

Figure 5: Level of Difficulty in Understanding STEM in Bengali Medium (n=261).

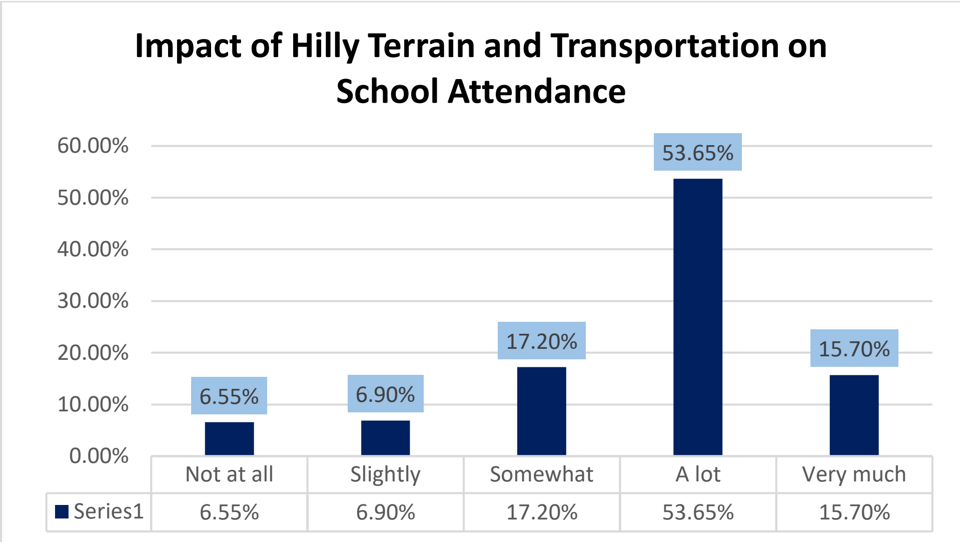

Figure 6: Impact of Hilly Terrain and Distance on School Attendance (n=261).

The functional science laboratory was available to only 23.0% of the students while computer laboratory was available to only 12.6% of the respondents (Figure 7).

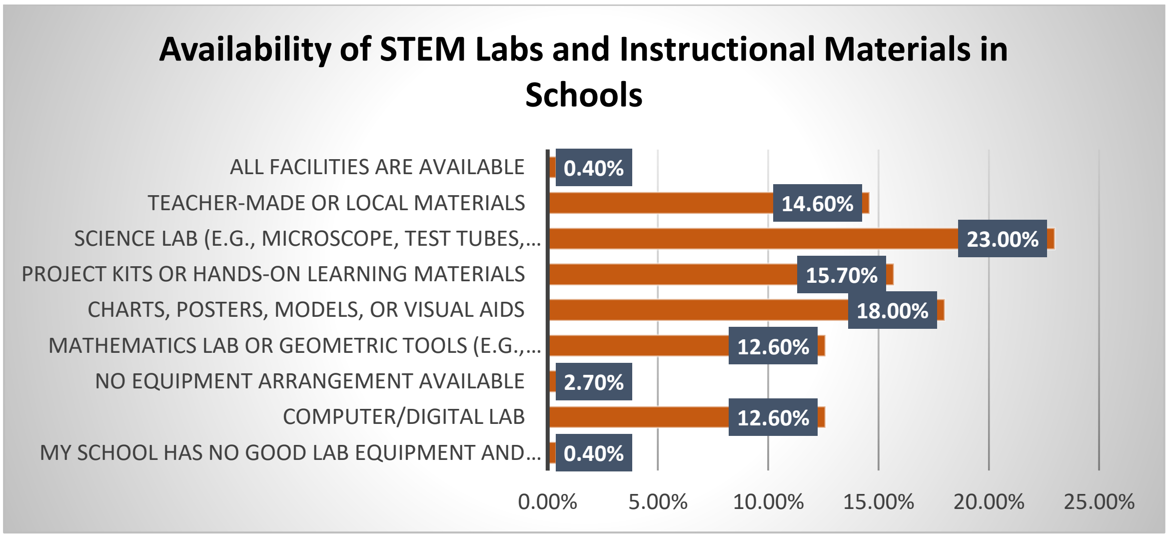

Figure 7: Availability of STEM Labs and Materials in Schools (n=261).

Mentoring and policy development

The levels of family and peer support for STEM education were mostly positive. Some 73.9% of respondents said they were encouraged regularly by their families and 67.8% said they were supported by their classmates while learning STEM.

The students felt that government STEM policies were not well implemented. Nearly 77.0% felt policy implementation was partial or very limited, while only 12.7% stated that it was adequately or fully implemented (Figure 8).

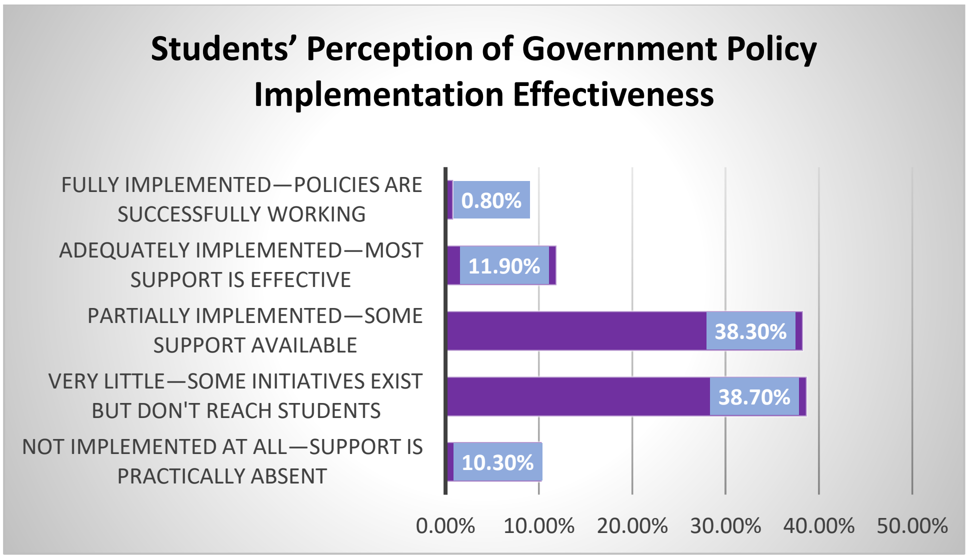

Figure 8: Perception of Government Policy Implementation Effectiveness (n=261).

Students ranked improved science laboratory, enhanced computer and internet facilities, financial assistance, mother-tongue instruction and project-based learning, which address local problems, as the top priorities for improvement in STEM education (Figure 9). The main communities problems that students would like to solve with STEM education were identified as communication and internet connectivity (47.1%), health and sanitation (26.8%), environmental conservation (13.0%) and agricultural development (11.5%) (Figure 10).

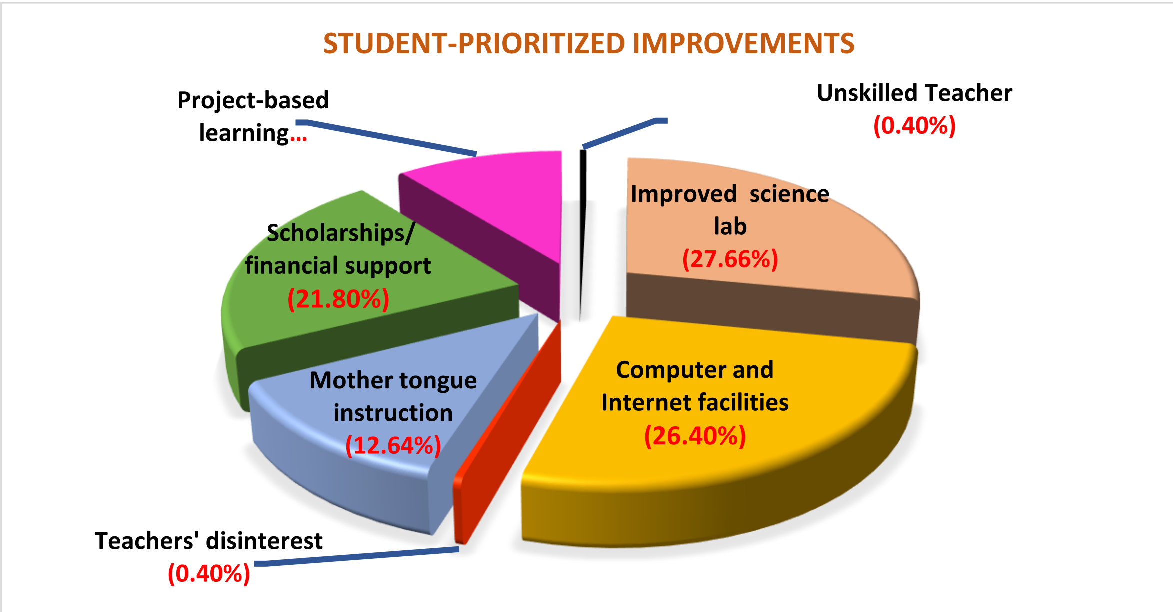

Figure 9: Student-Prioritized Improvements for STEM Education (n=261).

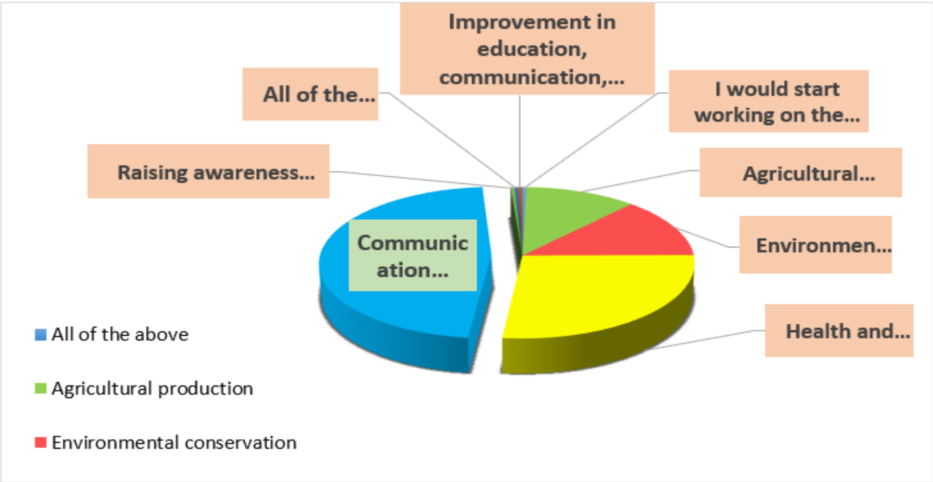

Figure 10: Local Community Problems Students Aspire to Solve via STEM (n=261).

Factors that predict STEM Educational Equity

The overall model significantly predicted STEM educational equity ($R^2 = 0.42$; adjusted $R^2 = 0.41$; $F(3,257) = 62.1$, $p < 0.001$) (Table 1).

Table 1: Hierarchical Multiple Regression Results Predicting STEM Equity Index.

Predictor	β	SE	t	p	Tolerance	VIF
(Constant)	2.15	0.18	11.92	<0.001	-	-
Policy Effectiveness (Q25)	**0.31**	0.05	6.20	<0.001	0.88	1.14
Barriers Composite	**-0.28**	0.09	-3.11	0.002	0.92	1.09
Support Composite	0.18	0.07	2.57	0.011	0.85	1.18

Family and peer support ($\beta = 0.18$, $p = 0.011$) and perceived policy implementation ($\beta = 0.31$, $p < 0.001$) were the next strongest positive predictors of STEM educational equity. However, there were significant negative correlations between socioeconomic and geographical barriers and STEM educational equity ($\beta = –0.28$, $p = 0.002$). Multicollinearity diagnostics showed good stability of the model (all VIF < 2). The standardized regression coefficients are shown in Figure 11.

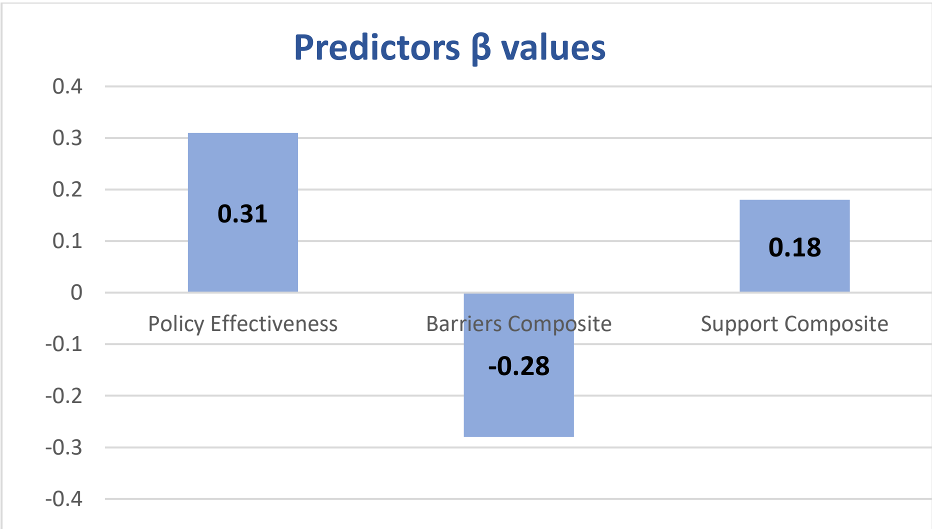

Figure 11: Standardized Coefficients in Multiple Regression Model Predicting STEM Equity (n=261).

Discussion

The current study aimed to examine the efficacy of focused policy interventions for attaining equity in STEM education for secondary school learners in the Chittagong Hill Tracts (CHT), Bangladesh. The findings show that students were highly interested in STEM education, aware of its benefits in the future, and gave it high marks on the capacity to make a difference in community development, but there were several structural and contextual barriers to equal participation. The regression analysis also showed that the implementation of effective policies was a positive factor on STEM educational equity, while the socioeconomic disadvantage and geographical barriers significantly reduced the educational opportunities that students experience. The results of this study are consistent with previous research, which has pointed to the need to go beyond access to educational opportunities to addressing social, economic, cultural and institutional factors that influence student learning as a means of achieving STEM equity (Kelley & Knowles, 2016; UNESCO, 2022; OECD, 2023).

Perhaps one of the most significant was the fact that both students and parents had high expectations for their children's education and that their actual educational opportunities were insufficient. The majority of the respondents expressed positive attitudes towards STEM subjects and felt that it is STEM education that can help in enhancing the livelihoods of the people and the well-being of the community. The interest in STEM has also been documented among students in rural and marginalized communities in other developing nations, where opportunities for hands-on STEM learning are scarce, and the educational environment is not well equipped to support STEM education (Margot & Kettler, 2019; UNESCO, 2022). The results indicate that the underrepresentation in STEM is primarily related more to structural disadvantages than to a lack of student motivation.

Socio-economic disadvantage was a key barrier to STEM engagement. Limited finances limit students' access to learning materials, transportation, digital technologies, and other school support, which decreases engagement in STEM learning. These findings mirror prior research that has found socioeconomic status to be one the largest factors affecting educational outcomes and STEM engagement globally (Reardon, 2011; OECD, 2023). The concentration of poverty is likely to exacerbate educational inequalities in geographically marginalized areas like the CHT, both through affecting the ability to attend school, and through affecting the ability to participate in practical learning.

Geographical isolation was another big problem. The mountain terrain and the poor transportation facilities in the CHT further limits the students' ability to get to schools and laboratory-based learning activity. Similar challenges have been reported in other countries, including Nepal, India, Australia and Canada, where there is ongoing educational disparity in relation to geographical remoteness, despite the implementation of national education reforms (UNESCO, 2022; OECD, 2023). These results reaffirm the need to take physical access into account as a vital part of STEM educational equity.

Language also had a significant impact on students' learning experiences. It was observed that many indigenous students found studying STEM subjects in Bangla only a challenging task. Academic language proficiency has been identified as a key component of successful learning, and research has also demonstrated that multilingual and culturally responsive teaching have an impact on conceptual understanding, engagement in the classroom, and academic achievement (Cummins, 2000; Sharma & Phyak, 2018; UNESCO, 2022). The creation of bilingual instructional materials and the use of Indigenous languages in STEM education, therefore, could help enhance educational equity in multilingual areas like the CHT.

The results also confirmed that poor educational facilities are still a significant problem in the effective learning of STEM. There is a shortage of science equipment that is functional, practical learning materials, and computer labs, all of which limit opportunities for inquiry-based and experiential learning, which are known to be critical to quality STEM education (National Research Council, 2012). Improving the laboratory infrastructure and increasing access to digital learning technologies, therefore, would benefit students' hands-on skills and learning outcomes in STEM.

Family encouragement and peer support were identified as protective factors that had a positive impact on students' involvement in STEM learning. The results align with Social Cognitive Theory, which focuses on importance of supportive social environments for students' self-efficacy and educational aspirations (Bandura, 1997), and more recent work showing a link between parental expectations and collaborative peer relationships on persistence in STEM learning (Eccles & Wigfield, 2020). However, such supportive relationships would not be sufficient to address deep-rooted structural inequalities without other institutional and policy-level strategies.

The most important result of this study was that perceived policy implementation was the greatest predictor of STEM educational equity. Learners who saw government initiatives as being well implemented, reported significantly higher levels of learning opportunity equality than those who saw limited implementation. This finding underscores the need to ensure that national education policies are adopted and implemented locally in a successful manner by providing adequate support infrastructure, capacity and implementation strategies that are culturally responsive. The results are comparable with those found across other countries, and show that educational reforms benefit most when they consider the local socio-economic, linguistic, and cultural context, as opposed to adopting uniform national approaches (OECD 2023; UNESCO 2022).

The overall results indicate that the socioeconomic factors, geographical accessibility, language, educational infrastructure, social support, and policy implementation are interacting to affect the educational equity of STEM in the Chittagong Hill Tracts. A comprehensive approach via policy design is needed to tackle these intertwined barriers by augmenting the educational infrastructure, increasing multilingual and culturally responsive STEM instruction, alleviating financial barriers, and enhancing the implementation of national education policy at the local level. This study provides empirical evidence for one of the least educationally favorable areas of Bangladesh, which adds to the literature on STEM education equity and offers practical solutions for creating policies that support inclusive STEM education in geographically remote and culturally diverse environments.

Conclusion

The present study is empirical evidence for the effectiveness of the policy measures of promoting STEM educational equity in secondary school students in Chittagong Hill Tracts (CHT), Bangladesh. The results of this study show that, although students are interested in STEM and have positive career goals, participation is still limited by interlocking socioeconomic, geographical, linguistic, and infrastructural factors. The most significant positive predictor of STEM educational equity was perceived policy implementation, which strongly suggests that good policy implementation is key to improving educational equity in STEM.

The study also suggests that greater equity in STEM will not be realized by increasing access to STEM education. To meet the specific needs of Indigenous and geographically isolated communities, culturally responsive curricula, multi-lingual support for teaching, improved laboratory and digital systems, and financial resources are needed. These results highlight the importance of local implementation of national STEM policies for the successful implementation of educational reforms as learning opportunities.

This study brings together policy, socioeconomic, cultural, and institutional aspects into a unified analytical tool, and helps fill the gap of literature on STEM educational equity in developing countries. Results offer information-driven lessons for policy makers and educators that can help them create STEM education systems that are inclusive for marginalized populations. Longitudinal and mixed methods studies are needed to assess the longer-term effects of policy interventions and develop ways to improve equitable STEM participation in a variety of educational settings.

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