

# Impact of Extracurricular and Co-curricular Activities on Students' Motivation Toward Learning Science: A Gender-Based Analysis

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**Abstract:** The research investigated how Structured Extracurricular Activities (ECA) and Co-curricular Activities (CCA) programs affected motivation level of secondary school students' toward learning science with particular attention to gender based differences. The study Employed a quasi-experimental study which included a non equivalent control group design that did not receive equivalent treatment to test 136 students of Grade IX from two schools in Kathmandu Valley, Nepal. The experimental group (n = 70; 30 boys and 40 girls) participated in a structured 8-month ECA/CCA intervention comprising 12 science-based activities, while the control group (n = 66; 42 boys and 24 girls) followed the standard national science curriculum without any structured intervention. Pre-testing with the Science Motivation Questionnaire II (SMQ-II) which assesses five motivational subscales: Intrinsic Motivation, Self-Efficacy, Self-Determination, Grade Motivation, and Career Motivation, standardized both groups. The experimental group demonstrated a statistically significant boost in total science motivation when compared with the control group as evidenced by post-test results ( $t(134) = 4.18, p < 0.001$ , Cohen's  $d = 0.74$ ). The two-way ANOVA demonstrated a significant Group  $\times$  Gender interaction ( $F(1,132) = 5.87, p = 0.017$ ) which showed that female students in the experimental group achieved greater motivational improvement than male students. The structured ECA/CCA experiences led to the most significant improvements in Self-Efficacy and Career Motivation for female students, showing that this method effectively addresses science motivation gaps between genders. Secondary school science education benefits from experiential learning programs because they increase student motivation and help achieve gender balance in STEM disciplines.

**Keywords:** *Extracurricular Activities, Co-curricular Activities, Science Motivation, Gender Analysis, STEM Education, Quasi-Experimental Study, Nepal.*

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## I. INTRODUCTION

The critical psychological determinants are recognized for science motivation, which drives students' persistence, engagement, and achievement in science education (Tuan et al., 2005; Glynn et al., 2011). Students' motivation to learn science experiences a worldwide decline which becomes more severe during their adolescence period that is globally observed and concerning trend (Osborne et al., 2003; Vedder-Weiss & Fortus, 2012). This declination in motivation level to learn science has far-reaching consequences, not only for students' immediate academic achievement but also for their long-term aspirations to pursue careers in the field of Science, Technology, Engineering, and Mathematics (STEM) (Maltese & Tai, 2010).

The South Asian region, particularly in the context of Nepal acute this problem as a major difficulty or an issue. The National Curriculum Framework (CDC, 2007) and the School Education Sector Plan (MoE 2016 to 2023) establish study science subject is as a mandatory requirement as a compulsory subject upto the Grade X. However, involvement in learning science at the higher secondary level (Grade XI and XII) and in university science programs (STEM-oriented programs) remains consistently low, especially among female students (ERO, 2020, Shrestha, 2015). The research conducted in the South Asian region has identified three primary obstacles which prevent students from studying science: cultural factors, inadequate access to labs, and the use of lecture-based teaching methods as the main instructional approach (Sharma, 2009). The absence of hands-on learning experiences and science engagement, in

Nepalese classrooms demands a critical need for innovative pedagogy that can supplement content-based instruction.

The academic achievement gaps between genders have decreased yet girls consistently presented lower science self-efficacy and career motivation than boys (Britner & Pajares, 2006; Wang & Degol, 2017). This disparity is influencing through social and cultural factors, differential expectations, and a lack of visible female role models in science (Hyde, 2014). In the Nepalese context, patriarchal social norms and family pressures have been identified as additional barriers that discourage girls from pursuing science-oriented paths. The correlation between achievement and extra activities (HW and CW) of the girl students was maximum while the correlation between achievement and interaction with teacher and peers of the girl students was minimum. Despite of this, the Girl's motivation toward learning science is showing higher than their achievement (Aryal, 2019). The learning obstacles which students face need dedicated teaching methods which will create fair access to educational resources that benefit every student.

The combination of Extracurricular Activities (ECA) and Co-curricular Activities (CCA) creates an effective solution as promising approach. Extracurricular Activities (ECA) and Co-curricular Activities (CCA) represent one such promising approach. ECA refers to voluntary science-related pursuits that are conducted out of school and out of formal class hours, such as science and environment clubs, independent science projects and science olympiads, that nurture students' personal interests and foster scientific identity (Furda & Shuleski, 2019; Lauer et al., 2006). While CCA, refers to well planned activities that are directly interrelated to the school curriculum or formal learning activities, such as science field trips, science fairs, and project-based learning modules, and are intentionally designed to reinforce and extend classroom Instruction (Bartkus et al., 2012; Sahin, 2013). Both Extra-curricular and Co-curricular activities are grounded in the theoretical frameworks of experiential learning (Dewey, 1938) and social constructivism (Vygotsky, 1978), which posit that practically active, socially embedded learning experiences in meaningful learning environments promote knowledge construction and intrinsic motivation.

Scholars have conducted extensive research about how students' motivation and interest in learning activities of teaching and learning are affected by their participation in extracurricular and co-curricular activities. The research evidence shows that students acquire knowledge outside classrooms through structured activities which support their academic studies. The empirical research which demonstrated that students who participated in extracurricular activities experienced academic advancement and personal growth according to his findings. The study shows that extracurricular activities in universities have a major impact on the academic success of students in Lahore Pakistan. (Zaman, 2017).

One of the study found that students who take part in extracurricular activities experience positive effects on their

overall growth. The research demonstrated that the activities lead to better academic results and students developed essential social skills which helped them transition into adulthood plus they showed improved behavior patterns and their school completion rates increased. Annu and Sunita (2014) suggested that secondary education systems which lack structured extracurricular programs should make extracurricular activities a standard requirement for educational institutions based on their research findings. The educational system gains major benefits from these activities since they create better learning opportunities for students while making the school environment more positive and motivational.

The educational benefits of ECA and CCA programs receive backing from research studies. Research shows that students who take part in organized science ECAs and CCAs experience better academic results and increased interest in their subjects and improved research skills (Gottfried & Williams, 2013; Lauer et al., 2006). The activities fulfill all three basic psychological requirements that Self-Determination Theory (SDT) states are essential for people to maintain their ability to learn through self-motivation according to Ryan and Deci (2020).

Research gaps still exist as major unresolved issues. The first problem exists because researchers have conducted too few quasi-experimental studies which measure how structured ECA/CCA programs affect science motivation through validated Science Motivation Questionnaire II (SMQ-II; Glynn et al., 2011) instruments. Researchers have not studied Nepalese secondary school students' motivational experiences especially how boys and girls experience different outcomes according to published literature. The study solves both existing research problems.

#### ➤ *Research Objectives*

The present study was guided by the following specific objectives:

- To examine the effect of a structured ECA/CCA on secondary level students' overall motivation to learn science.
- To compare science motivation across five SMQ-II subscales (Intrinsic Motivation, Self-Efficacy, Self-Determination, Career Motivation, and Grade Motivation) between the experimental and control groups.
- To analyze gender-based differences in motivational outcomes between and within the experimental and control groups following the intervention.

#### ➤ *Research Questions*

- Does participation in a structured ECA/CCA program significantly improve overall motivation toward learning science among Grade IX students compared to a control group following the standard curriculum?
- Is there a significant difference in motivational gains across the five SMQ-II subscales between the control and experimental groups?

- Does the ECA/CCA intervention have a differential effect on science motivation based on students' gender?

(Dean’s office, FOE, TU) approved the study after receiving ethical approval for research activities.

## II. METHODOLOGY

### ➤ Research Design

The study used a quasi-experimental study which included a non-equivalent control group design (Shadish, Cook, & Campbell, 2002). The design becomes necessary when researchers cannot randomly assign participants to different groups in their studies which occurs frequently in actual school environments. The researchers selected two secondary schools from Kathmandu Valley Nepal which had similar socio-economic student profiles and both schools provided equal access to fundamental science laboratory resources. The researchers established group equivalence before the study by using independent samples t-tests to compare pre-intervention SMQ-II scores which showed no statistical differences across all five subscales ( $p > 0.05$  for all) which confirmed both groups started with equal motivational levels. The researchers established one school as the experimental site while designating the other school as the control site to prevent any potential contamination between the different experimental conditions.

### ➤ Participants

The research study included 136 Grade IX students as participants who were between 14 and 16 years old from two secondary schools located in Kathmandu Valley, Nepal. The experimental group consisted of 70 students who included 30 boys and 40 girls while the control group contained 66 students who were made up of 42 boys and 24 girls. Both schools were operating under the curriculum framework of the Curriculum Development Centre (CDC), Nepal, which serves as the official educational system of Nepal. The study required voluntary participation after students and their guardians received informed consent information. The institutional review board of the author's organization

The two schools were selected purposively based on the following criteria: (a) comparable socio-economic composition of student population as assessed by school records and principal interviews; (b) equivalent basic laboratory infrastructure; (c) similar prior science achievement scores based on the Grade VIII final examination results; and (d) no prior history of implementing structured ECA/CCA programs. The intact classes at each school were assigned to conditions, consistent with the quasi-experimental design.

### ➤ Intervention

The experimental group underwent an 8-month ECA/CCA program which included 12 sequenced science-based activities that followed during the complete academic year. The activities were developed according to Self-Determination Theory principles (Ryan & Deci, 2020) which intended to help students achieve their three essential psychological needs of autonomy and competence and relatedness that lead to intrinsic motivation. The researcher and classroom science teacher implemented the program after receiving two days of orientation training before the intervention. The activities were designed to help students develop their skills and confidence while they worked with others, which led to their final presentation at a public science exhibition jointly organized by Madhyapur Municipality and Experimental school of Bhaktapur district.

The control group continued with the standard Grade IX national science curriculum as prescribed by the CDC Nepal, without any structured ECA or CCA components beyond regular classroom instruction.

The structured ECA/CCA Intervention Program is summarized in Table 1.

Table 1 Structured ECA/CCA Intervention Program

Month	Core Intervention Activities	Primary Science Motivation Target
1–2	Science & Environment Club (ECA); Science Gallery Visit and Gallery Preparation (CCA)	Building relatedness; Sparking curiosity (Intrinsic Motivation)
3	Science Field Trip (ECA); Science Seminar (ECA)	Enhancing relevance (Intrinsic/Career Motivation)
4	Science Quiz & Debate (ECA/CCA); Science Gamification (CCA)	Fostering mastery in low-risk settings (Self-Efficacy)
5	Intensive Science Practical Activities (SPA)	Building hands-on procedural confidence (Self-Efficacy)
6	Model Design Competition (CCA); Sci-Tech Talk (ECA)	Applying knowledge creatively (Self-Determination, Career Motivation)
7–8	Science Exhibition Project (ECA); School Science Parade (ECA)	Showcasing mastery; fostering pride and science identity (Self-Efficacy, Career Motivation)

- *Note.* ECA = Extracurricular Activity; CCA = Co-curricular Activity; SPA = Science Practical Activities.

### ➤ Instrument and Data Collection

The Science Motivation Questionnaire II SMQ-II was used to assess science motivation because it is a validated instrument that developed Glynn et al. (2011). The SMQ-II includes 25 items which are divided into five subscales that

each contain five items: (1) Intrinsic Motivation, (2) Self-Efficacy, (3) Self-Determination, (4) Grade Motivation, and (5) Career Motivation. The assessment uses a five-point Likert scale which allows respondents to rate each item from 1 (Never) to 5 (Always). Each subscale can achieve scores which range from 5 to 25 while the total motivation score for the assessment can reach between 25 to 125 points. The SMQ-II was chosen because it demonstrates excellent

psychometric characteristics which include high internal consistency (Cronbach's  $\alpha = 0.89$  to  $0.93$  across subscales) and evidence of construct validity with secondary and post-secondary student populations (Glynn et al., 2011). Permission for its use was obtained directly from the instrument developers prior to administration.

The SMQ-II was administered as a pre-test to both groups prior to the intervention and as a post-test upon the completion of the 8-month program. A bilingual education expert translated the instrument into Nepali and then back-translated it into English to verify its accuracy according to standard cross-cultural adaptation procedures. The research team conducted a pilot test of the Nepali version with 20 Grade IX students from a school not included in the main study. The pilot test produced a Cronbach's  $\alpha$  of  $0.87$  which confirmed the Nepali version's reliability for the Nepalese context.

#### ➤ Data Analysis

Researchers used SPSS version 27.0 to perform all statistical analyses. The researchers calculated descriptive statistics which included means and standard deviations for all five SMQ-II subscales and total motivation scores of each group and gender subgroup. The research team used Levene's test to confirm normality of the data which showed the Levene's test ( $p > 0.05$  for all subgroups) and Levene's test showed that all groups had equal variances. The researchers established that t-test and ANOVA assumptions were fulfilled before conducting their analysis.

Independent samples t-test was used to compare post-test total SMQ-II scores between the experimental and control groups to measure how the intervention affected overall science motivation. The researcher used two-way ANOVA to study how boys and girls performed in their motivation after they were assigned to either the experimental or control groups. The researchers conducted post-hoc independent samples t-tests with Bonferroni correction to determine specific gender differences between groups and within groups after they found significant interaction effects. The researcher calculated Cohen's  $d$  effect sizes for all significant comparisons to determine practical significance by applying conventional benchmarks which define small effect size as  $d = 0.2$  medium effect size as  $d = 0.5$  and large effect size as  $d = 0.8$  according to Cohen, (1988).

### III. RESULT

#### ➤ Pre-Test Equivalence

The independent samples t-tests showed no significant differences between the experimental and control groups across all five SMQ-II subscales before the intervention (all  $p > 0.05$ ). The pre-test total motivation scores showed no significant difference between the two groups (Experimental:  $M = 71.8$ ,  $SD = 8.4$ ; Control:  $M = 72.3$ ,  $SD = 7.9$ ;  $t(134) = 0.36$ ,  $p = 0.72$ ), which confirmed baseline equivalence and further established the internal validity of the following comparisons.

#### ➤ Overall Effect of ECA/CCA on Science Motivation

The results of an independent samples t-test showed that post-test total motivation scores differed significantly between the experimental group who had mean score of  $78.2$  and standard deviation of  $7.5$  and the control group who had mean score of  $74.0$  and standard deviation of  $7.4$ . The effect size measurement showed a medium-to-large effect which demonstrated that ECA/CCA intervention produced substantial improvements in students science motivation. The experimental group's motivational gains were  $4.2$  points higher than control group gains according to the 125-point SMQ-II scale results.

#### ➤ Gender-Based Analysis

The two-way ANOVA analysis which used Group and Gender as its two independent variables demonstrated that Group  $\times$  Gender interaction effect reached statistical significance with  $F(1, 132) = 5.87$  and  $p$  value of  $0.017$  and partial  $\eta^2$  of  $0.04$ . The interaction demonstrates that ECA/CCA program had different motivational effects on male and female students because female students experienced greater benefits from the program than male students did. The Group main effect reached statistical significance with  $F(1, 132) = 17.48$  and  $p$  value of  $0.001$  and partial  $\eta^2$  of  $0.12$ , while Gender main effect did not reach statistical significance with  $F(1, 132) = 1.23$  and  $p$  value of  $0.27$ , thus showing that motivation differences between genders occurred only through their specific group membership which in this case related to intervention participation.

The post-hoc independent samples t-tests which used Bonferroni correction showed that girls from the experimental group outperformed their control group counterparts in motivation scores during the post-test assessment ( $p < 0.001$ , Cohen's  $d = 0.91$ ), which demonstrated a large effect size. The experimental group of boys achieved better results than their control group counterparts ( $p < 0.05$ , Cohen's  $d = 0.48$ ) who showed a medium-sized effect. The experimental group showed that boys reached higher Self-Efficacy and Self-Determination subscale scores whereas girls obtained total motivation scores which exceeded boys due to their major advances in Career Motivation and overall composite score improvement.

#### ➤ Subscale Analysis

Table 2 presents the post-test descriptive statistics for each SMQ-II subscale by group and gender, along with key pairwise comparisons within the experimental group. The experimental group achieved their most significant progress when they compared it to the control group through the Self-Efficacy assessment and the Career Motivation assessment. Grade Motivation demonstrated the smallest between-group difference, which shows that the intervention mainly improved autonomous (intrinsic) motivation along with controlled (extrinsic) motivation. The program design follows the principles established by self-determination theory (SDT), which led to this outcome.

Table 2 Post-Test Motivation Subscale Scores (M and SD) and Key Gender Comparisons

Motivational Subscale	Control Boys M (SD)	Control Girls M (SD)	Exp. Boys M (SD)	Exp. Girls M (SD)	Key Gender Comparison (Within Exp. Group)
Intrinsic Motivation	14.9 (3.3)	14.9 (2.4)	15.1 (2.2)	14.8 (2.2)	No significant difference ( $p > 0.05$ )
Self-Efficacy	13.5 (3.1)	13.3 (2.2)	14.4 (2.5)	12.8 (2.7)	Boys > Girls ( $p < 0.05$ )
Self-Determination	13.6 (2.3)	13.7 (2.2)	14.2 (2.0)	13.2 (2.4)	Boys > Girls ( $p < 0.05$ )
Career Motivation	15.2 (3.6)	16.4 (2.2)	16.2 (3.5)	15.4 (2.9)	Girls $\approx$ Boys; both significantly above control ( $p < 0.05$ )
Grade Motivation	15.8 (2.8)	16.2 (2.3)	16.5 (2.5)	15.6 (2.6)	No significant difference ( $p > 0.05$ )
<b>Total Motivation</b>	73.1 (8.1)	75.2 (6.5)	79.4 (7.8)	76.8 (7.2)	Significant Group $\times$ Gender Interaction ( $F(1,132) = 5.87, p = 0.015$ ); Girls in Exp. > Girls in Control ( $d = 0.91$ )

• *Note.* M = Mean; SD = Standard Deviation; Exp. = Experimental. Post-hoc comparisons used Bonferroni correction.

#### IV. DISCUSSION

The study results establish strong evidence that the structured ECA/CCA program, which lasts from eight months, boosts secondary students' science learning motivation. The study results demonstrate a medium-to-large effect size with Cohen's  $d$  value of 0.72 which shows practical significance and positions the study results to compete effectively against international research results which report similar interventions (Lauer et al., 2006; Gottfried & Williams, 2013). The results show theoretical consistency because the SDT-based program design created conditions that directly addressed students' needs for autonomy (through student-directed project work), competence (through progressively scaffolded mastery experiences), and relatedness (through collaborative team activities), which are the very mechanisms Ryan and Deci (2020) identify as the foundations of intrinsic motivation., as focused by the Self-Determination Theory SDT (Ryan and Deci, 2019). One of the research explored that student participation in Extracurricular activities leads to higher levels of engagement which supports the established belief that learning occurs outside of classroom settings. Students who participate in various co-curricular activities such as clubs sports community service cultural programs debates and other initiatives will develop leadership skills and teamwork abilities and communication skills and critical thinking abilities which will help them to achieve academic success. Students who engage in these activities will develop stronger connections to their school which results in increased motivation and decreased absenteeism and improved academic results (Shrestha and Pradhan, 2025).

The subscale improvement pattern shows how the intervention produced changes in motivation. Self-Efficacy and Career Motivation achieved the highest improvements, while Grade Motivation experienced the smallest enhancement. The difference between the two patterns carries theoretical importance because ECA/CCA program

successfully developed autonomous self-directed motivation through genuine interest and perceived competence rather than increasing grade-dependent motivation. The educational system needs this distinction since autonomous motivation predicts better deep learning and science persistence than other forms of motivation according to Glynn et al. (2011) and Ryan and Deci (2020). The hands-on Science Practical Activities in Month 5 and the Science Exhibition Project in Months 7–8 established actual public mastery experiences that follow Bandura's (1997) definition of enactive mastery as the main source for self-efficacy constructions.

The study's primary and most intricate outcome arises from its findings which show different effects according to gender. The ECA/CCA intervention produced different motivational results for male and female students according to the Group  $\times$  Gender interaction effect which reached statistical significance. This finding establishes its importance because Nepal and South Asian countries continue to experience gender-related disparities which prevent women from joining scientific fields according to (Shrestha, 2015; ERO, 2020; UNICEF Nepal, 2018). Students whose hands-on experience used technology-enhanced simulations showed less nervousness during actual lab tasks because they used augmented or virtual labs as their preparatory tools. The study results lead to this specific recommendation which requires both educators and curriculum experts to execute strategies that will benefit girls' learning participation. All the activities which girls did in school activities especially through ECA and CCA contributed to their positive learning motivation. (Sharma, 2025)

The differential benefits which girls receive can be explained through different educational theories which work together with each other. The research by Wang and Degol (2017) shows that traditional Nepalese classroom settings disadvantages girls because lecture-based teaching methods limit their chances to participate actively and show their understanding of science as a social practice. The ECA/CCA program which uses collaborative project-based learning created an educational environment that treated all students equally by allowing girls to prove their scientific skills which

served as essential requirement for developing their science self-efficacy (Britner & Pajares, 2006). The Science Field Trip and Sci-Tech Talk with various role models and Science Exhibition activities established direct links between scientific knowledge and real-world social problems which studies show motivates girls who view social usefulness and community values as crucial elements in their career choices (Wang & Degol, 2017; Hyde, 2014). The experiences from these activities helped to increase Career Motivation among female students at a strong level. The activities which required teamwork and social interaction created an environment full of connections which helped girls sustain their motivation according to previous research findings about how different genders react to social need fulfillment (Ryan & Deci, 2020).

Boys in the experimental group achieved slightly better results on both subscales Self-Efficacy and Self-Determination assessments. Competitive activities, including the Science Quiz and Model Design Competition, might have created an advantage for males who already exhibited better confidence in competitive situations (Britner & Pajares, 2006). The upcoming program revisions should use mentoring programs together with cooperative learning activities to enhance female students' self-efficacy in competitive environments. The result pattern shows that girls did not achieve better results than boys because girls showed better results in career and total motivation but boys outperformed girls in specific subscales. Researchers studying motivation need to use subscale-level analysis because it reveals essential details that lead to a better understanding of motivational patterns.

The research results establish a connection with existing South Asian studies while introducing new findings. Students found technology-enhanced simulations such as augmented or virtual labs to be difficult because they used these tools to prepare for their hands-on experience. The study establishes which recommendation should be followed to improve girls' learning engagement through school-based implementation of the strategies which educators and curriculum experts will support. The girls showed positive motivation toward their learning through various activities which included both ECA and CCA. (Sharma, 2025) The Study found that Nepalese secondary students who took part in experiential learning activities developed a greater interest in science, although the researchers failed to use a validated motivation questionnaire and did not analyze data by gender. (Aryal, 2019) and Sharma (2015) showed that girls in Indian secondary schools gain motivational advantages from participating in practical science activities, but the study did not have a control group. The study uses a quasi-experimental design to validate its findings through gender-intersectional analysis and evidence collection which establishes a stronger evidence base for the region.

## V. CONCLUSION

The research demonstrates that structured Extracurricular Activities (ECA) together with Co-curricular Activities (CCA) constitute as an effective pedagogical

strategies that shows practical value for increasing secondary school students' science learning motivation in the educational system of Nepal. The 8-month SDT-aligned intervention which included 12 activities produced a medium-to-large effect on science motivation while it specifically enabled equal motivational development through larger gains for female students. The educational benefit of the intervention emerges as its capacity to develop autonomous motivational forms through Self-Efficacy and Career Motivation which lead to deep engagement and STEM field persistence.

The research results provide immediate practical benefits to Nepalese educational environments which are experiencing decreased science motivation and ongoing gender disparities in STEM fields and require immediate adoption of new pedagogical innovation. The study shows that science programs which provide meaningful experiences and fulfill students' basic psychological needs can improve motivation in secondary classrooms especially for girls who have not benefited from traditional teaching methods.

## VI. IMPLICATIONS AND RECOMMENDATIONS

**For School Administrators:** The school science program must establish structured ECA and CCA programs as essential resources which require full implementation. Sustainable implementation requires dedicated timetable slots and budget allocation for materials and continuous science teacher professional development. The study recommends schools to implement its 12-activity sequential model as a standardized model for their educational programs.

**For Science Teachers:** The ECA/CCA programs need to be developed through dedicated efforts to create educational programs which support all students and provide them with freedom. Teachers need to create learning activities which enable students to work together through practical experiences while showing different scientific career paths. The development of activities which help girls develop their confidence to compete in competitive environments needs to receive special focus through team-based contests and peer mentoring relationships and public acknowledgment of female scientific accomplishments.

### ➤ *For Policymakers:*

The Ministry of Education together with the Curriculum Development Centre of Nepal should establish a national framework system which provides schools with essential resources and benefits to develop their science ECA/CCA programs. Schools should include ECA and CCA programs in their assessment standards while education campuses should require teacher training programs to teach students how to create and implement experiential science learning experiences.

## VII. LIMITATIONS AND FUTURE RESEARCH

The study has several specific restrictions which need to be recognized. The research results which were obtained from the Kathmandu Valley, Nepal study with 136 participating students limit their application to other locations because the study used a particular cultural and geographical setting. The study used a quasi-experimental design because it was the best solution for its existing practical limitations, yet this method of research design prevents researchers from making reliable causal relationships between variables, which they could establish through a controlled study using random assignment. The study period fails to provide sufficient time for researchers to evaluate whether motivational improvements have permanent effects.

Researchers should attempt to replicate their study across different locations in Nepal and comparable regions of South Asia to evaluate whether their results apply to multiple geographical and socio-economic environments. Studies with larger samples and, where feasible, randomized designs would strengthen causal inference. The academic field would greatly benefit from research on ECA and CCA participation, which examines how motivational growth leads to students' academic decisions and their selection of subjects for higher secondary education and STEM careers. Mixed-methods studies that combine student interviews with classroom observation will produce deeper explanations of how the intervention created its outcomes.

Importantly, the study concluded that extracurricular activities exert broadly positive influences on students' lives, contributing to improved academic performance, behavioural development, school completion rates, and the cultivation of social competencies essential for adult success. On the basis of these findings, Annu and Sunita (2014) recommended that all secondary education systems—particularly those currently lacking structured extracurricular programs—should actively integrate such activities into school life, as they meaningfully expand students' learning experiences and foster a positive school environment

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