Impact of Student Academic Support on Student Engagement: The Mediating Role of Basic Psychological Needs and Academic Motivation

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Abstract: The global pandemic has further complicated the task of promoting student engagement (SE), as traditional classroom settings have been disrupted. Therefore, understanding and addressing students' challenges in physical and remote learning environments have become crucial. The study aimed to examine the relationships among proposed variables and test the serial mediating role of basic psychological needs (BPN) and academic motivation (AM) in the relationship between student academic support (AS) and SE. This study utilized Structural Equation Modeling to test the proposed relationships and assess the mediating role of BPN and AM of 461 respondents in a Malaysian public research university. The structural model analysis revealed that BPN and AM significantly and positively predicted student engagement. Student AS was also found to be a positive and significant predictor of BPN, but a negative and significant predictor of academic motivation. Additionally, BPN significantly and positively predicts academic motivation. Testing the serial mediating effect demonstrated that BPN and AM mediate the relationship between student AS and engagement. This study suggests that undergraduate students in a Malaysian public university require peer and other forms of AS to enhance their learning engagement. Peer AS can positively or negatively impact academic motivation.

Keywords: Student engagement, peer support, basic psychological needs, academic motivation, serial mediation

1.   Introduction

The significance of student engagement (SE) is widely recognized by academics (Martin & Bolliger, 2018; Zhoc et al., 2019), but no consensus has been reached on the definition of SE in the literature (Chong & Soo, 2021). Astin (1999) defines SE as "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 518). Other scholars such as Russell, Ainley, and Frydenberg (2005) and Ryan and Deci (2009) consider SE as a proxy and a means for achieving desired academic outcomes. Pike and Kuh (2005) emphasized the importance of engagement, stating that "students learn from what they do in college." Despite the discrepancies in the terminology, several themes remained constant among researchers: "student engagement represents the time and energy students invest in

educationally purposeful activities, and the effort institutions devote to using effective educational practices" (Kuh et al., 2008, p. 542). This definition of SE is widely used in contemporary higher education contexts (Mehdinezhad, 2011).

Empirical evidence from the literature suggests a decline in SE levels in higher education over the years (Castro & George, 2021; Vekkaila et al., 2013; Vinson et al., 2014), manifested by their increase in passive engagement and disengagement in institutes of higher learning (Abdullah et al., 2015). The recent global pandemic has further exacerbated this issue as educational institutions have transitioned from physical classes to online platforms, posing challenges in maintaining learners' engagement in learning activities. Disciplines such as engineering, electronics, and automotive face even greater difficulties as the hands-on tutorials were designed for in-person classes. Online classes have led to a rise in passive and disengaged students (Ferri et al., 2020; Oraif & Elyas, 2021), struggling to cope with the teaching content and potentially resulting in a decline in knowledge and skill acquisition.

The literature highlights the significance of understanding SE and the underlying factors to comprehensively conceptualize the various aspects (Fan et al., 2021; Putit et al., 2022). Student engagement is vital in promoting lifelong learning and facilitating collaborative experiences, which is essential for their future employment prospects. Furthermore, it is imperative to acknowledge that student academic support (AS) takes various forms. Peer support and friendships have been identified as motivating factors for SE in the classroom (Ricard & Pelletier, 2016). The AS offered by peers and peer groups is valuable for student engagement, socialization, collaboration, and networking for academic purposes. Students who receive support from their peers report greater satisfaction with their educational experiences and perform better academically compared to their less engaged counterparts (Krause, 2005). A friendly and supportive learning environment fosters active engagement in meaningful learning activities for students (Oh et al., 2018).

Academic support is crucial in fostering continuous SE and ensuring academic success in higher education (Cho & Yu, 2014; Hegarty, 2014). A study by Thompson (2009) revealed that most tertiary education students preferred informal support through peer communication over formal school services. Peer discussion is often perceived as the primary source of AS among students in institutes of higher learning, suggesting the significant influence in this context. Furthermore, Cho and Yu (2014) emphasized social support as a significant predictor of students' psychological well-being. Other scholars have proposed that peer-to-peer relationships may surpass parental and teacher-student relationships and, hence, the most substantial form of AS for students in their educational experiences (Maunder, 2017). Empirical evidence from previous studies substantiated that peer AS can outshine other forms of support in higher education (Dennis et al., 2005).

Thompson and Mazer (2009) supported these claims by proposing that peer support holds prominence in higher education due to the availability and expectation that peers could understand shared academic experiences better. Students struggling with peer relationships will likely face difficulties adjusting to university life and subsequent retention to stay engaged academically (Maunder, 2018). The recent COVID-19 global pandemic has significantly altered peer interaction patterns, making peer support more challenging and complex (Elmer et al., 2020). Consequently, understanding how students engage with peer learning becomes an intriguing question (Räisänen et al., 2020). Peer AS is crucial to social integration, fostering cohort identity and a sense of belonging to the group. Peer AS is expected to enhance SE by promoting academic, social, and cultural integration among students from diverse backgrounds. The degree of peer AS potentially correlates with SE levels at different multitudes.

Maxwell (2001) argues that "academic peer support", characterized by socialization and interaction for social development and establishing supportive academic relationships, highlights the importance of socializing education. Research findings consistently indicated peer support as a significant predictor of basic psychological needs (BPN) (Deci & Ryan, 1985; Roorda et al., 2011). Schenkenfelder et al. (2020) study findings demonstrated a positive correlation between peer support and autonomy, competence, and relatedness. Meanwhile, Zainuddin and Perera (2019) utilized a mixed-method design to examine the BPN of undergraduate students in flipped and non-flipped classrooms. The findings revealed that students were motivated by engaging in class activities and interacting with their peers. Moreover, the flipped classroom

experience enhanced students' sense of relatedness through interactions with instructors and peers, leading to positive motivational outcomes.

Chickering (1969) stated that "A student's most important teacher is another student" (p. 253). Positive peer interactions potentially enhance students' educational experiences through collaborative learning and academic activities. While teacher support is essential in fulfilling students' psychological needs, the impact may differ across autonomy, competence, and relatedness. Teacher support appears to have a stronger impact on students' satisfaction with autonomy and competence, whereas peer support carries a greater influence in fostering relatedness (Vasconcellos et al., 2020). It is important to note that this finding does not imply that peer support is inferior or less important than other forms of academic support; instead, this study emphasizes the significant role of peer support in meeting the diverse and varying aspects of students' BPN. Academic support also contributes significantly to student engagement, and higher institutions have the responsibility to ensure that they have access to these services.

Eccles and colleagues (1993) Stage-Environment Fit Theory suggests that peer acceptance and friendships are vital for meeting students' developmental needs, consistent with the Self-Determination Theory (SDT), which posits that fulfilling three BPN enhances student academic motivation (AM) (Deci et al., 1991). Peer support plays a unique role in supporting the social and academic aspects of student motivation and engagement (Kiefer et al., 2015; Marley & Wilcox, 2022; Saputra et al., 2020). The literature highlights that peer support can be among the most valuable and accessible forms of academic and non-academic support available to higher education students. Interactions with peers significantly improved student AM (Zhang et al., 2020) and success (Wang & Eccles, 2013) by fostering a responsive learning environment that addresses educational needs (Deci et al., 1991)

Richardson and Skinner (1992) emphasized the importance of peer support via study groups, sharing academic ideas, and learning strategies to motivate students to overcome specific academic challenges. Brown (2004) reported that peer support is crucial in fostering acceptance, relatedness, and other basic and developmental needs; thus, it is essential for motivation development. In addition, higher education students often perceive and rely on peer support as a valuable resource for learning experiences and acquiring information. Macakova and Wood (2020) suggested that satisfying BPN can influence students' perception of their abilities. Literature evidence supports the assertion that fulfilling BPN impacts intrinsic motivation (Levesque et al., 2004). Moreover, BPN are significant factors that could shape a university student's engagement and performance (Badri et al., 2014; Macakova & Wood, 2020).

The significance of BPN for optimal motivation development was emphasized by Deci and Ryan (1991) in their work on SDT. There are three universal BPNs for motivation and engagement according to SDT: autonomy, relatedness, and competence. Studies in Malaysia have also indicated the importance of fulfilling these needs for student motivation development (Hassan & Al-Jubari, 2016) and enhancing SE in higher education (Badiozaman et al., 2019; Benlahcene et al., 2020). Furthermore, an autonomous and supportive environment can facilitate motivation and engagement when BPN are satisfied in the social context or other activities (Reeve et al., 2019).

As postulated by SDT, engagement reflects the motivation that drives students to invest time and effort in learning to fulfill their psychological needs (Wu, 2019). Research has demonstrated that SE mediates motivation and achievement (Martin et al., 2017; Reeve, 2012). Student engagement and AM are interrelated constructs with significant implications for higher education students and are associated with positive educational outcomes (Roksa & Whitley, 2017; Trolian et al., 2016). Therefore, motivated and engaging students exhibited increased attentiveness in the classroom, resulting in better academic progress than their less engaged peers. Academic motivation and engagement mutually reinforce each other, contributing to high-quality learning experiences that align with the expectations of higher education (Martin et al., 2017). Conversely, a lack of motivation can lead to passive engagement, disengagement, lower grades, and a tendency to withdraw from the education program (Scheel et al., 2009).

The predictive role of motivation in SE has been consistently reported in the existing literature (Singh et al., 2022; Vansteenkiste et al., 2020). Research suggests that SE mediates between motivation and various outcomes, such as emotion, achievement (Pekrun & Linnenbrink-Garcia, 2012), and motivation and academic performance (Froiland & Worrell, 2016). Despite the substantial evidence on motivation as

a predictor of SE (Azila-Gbettor et al., 2021; Ferrer et al., 2020; Huang et al., 2019; Li et al., 2016), this sole component may be insufficient in ensuring SE (Reschly & Christenson, 2012). Therefore, researchers should explore other contributing factors to demonstrate the link between AM and student engagement.

Poor classroom engagement among Asian students in higher education has been reported by Subramainan and Mahmoud (2020). Furthermore, studies conducted in Western countries, including Australia, the Netherlands, and the United States of America, reported a decline in SE over time (Castro & George, 2021; Vekkaila et al., 2013; Vinson et al., 2014). This decreasing trend of SE has drawn the attention of researchers and educators globally, warranting further investigation and solutions (Boekaerts, 2016; Donald et al., 2019; Zepke, 2018).

The COVID-19 pandemic fundamentally altered the educational landscape and continues to shape the current way of learning, increasingly adopting remote and hybrid learning models. Even though most aspects of education have resumed to in-person settings, SE in relation to the proposed variables of this study and lessons from the pandemic continue to influence the learning experiences of many students. Thus, this paper aims to address the research gap by examining the relationship between student academic support (AS), basic psychological needs (BPN), academic motivation (AM), and student engagement (SE) at a Malaysian public research university during the COVID-19 pandemic lockdown. The objectives of this study are as follows:

1. To determine the relationship between student academic support (AS), basic psychological needs (BPN), academic motivation (AM), and student engagement (SE) among undergraduate students in a Malaysian public research university.
2. To examine the mediating role of basic psychological need (BPN) and academic motivation (AM) in the relationship between student academic support (AS) and student engagement (SE) among undergraduate students in a Malaysian public research university.

2. Materials and methods

2.1 Respondents

This study was approved by the Ethics Committee for Research Involving Human Subjects of Universiti Putra Malaysia (JKEUPM) and conducted at a Malaysian public research university. The selected respondents were undergraduate students from twelve different faculties. A total of 475 undergraduate students were recruited using proportionate stratified random sampling and systematic sampling techniques. However, only 461 responses were considered valid and included in the data analysis, as 14 responses were excluded due to extreme values or outliers. All respondents had to read and provide informed consent before completing the online questionnaire.

2.2 Measures

The Student Academic Support Scale (SASS) developed by Thompson and Mazer (2009) consists of 15 items scored on a 5-point Likert Scale (1 = not at all, 2 = once or twice a month, 3 = about once a week, 4 = several times a week, 5 = about every day). The scale is distinct from traditional social support instruments. The tool measures the frequency at which individuals perceive and receive action-facilitating support (informational support) and nurturant academic support (esteem, motivational, and venting support) over a specific period. The SASS is designed to assess various forms of academic support in higher education, including academic and non-academic peer support. Confirmatory factor analysis (CFA) was used for SASS validation, confirming the discriminant validity, convergent validity, and construct validity (Mazer & Thompson, 2011). Additionally, SASS has shown good reliability over time, with Cronbach's alphas ranging from 0.78 to 0.94 across four subscales (Mazer & Thompson, 2011; Thompson & Mazer, 2009).

The Basic Needs Satisfaction in General Scale (BNSG-S) is an adaptation of the Basic Needs Satisfaction at Work Scale (BNSW-S) developed by Ilardi et al. (1993). These tools were initially employed in workplace studies, but Gagné (2003) modified the scales to measure BPN satisfaction in personal life. The BNSG-S consists of 21 items, and respondents rate their responses on a 7-point scale (1 = Not at all true to 7 = Very true). This tool assesses three sub-constructs: autonomy, competence, and relatedness. Internal consistency for the BNSG-S ranges from 0.84 to 0.90, while the three subscales (autonomy, competence, and relatedness) demonstrate Cronbach's alpha values between 0.60 and 0.90 in multiple studies (Gagné, 2003; Meyer et al., 2007; Vansteenkiste et al., 2006; Wei et al., 2005).

The Academic Motivation Scale (AMS) was selected to assess undergraduate students' AM in this study. The AMS was developed by Vallerand et al. (1992) based on the foundation of Self-Determination Theory. This tool is one of the commonly used motivation scales with extensive evidence of the validity and reliability (Alivernini & Lucidi, 2008; Souza et al., 2021), and has been translated into many languages. This tool consists of 28 items with responses ranging from 1 = Does not correspond at all to 7 = Corresponds exactly. Nevertheless, AMS is rather lengthy, which may cause participant exhaustion and potentially affect the accuracy of the instrument. Consequently, a shorter version of AMS, the SAMS with 14 items, was developed to address the AMS limitation. The internal consistency of SAMS is slightly lower than AMS, but all the subscales of SAMS show acceptable to high reliability (0.61 to 0.85) (Griethuijsen et al., 2014; Raes et al., 2011). In addition, SAMS is a reliable and validated alternative to the original AMS in an earlier study (Kotera et al., 2020).

The Higher Education Student Engagement Scale (HESES) was developed based on a study by Krause and Coates (2008) and their First Year Experience Questionnaire (FYEQ). Zhoc and colleagues (2018) aimed to create a more concise scale by reducing the 61 items in FYEQ to 28. This adjustment minimizes participant exhaustion during the response process while maintaining the scale's accuracy. The HESES utilizes a 5-point Likert-type scale (1 = Strongly disagree to 5 = Strongly agree) to measure various aspects of undergraduate students' engagement, including academic (behavioral and online), affective, cognitive, and social dimensions. The scale content validity was established through expert review, yielding high convergent validity. The CFA results indicated strong internal consistency for the proposed 5-dimensional models, with Cronbach's alpha coefficients ranging from 0.71 to 0.88. Additionally, the reliability of the scale was supported by the estimation of McDonald's omega coefficients (Zhoc et al., 2020).

2.3   Statistical Analysis

All statistical analyses in this study were performed using Statistical Package for Social Sciences (SPSS) version 25 and AMOS 24 software (IBM, USA). Descriptive statistics were calculated for the respective latent variables, including frequencies, percentages, means, and standard deviations (SD). Structural equation modeling (SEM) was employed to examine the relationships between the latent variables and to test the serial mediation role of BPN and AM in the association between AS and SE. Data normality was assessed using skewness and kurtosis statistics. The preliminary analysis revealed that the skewness coefficients for each item ranged from -1.910 to +0.887, while the kurtosis coefficients ranged from -1.379 to +2.745. Based on the guidelines by Byrne (2010), Hair et al. (2010), and Tabachnick and Fidell (2007), the data can be considered normally distributed as the skewness coefficients fall within the range of ±2 and the kurtosis coefficients fall within the range of ±7.

The data collected in this study demonstrated a normal distribution, as indicated by the skewness values falling within the range of ±2 and the kurtosis values falling within the range of ±7. According to Hair (2010), maximum likelihood estimation (MLE) is the most suitable and flexible estimator for fitting the model parameters. The MLE calculates the likelihood function by determining the conditional probability of the data from the distribution probability and parameter input. It is important to note that MLE assumes the observed variables are normally distributed, which is appropriate when the data is continuous (Maydeu-Olivares, 2017). As the observed variables in this study were normally distributed, MLE is the most appropriate method for estimating the model parameters.

A good model fit is typically determined using the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) with a value of > 0.9, a Root Mean Square Error of Approximation (RMSEA) of < 0.08, and a Standardized Root Mean Square Residual (SRMR) of < 0.08 (Kline, 2015; Hu & Bentler, 1999). These recommended thresholds serve as benchmarks for evaluating the adequacy of model fit in structural equation modeling. However, achieving the desired fit may be challenging due to the extensive amount of items in the respective instruments (78 items) and the sample size of 461 respondents. Hair et al. (2010) suggest that sample sizes of > 400 may lead to poor goodness-of-fit indices, which could be addressed using the parceling technique (Orcan & Yanyun, 2016; Weijters & Baumgartner, 2022) to improve the quality of indicators and enhance model fit. Little et al. (2002) argue that parcel-based models are superior to item-based models as this method reduces spurious correlations between items and yields more stable solutions. Following the recommendations of Hair et al. (2010) and Zainudin (2012), items with factor loadings of < 0.50 were excluded to ensure one-dimensionality. The remaining 44 items with factor loadings of > 0.50 were included and adjusted using the parceling technique to meet the recommended fit criteria.

Convergent validity can be assessed using the Average Variance Extracted (AVE) and factor loadings. Two criteria must be fulfilled to establish convergent validity: 1) An AVE value of > 0.5 indicates that the construct captures more variance than measurement error (Fornell & Larcker, 1981), and 2) All factor loadings within a construct should be > 0.5 for convergent validity (Hair et al., 2006). The internal consistency of the instruments was assessed using Cronbach's alpha and Construct Reliability (CR). A Cronbach's alpha of ≥ 0.7 is sufficient to establish internal consistency (Gefen et al., 2000). Meanwhile, a Construct Reliability (CR) of ≥ 0.7 is generally deemed acceptable. Discriminant validity is established when the squared correlation of the AVE of a focal construct is greater than the squared correlation coefficient of other constructs in the model (Fornell & Larcker, 1981); thus, the construct is more related to its measures than other constructs, indicating discriminant validity.

3.   Findings

3.1   Sample characteristics

Table 1 presents the distribution of respondents' gender, age, and faculty. Out of 461 respondents, 135 (29.3%) were male undergraduate students with a mean age of 22.10 years (SD=1.496), and 326 (70.7%) were female with a mean age of 21.94 years (SD = 1.414). Meanwhile, Table 2 displays the distribution of respondents by faculty, with participant percentages ranging from 1.5% to 19.5%.

Table 1. Distribution of respondents by gender ($n = 461$)

	Frequency	Percentage	Mean Age	SD Age
Gender				
Male	135	29.3	22.10	1.496
Female	326	70.7	21.94	1.414
Overall	461	100%	21.98	1.438

Table 2. Distribution of respondents by faculties (*n* = 461)

	Faculty	Frequency	Percentage
1	Faculty of Agriculture	35	7.6
2	Faculty of Food Science and Technology	19	4.1
3	Faculty of Modern Languages and Communication	90	19.5
4	Faculty of Educational Studies	74	16.1
5	Faculty of Medicine and Health Sciences	27	5.9
6	Faculty of Design and Architecture	18	3.9
7	Faculty of Humanities, Management and Science	7	1.5
8	Faculty of Forestry and Environment	34	7.4
9	Faculty of Biotechnology and Biomolecular Sciences	31	6.7
10	Faculty of Human Ecology	33	7.2
11	Faculty of Engineering	47	10.2
12	Faculty of Science	46	9.9
	Total	**461**	**100%**

3.2   Harman's Single Factor Test

According to Podsakoff et al. (2003), the common method variance (CMV) occurs when the responses obtained from respondents are influenced by the measurement instrument used rather than solely reflecting their actual attitudes or behaviors. The CMV could potentially compromise the validity of a study by distorting the intercorrelations among the measures. Factors such as biased parameter estimation during factor analysis or an over-reliance on a single factor can contribute to the CMV. Harman's single-factor test can load all items onto a single common factor. In this study, the single-factor test results indicated that the items accounted for only 31.024% of the variance, below the suggested threshold of 50% (Fuller et al., 2016). This finding suggests that the study has no significant common method bias.

3.3   Confirmatory factor analysis, convergent validity, discriminant validity, and construct reliability

This study employed a subset-item-parcel approach, where items were grouped into parcels based on their respective sub-constructs guided by the underlying theory. The confirmatory factor analysis results, as presented in Table 3, revealed satisfactory factor loadings ranging from 0.595 to 0.854 for all 20 items. Additionally, the Average Variance Extracted (AVE) for each latent construct surpassed the recommended threshold of 0.5, and the Construct Reliability (CR) values exceeded the criterion of 0.7, indicating strong internal consistency. Therefore, the study successfully established and justified convergent validity. Furthermore, the square root of the AVE for each focal construct was higher than the correlation coefficient with other constructs, supporting the achievement of discriminant validity (see Table 4).

Table 3. Factor loadings, average variance extracted (AVE), and construct reliability (CR) of scales

Constructs and Items	Factor loading (r > 0.5)	Average Variance Extracted (AVE > 0.05)	Construct Reliability (CR > 0.7)
Student Academic Support (AS)		0.589	0.919
AS02	0.597		
AS06	0.724		
AS07	0.746		
AS08	0.820		
AS09	0.821		
AS10	0.850		
AS12	0.854		
AS13	0.691		
Basic Psychological Needs (BPN)		0.672	0.860
BPN 1	0.851		
BPN 2	0.780		
BPN 3	0.826		
Academic Motivation (AM)		0.554	0.860
AM 1	0.595		
AM 2	0.730		
AM 3	0.760		
AM 4	0.794		
AM 5	0.821		
Student Engagement (SE)		0.537	0.822
SE 1	0.756		
SE 2	0.717		
SE 3	0.767		
SE 4	0.688		

Table 4. Discriminant validity of latent constructs

	SE	AM	BPN	AS
SE	**0.733**			
AM	0.720	**0.744**		
BPN	0.667	0.560	**0.820**	
AS	0.114	0.045	0.255	**0.768**

Note: SE = Student Engagement; AM = Academic Motivation; BPN = Basic Psychological Needs; AS = Student Academic Support

3.4 Structural equation model (SEM)

The multivariate technique of SEM was used to examine the structure of the hypothesized research model and the direct impact of independent variables on student engagement. Additionally, SEM was employed to test the serial mediation role of BPN and academic motivation. Figure 1 illustrates the standardized regression weights of the structural model, which demonstrated acceptable or excellent fit based on the model fit indices. The final structural model exhibited a good fit with the data, as evidenced

by the following indices: χ^2 (162) = 349.211, p < 0.001, CFI = 0.964, TLI = 0.958, RMSEA = 0.050, SRMR = 0.046 (see Table 5). The model accounted for 62% of the variance in SE (see Figure 1).

Table 5. Goodness-of-fit indices of the SEM model

Fit Indices					
Chi-square test χ^2		CFI	TLI	RMSEA	SRMR
349.211 (df = 162) < 0.001	*p*	0.964	0.958	0.050	0.046

Note: CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual
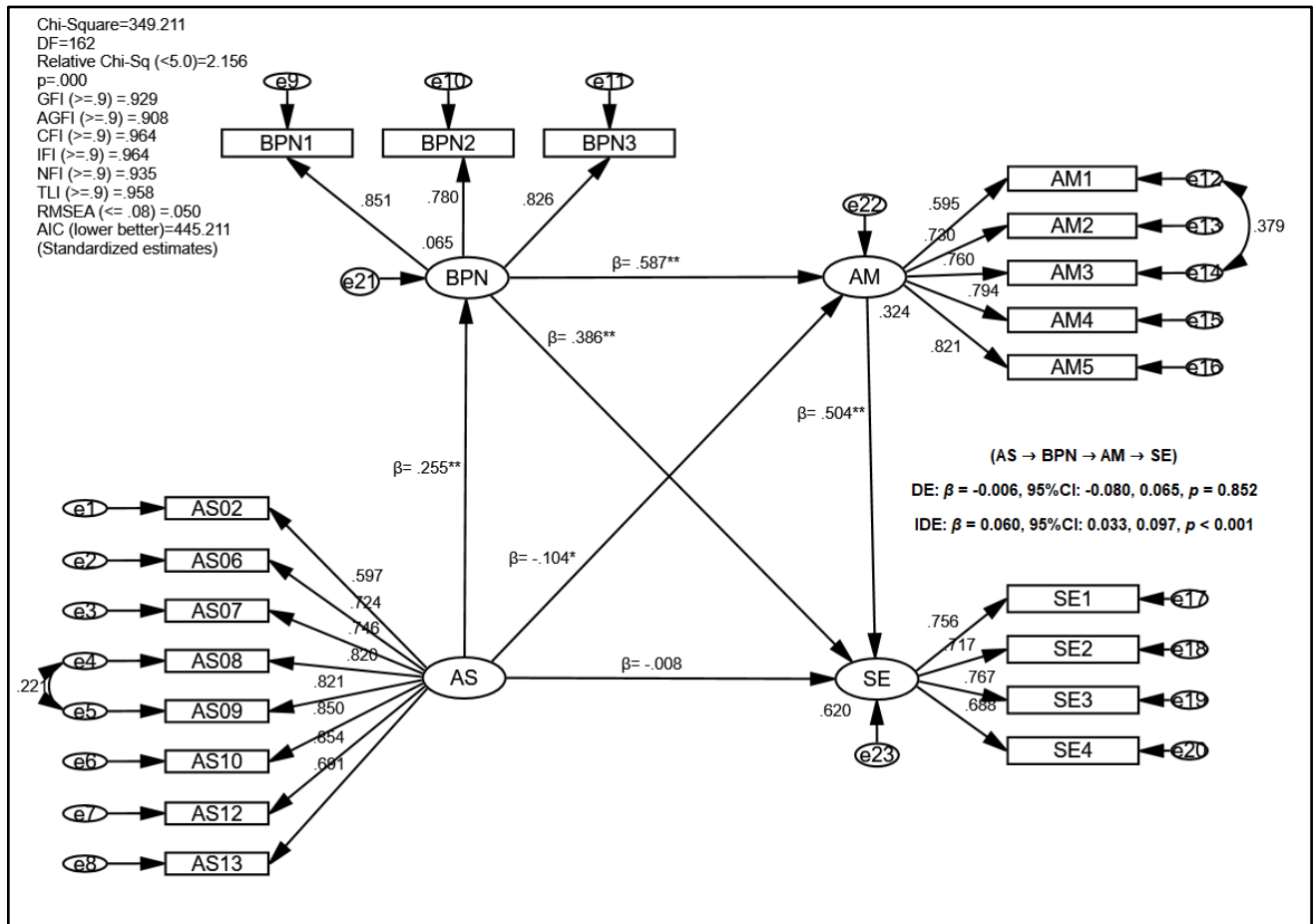
Fig. 1 Structural equation model of student academic support (AS), basic psychological needs (BPN), and academic motivation (AM) in relation to student engagement (SE).
(Latent variables are drawn in circles, and manifest variables are drawn in squares. β, Standardized coefficient; *β*, Unstandardized coefficient; *p*, p-value; CI, Confidence interval; DE, Direct effect; IDE, Indirect effect)

Table 6 shows that student academic support has no significant association with SE (β = -0.008, CR = -0.183, p = 0.855). The reported standardized path coefficient between BPN and SE (β = 0.386, CR = 6.505, p < 0.001) suggests a significant positive association. The result of the structural model analysis also signifies a significant positive association between AM and SE (β = 0.504, CR = 8.318, p < 0.001). Similarly, the standardized path coefficient in Table 6 reveals a significant positive association between student academic support and BPN (β = 0.255, CR = 4.844, p < 0.001).

On the other hand, the structural model analysis results demonstrate a significant negative association between student academic support and AM (β = -0.104, CR = -2.171, p = 0.030). In examining the association between BPN and academic motivation, the standardized path coefficient suggests a significant positive association (β = 0.587, CR = 10.543, p < 0.001).

Table 6. The regression weights of the hypothesized structural model

Hypothesized Relationship	Unstandardized Regression weights Estimate B	Standardized Regression weights Beta	SE	CR	*P*-value (2-Tailed)
AS → SE	-0.006	-0.008	0.033	-0.183	0.855
BPN → SE	0.311	0.386	0.048	6.505	< 0.001
AM → SE	0.351	0.504	0.042	8.318	< 0.001
AS → BPN	0.251	0.255	0.052	4.844	< 0.001
AS → AM	-0.118	-0.104	0.055	-2.171	0.03
BPN → AM	0.679	0.587	0.064	10.543	< 0.001

Note: SE = standard error; CR = critical ratio

3.5   Mediation analysis

The study assessed the serial mediating role of BPN and AM on the relationship between student academic support and engagement. The serial mediation analysis in Table 7 revealed a significant and positive indirect effect of student academic support with SE through BPN and AM (β = 0.060, p < 0.001). Likewise, the reported lower and upper bound at 95% of bias-corrected bootstrap CI: (0.033, 0.097) indicated the coefficient interval is not an intersected zero value, which also implied a significant indirect effect. The direct effect of student academic support on SE with the inclusion of mediators was found insignificant (β = -0.006, p = 0.852).

Table 7. Indirect effect of student academic support in student engagement (SE) through the serial mediation of basic psychological needs (BPN) and academic motivation

Hypothesized Relationship	Direct Effect	*P*-value	Indirect Effect	*P*-value	95% Confidence Interval Bootstrap Bias-corrected		Conclusion
					Lower	Upper	
Student Academic Support → Basic Psychological Needs → Academic Motivation → Student Engagement	-0.006	0.852	0.060	<0.001	0.033	0.097	Full serial mediation

Note: Unstandardized coefficients were reported. Bootstrap sample = 5,000 with replacement.

Ogbeibu et al. (2021) recommend adjusting Cohen's recommendations by halving the values to calculate the indirect effect size. This adjustment yields suggested values of 0.175 for a large effect, 0.075 for a medium effect, and 0.01 for a small effect. After applying this adjustment, the calculated indirect effect size ($v^2 = 0.004$) between student AS and SE through BPN and AM was determined to be negligible despite being statistically significant.

4.   Discussion

4.1   Student academic support (AS) and student engagement (SE)

The BPN and AM significantly mediated the relationship between students' AS and SE. The current study focused on student AS, specifically peer support. However, it is essential to acknowledge that the literature on peer support often presents conflicting findings (Altermatt, 2019), and previous studies have shown variations in SE in peer learning activities (Räisänen et al., 2020). The global pandemic has profoundly impacted students, leading to physical isolation and limited access to academic and emotional support from peers and peer groups (Elmer et al., 2020). Transitioning to online remote learning causes a lack of face-to-face interactions with peers, potentially reducing or adversely impacting SE. Thus, support from family members and teachers may have assumed a more significant role during this period due to their proximity and professional responsibilities. The findings of this study suggest that peer support may not be a significant predictor of SE during A pandemic and may not be the primary form of academic support in Malaysian public research universities.

Malaysia has traditionally followed a teacher-centered approach in higher education (Mustapha & Rahman, 2011). This approach positions the lecturer as the central authority and primary source of knowledge, while students are expected to participate only when prompted, discouraging the questioning of the teacher's authority. This learning style tends to foster passive engagement, contradictory to Western education systems' student-centered and participatory approach (Nurjannah et al., 2017; Serin, 2018). While Malaysia is undergoing significant educational reforms, teachers and students may need time to adapt to student-centered learning approaches. Students tend to perceive teachers as the primary providers of knowledge and information, leading to a reduced reliance on peer academic support and potentially diminishing the impact on SE. This situation may partly explain the absence of a direct correlation between peer support and SE in this study.

4.2   Basic psychological needs (BPN) and student engagement (SE)

Reeve et al. (2019) have posited that fulfilling BPNs is closely linked to behavioral, affective, cognitive, and agentic engagement, consistent with previous studies (Koch et al., 2017; Núñez & León, 2019). An optimal learning environment is achieved when students' needs are satisfied, characterized by self-determination, intrinsic motivation, active participation, and high-quality engagement, ultimately leading to positive academic outcomes (Ryan & Deci, 2017). The results of the current study align with recent Malaysian research conducted by Benlahcene et al. (2020) and Hassan and Al-Jubari (2016), emphasizing the importance of fulfilling BPN as a critical determinant of SE.

In addition to the extensive empirical evidence supporting the positive relationship between BPN and SE, it is essential to highlight that research acknowledges the differential impact of fulfilling these universal needs on various dimensions of SE. Benlahcene et al. (2020) revealed that competence and relatedness positively correlated with all four dimensions of SE. Nevertheless, autonomy exhibited relatively weaker predictive power among the three psychological needs associated with a single dimension of student SE. The authors suggested that the significance of autonomy satisfaction may be influenced by cultural values, particularly in collectivistic societies like Malaysia.

4.3   Academic motivation (AM) and student engagement (SE)

Extensive research and evidence from the literature consistently underline the imperative role of AM in predicting and promoting SE (Singh et al., 2022; Vansteenkiste et al., 2020), a pivotal factor that influences students' active participation and investment in their learning experiences. Lin (2012) distinguished between motivation and engagement by explaining that while motivation encompasses a broader perception that shapes attitudes toward task involvement, engagement refers to the actual active participation in tasks and activities. This study findings align with the research conducted by Ferrer et al. (2020) and Huang et al. (2019), providing further evidence of a positive association between motivation and student engagement. Moreover, the well-established SDT also supports the direct link between AM and SE, which asserts that AM plays a vital role in fostering SE (Deci & Ryan, 2000; Reeve, 2012).

The findings of this study align with the earlier research (Azila-Gbettor et al., 2021; Singh et al., 2022; Vansteenkiste et al., 2020) regarding the crucial role of motivation in predicting SE. Martin et al. (2017) reported the significance of motivation and engagement in determining positive educational behavior. Nonetheless, Reschly and Christenson (2012) stress that while motivation is necessary for student engagement, this factor alone cannot fully explain engagement. This discrepancy highlights the need for future studies to explore additional antecedent and intervening variables to elucidate the underlying mechanisms in this relationship. Furthermore, the current study found that learners with higher motivation levels are more likely to participate in their studies actively. Most importantly, this finding holds true for blended classes and online learning, as the teaching and learning activities were conducted in a hybrid format during the survey period.

4.4 Student academic support and basic psychological needs (BPN)

The current study findings support previous research by Schenkenfelder et al. (2020) and Zainuddin and Perera (2019), highlighting the significant role of peer support in fulfilling BPN. Moreover, a recent study by Vasconcellos et al. (2020) emphasized the relevance of peer support in satisfying the need for relatedness, while teacher support was more strongly associated with autonomy and competence. The works of Deci and Ryan (1985) and Roorda et al. (2011) have also identified peer support as a significant predictor of BPN. According to SDT, autonomy is considered the most crucial need, followed by competence and relatedness. This finding does not diminish the influence of peer support on learners compared to autonomy and competence; instead, peer support may impact learners differently at varying degrees. The relative significance and impact of each need can vary depending on the specific context and individual differences. Notably, Müller and colleagues (2021) reported lower satisfaction with the need for relatedness with peers during the global pandemic.

The limitations imposed by the global pandemic and the shift to online learning have greatly restricted opportunities for peer group learning. Despite these challenges, peer support remains crucial in fulfilling the students' BPN. This resilience and adaptability of peer support in meeting fundamental needs is fundamental, even under non-optimal circumstances. While Thompson (2009) argues that peer support is the primary source of academic support in higher education, this claim may only hold true in educational systems that prioritize individualism and independent learning, typically found in Western contexts. Conversely, the primary sources of academic support may differ in Southeast Asian countries where collectivism is more prevalent. In such cultural and contextual settings, teacher support and guidance may assume more prominent roles in providing academic support. Therefore, it is crucial to consider these cultural and contextual factors when discussing the primary sources of academic support in different regions.

The significant relationship observed in this study between peer support and BPN suggests a shifting perspective in Malaysian higher education, where greater emphasis is being placed on holistic development. This progress aligns with the objectives outlined in the Malaysia Education Blueprint 2013-2025, which aims to promote overall growth by prioritizing social development, problem-solving skills, and teamwork, moving away from solely valuing academic achievement as the sole measure of success.

4.5 Student academic support (AS) and academic motivation (AM)

Peer support is critical in enhancing AM by facilitating positive social interactions among peers and creating a supportive learning environment that fulfills educational needs (Marley & Wilcox, 2022; Saputra et al., 2020). This recognition highlights the significance of social support and collaborative interactions in promoting student well-being and fostering active academic engagement (Awang & Mahudin, 2023; Halif et al., 2020; Tan, 2020).

The findings of this study are consistent with a substantial body of research, including studies by Kiefer (2015) and Sulva and Sukma (2020), highlighting the significant relationship between student AS and AM. Despite that, an earlier study examining the impact of online peer support groups on motivation reported insignificant results (Norhasmi et al., 2021). This contradiction suggests that Malaysian university students may prioritize alternative forms of academic support over peer support, emphasizing the need to consider contextual factors and individual preferences when assessing the effectiveness of different types of academic support. Additionally, it is crucial to acknowledge that peer influence can either positively or negatively affect students. Nevertheless, peer support remains a significant predictor of academic motivation. The critical role of peer interactions in fostering motivation and academic achievement has been consistently emphasized in previous research (Wang & Eccles, 2013; Wentzel, 2012).

These studies provide valuable insights into the positive influence of peer interactions on student motivation and underline the importance of peer support in creating an optimal learning environment. It is crucial to foster positive peer interactions and establish support systems to encourage mutual motivation and academic success among students. Peer support is a valuable educational resource that contributes to psychological well-being and cultivating collaborative behavior among learners striving toward a common academic goal (Saputra et al., 2020). The impact of peer feedback on AM can vary depending on cultural values (Zhang et al., 2020). Cultural context plays an important role in determining whether peer feedback acts as a motivator or a demotivator in academic pursuits. Different cultural values and norms shape individuals' perceptions of feedback and how this factor influences their motivation. Therefore, considering cultural factors is crucial when assessing the impacts of peer feedback on AM.

4.6 Basic psychological needs (BPN) and academic motivation (AM)

The SDT posits that fulfilling psychological needs for autonomy, competence, and relatedness is crucial for optimal AM (Müller et al., 2021). Academic motivation is closely intertwined with the satisfaction or frustration of these psychological needs (Chevrier & Lannegrand, 2021). According to SDT, learners' are more likely to experience heightened AM when their autonomy, competence, and relatedness needs are satisfied, thus enhancing learning outcomes and academic success. The significant and positive association between BPN and AM observed in this study aligns with a substantial body of empirical research spanning various cultures and academic fields (Goldman et al., 2017; Walker et al., 2020).

Recognizing the interdependence of autonomy, competence, and relatedness is essential, as these three universal needs are interconnected rather than separate entities. The literature highlights the distinct yet intertwined linkages among these needs, as evidenced in studies conducted by Deci & Ryan (2000), Huang & Wang (2022), and Vansteenkiste et al. (2020). Additionally, Chue & Nie (2016) found that perceived support for psychological needs significantly predicts motivation among university students, emphasizing the role of a supportive environment in meeting these basic needs and fostering academic motivation. These findings are consistent with the propositions made by Guay (2022) and Müller et al. (2021), highlighting the significance of fulfilling BPN that directly and indirectly improves the quality of motivation, academic goals, and student well-being. Recognizing the interconnectedness of these needs can provide a more comprehensive understanding of their impact on motivation and SE.

4.7   The mediating role of basic psychological needs (BPN) and academic motivation (AM)

The significant serial mediating roles of BPN and AM found in this study align with the propositions of previous researchers (Teixeira et al., 2020; Wu, 2019), suggesting that psychological need satisfaction plays a mediating role in the relationship between basic needs and motivation. Additionally, the study by Yu et al. (2016) agreed that academic support contributes to the satisfaction of BPN, leading to increased motivation and greater engagement. According to SDT, a supportive environment facilitates the satisfaction of psychological needs, with motivation being the outcome of this satisfaction and engagement representing the behavioral, cognitive, and affective manifestation of motivation (Wang & Degol, 2014). Understanding the serial mediating roles of BPN and AM provides valuable insights into the underlying processes contributing to students' engagement and educational outcomes.

The mediation analysis results indicate that although there is a significant indirect effect between student AS and SE through BPN and academic motivation, the calculated effect size is below the threshold for a small effect. This finding suggests that the observed indirect effect may not have a substantial practical significance on the relationship between student AS and SE. Therefore, relying solely on peer support as a supportive environment may be inadequate to promote SE in Malaysian public research universities. An earlier study reported students' satisfaction of needs was significantly lower and controlled forms of motivation were higher during the global pandemic and the shift to emergency remote learning (Müller et al., 2021), which could partially explain why student AS had a negative and significant association with AM but not with BPN.

Suboptimal motivation is inevitable when BPN is not met, affecting the relationship between student AS and SE. Moreover, it is crucial to acknowledge that peer support can yield positive and negative outcomes. On one hand, peer support can enhance AM and foster desirable behaviors, such as encouragement and knowledge sharing. Conversely, research has shown a significant link between peer influence and the adoption of collaborative cheating attitudes and behaviors among higher education students (Zhang & Yin, 2019). Therefore, it is vital to comprehensively understand the impact of peer support and the importance of promoting positive peer interactions while being mindful of potential negative consequences.

5.   Limitation and delimitation

The target population in this study was limited to undergraduate students at a single Malaysian public research university, thus reducing the inferential power of the findings and may not be generalized in other populations. The use of a single-site sample may also introduce measurement bias. Nonetheless, the enrollment of public research university students is based on the requirements set by the Malaysian Ministry of Higher Education. Therefore, it is reasonable to assume that undergraduate students from public research universities share similar characteristics and that the findings from a single Malaysian public research university could be appropriately generalized to the local public institutes of higher learning. The researchers addressed this limitation by employing stratified random sampling and systematic random techniques to ensure that the recruited respondents represented the population. Another shortcoming of the current study is the sole reliance on self-report questionnaires, as there is no other way to verify if respondents answered all the items in the online survey honestly. One of the disadvantages of the survey method is the potential fabrication and invalid data. Thus, the author proposes a countermeasure to address this issue by providing detailed instructions and necessary explanations through online platforms such as WhatsApp, email, and the Zoom application to guide respondents as soon as possible. These methods were used to clarify any confusion or misinterpretation related to the study instrument.

6.   Conclusion

The current study significantly contributes to understanding SE, a multifaceted concept critical for promoting learning and personal growth. The research framework utilized the structural equation modeling

analysis to provide evidence on the factors influencing SE. The findings highlight the vital role of BPN and AM as key predictors of SE, emphasizing their importance in fostering active involvement in academic activities. Furthermore, the study reveals an indirect effect of student AS on SE, mediated by the sequential variables of BPN and AM, highlighting the significance of fulfilling students' psychological needs and cultivating their motivation to enhance their level of engagement. It is worth noting that while the direct impact of student AS on SE may not be statistically significant, the influence is possibly manifested through the interconnectedness of these variables.

The findings illuminate the intricate interplay between BPN, AM, student AS, and SE, which acts as a guideline in designing educational practices and interventions to promote SE. Educators and institutions can prioritize meeting students' BPN, nurturing their academic motivation, and implementing effective strategies for student AS to create a supportive and engaging learning environment that fosters students' overall academic success and personal development. In addition, this study provides valuable insights into the complex dynamics of SE, offering practical implications for educational practitioners seeking to optimize SE and improve learning outcomes.

There are two key recommendations for future study: first, the study population should focus more on 'inclusive' and 'specific' underrepresented groups, such as students with disabilities, indigenous students, and minority sexual orientation students, which were scarce in the literature. The SE for these minority groups has not received much attention from the public and the research community, despite their higher education experience being as important as other learners. More studies focusing on these minority groups are necessary to gain a better overview of their SE in higher education. Finally, recruiting respondents from different institutes of higher learning (public and private universities) would make the study findings more generalizable and comparable across higher learning centers.

7.   Co-Author Contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

8.   Acknowledgement

9.   References

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