Role of Behavioral Factors in Shaping Academic Procrastination and Mathematics Achievement

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Abstract

Academic procrastination in mathematics is a common phenomenon among students, characterized by a persistent tendency to postpone important educational tasks that are assigned to them. This intentional delay of academic responsibilities obstructs their capacity to understanding fundamental mathematical concepts and contributes to increased stress, reduced self-efficacy, and ultimately, a decline in overall academic performance. This study investigates the role of students' behavior-related factors such as sincerity and personal initiative in shaping academic performance. A cross-sectional survey research design was used among 474 secondary school students. The multi-stage cluster sampling technique was employed to select the sample. The data were analyzed by using one-sample t-tests, ANOVA, and linear regressions. The finding reveals that the reason for sincerity and personal initiative related to procrastination was significantly high. Additionally, the regression analysis shows that the students' study hours at home, sincerity, ethnicity, and parents' education are significant predictors of mathematics achievement scores since the role of sincerity has a negative effect on achievement scores, as the concerned stakeholders should collaborate synergistically to address the learners' sincerity for promoting mathematics learning.

Keywords: Academic procrastination, mathematics achievement, sincerity, personal initiatives, secondary school

Introduction

Academic procrastination is a common and widespread issue among students at various educational levels (Warniasih et al., 2024). Simply, this issue is known as students' intentional delay in essential academic tasks (Ajayi, 2020). It is related to students' behavior and can obstruct their academic performance (Adam & Hasbullah, 2019; Sæle et al., 2017). Mathematics is a science of patterns and relationships that relies both logic and creativity, therefore it requires students' consistent effort, dedication and regular practice to success in this subject (Avvisati & Borgonovi, 2020). Previous studies have identified multiple factors contributing to academic procrastination, including psychological, environmental, and behavioral elements. Among these, behavioral factors such as sincerity and personal initiative also play a crucial role in shaping students' academic habits and performance outcomes.

Sincerity is a measure of commitment that integrates students' honesty and efforts in learning (Trilling, 2009). High level of sincerity increases the students' dedication in the mathematics study as a result they can able to manage their time ultimately reduce the procrastinate behavior (Wirajaya, 2020). Sincerity in mathematics learning can reflect through the changing behavior of students' in daily life such as doing assignment and project work regularly and on time, seeking academic support, participation in extra-curricular learning activities, minimizing involvement in non-academic task and developing confidence in ones' abilities. However, a lack of sincerity may increase the procrastinating behavior such as avoiding educational task, postponing the homework and regularly failing to manage study plans. Similarly, Personal initiative is a careful practices of students use to attain their educational objectives. It includes several factors such as self-motivation, self-regulation, and willingness and accepts responsibility for

one's learning. Students who show great personal initiative are more likely to take early action in their studies, seek help when necessary, and practice consistently (Fese et al., 1997).

Various psychological, cognitive, and environmental factors often influence the tendency to postpone academic tasks (Svartdal et al., 2020). Success in mathematics depends largely on core ideas and past knowledge, thus regular practice and prompt participation are crucial. However, due to its difficult nature students procrastinate frequently on this subject. procrastination can lead to incomplete assignments (Fentaw et al., 2022) and poor exam preparation (Hayat et al., 2020). Research by Fentaw et al. (2022) indicates that nearly 80 percent of students are procrastinators to varying degrees, of which half always procrastinate due to poor time management skills, lack of planning for academic activities, laziness, and stress. Findings by Setiyowati et al. (2020) showed that mathematics (44%) had the highest rate of procrastination than Physics (31%), and other subjects (28%). Their study further shows that more students postpone on their homework and their mathematics achievement is low. Students that frequently postpone cannot accomplish learning outcomes (Adam & Hasbullah, 2019).They may be demotivated to complete specific duties. Furthermore, procrastination impacts students' quality of life through health, mental, and psychological problems (Hayat et al., 2020). Delays in studying cause knowledge gaps to grow and making the subject more difficult for students to learn (Fulano et al., 2021). Falling behind in math makes it increasingly difficult for students to catch up and ultimately lower achievement (Asri et al., 2017). Xue et al. (2023) indicated significant correlations among students' mathematical attitudes, academic procrastination, mathematical metacognition, and mathematical achievement, suggesting their interconnected influence on students' academic performance in mathematics. In addition, scholars have extensively explored the causes and consequences of academic procrastination. Several Researchers (e.g. Asri et al., 2017; Cerezo et al., 2017; Deniz et al., 2009; Feyzi Behnagh & Ferrari, 2022; Haghbin et al., 2012; Haycock et al., 1998; Nayak, 2019; Ocak & Boyraz, 2016; Patrzek et al., 2012; Pychyl et al., 2002; Simon et al., 2020; Tus, 2020; Wang et al., 2017; Zacks & Hen, 2018; Zarrin et al., 2020) have identified internal factors as key contributors to academic procrastination. Additionally, other studies (Patrzek et al., 2012; Pychyl et al., 2002; Zakeri et al., 2013) have highlighted external psychosocial factors as influential in the development of academic procrastination. Hence, the study of procrastination is crucial as it lights a widespread behavioral issue influencing productivity and mental health globally.

Many variables contribute to this behavior, including lack of interest, task complexity, time management, task aversiveness and insufficient understanding (Asri et al., 2017; Chapai & Joshi, 2025; Warniasih et al., 2024). In the context of Nepal, there is a lack of empirical studies about the perceived causes of academic procrastination as well as their relationship with mathematics achievement, particularly its specific dimensions such as sincerity and personal initiative. While, socio-demographic variables such as ethnicity, parental education, and study hours have been explored in Nepal in broader academic contexts (Adhikari et al., 2022; Chapagain, 2021; Khanal et al., 2020), their direct effects on sincerity and personal initiative in relation to academic procrastination in mathematics remain under-researched. Hence, this research aims to examine the role of sincerity and personal initiatives as the behavioral predictors of academic procrastination and their role for shaping mathematics achievement. To fulfill the objectives the following research questions were devised.

i. What is the level of sincerity and personal initiatives related causes in academic procrastination?

ii. What is the role of ethnicity, study hour and parents' education for shaping sincerity and personal initiatives?

iii. What is the role of sincerity and personal initiatives related cause of academic procrastination for shaping mathematics achievement?

Literature Review

Academic procrastination, a habitual deferral of academic tasks, is prevalent among students and is linked to negative effects on both academic performance and emotional well-being. This literature review investigates the contributing factors of academic procrastination and its consequences in mathematics achievement among secondary school students, synthesizing insights from the existing studies.

Factors Contributing to Academic Procrastination

Several studies have identified diverse factors contributing to academic procrastination. Various researchers categorized diverse factor as internal and external factors. Internal factors include personality traits such as negative self-image, avoidance, and perfectionism (Patrzek et al., 2012; Pychyl et al., 2002; Wang et al., 2017); competence-related elements such as insufficient knowledge, regulation of low self-esteem, study attitude and poor study skills, perceptions of task importance, task difficulty, perfectionism, poor learning management, lack of self-regulation, stress, fatigue (Asri et al., 2017; Tus, 2020; Zacks & Hen, 2018) and affective factors like anxiety, frustration, boredom, fear, shame, guilt, regret, revenge and anger (Deniz et al., 2009; Feyzi Behnagh & Ferrari, 2022; Haghbin et al., 2012; Haycock et al., 1998). Cognitive aspects, such as fear, lack of internal motivation, self-efficacy and failure of self-regulation also play a critical role (Hussin & Matore, 2023; Zarrin et al., 2020), along with a history of negative learning experiences (Cerezo et al., 2017), physical and mental health issues, and perceptions of academic tasks as adversarial, difficult, or highly important (Simon et al., 2020). Additionally, inadequate time management skills (Chapai & Joshi, 2025; Nayak, 2019; Ocak & Boyraz, 2016), poor prioritization, and the choice of ineffective coping strategies (Asikhia, 2010) further contribute to

procrastination. In addition to these internal factors, external factors also play a significant role. These include school-related variables such as indiscipline among teachers, and unconducive school culture (Asri et al., 2017), educational quality, teacher–student interaction, peer interactions, and the broader learning environment (Patrzek et al., 2012), as well as familial influences, including parenting styles (Pychyl et al., 2002; Zakeri et al., 2013).

Additionally, Mohebi et al.(2018) identified lack of interest, poor time management, fatigue, low self-confidence, lack of sufficient knowledge as a student related factor, traditional and boring teaching methods, unfair evaluation, lack of the role model educators as educator- related factors. Similarly, unable to present proper reference for assignments, ambiguous and boring assignments, repetitious assignments, useless tasks in daily life, disharmony between tasks and course goals as an assignment related factors, non-scheduled courses, numerous exams and tasks at the end of the semester, numerous theoretical and clinical courses in a semester, lack of library facilities as an institution related factors. Together, these internal and external elements shape the tendency for academic procrastination and its broader impact on student performance.

Behavioral Factors and Mathematics Achievement

A person's personality, circumstances, and response to the surroundings influence their behavior. Behavioral aspects greatly influence the students' learning activities that directly affect their performance. Students' attitude about mathematics, their motive, sincerity, confidence, self-discipline, learning habits and individual initiatives plays crucial role on their involvement to learn mathematical concepts and problem- solving skills. All individual carried both positive and negative behavior by born, and of course, positive behaviors, such as effective time management, positive thinking can lead to better performance, while negative behavior such as procrastination, lack of self – regulation, lack of discipline can hinder the success. . This section explores various behavioral factors that influence students' success in mathematics.

Self-regulated and self-efficacy both plays vital role in learning mathematics and . both were positively explained by prior knowledge in mathematics (Fulano et al., 2021). Additionally,the study conducted by Fulano et al. (2021) shows self-efficacy and self-regulate learning are positively related in mathematics however, both were negatively related to mathematics procrastination. The study conducted by Chapai et al. (2024) shows a high level of academic procrastination have a significant negative effect on mathematics achievement. In another context, Saman (2024) found significant correlations between academic achievement and procrastination tendencies. Further, this study indicates students having higher levels of psychological capital, including hope, resilience, optimism, and self-efficacy, were correlate with higher academic success and lower levels of procrastination.

Similarly,study conducted byXue et al. (2023) showed that interrelationships among students' mathematical attitudes, academic procrastination, mathematical metacognition, and mathematical achievement. Further, this study shows significant correlations among mentioned variables.

Similarly, Bashir and Gupta (2019) reported sincerity, and personal initiatives were negatively correlated with students' academic performance among university students. A Systematic Review conducted by Hussin and Matore (2023) entitled factors affecting academic procrastination in mathematics among students showed that self-efficacy, students' motivation and interest were the two most dominant factors influencing academic procrastination in mathematics. Asri et al. (2017) identified multiple causes of procrastination, including perceptions of task importance, task difficulty, insufficient knowledge, perfectionism, poor learning management, lack of self-regulation, stress, fatigue, inadequate social support, teacher indiscipline, and an unconducive school culture, all of which collectively contribute to low learning achievement. Chapai and Joshi (2025) found time management and task aversiveness are significant contributors to procrastination on their study. Further, their study showed that study hour, aversiveness of task, ethnicity, father education and mother education are major significant factors to determine mathematics achievement score in the context of Nepal. Bigno et al. (2024) examined the relationship between mathematical attitudes and academic procrastination among college students using descriptive, correlational, and causal-comparative methods, revealing that students exhibited a moderate level of academic procrastination concerning sincerity and personal initiative. Researcher (Bakhshayesh et al., 2016; Gareau et al., 2019; Njuguna & Ireri, 2022) also found a significant negative relation between academic procrastination and math performance. However, the influence of Sincerity and personal initiative related reason of procrastination on mathematics achievement, especially in specific contexts such as Nepal, remains underexplored hence; it is the need for investigation.

Methods

This study adopted a cross-sectional survey research methodology within a quantitative research framework. The target population comprised 8,080 students enrolled in public secondary schools in the Bardiya district. By using solvin's formula (Costa et al., 2022), 480 students was taken as a sample for this study. Multi-stage cluster sampling technique was used to ensure sampling representativeness that was shown in fig.1. The population framework, sample size, and sampling procedure were consistent with the author's previous studies (Chapai & Joshi, 2025; Sharma Chapai et al., 2024) to maintain methodological rigor and comparability.
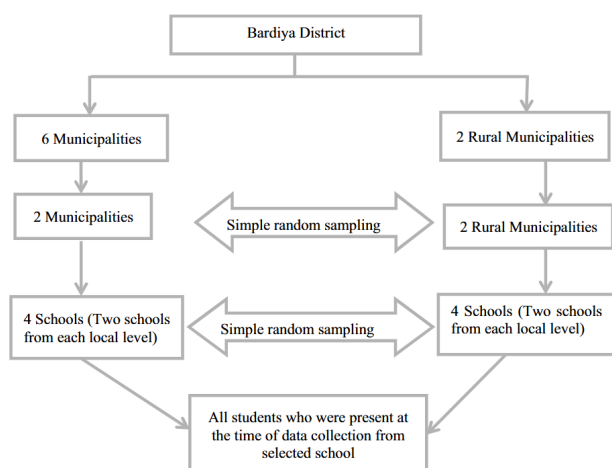
Figure 1: *Sampling frame*

Source: Sharma Chapai et al., 2024

During data cleaning, six cases were excluded due to missing data and outliers then final sample size was 474. Informed consent was obtained from all participants; their identities were kept confidential using coded identifiers and a secure, password-protected database.

Variables Information

The sample included a nearly balanced distribution of boys (50.2%) and girls (49.8%). In terms of ethnic composition, Janajati (40.7%) and Brahmin/Chhetri (40.1%) were represented in similar proportions, whereas Madhesi (13.3%) and Dalit (5.9%) were notably underrepresented.

Sincerity (SSP)

Sincerity concerns to the students' sincere engagement and commitment to their academic work. This domain contains items like didn't feel to prepared homework (SSP1), worried when their classmates would dislike them if they did well (SSP2), lacked confidence in their ability to do well (SSP3), lacked the energy to start the home assignment (SSP4), feel bitter if people set deadlines (SSP5), always worried to fulfill academic expectations (SSP6), friends' expectation to support from themselves, if who got good marks in the test (SSP7), friends enforce for non-academic activities (SSP8).

Personal Initiatives (PIP)

Personal initiatives denote to the positive behaviors and attitudes of students towards their academic responsibilities. This contains hesitation to ask teachers for help (PIP1), found challenges to ask home assignment others for information (PIP2), imagining the pleasure of last-minute completion (PIP3), waiting for additional information from teachers (PIP4), expect high standards academic activities in the classroom (PIP5), feel too lazy to write a given assignment in the classroom (PIP6).

Description of Instrument

To examine the key variables of the study, a structured research instrument was developed based on relevant literature and the objectives of the study. This study used

a survey questionnaire named Procrastination Assessment Scale-Students (PASS) and a self-developed Mathematics Achievement Test that is described below.

Procrastination Assessment Scale-Students (PASS)

The data were collected using a standardized academic procrastination scale named PASS. The PASS consisted of three sections: one having demographic details, second section measured area of academic procrastination and the other accessed reason for procrastination, including time management, task aversiveness, sincerity, and personal initiatives. In earlier publications, the researcher examined time management and task aversiveness related causes of academic procrastination using this data set (Chapai & Joshi, 2025). The present study, however, focuses specifically on sincerity and personal initiatives, which have not been previously explored. Thus, although the dataset remains the same, each article addresses distinct variables and research objectives, ensuring originality and avoiding data duplication. In this article this instruments consists only 14 items. The items, initially developed by Solomon and Rothblum (1984), and measured on a five-point Likert scale, ranging from "never" to "always" procrastinate. As the original PASS was designed for general subjects, however, to measure the objective of this study its items were modified to assess academic procrastination specifically in mathematics learning. The instrument underwent thorough reliability and validity assessments, including expert evaluation and a pilot study, achieving a Cronbach's Alpha of 0.83, indicating strong internal consistency (Cohen et al., 2017; Creswell, 2014).

Mathematics Achievement Test

Self-designed Mathematics achievement test was used in the study that consist 50 multiple-choice questions. All questions were based on ninth-grade mathematics curriculum and it covers seven domains of mathematics such as set, mensuration, arithmetic, algebra, trigonometry, geometry, probability and statistics. Questions were developed under the cognitive level of Bloom's revised taxonomy (Airasian & Miranda, 2002; Krathwohl, 2002). Content validity was ensured by experts and it was reviewed the test following the guidelines of Yaghmalef (2003) and Lawshe (1975). The test demonstrated high reliability, with a KR-20 reliability coefficient of 0.91 (Mohajan, 2017).

Data Analysis

This study used both descriptive and inferential statistics. Mean and standard deviation were used to provide an overview of academic procrastination and mathematics achievement level as in descriptive statistics. Similarly, one-sample t-test (population mean=3) used to evaluate reasons for procrastination (Joshi et al., 2022), Independent t-tests and ANOVA were applied to examine the mean differences based on demographics such as ethnicity, study hours, and parental education and multiple linear regression was applied to find the effects of academic procrastination on mathematical achievement as in inferential statistics. Data

analysis was performed by using SPSS and JASP. These softwares are also used to ensure all statistical assumptions, including addressing outliers, missing data, normality, linearity, multicollinearity, and homogeneity of variance (Kao & Green, 2008)surgeons require an understanding of basic statistics. Despite the increasing complexity of reported statistical analyses in surgical journals and the decreasing use of inappropriate statistical methods, errors such as in the comparison of multiple groups still persist. This review introduces the statistical issues relating to multiple comparisons, describes the theoretical basis behind analysis of variance (ANOVA. Additionally, Flexplot was applied for visual representation of the effect of procrastination and sample characteristics on mathematics achievement.

Results

The results of this study are presented systematically to in connection with the research objectives. This section first reports the status of students' reason for academic procrastination that directly answers the first research question presented in the previous section. Other results are also organized according to the subsequent research questions. The findings are explained using appropriate statistical measures and are presented in detail in the following subsections.

Status of Reasons for Procrastination Related to Sincerity and Personal Initiatives

Table 1 provides awareness into the reasons for procrastination related to sincerity, with a focus on the students' feelings and perceptions regarding their academic work. The overall (Mean=3.13, SD=0.54) and the significant t-value (5.38) and p-value (0.00) suggest that sincerity-related reasons are significant of procrastination.

An item-wise analysis reveals that statements SSP8 (Mean=3.55, SD=1.33) and SSP7 (Mean=3.53, SD=1.10) have the highest mean scores, suggesting that peer influence, including engagement in non-academic activities and expectations from high-achieving peers, was a key factor contributing to procrastination. In contrast, statement SSP3, which has the lowest mean score (Mean=2.82, SD=1.31) indicates a relative disagreement among students. However, the significant negative t-value (t = -2.91) and p-value (p = 0.00) suggests that a lack of confidence in their academic abilities was significantly associated with reduced procrastination in this context.

Table 1: *Status of Reasons for Procrastination Related to Sincerity and Personal Initiatives (n=474)*

Statement	Mean	SD	t-value	p-value
Sincerity	3.13	.54	5.38	.00
I didn't feel to prepare my homework (SSP1)	3.30	1.36	4.76	.00
I am worried when my classmates would dislike me if I did well (SSP2)	2.93	1.40	-1.11	.27
I lacked confidence in my ability to do well (SSP3)	2.82	1.31	-2.91	.00
I lacked the energy to start the home assignment (SSP4)	2.85	1.19	-2.78	.01
I feel bitter about people when they set deadlines (SSP5)	3.09	1.31	1.54	.12
I always worried to fulfill my academic expectations (SSP6)	3.00	1.28	-.07	.94
My friend expects to support from myself, if I got good marks in the test (SSP7)	3.53	1.10	10.46	.00
My friends enforce me to do non-academic activities (SSP8)	3.55	1.33	9.07	.00
Personal initiative	3.27	.63	9.52	.00
I feel hesitation to ask my problems with the teacher (PIP1)	2.74	1.31	-4.23	.00
I found challenges to ask home assignment others for information (PIP2)	2.94	1.19	-1.12	.26
I imagined the pleasure of completing assignment at the last time (PIP3)	3.40	1.33	6.59	.00
I waited to listen carefully for the teacher if any more information on the given project work (PIP4)	3.64	1.09	12.82	.00
I expect high standards academic activities in the classroom (PIP5)	3.29	1.21	5.17	.00
I feel too lazy to write a given assignment in the classroom (PIP6)	3.63	1.28	10.67	.00
Achievement Score in Achievement Test	25.59	4.59	38.37	.00

Table 1 further shows that the overall (Mean=3.27, SD=0.63) for personal initiative reasons was above the midpoint and show that personal initiative-related reasons were significant contributors to procrastination expect PIP2. In item wise analysis PIP4 (Mean=3.64, SD=1.09) and PIP6 (Mean=3.63, SD=1.28) had approximately an equal and highest mean with significant p-value (0.00) suggesting that waiting for more information from the teacher and feeling lazy contributed to more procrastination than other. PIP1 was significant having the lowest mean value (Mean=2.74, SD=1.31) with negative t-value suggesting hesitation to ask the teacher about the could reduce procrastination. Table 1 also shows that Mathematics achievement test (Mean=25.59, SD= 4.59) which was significantly higher than the national average of mathematics achievement score 35% at the secondary level (ERO, 2022).

Table 2 shows the result of the causes (sincerity and personal initiatives) of procrastination based on the sample characteristics. On the basis of the students' study hours, sincerity related cause was found highest in those students who studied only 2-4 hours (Mean=3.20, SD=0.56) higher Furthermore, it showed that the study hour was a significant cause for sincerity to produce procrastination. Similarly, considering ethnicity, the sincerity-related cause was found highest in the Madheshi ethnical group (Mean=3.16, SD=0.48) as compared to the Dalit, Janajati and Brahmin/Chhetri groups. On the basis of the parents' education, sincerity related cause was found highest in those students whose fathers and mothers were illiterate (Mean=3.15, SD=0.56).

Similarly, on the basis of ethnicity, the personal initiatives related cause was found highest in the Brahmin/Chhetri (Mean=3.31, SD=0.64) ethnical group as compared to the Dalit, Janajati, Madheshi students. On the basis of the students' study hours, the personal initiatives related cause was found higher, with the study hour remaining between two to four hours (Mean=3.28, SD=0.64) at home, than another group. Similarly, on the basis of parents' education, the personal initiatives related cause was found highest in the students whose father's and mother's education was confined to the school level (Mean=3.30, SD=0.61). Furthermore, a one-way ANOVA result shows that the students' ethnicity, study hour, father's education, and mother's education were all insignificant to the personal initiatives related cause.

Table 2: *Results of Causes of Procrastination (Sincerity and Personal Initiatives) Based on the Sample Characteristics (n= 474)*

Variables with categories	Percentage	Sincerity			Personal Initiatives		
		Mean	SD	P-value	Mean	SD	P-value
Ethnicity							
Janajati	40.7	3.15	0.55	0.79	3.26	0.64	0.78
Dalit	5.9	3.06	0.51		3.27	0.52	
Madhesi	13.3	3.16	0.48		3.22	0.66	
Brahmin/Chhetri	40.1	2.11	0.55		3.31	0.62	
Study hour							
<2 hrs	41.8	3.06	0.52	0.03	3.26	0.61	0.95
2-4 hrs	49.8	3.20	0.56		3.28	0.64	
≥ 4 hrs	8.4	3.11	0.51		3.27	0.65	
Father education							
Illiterate	23	3.11	0.50	0.64	3.23	0.68	0.42
School education	61.6	3.15	0.55		3.30	0.61	
University education	15.4	3.09	0.59		3.21	0.58	
Mother Education							
Illiterate	31.9	3.15	0.56	0.21	3.27	0.65	0.37
School education	55.9	3.15	0.53		3.30	0.61	
University education	12.2	3.01	0.53		3.17	0.60	

Table 3 shows the effect of the causes of procrastination in mathematics achievement. Moreover, the sample characteristics were used as mediating variables. The regression model was 13.1% variance with significant ANOVA $F_{(6,473)}=12.88$ whereas the adjusted R square value was 0.142, indicating that the model was a modest fit (Cohen et al., 2007). In the analysis, sincerity, ethnicity, study hour, father's education, and mother's education were significant predictors of mathematics achievement. Moreover, the absolute beta value was found to be significantly high in the study hour (Beta= 0.20) as compared to the remaining variables as fathers' education (Beta=0.17), ethnicity (Beta=0.14), mother's education (Beta=0.09) and sincerity (Beta= 0.09). Hence, study hour was the main predictor of mathematics achievement. The beta value was positive in the study hour, indicating that this variable's increment helps increase mathematics achievement.

Table 3: *Effect of the Causes of Procrastination on Mathematics Achievement*

Model	B	Std. Error	Beta	t-value	p-value
(Constant)	21.70	1.61		13.48	0.00
Ethnicity	.48	.14	.14	3.31	.00
Study hour	1.47	.32	.20	4.65	.00
Father's education	1.25	.35	.17	3.52	.00
Mother's education	.67	.35	.09	1.94	.05
Sincerity	-.72	.38	-.09	-1.91	.06
Personal initiative	-.35	.33	-.05	-1.07	.29

Figure 1 presents a faceted scatter plot showing the relationship between sincerity and achievement, moderated by ethnicity and study hours, with personal initiatives

represented by different colors and line styles. Each panel corresponds to a specific ethnicity (Janajati, Dalit, Madhesi, and Brahmin/Chhetri) and study hour category (<2 hrs, 2-4 hrs, and ≥4 hrs). The trend lines indicate different personality score groups, illustrating how sincerity correlates with the achievement. The patterns suggest varying relationships across the ethnicities and study hour groups, with some subgroups showing positive correlations while the others exhibiting negative or negligible trends. These variations highlight the complex interactions between sincerity, personality, study habits, and academic achievements.

Figure 2: *Effect of personal initiatives and sincerity in mathematics achievement with references to the categories of study hours and ethnicity.*

Figure 2 illustrates the relationship between sincerity and achievement, moderated by the parental education levels (father's and mother's education) and personal initiatives (PersonalIn). Each panel represents different levels of father's education (FEducation: Illiterate, School education, University education) and mother's education (MEducation: Illiterate, School education, University education). The different colors and line styles indicate the varying personality score groups. The trends suggest that the relationship between sincerity and achievement varies across different parental education levels. Some groups exhibited positive correlations, particularly when parental education was lower, while the others showed negative or weak correlations, especially among those students whose parents had higher education. These variations highlight the complex interplay between personality, parental education, and academic achievement.
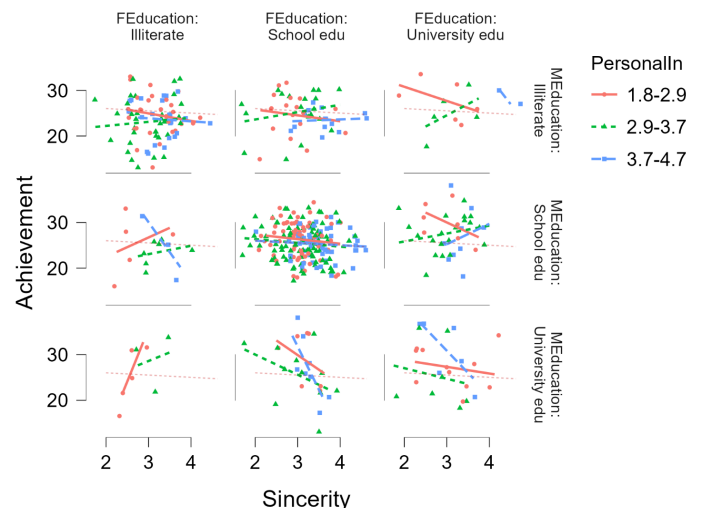

Figure 3: *Effects of personal initiatives and sincerity in mathematics achievement with references to the categories of parents' education level*
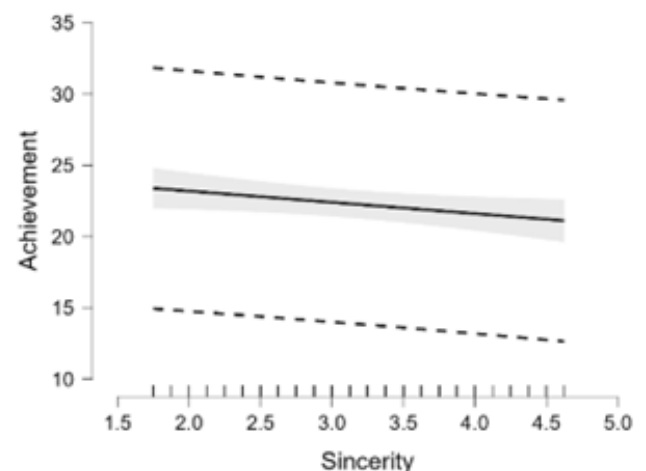

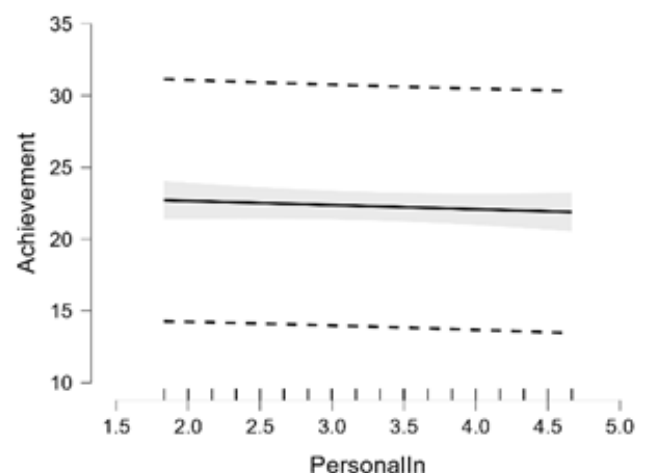**Figure 4:** *Marginal effect of Sincerity on Achievement*

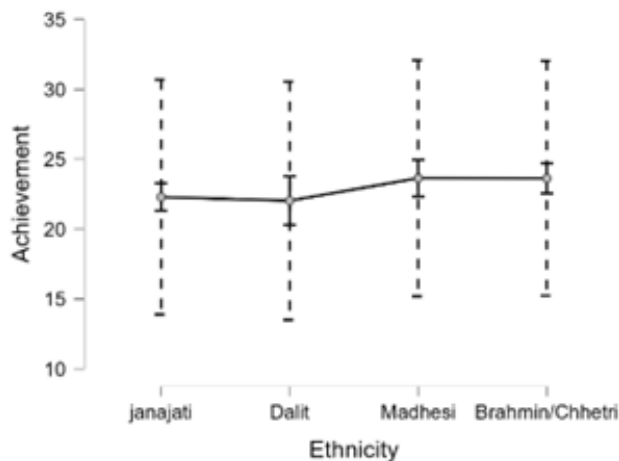**Figure 5:** *Marginal effect of Personal initiatives on Achievement*
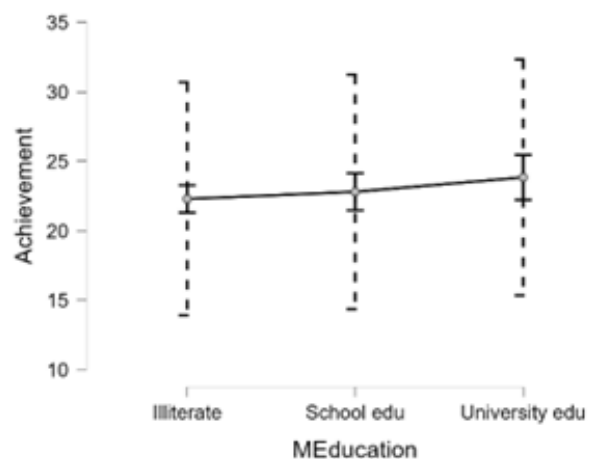
Figure 6: *Marginal effect of Ethnicity on Achievement*

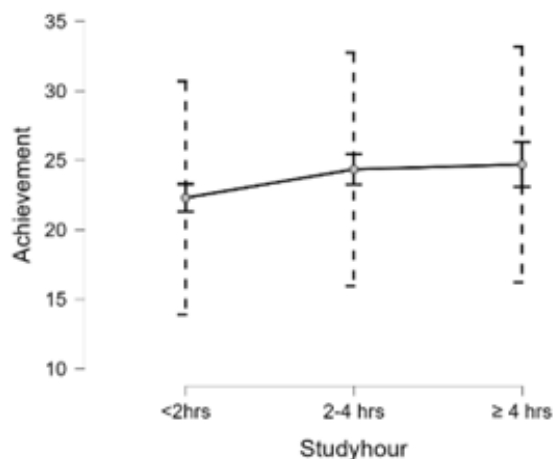**Figure 7:** *Marginal effect of study hour on Achievement*

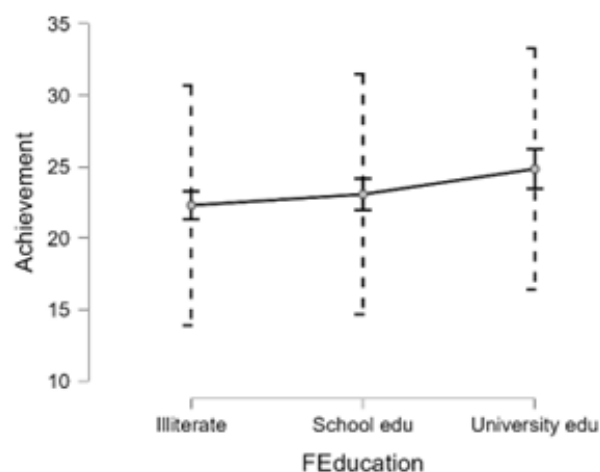**Figure 8:** *Marginal effect of fathers' education on Achievement*

Figure 9: *Marginal effect of mothers' education on Achievement*

Discussion

The present study aimed to examine the role of sincerity and personal initiatives as the behavioral predictors of academic procrastination and their role in shaping mathematics achievement. The findings indicate that both sincerity and personal initiatives significantly contribute to students' procrastination tendencies. This finding aligns with previous research (Asri et al., 2017; Bigno et al., 2024; Tus, 2020; Zacks & Hen, 2018) identifying internal behavioral factors such as poor learning management, lack of self-regulation, task aversiveness and perfectionism as major contributors to procrastination.

Regarding sincerity, the study shows that lack of preparedness for homework, lacked confidence in the students' own ability to do well, lack of energy to initiate assignments, peer expectations to support the high achievers, and peer pressure towards non-academic activities significantly contribute to procrastination. Moreover, peer expectation to support (SSP 7) and their pressure to do non–academic task (SSP 8) are significant causes of students' academic procrastination. This finding aligns with the previous literature (Munda et al., 2024). The expectation to support high-achieving peers and engagement in non-academic activities suggest that social pressures play a substantial role in students' procrastination tendencies. Interestingly, students' low confidence about their own ability (SSP3) i.e. reduced confidence level of students is significantly associated with lower procrastination which is unreliable and deviates from the existing literature (Saman, 2024; Hussin & Matore, 2023). Hence, it indicates the urgent need for further exploration in the given educational context.

Regarding personal initiatives, all reasons included in this study are significant with academic procrastination except PIP2 that indicates towards challenges to ask other for information needed for accomplishing home assignment. Notably, waiting for additional information from teachers

and laziness in completing assignments emerge as the strongest predictors. This supports Mohebi et al. (2018), who reported dependency on teachers and lack of intrinsic motivation as the major causes of procrastination. Interestingly, students who hesitate to ask questions (PIP1) demonstrate a negative relationship with procrastination, implying that students who refrain from seeking help are less likely to procrastinate. This finding is deviated from the existing literature suggesting that help-seeking behavior reduces procrastination (Hussin & Matore, 2023). This could be because the institution may be conducting capacity building programs. Students may either build their own strategies to solve problems independently or fear embarrassment or feeling confident in their understanding or that may be reduced procrastination. Furthermore, due to societal norm or fear of the teacher, students may feel hesitant to seek assistance from their guardians and teachers. This hesitationmay inspire them to adopt alternative strategies like seeking peer help or using online resources. These activities may keep them engaged in academic tasks and help to reduce procrastination.

In analyzing mathematics achievement, the finding of this study shows students' average mathematics score which is higher than the national benchmark of 35% (ERO, 2022) by indicating students' study hour at home as a significant predictor of achievement. This result aligns with Chapai and Joshi (2025). Their finding shows that students' increased study time at home significantly improves mathematics achievement. This supports the idea that structured learning habits and time management skills play a vital role for academic success (Ocak & Boyraz, 2016; Nayak, 2019).

In terms of the socio-demographic variables, the finding of this study shows that sincerity-related procrastination is highest among students studying two to four hours daily, Madheshi ethnic group, and students with illiterate parents. This finding is consistent with Zakeri et al.(2013) and Pychyyl et al. (2002). These studies show that procrastination is greatly influenced by students' parental education and their cultural backgrounds.

Conversely, in this study, personal initiative-related procrastination was highest among the Brahmin/Chhetri students, whose parents was limited to school-level education. However, the demographic variables were not significant predictors. It clearly shows that personal initiatives related procrastination may be more individually driven than socially influenced. This supports the study conducted by Cerezo et al. (2017), whose finding indicates that personal learning histories shape the procrastination behavior. The finding of this study further confirms that sincerity, ethnicity, study hours, and parental education are significant predictors of mathematics achievement. Of these, study hours exert the strongest influence, emphasizing the critical role of consistent academic engagement in improving mathematics performance (Bakhshayesh et al., 2016; Gareau et al., 2019; Njuguna & Ireri, 2022). These findings underscore the importance of fostering positive mathematical attitudes, enhancing metacognitive

strategies, and addressing academic procrastination to improve the students' mathematical performance (Xue et al.,2023).

Implications

The findings of this study have several practical and theoretical implications. First, they suggest the behavioral factors sincerity and personal initiative both play a significant role for predicting procrastination. Therefore, it is necessity to provide educational intervention to promote students' self-discipline, confidence and proactive learning behavior to reduce procrastination. Similarly, it is necessary to foster students' intrinsic motivation and self- regulation skills. Secondly, the students' non-academic activities and peer expectation are significant for procrastination.It highlights the need for peer-focused intervention. For this purpose, school can implement mentorship programs. Such programs will prove beneficial for the student and the school also. In such programs, high-achieving students guide their peer, which helps to balance academic and social responsibilities. Additionally, integrating collaborative learning strategies may mitigate negative peer influence and encourage academic engagement. Thirdly, the study shows students' study hours as a significant factor to enhance mathematics achievement. This emphasizes the importance of structured study habits. For this purpose, educational institutions and parents should provide guidance for effective time management strategies and encourage students to develop consistent study routines. Furthermore, the impact of socio-demographic factors, particularly ethnicity and parental education, emphasizes the need for comprehensive educational policies. Therefore, educationalists, curriculum designers and policy-makers should pay attention to designing the curriculumaddressing the problem of students from underprivileged backgrounds. The Government should also consider implementing community-based educational programs to reduce parental educational gaps and raise awareness about the importance of educational involvement. As this study suggests, the socio-demographic factors are not significant to personal initiative procrastination, hence, it suggests that a focus should be on individual behavioral change for enhanced personal initiatives rather than demographic characteristics. Developing school-based programs that encourage active participation, self-reflection, and goal setting may help students take greater responsibility for their academic tasks.

Conclusion

This study was related to the behavioral nature of secondary level students and their mathematics achievement. The key finding of study shows that behavioral nature, mainly sincerity and personal initiatives, are significant for academic procrastination. Peer influence, students' confidence levels, and dependency on teacher guidance appear to be the main reasons contributing procrastination. Notably, academic procrastination was found to have differed across

demographic variables such as students' ethnic group, their parental education and study hours.

This study also shows study hour as a significant factor of mathematics achievement that emphasizes the importance of students' structured learning habits. Furthermore, socio-demographic variables such as ethnicity, parental education and study hours and behavioral nature, particularly sincerity and personal initiative are significant for mathematics achievement. Hence, it is necessary to design self-regulation strategies, academic support programs, and motivational programs to reduce procrastination and enhance achievement.

This study contains several limitations. It covers only one district having a small sample size, and a cross sectional survey design. It cannot include key psychological factors such as resilience and self-efficacy. Hence, future research should address these limitations. Educators and policymakers should focus on fostering positive learning behaviors and enhancing student motivation to mitigate procrastination and improve mathematics achievement.

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