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PATHWAYS TO ACADEMIC SUCCESS: THE MEDIATING ROLE OF STUDENT ENGAGEMENT IN THE RELATIONSHIP BETWEEN SOCIO-EDUCATIONAL FACTORS AND ACADEMIC PERFORMANCE AMONG HIGH SCHOOL STUDENTS IN PAKISTAN AND CHINA

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ABSTRACT

A growing body of literature focuses on students' academic outcomes, often categorized as Student Engagement (SE) and Academic Performance (AP). SE refers to students' engagement, attachment, participation, and commitment to learning activities. Student engagement was categorized into four dimensions: behavioral, emotional, cognitive, and agentic. This study drew on self-determination theory, participation-identification models, stage environment fit theory, and socio-ecological models. The researchers collected the data from N=50 registered high schools (N_P=25, N_C=25) in China and Pakistan. The researchers selected N=1500 (NP=750, NC=750) students from the 9th and 10th grades using multistage sampling. The study used univariate (frequency, percentage, mean, and standard deviation) and bivariate (simple linear regression) analyses. Results showed that the academic classroom environment (80.2%, p=.000<.01), and goal-directedness (77.6%, p=.000<.01) had the largest magnitude and positively affected high school students' AP in China. In addition, the academic classroom environment was more influential in increasing the SE in Pakistan (60.7%, p=.000<.05) and China (73.8%, p=.000<.01). Furthermore, it was also evident that the overall engagement of students in high schools (Pakistan: 72.4%, p=.000<.05; China: 90.5%, p=.000<.01) has the highest positive effect on their academic skills. Providing an academic classroom environment, encouraging collaborative group work strategies, and emphasizing time management and short-term goal directness can help elevate students' academic outcomes in Pakistan and China.

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Introduction

Students' academic outcomes have emerged as a theoretical and hypothetical reference point for understanding absenteeism, failure, and dropout rates in high schools (Schnitzler et al., 2021). Studies further segregated these outcomes into Student Engagement (SE) and Academic Performance (AP). These dimensions were derived from various logical and methodical abstractions of academic success. SE drives AP in the learning process (Romano et al., 2021). Numerous social science disciplines, such as Sociology, Social Psychology, Education, Psychology, and Educational Psychology, also emphasize SE as a major underlying factor in determining students' exam grades. The foremost novelty of the phenomenon was measuring AP through dimensions such as memorization, homework completion, mastery, and problem-solving skills (in Science and Mathematics subjects), along with grades and scores on standardized tests (Beatson et al., 2023). This study adds to the literature by measuring AP variables through enriched indicators such as memorization, mastery of Science and Mathematics subjects, and final exam grades (Sattar et al., 2020).

Prior literature suggests that SE is a multifaceted meta-construct developed in the 1980s (Zilvinskis et al., 2017). Later, Mosher & McGowan (1985) used the same terminology to explain students' external motivation toward their academic needs. Previous theoretical debates emphasize what helps students engage in learning. In turn, what major factors contribute to students' academic disengagement and hinder academic success? For decades, Social Scientists have been studying how SE leads to better academic grades. By consensus, students' grades cannot be measured without considering their engagement in studies (Xiong et al., 2021).

SE as a meta-construct was measured through thoughtfulness," "behavioral compliance," "emotional attachment," "internal motivation," "participation in studies," "cognitive integration," and "learning investment" (Salmela-Aro et al., 2021). The meta-construct comprised several subtypes: behavioral, emotional/affective, cognitive, and agentic. These subtypes showed that youth must be engaged and integrated into the academic learning process. This four-dimensional model was based on the nexus of "identity," "integration," "attachment," "thoughtfulness," "belonging," "learning," "success," and "productivity." Previous studies also show that students who disengage from their studies perform poorly on standardized tests and annual examinations (Reeve et al., 2020). Conversely, better academic outcomes in high schools are accompanied by learning engagement and stronger exam performance. Globally, more than 40 percent of students are disengaged from high school, which in turn increases dropout and absenteeism rates (Sattar et al., 2019).

The unified construct of SE-AP has numerous determining factors, such as parental involvement in their children's academic outcomes. Moreover, teachers and peers in the school milieu also provide external motivation and increase students' motivation. The integrating academic factor was students' aspirations to remain engaged in their studies and achieve better grades (Yu et al., 2023).

In light of these findings, the current study compares two diverse but geographically adjacent countries, Pakistan and China. The predictors of students' academic outcomes have differential magnitudes in determining SE and AP across the two countries (Gao et al., 2023). UNDP reports have found that

education quality in Pakistan is low. Moreover, high school is the most neglected sector, resulting in high student dropout rates and low AP. In contrast, Chinese high schools make a drastic transition by focusing on engaging students in their studies, which ensures better academic skills (Liu et al., 2020).

To address these research gaps, the present study examined stakeholders' participation (parents, teachers, peers), SE, and AP (academic outcomes). The study compared Pakistani and Chinese high schools. Relating this, the major objectives of the study were i) To investigate the role of parental contribution towards students' AP through their engagement in studies ii) To demonstrate how peer-teacher role contributes in elevating students' academic outcomes (SE and their AP) iii) To illustrate the role of academic aspirations of the students that leads towards their high scores attained through engagement in studies iv) To find out the role of the academic classroom environment in students academic outcomes v) To put forth recommendations at the level of parents, peers, teachers, student aspirations, and classroom milieu to elevate the students' grades attained in exams through their elevated engagement level.

Theoretical framework, Research gaps, and Hypothetical Model Construction

This section sets forth theoretical underpinnings for investigating students' academic productivity at the high school level in Pakistan and China. The researchers drew on various theoretical insights from diverse social science disciplines. These abstract conceptualizations suggest multiple pathways to academic success. These pathways depend on students' engagement in their studies and their academic outcomes, shaped by various socio-educational factors. The following theories provide the theoretical underpinnings of the present study and help identify research gaps and a hypothetical research model.

Self-Determination Theory

The first theoretical abstraction is self-determination theory, which was developed 40 years ago; the theory emphasizes the social and academic context of schools (Ryan & Deci, 2024). In its early years, the theory focused on background, individual, and socio-academic variables that determine SE and exam/test scores. Later, it shifted to students' internal motivations that regulate their engagement in studies (Guay, 2022). The theory has deep roots that highlight the role of classrooms in student satisfaction and knowledge attainment. In this regard, academic resources such as learning materials and supportive contextual factors also shape students' success and productivity in school. This theory also showed that students' interest in subjects, conceptual learning, and a supportive classroom environment, along with support from key academic stakeholders (parents, teachers, and peers), form the basis for autonomy-supported classroom environments in schools.

Participation identification models

Finn's (1989) participation identification model revealed that school context and classroom environment provide academic motivation for students to perform well in exams. In this regard, academic assets include educational resources and materials, along with stakeholder participation (such as peers, teachers, students, and parents), which build students' competencies and motivate them to perform well in exams. The model revealed that background characteristics, school contextual factors, and stakeholder

participation lead to different learning outcomes. The socio-cultural milieu relates to the classroom environment and supports students' participation and identification in the learning context. Moreover, students identify with the school through their bonding, commitment, learning, and involvement in the syllabus. The theoretical assumptions also identify two major internal factors that ensure students' participation in the learning process: commitment to learning (internal) and student role reinforcement (external). The model also showed that students' satisfaction with the work environment, lack of parental involvement in their children's studies, inadequate provision of academic resources, and non-compliance with school rules lower students' cognitive attention to studies and undermine their exam grades (Fredricks, 2022).

Stage environment fit theory

Stage environment fit theory suggests that schools provide a setting where students can achieve their academic aspirations. Students fit best within the school milieu when they have adequate learning materials and their relatedness needs with peers and teachers are met. Students who feel dissatisfied with learning materials, teaching methods, and peer-teacher relationships may not have the chance to fit into the academic environment. School structure is the best place to meet students' academic needs and prepare them to cope with academic challenges. In light of these theoretical constructs, middle and high school are also critical periods for engaging students in different course content. This is also called the "school fit" approach, in which students must be engaged in the learning process to pursue their future developmental pathways (Eccles & Wigfield, 2020).

Socio-Ecological Model

The Socio-Ecological Model (SEM), developed in the 1970s and revised through 2005, is the best-suited approach for the macro-system, comprising microsystems such as students' families and the roles of familial and academic stakeholders in the academic environment. These subsystems can positively or negatively affect the students' academic outcomes. Along with stakeholder contributions, the microsystem highlights the school's social context, which supports students' relatedness needs (Butler et al., 2022). The next system is the macrosystem, which describes interactions among stakeholders and the broader normative academic system. This system illustrates how parents hold ideologies about their school-going children's academic success. Furthermore, schools have different norms and values that can encourage students to reach their full potential. The exo-chrono system is the political-level system that directly affects the mesosystems and macrosystems. This system includes educational policies and strategies, as well as the role of media and social networking in shaping the school education system (Allen & Boyle, 2022).

Addressing the research gaps

Based on the theoretical underpinnings above, the following research gaps were identified.

Previous theoretical and empirical evidence discussed the role of socio-educational factors separately in determining the academic outcomes of students. However, past studies did not integrate these variables or compare high school students across two countries.

In the previous literature, the variable of overall engagement of these students was measured through a two-dimensional (BE-EE) and tripartite (BE-EE-CE) model. The integration of the fourth sub-variable, i.e., AE, was not included when comparing it with SE.

In the previous literature, the AP variable was measured through academic grades and scores. However, the present study measured the variables across multiple dimensions, including academic success, academic productivity, and academic skill development, as well as examination scores/grades.

Preceding literature used the present variables in the global and South Asian context. Although some studies examined this phenomenon in South Punjab (Pakistan) (Sattar et al., 2019; Sattar et al., 2020), no empirical evidence has integrated these predictor, mediator, and response variables to compare high school students in China and Pakistan.

Hypothetical model construction

The present study constructed a hypothetical model that was grounded in the aforementioned theoretical and methodological gaps. Building on these lines of inquiry, we established a linear, convoluted web-based model linking the predictors, mediator, and response variable. In this model, background variables, the contribution of academic stakeholders (i.e., goal-directedness), and the school environment were treated as independent variables, with students' exam performance as the response variable, mediated by external engagement in studies (Sattar et al., 2022a). The hypothetical pictorial representation of the below-mentioned hypothetical model is described below;

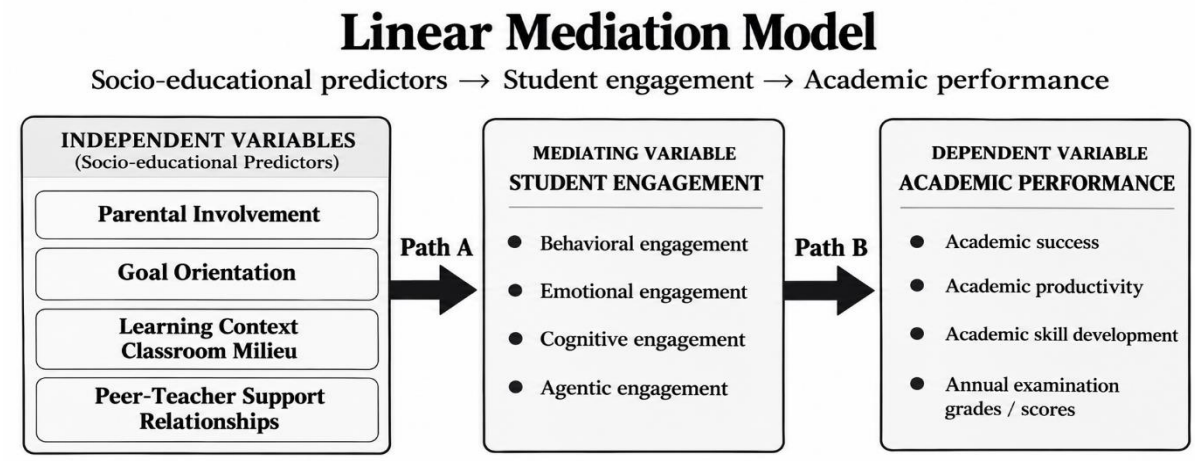


Fig. 1: Linear mediation model between predictor, mediator, and response variables

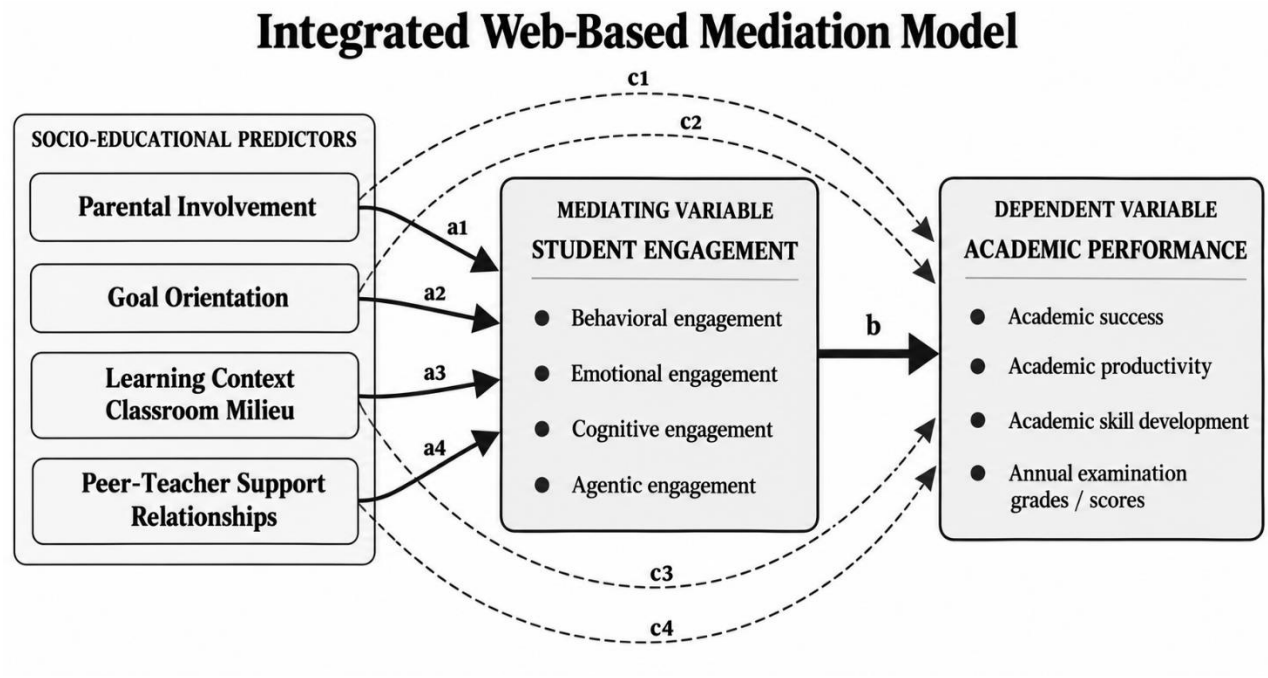


Fig. 2: Integrated web-based model between predictor, mediator, and response variables

Materials and Methods

Participants and Study Site

Participants in the present research were high school students (grades 9 and 10) from Pakistan and China. We selected Multan (Pakistan) and Wuhan (China) because they showed transitions in students' academic outcomes. This study focused on students' final annual grades (i.e., 8th or 9th) and their transition to the 9th and 10th grades. These structural domains strongly contributed to parental concerns about children's studies, as well as to the role of peers and teachers in shaping students' engagement and their academic productivity. The education system in these geographical areas was complex, including government and private schools, girls' and boys' schools, and semi-government and co-education schools.

Research design

Due to limited economic resources and time, the researchers collected data at a single point in time using a survey method. For this purpose, the researchers used a Cross-Sectional Survey Research Design (CSSRD). This design was further segregated into two subtypes, i.e., i) Contextual designs and ii) Social Network designs. The contextual designs were based on individual and household-level parameters in

which the linear relationship between the study variables was investigated. The social network design used a web-based model to investigate the complex relationship among the study variables.

Sample size and Sampling procedure

The researchers selected a sample of N=1500 high school students (Np=750, Nc=750) using a multistage sampling technique in Pakistan and China. In the first stage, the researchers randomly selected 50 registered schools (25 from Pakistan and 25 from China). Next, the researchers sampled class sections. They divided classes in Pakistani and Chinese schools into Science and Arts sections. Next, we selected 30 students from each school (15 Science and 15 Arts). The eligibility criteria for the sample section were that i) Pakistani and Chinese enrolled students in the registered high schools were included; ii) the students who had not yet undergone the final exams or standardized tests were excluded; iii) the students who were enrolled in the non-registered Chinese and Pakistani high schools were excluded; iv) Students whose results were pending due to non-payment of fees, behavioral misconduct, or some academic issue were excluded.

Instrumentation and measures

Consistent with the study's rationale, we developed a self-administered questionnaire. The instrumentation was segregated into four sections named as i) Demographic profile [gender, parental education, family size, and family type], ii) Predictor variables [role of parents, peers, teachers, student aspirations, and classroom academic environment], iii) Mediation variable (SE along with its subtypes), and iv) Response variable (AP).

Predicting variables

The first set of predictor variables was the demographic correlates. Later, we established four major modules. Module 1 encompassed parental contributions to their children's studies, represented by Parental Involvement (PI) and Parental Discussion (PD. Module 2 comprised support from peer groups and teachers to engage students in the learning process and help them improve their exam grades. The results section represented the module through Teacher Personal Support (TPS), Teacher Academic Support (TAS), Peer Personal Support (PPS), and Peer Academic Support (PAS). Module 3 then examined students' goal orientation, represented by three major sub-variables: Prescription Clarity (PC), Personal Obligation (PO), and Personal Control (PCNT). Next, the learning context of the classroom was measured using "The Climate Questionnaire," with Cronbach's $\alpha = .90$. The scale captures the academic context of the classroom through the provision of learning opportunities in high schools.

Mediating variable

The mediating variable was Student Engagement (SE), which was further subdivided into four-dimensional models. Accordingly, the first subscale was Behavioral Engagement (BE), which reflects students' behavioral integration into the school's normative patterns. Emotional Engagement refers to students' affective integration, compliance, and sense of belonging in school activities and the academic

learning process. It helps students reduce disengagement and boredom in their studies. Next, the third dimension was students' Cognitive Engagement (CE), which reflects their mental effort in learning outcomes. Afterward, the fourth dimension was Agentic Engagement (AE), which represents students' contributions through various suggestions, opinions, and recommendations to increase their knowledge.

Response variable

The response variable was students' AP, measured with the scale developed by Du-Paul et al. (1991), with Cronbach's $\alpha = .95$. The scale also reflects education planning, management, and policy-level interventions. The AP scale is considered the most authentic instrument for measuring students' AP at the high school level. It represents students' social, psychological, and academic contributions toward achieving their academic grades. The aforementioned literature measured students' AP through exam scores/grades. In contrast, the present scale was enriched, measuring students' performance through final scores/grades attained, along with memorization, academic skills development, homework completion, and reading, writing, and listening skills, which increase students' academic productivity.

Data Collection and Data Analysis Procedure

After constructing the questionnaire, the researchers collected data from Pakistani and Chinese high schools. First, we requested attendance sheets and a list of enrolled students (for the sampling frame) in grades 9 and 10 from each school. In addition, the researchers explained the purpose of their research to teachers, principals, and administrative staff. Together, they collected attendance sheets and academic grades for registered students. The administrative process in Chinese high schools was smooth, which helped the researchers gather the required documents for data collection. Conversely, the Board systems in Pakistan were complicated and poorly managed, creating many impediments to data collection.

Afterward, we went to the classrooms of the selected high schools to collect data. The main phase was to follow ethical guidelines. The researchers delivered the questionnaires to the participants with their consent (through a consent letter). After meeting the initial prerequisites for data collection, we gave students their annual result cards to ensure accurate reporting of the grades they attained in the last annual examination. In addition, we evaluated their assignment completion records, differential test scores, and annual academic productivity to verify changes in students' academic productivity. We used this point scoring to evaluate students' AP (aligned with the scale used). Meanwhile, the researchers also asked about students' behavioral, cognitive, emotional, and agentic productivity, which motivates them to maintain engagement in their studies.

The researchers collected data using students' result cards, test scores, and engagement levels. The students were also assured that their personal information and research data would be kept confidential. These ethical guidelines, along with the overall research process, ensured students provided accurate responses about their academic outcomes. Without them, students might not have been as careful to provide accurate responses to the questionnaire. To ensure a transparent data-collection process in line with ethical considerations, the researchers assigned specific codes to the sampled students. For example, the student from Multan, Pakistan, serial number 5, in grade 9 was labeled MUL-PAK-05-GRD-9.

Similarly, the student from Wuhan, China, serial number 05, in grade 10 was labeled as WUH-CHI-05-GRD-10.

We analyzed the data using SPSS version 21. The data were coded, labeled, recorded, and computed to analyze the research codes. The researchers applied univariate and bivariate analyses between the study variables. First, the researchers used frequencies, percentages, means, and standard deviations for univariate analysis. Next, the researchers conducted bivariate analyses, i.e., simple linear regression. The simple linear regression analysis examined direct (predictor–response variable) and indirect (predictor–mediator) and (mediator–response) relationships between the study variables.

Results

Univariate analysis

Table No. 1: Demographic correlates of the respondents in Pakistan and China (N=1500; N_P=750, N_C=750)

Demographic correlates	Indicators	Frequency (%) in Pakistan (N=750)	SE in Pakistan Means ± SD^	AP of Students in Pakistan	Frequency (%) in China (N=750)	SE in Means ± SD in China	AP of students in China
Gender segregation	Male	534 (71.2)	37.51 ± 6.248	41.53 ± 4.842	427 (56.9)	39.47 ± 7.412	39.33 ± 4.186
	Female	216 (28.8)	66.86 ± 8.481	58.88 ± 7.451	323 (43.1)	46.74 ± 8.415	58.81 ± 8.423
Father education	Illiterate/Equivalent	104 (13.9)	71.71 ± 37.421	47.13 ± 5.451	21 (2.8)	70.61 ± 37.415	49.08 ± 4.493
	Primary/ Equivalent	263 (35.1)	73.82 ± 31.754	48.74 ± 4.257	36 (4.8)	72.16 ± 34.753	46.93 ± 4.740
	Secondary/Equivalent	219 (29.2)	74.84 ± 36.751	41.44 ± 3.614	220 (29.3)	72.54 ± 36.942	53.56 ± 5.297
	Tertiary/ Equivalent	97 (12.9)	77.85 ± 36.428	51.73 ± 4.775	318 (42.4)	74.36 ± 38.648	56.30 ± 5.374
	Any Other	67 (8.9)	75.74 ± 38.418	45.88 ± 5.349	155 (20.7)	72.24 ± 35.276	47.84 ± 4.849
Mother education	Illiterate/Equivalent	207 (27.6)	71.37 ± 36.741	47.18 ± 6.344	31 (4.1)	72.28 ± 35.199	47.57 ± 5.421
	Primary/ Equivalent	319 (42.5)	74.87 ± 36.654	52.42 ± 5.872	55 (7.3)	73.96 ± 36.982	52.72 ± 4.847
	Secondary/Equivalent	129 (17.2)	75.48 ± 35.954	50.61 ± 7.522	185 (24.7)	77.68 ± 37.969	51.61 ± 6.347
	Tertiary/ Equivalent	60 (8.0)	78.18 ± 38.347	54.77 ± 6.826	401 (53.5)	79.07 ± 39.942	55.94± 4.811
	Any Other	35 (4.7)	72.84 ± 35.842	45.19 ± 5.791	78 (10.4)	71.44 ± 34.813	46.43 ± 5.439
Family size	Less than 5 members	327 (43.6)	71.97 ± 7.784	55.32 ± 4.427	513 (68.4)	71.88 ± 7.858	57.79 ± 5.473
	Greater than 5 members	423 (56.4)	67.64 ± 8.347	45.72 ± 5.941	237 (31.6)	66.72 ± 6.813	43.26 ± 4.249
Family type	Nuclear	162 (21.6)	74.42 ± 7.741	51.44 ± 7.344	413 (55.1)	77.33 ± 7.278	50.33 ± 7.310
	Extended	384 (51.2)	75.37 ± 8.644	54.31 ± 5.514	276 (36.8)	73.71 ± 8.354	49.74 ± 6.241
	Joint	204 (27.2)	71.92 ± 8.943	50.66± 6.263	61 (8.1)	72.94 ± 7.821	53.92 ± 6.742

SD^ stands for Standard Deviation

Demographic correlates of high school students across Pakistan and China

Table 1 illustrates gender segregation in enrollment: the sample from Pakistan has NP=534 (71.2%) male students and N_P=216 (28.8%) female students. In the pole position, the gender segregation of Chinese students at the high school level was N_C=427 (56.7%) male students and N_C=323 (43.1%) female students. The gender variable also revealed a convergent fact, i.e., the female students in Pakistan and China were more engaged in studies and had higher AP [Pakistan: 66.86 ± 8.481 (SE), 58.88 ± 7.451 (AP)] [China: 46.74 ± 8.415 (SE), 58.81 ± 8.423 (AP)] as compared to the male students.

The education level showed that the parents in Pakistan were mostly illiterate and less educated as compared to China. According to the present data from Pakistan, N_P=263 (35.1%) fathers and NP=319

mothers were illiterate. Conversely, China showed high parental literacy: fathers Nc=318 (42.4%) and mothers Nc=401 (53.3%). The statistical analysis also showed that parental education at the tertiary level helped students become more engaged in their studies and had higher AP. Table I validated that students' academic outcomes were high for the tertiary education level of fathers [Pakistan: 77.85 ± 36.428 (SE), 51.73 ± 4.775 (AP)][China: 74.36 ± 38.648 (SE), 56.30 ± 5.374 (AP)], and mothers [Pakistan: 78.18 ± 38.347 (SE), 54.77 ± 6.826 (AP)] [China: 79.07 ± 39.942 (SE), 55.94± 4.811(AP)] in the neighboring geographical areas of Pakistan and China.

Data revealed that targeted high school students in Pakistan lived in families with >5 members (Np=423, 56.4%), while a significant majority of Chinese students lived in smaller families, i.e., <5 members (Nc=513, 68.4%). Statistical inquiry also showed that the high school students who were living in a family with <5 family members were academically more competent in the two studied countries, i.e., Pakistan [Pakistan: 71.97 ± 7.784 (SE), 55.32 ± 4.427 (AP)] and China [China: 71.88 ± 7.858 (SE), 57.79 ± 5.473 (AP)].

The demographic data showed that a significant majority of students in Pakistan lived in extended (Np=384, 51.2%) and joint family systems (Np=204, 27.2%). Conversely, in China, most high school students lived in nuclear (Nc=413, 55.1%) and extended (Nc=276, 36.8%) family types. A glance at the univariate analysis showed that students in Pakistan living in extended families had higher academic outcomes [Pakistan: 75.37 ± 8.644 (SE), 54.31 ± 5.514 (AP)] than students living in nuclear and joint family systems. In contrast, high school students in China living in nuclear families showed higher engagement in studies and performed better on annual exams and test scores [China: 77.33 ± 7.278 (SE), 50.33 ± 7.310 (AP)].

Bivariate analysis

Simple Linear Regression Analysis and Web Model Analysis

Linear Model Relationship

Table No. 2: Simple linear regression between i) predictors and AP (Path-A Direct relationship), ii) predictors and SE (Path-B Indirect relationship), along with iii) SE-AP (Path C-Indirect relationship) of high school students in Pakistan and China (N=1500; Np=750, Nc=750)

Simple linear regression relationship of predictors with AP in Pakistan					Simple linear regression relationship of predictors with AP in China				
Predicting modules	Variables	R2	*P*	Sig.^ Level	Predicting modules	Variables	R2	*p*	Sig. level
M-1	PI+PD	.247	.000*	<.05	M-1	PI+PD	.549	.000**	<.01
M-2	TPS+TAS+PPS+PAS	.385	.000*	<.05	M-2	TPS+TAS+PPS+PAS	.712	.000*	<.05
M-3	PC+PO+PCNT	.306	.004*	<.05	M-3	PC+PO+PCNT	.776	.000**	<.01
M-4	LCC	.394	.000*	<.05	M-4	LCC	.802	.000**	<.01
Simple linear regression relationship of predictors with SE in Pakistan					Simple linear relationship of predictors with SE in China				

Predicting modules	Variables	R2	*P*	Sig Level	Predicting modules	Variables	R2	*p*	Sig level
M-1	PI+PD	.347	.000*	<.05	M-1	PI+PD	.204	.000*	<.05
M-2	TPS+TAS+PPS+PAS	.411	.000*	<.05	M-2	TPS+TAS+PPS+PAS	.337	.000**	<.01
M-3	PC+PO+PCNT	.483	.000*	<.05	M-3	PC+PO+PCNT	.699	.000**	<.01
M4	LCC	.670	.000*	<.05	M-4	LCC	.738	.000**	<.01
Simple linear regression relationship of SE with AP in Pakistan					Simple linear regression relationship of SE with AP in China				
Predicting modules	Variables	R2	*P*	Sig. Level	Predicting modules	Variables	R2	*p*	Sig. level
M1	SAE, SBE, SEE, SCE	.724	.000*	<.05	M1	SAE, SBE, SEE, SCE	.905	.000**	<.01
M2	SAE	.101	.152	NS	M2	SAE	.710	.000*	<.05
M3	SBE	.663	.000*	<.05	M3	SBE	.688	.000**	<.01
M4	SEE	.820	.000*	<.05	M4	SEE	.876	.000**	<.01
M5	SCE	.893	.000*	<.05	M5	SCE	.869	.000*	<.05

*Stands for the significance level at <.05

**Stands for the significance level at <.01

^Sig. stands for Significance level)

Convoluted Web Model Relationship

Table No. 3: Simple linear regression relationship of predictors with AE-BE-EE-CE (Path B-Indirect relationship) of high school students in Pakistan and China (N=1500; N_P=750, N_C=750)

Simple linear regression relationship of predictors with AE in Pakistan					Simple linear regression relationship of predictors with AE in China				
Predicting modules	Variables	R2	*P*	Sig Level	Predicting modules	Variables	R2	*p*	Sig. level
M1	PI+PD	.102	.000**	<.01	M1	PI+PD	.273	.000*	<.05
M2	TPS+TAS+PPS+PAS	.283	.000*	<.05	M2	TPS+TAS+PPS+PAS	.634	.000*	<.05
M3	PC+PO+PCNT	.448	.000*	<.05	M3	PC+PO+PCNT	.811	.000**	<.01
M4	LCC	.371	.000	<.05	M4	LCC	.736	.000**	<.01
Simple linear regression relationship of predictors with BE in Pakistan					Simple linear regression relationship of predictors with BE in China				
Predicting modules	Variables	R2	*P*	Sig. Level	Predicting modules	Variables	R2	*p*	Sig. level
M1	PI+PD	.485	.000*	<.05	M1	PI+PD	.317	.000**	<.01
M2	TPS+TAS+PPS+PAS	.577	.000*	<.05	M2	TPS+TAS+PPS+PAS	.582	.000**	<.01
M3	PC+PO+PCNT	.226	.000*	<.05	M3	PC+PO+PCNT	.812	.000**	<.01
M4	LCC	.284	.000*	<.05	M4	LCC	.864	.000**	<.01
Simple linear regression relationship of predictors with EE in Pakistan					Simple linear regression relationship of predictors with EE in China				
Predicting modules	Variables	R2	*P*	Sig. Level	Predicting modules	Variables	R2	*p*	Sig. level
M1	PI+PD	.478	.000*	<.05	M1	PI+PD	.409	.000**	<.01

M2	TPS+TAS+PPS+PAS	.677	.000*	<.05	M2	TPS+TAS+PPS+PAS	.660	.000**	<.01
M3	PC+PO+PCNT	.863	.003**	<.01	M3	PC+PO+PCNT	.893	.000**	<.01
M4	LCC	.804	.000**	<.01	M4	LCC	.901	.000**	<.01
Simple linear regression relationship of predictors with CE in Pakistan					Simple linear regression relationship of predictors with CE in China				
Predicting modules	Variables	R2	*P*	Sig. Level	Predicting modules	Variables	R2	*p*	Sig. level
M1	PI+PD	.549	.002*	<.05	M1	PI+PD	.338	.000**	<.01
M2	TPS+TAS+PPS+PAS	.326	.001*	<.05	M2	TPS+TAS+PPS+PAS	.660	.000**	<.01
M3	PC+PO+PCNT	.452	.000*	<.05	M3	PC+PO+PCNT	.810	.000**	<.01
M4	LCC	.610	.000*	<.05	M4	LCC	.947	.000**	<.01

Simple linear regression between socio-educational predictors, student engagement and academic outcomes

The bivariate analysis in Table 2 shows that the academic classroom environment (39.4%, p=.000<.05) and the roles of two stakeholders, peers and teachers (38.5%, p=.000<.05), affect students' grade attainment in Pakistan. In comparison, data from China showed that the academic classroom environment (80.2%, p=.000<.01) and goal-directedness (77.6%, p=.000<.01) had the largest magnitude and positively affected high school students' AP. In extension, the statistical analysis revealed that the academic classroom environment was more influential in increasing the SE in Pakistan (60.7%, p=.000<.05) and China (73.8%, p=.000<.01). Above and beyond this, goal orientation has also the high magnitude on changing the SE in studies across the geographical areas of Pakistan (48.3%, p=.000<.05), and China (69.9%, p=.000<.01). The comparative results demonstrated that the emotional (Pakistan: 82.0%, p=.000<.05; China: 87.6%, p=.000<.01), and cognitive consolidation (Pakistan: 89.3%, p=.000<.05; China: 86.9%, p=.000<.01) in studies increased the academic productivity of Pakistani and Chinese students. Moreover, overall student engagement was also evident (Pakistan: 72.4%, p=.000<.05; China: 90.5%, p=.000<.01) among 9th- and 10th-grade students in Pakistan and China.

The linear regression-based relationship showed that the predicting variables have an indirect effect on the sub-variables of SE. In this regard, Table 3 revealed that students contribute significantly in the classroom by triggering teachers' lecture-delivery capacity through their suggestions, opinions, and differing statements. Statistical analysis showed that the specific and enthusiastic academic goals of students helped them to be agentically more engaged in Pakistan (44.8 %, p=.000<.05), and China (81.1 %, p=.000<.01). Moreover, if the classroom was fully equipped with the learning materials, and adequate academic debates, then the students became more agentically engaged in Pakistan (37.1 %, p=.000<.05), and China (73.6%, p=.000<.01). In addition to AE, peer and teacher relationships have an indirect and high magnitude for changing the student's attentiveness in studies and compliance towards school rules (57.7%, p=.000<.05) in Pakistan. Moreover, the parental contribution to studies also significantly contributed to the students' BE in high schools of Pakistan (48.5%, p=.000<.05). In diversification, it was evident that the academic environment of the classroom (86.4%, p=.000<.01) and aspirations to attain good grades (86.4%, p=.000<.01) helped the Chinese students to be behaviourally more engaged in studies.

After the two-dimensional model (AE and BE), the data in Table 3 showed that the predictor variables also change the belonging and valuing needs of high school students in Pakistan. Supporting this, goal-directed behavior has the largest magnitude and can change the EE of Pakistani (86.3%, p=.003<.01) and Chinese (89.3%, p=.000<.01) students. The academic nexus of the classroom determines the students' EE in Pakistan (80.4%, p=.000<.01) and China (90.1%, p=.000<.01). In contrast, the learning environment of classrooms in high schools became the baseline factor for ensuring the cognitive compliance of Pakistani (61.0%, p=.000<.05) and Chinese (94.7%, p=.000<.01) students. The divergent results illustrated that the cognitive powers of Chinese students were more triggered by their academic aspirations to achieve good grades in school (81.0%, p=.000<.01). Instead, the CE of Pakistani students was more triggered through their parental contribution, interest, and motivation towards their children's studies (54.9%, p=.002<.05).

Discussion and Conclusion

The empirical evidence shows that students' correlates affect their academic outcomes in selected geographical zones of Pakistan and China. Gender segregation, family size, family type, and parental education directly affect students' motivation toward the learning process. Previous empirical research from Pakistan and China also found that demographic correlates directly and significantly affect SE and their AP (see Jabeen et al., 2022; Li & Qiu, 2018; Sattar et al., 2020).

These theoretical findings and identified gaps suggest that SE comprises four typologies: BE-EE-CE-AE. This four-dimensional construct served as the baseline factor for fluctuations in high school students' grades, scores, and academic skills enrichment. Consistent with this finding, previous studies have also shown that students' academic engagement influenced their exam scores and grades (see Raza et al., 2020; Wong & Liem, 2022). The present study also demonstrates that the outcome variables of SE and AP were triggered through multiple predictors that encompass parental contribution and interest in their children's studies, teachers' expertise to address the learning needs of the students, peer contribution in enhancing the academic motivation of their companions, goal directness towards securing good grades, and classroom environment for supporting the academic needs of the students in the given structural contextualities. Recent empirical evidence from Pakistan and China also validated these facts (see Ahmed et al., 2020; Tao et al., 2022). Previous empirical evidence from Pakistan and China also confirmed that home- and school-related stakeholders (such as parents, teachers, and peers), along with academic aspirations and school milieu, influenced students' academic outcomes (Ali et al., 2020; Nunes et al., 2023).

Findings also showed that parental interest, involvement, attention, and concentration in their children's studies are positively related to students' academic outcomes (see the previous theoretical validations of Dotterer & Wehrspann, 2016; Jaiswal & Choudhuri, 2017). Previous literature reviews also highlighted that parental participation in their children's studies contributes negatively to students' AP (Boonk et al., 2018). The findings also showed that parents' contribution to engaging their children in studies was smaller than that of the other variables. However, parents' contribution was stronger among Pakistani students than among Chinese students. Previous empirical evidence from Pakistan also supported these findings (Shahzad et al., 2020).

Consistent with prior findings, the present research found that students' academic aspirations (based on their academic goals) were more engaged in school and became more academically productive. Previous literature supported the triangular relationship among goal directness, SE, and students' AP (see Froiland & Worrell, 2016; Wang & Eccles, 2013). The data also indicate that goal orientation was the key predictor of academic outcomes (SE–AP) among Pakistani and Chinese students (Rashid & Asghar, 2016; Wang et al., 2019), suggesting that an adequate classroom context served as a baseline factor influencing students' grades. The results showed that the classroom milieu was the main factor influencing SE. This academic environment was measured by the provision of learning materials, appropriate teaching styles, and adequate academic infrastructure. Studies around the globe in recent years also supported the fact that learning materials, teaching styles, and adequate academic infrastructure are basic prerequisites for better academic outcomes among high school students (see Franklin & Harrington, 2019; Wang & Hofkens, 2020). The linear regression–based web model shows that learning context was the strongest predictor of academic outcomes for Pakistani and Chinese students. Empirical evidence from Pakistan and China supported this finding (see Ali & Siddiqui, 2016; Shernoff et al., 2017).

The findings also revealed that peers and teachers were the main associated stakeholders, and their contributions affected students' academic outcomes. These contributions occur at two major levels: personal and academic. The findings showed that teachers and peers positively affect students' motivation, integration into studies, and academic outcomes. According to the present research, peer and teacher support for students' exam scores was significant; however, it contributed less than parents' support, students' aspirations to perform well, and the classroom academic context. Earlier empirical evidence from Pakistan and China also supported the relationship between teacher and peer support and students' academic outcomes (see Geng et al., 2020; Sattar et al., 2022b).

Strengths, Limitations, and Future Research Directions

Based on the above research procedures, the study showed several strengths. The foremost strength of the contemporary research was the sample size (N=1500; NP=750, NC=750), which helped reduce sampling error. In line with this, the present study used enriched predictor variables, namely the roles of three major stakeholders (parents, teachers, peers), along with goal orientation and the classroom academic environment. In addition, the complex simple linear and web relationships among the predictor, mediator (SE along with its types AE–BE–EE–CE), and response variable (students' AP through their grades attained and scores acquired in exams) helped readers understand the phenomenon under study. The alignment of students' self–reporting (with their previous result cards) reduces data–collection bias. Supporting this, Lamal (2012) noted that teachers' reports about their students became more biased and complicated generalization of the phenomenon under study. Building on these strengths, another key strength of the study was its data collection from two neighboring South Asian countries, i.e., Pakistan and China. Comparing two educationally segregated and developmentally polarized countries would fill gaps in the preceding literature.

Despite these strengths, the present research also faced some limitations. The first limitation was the lengthy questionnaire with different modules for demographic profile, four major predictors, mediation, and the response variables. In future studies, researchers should shorten the instrument to reduce content

errors. Moreover, the research used a linear model (through simple linear regression and the Sobel test). Future researchers should address this statistical weakness by incorporating Structural Equation Modeling (SEM). In line with this, the present research used an explanatory research design. Therefore, the perspectives of teachers, principals, and policymakers at the high school education level were missing. For this purpose, future studies should use a triangulation method that combines explanatory and exploratory research designs.

Conclusion and Recommendations

In conclusion, various socio-educational factors influence students' academic engagement and performance. These factors comprise the role of familial and educational stakeholders such as parents, students themselves, teachers, and peers. Beyond the classroom, focusing on specific academic goals also triggers student engagement and influences academic success. A comparison between the two countries revealed that these factors determine the students' overall academic outcomes, such as academic productivity and academic skill development. In light of the findings and conclusion, the following recommendations were proposed by the authors,

1. Parental involvement, participation, and discussion with children about academic activities can help to increase their academic outcomes in school.
2. Collaborative team-building approaches, group work activities, and a supportive classroom environment also help improve high school students' academic skills.
3. Collaborative work patterns and cooperative, self-regulated learning with peers also help them master their cognitive skills.
4. Prioritizing short- and long-term goal setting at three major levels: cooperative, competitive, and individualistic, which determine the students' grades attained in exams.
5. Teachers and school administration should focus on the social constructionism approach in which knowledge-based skills must be transferred to the students.

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