MALAYSIAN ONLINE JOURNAL OF EDUCATIONAL MANAGEMENT (MOJEM)

APRIL 2025, VOLUME 13, ISSUE 2, 28-49
E-ISSN NO: 2289 – 4489

THE ROLE OF SELF-LEADERSHIP BEHAVIOR-FOCUSED STRATEGIES IN ENHANCING ACADEMIC PERFORMANCE OF STUDENTS AT HIGHER EDUCATION

Fadhilah Jamaluddin[1], *Ahmad Zabidi Abdul Razak[1], Suzieleez Syrene Abdul Rahim[2]

[1]
Department of Educational Management, Planning and Policy, Faculty of Education, Universiti Malaya, 50603 Kuala Lumpur, Malaysia

[2]
Department of Mathematics and Science Education, Faculty of Education, Universiti Malaya, 50603 Kuala Lumpur, Malaysia

Corresponding Author:
Department of Educational Management, Planning and Policy, Faculty of Education, Universiti Malaya, 50603 Kuala Lumpur, Malaysia
zabidi@um.edu.my

ABSTRACT

This study explores the impact of self-leadership behavior-focused strategies on the academic performance of higher education students, with a specific focus on Science, Technology, Engineering, and Mathematics (STEM) students. The study employs a quantitative approach, surveying 436 STEM students enrolled in the Malaysian matriculation program under the Ministry of Education Malaysia for the 2023/2024 academic year. Data analysis is conducted using SPSS for descriptive statistics and SmartPLS 4 for PLS-SEM. This dual approach comprehensively explores demographic trends, variable levels, and the intricate relationships between self-leadership behavior-focused strategies and academic performance. Utilizing PLS-SEM, the research examines four key components: self-goal setting, self-observation, self-reward, and self-cueing. The findings reveal that self-goal setting is the most impactful self-leadership strategy for academic success ($\beta=0.252, p<0.05$), indicating that students who set clear academic goals tend to perform better. This is followed by self-reward ($\beta=0.197, p<0.05$), suggesting that recognizing personal achievements reinforces motivation. Self-cueing ($\beta=0.177, p<0.05$) also plays a crucial role, as using reminders and prompts helps students stay focused on their studies. Lastly, self-observation ($\beta=0.147, p<0.05$) contributes to academic performance by encouraging students to monitor their progress and adjust their learning strategies accordingly. Together, these strategies account for a moderate portion of the variation in academic performance, emphasizing the importance of self-leadership behavior-focused strategies in student success. By addressing critical gaps in the literature, the study shifts the lens of self-leadership research from organizational settings to educational contexts, dissecting the individual contributions of behavior-focused strategies. The integration of advanced analytical methods strengthens the reliability of the results and offers nuanced insights into the direct effects of these strategies on academic outcomes.

Keywords: **Behavior-focused strategies, self-leadership, self-goal setting, self-observation, self-reward, academic performance.**

INTRODUCTION

Higher education is a cornerstone of academic success, providing students with opportunities to acquire advanced knowledge, develop critical skills, and make meaningful contributions to society. As a vital platform for intellectual growth and professional development, higher education equips learners with the tools needed to navigate an increasingly complex and competitive world. Beyond individual achievements, academic success within higher education serves as a key driver of societal progress, fostering innovation, economic growth, and global competitiveness (UNESCO, 2022a).

Higher education institutions (HEIs), including universities, colleges, polytechnics, and technical and vocational education and training (TVET) centers, play a central role in cultivating these outcomes (Arnhold, 2021). By leveraging their unique capacities to disseminate knowledge, develop skills, and provide equitable learning opportunities, HEIs empower students to excel academically and professionally. These institutions are critical in promoting lifelong learning (LLL), ensuring that students remain adaptable and prepared for the workforce and society's evolving demands (UNESCO, 2022a; UNESCO, 2022b). This is aligned with the Sustainable Development Goal (SDG 4) by the United Nations, calling for equal access to higher education to promote lifelong learning opportunities for all. In 2030, Target 4.3 of SDG 4 aims "to ensure equal access for all women and men to affordable quality technical, vocational and tertiary education, including university" (UNDP, 2023).

Higher educational academic success is often defined by achieving a high cumulative grade point average (CGPA). Typically, students' academic performance is evaluated through their GPA, which represents the average of grades earned in courses contributing to the final degree assessment (Adamuti-Trache et al., 2013; Coronella, 2022; De Clercq et al., 2022; García-Ros et al., 2019; Geisler & Rolka, 2021; Kokaua et al., 2014; Kosiol et al., 2019; Kroshus et al., 2021; Lin et al., 2023; Milienos et al., 2021; Parker et al., 2017; Richardson et al., 2012; Wilcox & Nordstokke, 2019; Zheng et al., 2014). Consequently, GPA remains higher education's primary and most extensively researched metric (Bacon & Bean, 2006).

Indeed, attaining success in academic performance relies on the fundamental driving force behind a student's actions and thoughts, enabling personal control, which originates from their inner world (Uzman & Maya, 2019). Through this process, students motivate themselves to take action, leading to effective living (Haisten, 2008). This principle falls within the realm of self-leadership.

Self-leadership is a self-influence process through which people achieve the self-direction and self-motivation necessary to perform effectively (Neck & Houghton, 2006; Neck et al., 2017). The individual needs to capably manage and guide their actions (Ioannis, 2019; Marshall et al., 2012). In essence, behavior-focused self-leadership strategies aim to promote favorable actions yielding success while discouraging unfavorable actions leading to failure. Natural reward strategies foster motivation through the inherent enjoyment of tasks. Meanwhile, constructive thought pattern strategies facilitate positive thinking habits and performance enhancement by identifying and replacing dysfunctional beliefs, visualizing successful transition and using positive self-talk (Neck & Houghton, 2006; Neck & Manz, 1992; Neck & Manz, 2004).

Prior research has indicated a positive significant correlation between behavior-focused strategies and academic performance (Bjerke, 2024; Boonyarit, 2021; Kim, 2018; Napiersky & Woods, 2018; Napitupulu, 2024; Sampl et al., 2017; Vaeazi et al., 2016; Woods et al., 2022; Zakir et al., 2023). These findings underscore the importance of behavior-focused strategies in achieving favorable academic outcomes.

LITERATURE REVIEW

Theoretical Outline

Self-leadership, a concept rooted in self-regulation, is integral to educational leadership and student success. In the broader discourse of education management, self-leadership aligns with leadership theories such as transformational leadership (Bass, 1985) and distributed leadership (Pearce & Conger, 2003), emphasizing individual agency, self-direction, and intrinsic motivation. Transformational leadership underscores the importance of inspiring individuals to take ownership of their personal development, which resonates with self-leadership strategies that empower students to regulate their learning behaviors effectively (Liu & Huang, 2023; Moss et al., 2009; Yuner, 2020). Distributed leadership, on the other hand, acknowledges the role of shared leadership within educational contexts, where students take an active role in their academic growth through self-directed learning. These perspectives highlight self-leadership as crucial in fostering independent, resilient learners capable of navigating higher education challenges (Göksoy, 2015; Ling et al., 2023; Shava & Tlou, 2018).

Self-regulation theory (Carver & Scheier, 1981; Carver & Scheier, 1998; Powers, 1973) is chosen as the theoretical foundation for this study because it provides a structured framework for understanding behavior-focused strategies, a key component of self-leadership in students at matriculation college. Self-leadership is fundamentally a self-regulatory process, as it involves goal-setting, self-monitoring, and self-motivation, all of which are central to self-regulation theory.

Self-regulation theory proposes a hierarchical structure comprising superordinate and subordinate feedback loops or goals. Goals at different levels concurrently influence behavior, with a tendency towards upward abstraction as individuals become more confident in their actions. Conversely, difficulties in maintaining regulation may lead to a shift towards more concrete goals at lower levels of abstraction (Neck & Houghton, 2006). This theory suggests that individuals with positive expectations for goal achievement tend to persist or increase efforts when facing challenges, whereas those with negative expectations may seek alternative goals or disengage altogether (Carver & Scheier, 1981; Carver & Scheier, 1998).

A critical aspect of self-regulation theory is the role of confidence and hope, reflected in performance-related expectancies. While disengagement from unattainable goals is necessary, cognitive distortions that lower confidence levels can result in premature goal abandonment, negatively impacting self-regulation (Carver & Scheier, 1998). Self-regulation theory differentiates between promotion and prevention regulatory focuses (Carver & Scheier, 1998; Carver, 2001). A promotion focus centers on accomplishments, hopes, and aspirations, regulating positive outcomes and aligning with the ideal self-guide (Higgins, 1987; Higgins, 1989). In contrast, a prevention focus prioritizes safety, responsibility, and obligations, regulating negative outcomes and aligning with ought self-guides (Higgins, 1998). While regulatory focus is often seen as a stable trait, it can also shift depending on situational factors (Higgins, 1996; Higgins, 1998).

Self-regulation theory is particularly relevant in educational leadership and student success models because it emphasizes proactive self-management and self-motivation. By strengthening self-regulatory abilities, self-leadership strategies enhance self-focus, goal-setting, effective feedback management, and task-related confidence, essential skills for academic success. The alignment between self-leadership and self-regulation theory supports that students who effectively regulate their learning behaviors are likelier to persist through challenges and achieve better academic outcomes.

Ultimately, self-regulation is vital in helping students navigate the demands of higher education by enabling them to manage and direct their learning behaviors. When students set goals, monitor their progress, and adjust their actions accordingly, they are more likely to stay focused, persist through difficulties, and improve their academic performance. This approach seamlessly aligns with behavior-focused strategies, empowering students to take charge of their learning journey and succeed academically. As such, self-regulation theory is the most appropriate theoretical framework for understanding self-leadership within educational contexts, providing a robust foundation for fostering student autonomy and resilience in higher education.

Behavior-focused Strategies (BFS)

In essence, behavior-focused self-leadership strategies aim to promote positive behaviors conducive to success while curtailing negative behaviors leading to a failure (Neck & Houghton, 2006). These strategies are particularly valuable for handling essential yet potentially unpleasant tasks like studying for a professional exam or completing a major project, crucial for long-term goal achievement (Houghton et al., 2012). According to Neck and Manz (2004), these strategies emphasize enhancing self-awareness to facilitate managing behaviors, especially those related to necessary but undesirable tasks.

Behavior-focused strategies offer particular techniques for recognizing ineffective behaviors and substituting them with more productive ones by utilizing self-observation (SO), self-goal setting (SG), self-reward (SR), and self-cueing (SC) (Neck & Houghton, 2006). Self-observation entails increasing one's consciousness of the instances and reasons behind specific behaviors. This form of self-awareness constitutes an essential initial stage towards altering or eliminating ineffective and unproductive behaviors (Houghton et al., 2012; Mahoney & Arnkoff, 1978; Mahoney & Arnkoff, 1979; Manz & Sims, 1980; Neck & Houghton, 2006; Neck & Manz, 2004).

With precise knowledge of their current behaviors and performance levels, individuals can better establish goals to modify their behavior (Manz, 1986; Manz & Sims, 1980; Neck & Houghton, 2006). Numerous studies on goal setting, for instance, Locke and Latham (1990) indicated that embracing precise, demanding, and feasible performance objectives can profoundly affect task-related performance.

Next, self-reward, combined with self-established objectives, can substantially boost the motivation needed to achieve those goals (Mahoney & Arnkoff, 1978; Mahoney & Arnkoff, 1979; Manz & Sims, 1980; Neck & Houghton, 2006; Neck & Manz, 2004). Self-reward might range from a straightforward or intangible action, like mentally acknowledging one's accomplishment, to something more tangible, such as buying oneself a new outfit, enjoying a night out at the movies or planning a special vacation upon completing a challenging project (Houghton et al., 2012; Neck & Houghton, 2006).

Finally, tangible environmental cues can be useful for promoting positive behaviors and diminishing or eradicating negative ones (Manz & Sims, 2001; Neck & Manz, 2004). Examples of external cues such as task lists, reminders, screensavers and motivating decorations can assist in maintaining concentration and dedication towards achieving goals (Houghton et al., 2012; Neck & Houghton, 2006; Neck & Manz, 2004).

Behavior-focused Strategies and Academic Performance

When faced with challenges in education, effective self-leadership mandates a systematic approach to foster positive behavior's that pave the way for achieving academic excellence (Boonyarit, 2021). Behavior-focused strategies are crucial for managing one's actions, thereby averting academic setbacks (Houghton & Neck, 2002). Prior research has indicated a positive significant correlation between behavior-focused strategies and academic performance (Bjerke, 2024; Boonyarit, 2021; Kim, 2018; Napiersky & Woods, 2018; Napitupulu, 2024; Sampl et al., 2017; Vaeazi et al., 2016; Woods et al., 2022; Zakir et al., 2023) have been associated with positive academic outcomes.

For instance, Napiersky and Woods (2018) utilize a longitudinal design to investigate the relationship between various self-leadership processes and higher educational attainment among 150 business students from a UK-based university business school. At the beginning of the academic year, students self-report their use of strategies, including behavior-focused strategies. The results reveal that the use of behavior-focused strategies is significantly and positively associated with the students' end-of-year grade point averages (GPA), further supporting the positive impact of the strategy on academic outcomes.

This is consistent with a study conducted by Kim (2018) at a university in South Korea involving 199 students. The researcher uses a survey questionnaire to examine the relationship between behavior-focused strategies and students' academic performance. Through Pearson correlation analysis, the study reveals a significant positive correlation between these strategies and academic performance.

Apart from that, 109 undergraduate students from the University of Innsbruck participated in an intervention study, with all participants completing the study. The findings reveal that behavior-focused strategies significantly and positively affect students' academic performance, as measured by their cumulative grade point average (CGPA). Notably, the intervention group, which receives training in behavior-focused strategies, achieves significantly higher grade point averages than the control group (Sampl et al., 2017).

Next, Zakir et al. (2023) discovered a strong positive significant correlation between behavior-focused strategies and CGPA. This study was conducted across various departments at the Women University of AJK Bagh, with a sample of 326 students selected through simple random sampling. They utilize a survey method to gather data. Data is collected using a close-ended questionnaire to capture relevant information about students' constructive thought pattern strategies and academic performance. For the analysis, the statistical technique of Pearson correlation is employed to determine the strength and direction of the relationship between the two variables. The findings underscore the critical role of these behavior-focused strategies in enhancing academic performance, particularly in higher education settings. Students are better equipped to navigate academic challenges and achieve superior outcomes by fostering behavior-focused strategies.

The following hypotheses are proposed to study the relationship between self-goal setting, self-observation, self-reward, and self-cueing and academic performance:

1. *H1*: Self-goal setting is positively associated with academic performance.
2. *H2*: Self-observation is positively associated with academic performance.
3. *H3*: Self-reward is positively associated with academic performance.
4. *H4*: Self-cueing is positively associated with academic performance.

Research Gaps

Past research has extensively explored the relationship between self-leadership behavior-focused strategies and various organizational outcomes, such as job performance and satisfaction and organizational commitment. However, most of these studies are concentrated within the business and management domains, with a limited focus on the education sector. This imbalance leaves a critical gap in understanding how these strategies function in educational contexts, particularly concerning academic outcomes.

Next, previous studies within the education sector have examined behavior-focused strategies as a unified construct, overlooking the individual components that may have distinct and direct impacts on academic performance. To date, no research has delved into the specific contributions of self-goal setting, self-observation, self-reward, and self-cueing in shaping academic outcomes. This lack of granular analysis represents a critical gap in the literature, limiting our understanding of how behavior-focused strategies function at a component level to influence academic success.

The existing studies within the education industry have predominantly relied on traditional statistical techniques such as Pearson correlation and regression analysis. While these methods provide valuable insights, they fall short of capturing the intricate, multidimensional relationships between variables. Notably, no prior research has employed advanced analytical approaches such as Partial Least Squares Structural Equation Modeling (PLS-SEM), which offers the advantage of simultaneously examining direct and indirect effects, as well as individual components and their measurement items.

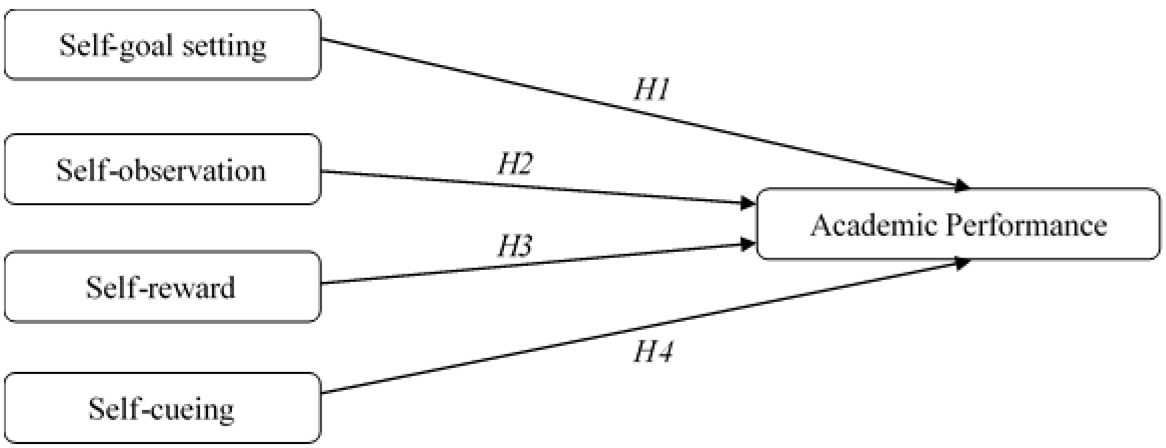
This study seeks to address these gaps by making a novel contribution to the literature. It investigates the relationship between behavior-focused strategies, including self-goal setting, self-observation, self-reward, and self-cueing, and academic performance using PLS-SEM. By leveraging this advanced analytical method, the study aims to provide a more comprehensive understanding of the dynamics at play, offering valuable insights for academic and practical applications in the education sector.

The Development of Conceptual Framework

Building upon existing literature, this study seeks to address previously identified research gaps by investigating the relationships among the variables under examination and tackling the associated research questions.

1. Q1. What is the level of behavior-focused strategies, self-goal setting, self-observation, self-reward, and self-cueing among STEM students at matriculation college?
2. Q2. What is the impact of self-goal setting, self-observation, self-reward, and self-cueing on the academic performance of STEM students at matriculation college?

Figure 1. *The Conceptual Framework of the Study*



METHODOLOGY

Research Design

The influence of behavior-focused strategies within self-goal setting, self-observation, self-reward, and self-cueing on academic performance is investigated through a quantitative method using a survey approach obtained through questionnaires. This research was approved by the Faculty of Education, Universiti Malaya and the Matriculation College Division, Ministry of Education Malaysia. All participants gave informed consent before participating in the study.

Study Setting and Population

The study focuses on students enrolled in the matriculation program under Malaysia's Ministry of Education (MoE) for the 2023/2024 academic session, specifically those pursuing Science or Technical streams. The sampling covers five regions across Malaysia: Northern, Central, East Coast, Southern, and Borneo. Matriculation colleges were selected due to their critical role as primary feeders into public universities' STEM programs, equipping students with foundational skills and knowledge essential for STEM success. Notably, 77.21% of MoE matriculation graduates in 2020 advanced to STEM-related degree programs (Matriculation Division, 2022).

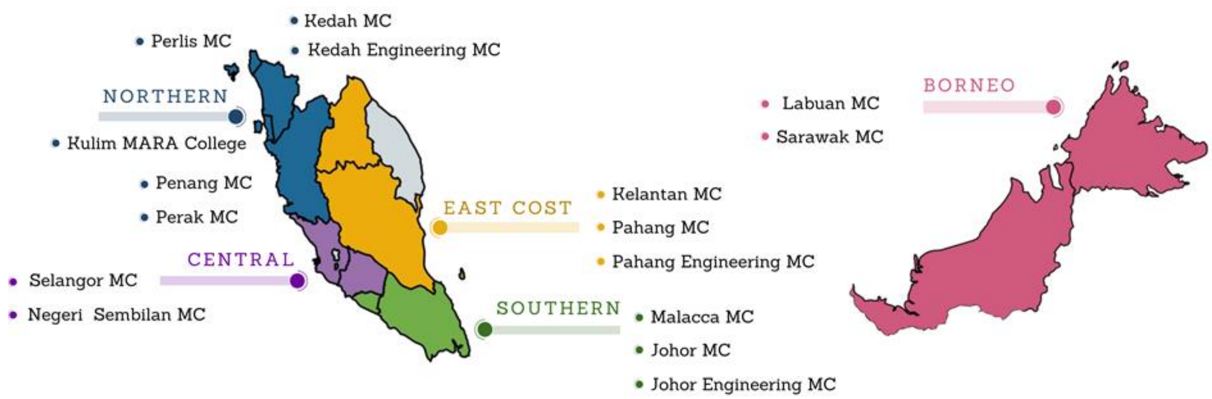
The researcher consulted the 2023 Malaysia Educational Statistics report by the Educational Planning and Research Division (EPRD) to determine the study population. As of August 2023, 19,263 students were enrolled in STEM majors within matriculation colleges, encompassing those active in the Two-Semester and Four-Semester Systems for the 2023/2024 session (EPRD, 2023).

Sampling Technique

The study utilized a multi-stage sampling technique to select samples from STEM students across matriculation colleges dispersed throughout Malaysia. The methodology systematically divides the broader population into progressively smaller clusters to achieve inclusivity and geographical diversity. The sampling process is structured around two levels of sub-clusters: regions and matriculation colleges. Initially, the data is organized into five distinct regions: the Northern region (encompassing Perlis, Kedah, Penang, and Perak), the Central region (Selangor and Negeri Sembilan), the East Coast region (Kelantan and Pahang), the Southern region (Johor and Malacca), and the Borneo region (Sabah and Sarawak). Within these regions, 16 matriculation colleges offer STEM-focused programs in Science or Technical streams, as depicted in Figure 2.

Using the total population of 19,263 students enrolled in STEM programs during the 2023/2024 academic session, the study determines the minimum required sample size by referencing the sample size determination table developed by Krejcie and Morgan (1970). Based on this framework, a minimum sample size of 377 students is necessary to ensure statistical reliability and validity. This approach ensures that the findings represent the broader population of STEM students in Malaysia's matriculation colleges.

Figure 2. *Matriculation Colleges*



Note. MC = Matriculation College

Survey Questionnaires

A structured, adapted questionnaire is employed to gather data from survey participants. The study utilizes established scales validated and statistically tested in prior research, aligning with recommendations from existing literature to ensure measurement reliability and consistency. The survey is divided into two sections: the first focuses on behavior-focused strategies and academic performance, while the second collects demographic information about the participants.

14 items were assessed using 14 adapted from Houghton and Neck (2002) to measure behavior-focused strategies. These items were categorized into four dimensions: self-goal setting (5 items), self-observation (4 items), self-reward (3 items), and self-cueing (2 items). Responses were measured on a 5-point Likert scale, ranging from 1 ("strongly disagree") to 5 ("strongly agree"). The questionnaire undergoes review by a panel of academic experts and university professors to ensure content validity (Yusoff, 2019). Based on their feedback, minor adjustments are made to the wording of several statements to improve clarity and comprehensibility for respondents. This validation process ensures the instrument is reliable and suitable for capturing the intended constructs.

Reliability Test

In this study, Cronbach's alpha assessed the reliability of items within each construct, ensuring that all items consistently measure their intended concepts, as is common practice in science education research (Taber, 2018). Cronbach's alpha, a standard measure of internal consistency, ranges from 0 to 1. Field (2017) and Hair et al. (2019) stated a Cronbach's alpha value of 0.60 to 0.70 is considered the minimum threshold for acceptable reliability.

As presented in Table 1, each construct of the self-leadership behavior-focused strategies achieves acceptable reliability values, ranging from 0.710 to 0.799. Ultimately, the reliability analysis verifies that all constructs meet the acceptable criteria, confirming that the items are well-suited for measuring the concepts central to this study. Consequently, all items are retained for further data collection, strengthening the validity of the study's findings.

Table 1. *Reliability Test*

Construct	Cronbach's Alpha	Total Item
Self-Goal Setting	0.714	5
Self-Observation	0.793	4
Self-Reward	0.799	3
Self-Cueing	0.710	2

Data Collection and Analysis

Data collection is conducted through an online survey questionnaire, ensuring broad reach across the five regions. The structured questionnaire was adapted to align with the study's objectives and was reviewed by academic experts to confirm its validity. Minor adjustments were made to enhance clarity and comprehension.

Data were analyzed using SmartPLS for Structural Equation Modelling (SEM) and Statistical Package for Social Sciences SPSS for descriptive analysis. SPSS examines the demographic profiles of the respondents and the levels of the study variables, providing a foundational understanding of the sample. Meanwhile, SmartPLS 4 facilitates exploring the relationships between variables through PLS-SEM. These analytical tools provide robust insights into the relationships between behavior-focused strategies and academic performance, ensuring methodological rigor and reliability in the findings.

ANALYSIS AND FINDINGS

Demographic Profile of the Respondents

Of the 900 online survey questionnaires distributed, 436 were returned, yielding a response rate of 48.44%. This is consistent with the guideline provided by Wu et al. (2022), which indicates that the average response rate for online surveys is approximately 44.4%. Additionally, the response rate exceeds the minimum sample size required, as per Krejcie and Morgan (1970), who recommend a sample size of 377 students for a population of 19,263. The population in this study refers to students enrolled in the matriculation program under the Ministry of Education (MoE) for the 2023/2024 academic session, specifically those majoring in Science or Technical streams across Malaysia. The obtained sample size ensures a robust and reliable basis for subsequent data analysis.

The demographic profiles of the respondents (Table 2) provide important insights that help contextualize the findings of this study. These profiles cover gender, age, academic program, major of study, and key reasons for choosing their academic paths. Out of these 436 respondents, the number of female students participating in this study is 258, representing 59.2% of the respondents. Meanwhile, the number of male students is 178, accounting for 40.8%.

Within age, most respondents are 19 years old, accounting for 91.3% (n = 398) of the total. Meanwhile, 18-year-old students constitute 5.7% (n = 25), followed by 20-year-olds at 2.5% (n = 11). The least represented age group is 17-year-olds, with only 0.5% (n = 2) of the respondents. Concerning academic programs, the number of students enrolled in the Two Semester System is 383, accounting for 87.8% of the total respondents. Meanwhile, 53 students (12.2%) are enrolled in the Four Semester System.

Regarding academic majors, the highest number of respondents (114 students), accounting for 26.1%, are from the Basic Engineering Stream, followed by 109 students (25.0%) in the Life Sciences Stream. Additionally, 51 students (11.7%) are in the Civil Engineering Stream, 44 students (10.1%) in the Mechanical Engineering Stream, 41 students (9.4%) in the Physical Sciences Stream, 40 students (9.2%) in the Electrical & Electronics Engineering Stream, and the lowest representation is in the Computer Science Stream, with 37 students (8.5%).

Table 2. *Demographic Profiles of Respondents*

No.	Demographic Variables	Frequency *(f)*	Percentage *(%)*
1.	**Gender**		
	Female	258	59.2
	Male	178	40.8
2.	**Age**		
	17 years old	2	0.5
	18 years old	25	5.7
	19 years old	398	91.3
	20 years old	11	2.5
3.	**Program of Study**		
	Two Semester System	383	87.8
	Four Semester System	53	12.2
4.	**Major of Study**		
	Life Sciences Stream	109	25.0
	Physical Sciences Stream	41	9.4
	Computer Science Stream	37	8.5
	Basic Engineering Stream	114	26.1
	Civil Engineering Stream	51	11.7
	Electrical & Electronics Engineering Stream	40	9.2
	Mechanical Engineering Stream	44	10.1

Note. n = 436

Descriptive Analysis

Descriptive analysis utilizing frequency and percentage for individual items, along with mean and standard deviation for dimensions within the variables. Descriptive statistics are generated for each variable individually and at the subscale level, providing a detailed representation of respondents' feedback regarding behavior-focused strategies. The dimensions of each variable and their corresponding items are ranked to facilitate a comparative analysis of the results. This approach ensures a comprehensive understanding of the students' engagement with these strategies.

The level of behavior-focused strategies is measured through 14 items, categorized into four distinct dimensions: self-goal setting (SG) with 5 items, self-observation (SO) with 4, self-reward (SR) with 3, and self-cueing (SC) with 2.

Table 3 presents the results of the descriptive analysis for these sub-constructs. Behavior-focused strategies are found to exist at a very high level, with an overall mean score of 4.33. Among the dimensions, self-goal setting records the highest mean score of 4.41, followed by self-reward with a mean of 4.34. Self-observation and self-cueing share an equal mean score of 4.26, with all dimensions rated at a very high level.

To gain a more detailed understanding of these dimensions, Table 3 also provides an item-level analysis, displaying the mean values and the percentage of responses for each item. The mean values for the self-goal setting items range between 4.25 and 4.50, indicating a very high level of agreement among STEM students. The highest-rated item, "I establish specific goals for my own performance," is agreed or strongly agreed upon by 93.6% of respondents. For self-observation, the mean values range from 4.23 to 4.29, reflecting a very high level of agreement. The item "I keep track of my progress on projects I'm working on" receives the highest level of agreement, with 89.9% of students agreeing or strongly agreeing. The self-reward dimension shows a mean range of 4.31 to 4.37, maintaining a very high level. The highest-rated item in this dimension is "When I have successfully completed a task, I often reward myself with something I like," which is agreed or strongly agreed upon by 89.2% of the students. Lastly, the mean values for the self-cueing items range from 4.25 to 4.27. Both items in this dimension are highly rated, with 83.7% of students agreeing or strongly agreeing with statements like "I use written notes to remind myself of what I need to accomplish" and "I use concrete reminders (e.g., notes and lists) to help me focus on the things I need to accomplish."

Overall, the analysis reveals that STEM students display very high levels of behavior-focused strategies across all dimensions: self-goal setting, self-observation, self-reward, and self-cueing. The self-goal setting is particularly prominent, indicating a strong emphasis on clear goal-setting among students. These results suggest that students effectively employ self-regulation techniques to support their academic success and maintain motivation.

Table 3. *Level of Behavior-focused Strategies (BFS) and Its Components*

Dimension/Item	Percentage of Responses (%)							Mean	SD	Level
	SDA	DA	N	A	SA	-ve	+ve			
SG1: I establish specific goals for my own performance.	0.0	1.1	5.3	35.8	57.8	1.1	93.6	4.50	0.652	VH
SG2: I consciously have goals in mind for my work efforts.	0.0	1.1	7.8	36.9	54.1	1.1	91.1	4.44	0.687	VH
SG3: I work toward specific goals I have set for myself.	0.2	1.6	7.1	37.8	53.2	1.8	91.1	4.42	0.715	VH
SG4: I think about the goals that I intend to achieve in the future.	0.0	1.8	5.3	38.1	54.8	1.8	92.9	4.46	0.682	VH
SG5: I write specific goals for my own performance.	0.0	2.1	11.2	46.8	39.9	2.1	86.7	4.25	0.731	VH
SG						**1.6**	**91.1**	**4.41**	**0.699**	**VH**
SO1: I try to keep track of how well I'm doing while at college.	0.2	2.5	8.9	50.5	37.8	2.8	88.3	4.23	0.733	VH
SO2: I usually am aware of how I am performing on an activity.	0.2	2.3	9.9	48.4	39.2	2.5	87.6	4.24	0.739	VH
SO3: I pay attention to how well I am doing in my work.	0.0	2.1	9.2	46.8	42.0	2.1	88.8	4.29	0.716	VH
SO4: I keep track of my progress on projects I'm working on.	0.0	2.1	8.0	49.3	40.6	2.1	89.9	4.28	0.699	VH
SO						**2.4**	**88.6**	**4.26**	**0.722**	**VH**
SR1: When I do an assignment especially well, I like to treat myself to something or activity I enjoy.	0.5	2.8	8.5	36.0	52.3	3.2	88.3	4.37	0.790	VH
SR2: When I do something well, I reward myself with a special event such as a good dinner, movie, shopping trip, etc.	0.2	3.2	9.6	39.4	47.5	3.4	86.9	4.31	0.792	VH
SR3: When I have successfully completed a task, I often reward myself with something I like.	0.2	3.4	7.1	40.6	48.6	3.7	89.2	4.34	0.776	VH
SR						**3.4**	**88.1**	**4.34**	**0.786**	**VH**
SC1: I use written notes to remind myself of what I need to accomplish.	0.5	2.5	13.3	39.4	44.3	3.0	83.7	4.25	0.812	VH
SC2: I use concrete reminders (e.g., notes and lists) to help me focus on the things I need to accomplish.	0.0	2.1	14.2	38.8	45.0	2.1	83.7	4.27	0.778	VH
SC						**2.5**	**83.7**	**4.26**	**0.795**	**VH**
BFS						**2.5**	**87.9**	**4.33**	**0.742**	**VH**

Following that, this study uses Partial Least Squares Structural Equation Modeling (PLS-SEM) with Smart PLS 4 to test the hypotheses through Confirmatory Composite Analysis (CCA) (Hair et al., 2011, 2020, 2022; Sarstedt et al., 2016). CCA is a systematic approach for assessing the reliability and validity of measurement models in PLS-SEM (Hair et al., 2020). This approach involves two stages: (i) assessing the reflective measurement model and (ii) evaluating the structural model, as outlined below.

Reflective Measurement Model

The evaluation of reflective measurement models includes assessing reliability at the indicator level (indicator reliability) and the construct level (internal consistency reliability). Validity is assessed through two main types: convergent validity, measured using the average variance extracted (AVE) for each indicator. The second type is discriminant validity, assessed by comparing constructs within the model using the heterotrait-monotrait (HTMT) ratio of correlations (Hair et al., 2022).

The reflective measurement model for this study is developed using SmartPLS 4. It consists of four key constructs, each representing a lower-order reflective measurement. The first construct, self-goal setting (SG), is measured by 5 items, while self-observation (SO) is measured by 4 items. The self-reward (SR) construct comprises 3 items, and self-cueing (SC) includes 2 items.

Indicator Reliability. The first step in evaluating a reflective measurement model is to examine the outer loadings of its indicators. Outer loadings around 0.70 are generally acceptable (Hair et al., 2022). In social sciences, weaker loadings (below 0.70) are common (Hulland, 1999). Indicators with loadings between 0.40 and 0.70 should only be removed if doing so significantly improves internal consistency reliability or convergent validity (Hair et al., 2022). As shown in Table 4, all factor loadings range from 0.833 to 0.926, indicating strong indicator reliability. Thus, no indicators were removed.

Internal Consistency Reliability. Internal consistency reliability was assessed using rho_a and Cronbach's alpha. Scores between 0.70 and 0.95 are considered "adequate to good," while scores between 0.60 and 0.70 are "suitable for exploratory research" (Hair et al., 2019, 2022). As shown in Table 4, all rho_a and Cronbach's alpha values are within the acceptable range, exceeding 0.70 but below the critical threshold of 0.95, confirming sufficient internal consistency reliability without redundancy. Consequently, the measurement model meets the required reliability standards, allowing for confident progression to further analysis. This ensures that the indicators capture a diverse range of aspects of the underlying constructs, enhancing the overall validity and robustness of the measurement model.

Convergent Validity. Convergent validity is confirmed, as the Average Variance Extracted (AVE) for each construct exceeds the 0.50 threshold (see Table 4), demonstrating that the constructs effectively explain the variance of their indicators (Hair et al., 2019, 2022).

Table 4. *Outcomes of (Validity and Reliability) Reflective Measurement Model*

Construct	Indicators	Factor loadings	Cronbach's alpha	Composite reliability (rho_a)	AVE
Self-goal setting	SG1	0.852	0.917	0.938	0.751
	SG2	0.873			
	SG3	0.891			
	SG4	0.884			
	SG5	0.833			
Self-observation	SO1	0.854	0.877	0.916	0.731
	SO2	0.849			

	SO3	0.868			
	SO4	0.847			
Self-reward	SR1	0.911	0.910	0.943	0.847
	SR2	0.926			
	SR3	0.924			
Self-cueing	SC1	0.900	0.777	0.900	0.818
	SC2	0.909			

Discriminant Validity. Discriminant validity measures how distinct a construct is from other constructs in a structural model (Hair, Black et al., 2019; Hair, Risher et al., 2019). As illustrated in Table 5, the analysis confirms discriminant validity, evidenced by each construct's stronger associations with its respective indicators compared to other constructs. The study employs the heterotrait-monotrait ratio of correlations (HTMT) to evaluate this, a relatively recent and robust method for assessing discriminant validity alongside conventional approaches (Hair et al., 2020; Hair et al., 2022; Henseler et al., 2015; Sarstedt et al., 2017). Henseler et al. (2015) suggest an HTMT threshold of 0.90 for conceptually similar constructs, where values exceeding this threshold indicate insufficient discriminant validity. For conceptually distinct constructs, a stricter threshold of 0.85 is advised (Sarstedt et al., 2017). As presented in Table 5, all HTMT values in this analysis are below 0.860, indicating no discriminant validity issues and confirming the constructs' distinctiveness within the model.

Table 5. *Heterotrait–Monotrait Ratio of Correlation (HTMT)*

	SC	SG	SO	SR
SC				
SG	0.859			
SO	0.802	0.798		
SR	0.805	0.817	0.779	

Note. SC = Self-cueing; SG = Self-goal setting; SR = Self-reward; SO = Self-observation
Note. Academic performance (AP) is excluded from the table since it is a single-item construct and thus not relevant for discriminant validity assessment.
Source(s): Calculations by the author

Structural Model

After confirming the reliability and validity of the construct measures, the next step involves evaluating the structural model. This follows a four-step process outlined by Hair et al. (2022), Hair, Black et al. (2019), and Hair, Risher et al. (2019): (1) assessing collinearity using the variance inflation factor (VIF) to ensure accurate path coefficient estimates; (2) testing the significance and relevance of hypothesized relationships through path coefficients; (3) evaluating the model's explanatory power using R^2 values and f^2 effect sizes to measure variance explained by independent variables; and (4) assessing predictive power with PLS-predict, including $\boldsymbol{Q^2_{predict}}$ values, to confirm the model's ability to predict future outcomes. The results show no multicollinearity issues, as all VIF scores are below the threshold of 5.0 (see Table 6), consistent with guidelines from Hair, Black et al. (2019) and Hair et al. (2020).

Table 6. *Variance Inflation Factor (VIF) Values*

	SC	SG	SO	SR	SS
SC					2.432
SG					3.102

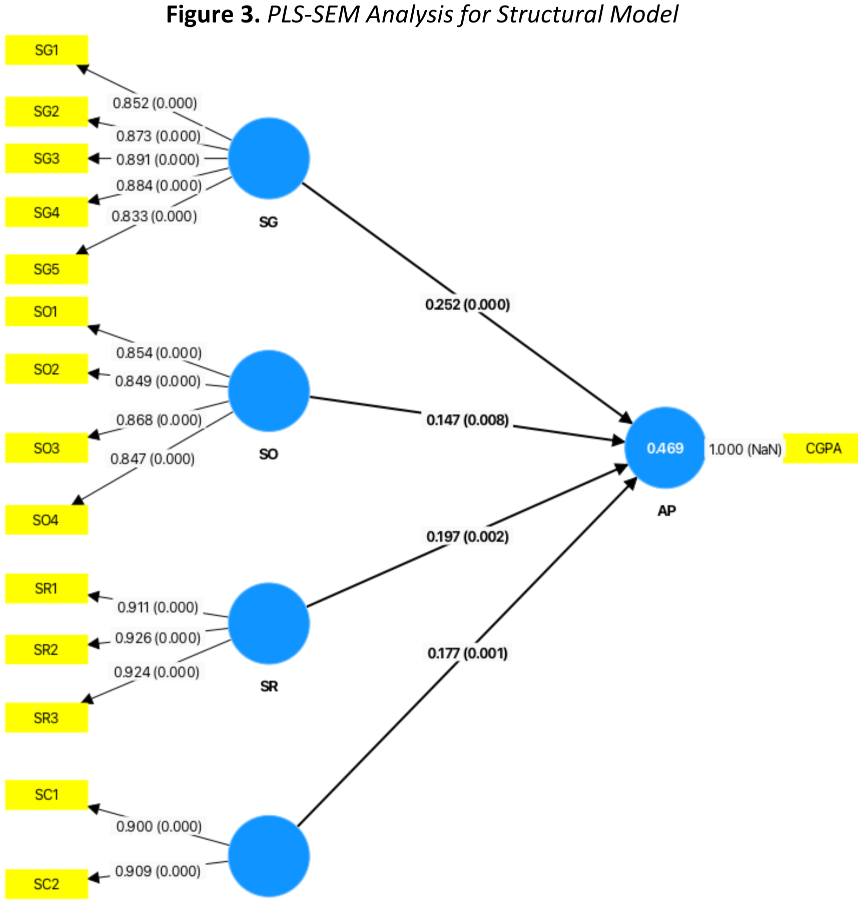
SO		2.45
SR		2.704
AP		

Note. SC = Self-cueing; SG = Self-goal setting; SO = Self-observation; SR = Self-reward; AP = Academic Performance
Source(s): Calculations by the author

Bootstrapping, a reliable resampling method, was used to evaluate the significance of the hypothesized relationships. The structural model analysis (see Figure 3 and Table 7) shows that all four behavior-focused strategies positively and significantly impact academic performance. Specifically, self-goal setting demonstrated the strongest effect on academic performance ($\boldsymbol{\beta = 0.252, p < 0.05, t = 3.955}$), followed by self-reward ($\boldsymbol{\beta = 0.197, p < 0.05, t = 2.872}$), self-cueing ($\boldsymbol{\beta = 0.177, p < 0.05, t = 3.050}$), and self-observation ($\boldsymbol{\beta = 0.147, p < 0.05, t = 2.392}$).

Therefore, hypotheses H1, H2, H3, and H4 are supported. These results emphasize the critical role of self-goal setting in enhancing academic performance, along with the positive effects of self-observation, self-reward, and self-cueing. Together, these results provide compelling evidence for the efficacy of behavior-focused strategies in enhancing students' academic success.

Figure 3. *PLS-SEM Analysis for Structural Model*



Source: Author's own work

Table 7. *Path Analysis*

Hypothesis	Relationship	Path coefficient (β)	Standard deviation (STDEV)	*t* value	*p* value	95% CI BC	
						LB 5.00%	UB 95.00%
H1	SG -> AP	0.252	0.064	3.955	0.000	0.152	0.362
H2	SO -> AP	0.147	0.061	2.396	0.008	0.046	0.249
H3	SR -> AP	0.197	0.068	2.872	0.002	0.083	0.308
H4	SC -> AP	0.177	0.058	3.050	0.001	0.079	0.270

Note. SC = Self-cueing; SG = Self-goal setting; SO = Self-observation; SR = Self-reward; AP = Academic Performance; CI BC = Confidence interval bias corrected; LB = Lower bound; UB = Upper bound
Source(s): Calculations by the author

The structural model reveals an $\boldsymbol{R^2}$ value of 0.50 for academic performance, indicating that self-reward, self-goal setting, self-cueing, and self-observation collectively explain 46.9% of the variance in the successful transition of STEM students. According to the guideline provided by Hair et al. (2022), $\boldsymbol{R^2}$ values of 0.75, 0.50, and 0.25 are categorized as substantial, moderate, and weak explanatory power, respectively. Thus, the $\boldsymbol{R^2}$ value obtained for the successful transition of STEM students reflects a moderate level of explanatory power, emphasizing the meaningful impact of these self-leadership strategies on academic performance.

Table 8 details the $\boldsymbol{f^2}$ values for all combinations of endogenous constructs (columns) and their corresponding exogenous (predictor) constructs (rows). These values indicate the effect sizes of predictor constructs on the variance explained in the endogenous constructs. Based on established guidelines (Cohen, 1988), $\boldsymbol{f^2}$ values are classified into three categories: small effects ($\mathbf{0.02} < \boldsymbol{f^2} \leq \mathbf{0.15}$), medium effects ($\mathbf{0.15} < \boldsymbol{f^2} \leq \mathbf{0.35}$), and large effects ($\boldsymbol{f^2} > \mathbf{0.15}$). Constructs with $\boldsymbol{f^2}$ values below 0.02 are considered to have no measurable impact on the model (Cohen, 1988; Hair et al., 2020, 2021; 2022).

The analysis shows that self-goal setting ($\boldsymbol{f^2} = \mathbf{0.039}$), self-reward ($\boldsymbol{f^2} = \mathbf{0.027}$), and self-cueing ($\boldsymbol{f^2} = \mathbf{0.024}$) each exerts a small yet meaningful effect on the variance in academic performance, underscoring their critical role in explaining differences in CGPA. However, self-observation ($\boldsymbol{f^2} = \mathbf{0.017}$) does not exhibit a significant effect on the variance in academic performance. These findings highlight the varying contributions of behavior-focused strategies to students' academic success.

Table 8. f^2 *Effect Sizes of Predictor Variables in Each Relationship*

	SC	SG	SO	SR	AA
SC					0.024
SG					0.039
SO					0.017
SR					0.027
AP					

Note. SC = Self-cueing; SG = Self-goal setting; SO = Self-observation; SR = Self-reward; AP = Academic Performance
Source: Author's own work

The predictive relevance of the model is subsequently evaluated using $Q^2_{predict}$, which must exceed zero to confirm predictive relevance, as recommended by Hair, Risher et al. (2019). The $Q^2_{predict}$ value for the model's academic performance is 0.457, significantly above the threshold. This confirms the model's predictive relevance, demonstrating its ability to reliably forecast academic performance outcomes.

DISCUSSIONS

This study highlights the impact of behavior-focused self-leadership strategies, precisely self-goal setting, self-observation, self-reward, and self-cueing, on the academic performance of higher education students. The results strongly support their positive role in enhancing self-regulation, motivation, and academic success, particularly among STEM students in Malaysian matriculation colleges.

Key Findings

The results show that self-goal setting has the strongest impact on academic performance among the strategies studied, consistent with previous research emphasizing the importance of clear goals in driving academic success (Boonyarit, 2021; Zakir et al., 2023). Setting specific, measurable objectives helps students focus their efforts effectively. Self-reward and self-cueing also significantly contribute to academic success, highlighting the role of positive reinforcement and consistent reminders in maintaining focus and persistence (Sampl et al., 2017; Napiersky & Woods, 2018). While self-observation positively influences academic performance, its impact is weaker than other strategies, suggesting that monitoring progress alone may not be as effective without proactive goal-setting and motivational support.

Theoretical Implications

This study substantiates the relevance of self-regulation theory within higher education, demonstrating that behavior-focused self-leadership strategies enable students to manage their learning behaviors effectively. The findings reinforce the hierarchical nature of self-regulation, where higher-order goals influence specific learning behaviors, ultimately leading to improved academic performance.

Moreover, by extending self-leadership theory beyond organizational settings, this research provides a novel perspective on how these strategies operate in academic environments. While self-leadership has been widely studied in professional and business contexts, its application in higher education remains underexplored. This study bridges that gap by illustrating how self-goal setting, self-observation, self-reward, and self-cueing function as mechanisms for student self-regulation, offering a structured framework for fostering independent learning.

Contributions to the Literature

By analyzing individual behavior-focused strategies, this study addresses gaps in previous research that treated them as a unified construct. The use of PLS-SEM improves methodological rigor by capturing direct effects. Furthermore, applying self-leadership theory to academic performance extends its relevance beyond organizational settings, providing valuable educational insights.

STUDY IMPLICATIONS AND RECOMMENDATIONS

This study underscores the pivotal role of self-leadership behavior-focused strategies in enhancing students' academic performance. By fostering self-regulatory skills such as goal setting, self-observation, self-reward, and self-cueing, institutions can equip students with essential tools for academic and personal success. The following recommendations provide structured insights for university administrators and policymakers to effectively integrate self-leadership training into educational practices and institutional frameworks.

Educational Practice

Higher education institutions should take a proactive approach to embed self-leadership training into student success programs. Universities should integrate self-leadership modules into core courses, particularly in first-year programs, study skills courses, or career development subjects. This integration ensures that students develop self-regulatory skills from their early academic journey. In addition to curriculum integration, institutions should organize structured self-leadership workshops focusing on goal-setting techniques, self-monitoring strategies, and resilience-building exercises. These workshops can be facilitated by faculty members, career advisors, or industry experts to provide real-world perspectives.

Faculty members should adopt personalized learning approaches by implementing adaptive teaching strategies such as self-paced learning modules, reflection-based assignments, and peer mentoring programs. These methods can reinforce self-leadership strategies and allow students to develop self-regulation techniques at their own pace. Furthermore, universities should establish mentorship programs where students are paired with faculty advisors or senior peers who can guide them in applying self-leadership strategies to overcome academic challenges. To support these initiatives, institutions should develop digital learning platforms that provide self-leadership resources, including video tutorials, interactive assessments, and virtual coaching tools, ensuring continuous access to training materials.

Policy

Policymakers should institutionalize self-leadership training as a core component of student development programs to create a sustainable and effective self-leadership culture in higher education. This can be achieved by integrating self-leadership competencies into institutional learning outcomes and graduate attributes. Adequate funding and resource allocation are essential to successfully implement these programs. Policymakers should provide dedicated funding for faculty training, research on self-leadership interventions, and the development of instructional resources.

Additionally, universities should consider establishing dedicated self-leadership centers that offer workshops, coaching services, and research opportunities focused on self-leadership practices. These centers can serve as hubs for students seeking self-regulation and goal-achievement guidance. Regular assessments of self-leadership initiatives should also be implemented to measure student outcomes, refine training methodologies, and ensure alignment with institutional goals. Continuous evaluation will help improve program effectiveness and inform future best practices.

Policymakers should also promote collaboration between universities and industries to align self-leadership training with workforce demands. Employers can provide insights into the self-regulatory skills required in professional settings, helping universities tailor their programs accordingly. By embedding self-leadership training into institutional practices and national education policies, universities can cultivate a generation of proactive, self-motivated learners who are well-equipped to navigate academic challenges and transition successfully into the workforce.

CONCLUSIONS

In alignment with Sustainable Development Goal (SDG) 4 of the 2030 Agenda for Sustainable Development, which emphasizes inclusive and equitable quality education, this study highlights the critical role of behavior-focused self-leadership strategies in enhancing academic performance among higher education students. The findings demonstrate that self-goal setting, self-observation, self-reward, and self-cueing significantly contribute to academic success, with self-goal setting exerting the most substantial impact. By offering actionable insights for integrating self-leadership strategies into educational frameworks, particularly for STEM students, this study provides a foundation for fostering self-regulation, personal accountability, and academic excellence. Moreover, by strengthening connections between self-leadership and educational leadership practices, this research supports institutional efforts to enhance student success, ensuring higher education systems cultivate independent, resilient learners capable of thriving in an increasingly complex academic and professional landscape.

LIMITATIONS AND FUTURE SCOPE

This study highlights the importance of self-leadership behavior-focused strategies in enhancing academic performance among higher education students. However, several limitations must be addressed to improve the robustness of future investigations. These limitations also open avenues for further research to broaden the understanding of self-leadership strategies in academic contexts. Firstly, one notable limitation is the lack of comparative analysis among students from different academic streams. Future studies could explore the differential impacts of self-leadership behavior-focused strategies on students from varying disciplines, such as arts and STEM, particularly in matriculation colleges. Such comparative analyses could uncover stream-specific dynamics that influence the effectiveness of these strategies. Secondly, the exclusive use of an online survey as the sole data collection method imposes limitations on the depth of insights obtained and may inadvertently exclude students less inclined to engage with this format. The self-reported nature of the survey introduces the possibility of response bias, as students may either overestimate or underestimate their self-leadership abilities. Future studies should adopt a mixed-methods approach, incorporating interviews or focus groups alongside surveys. This combination would provide richer qualitative data and improve the overall reliability of findings.

Next, this study did not account for academic anxiety as a potential mediating variable in the relationship between self-leadership strategies and academic performance. Given that a significant proportion of higher education students (88.4%) report experiencing anxiety during their transition to higher education, future research should examine how academic anxiety mediates this relationship. Incorporating this mediating factor could provide a more nuanced understanding of the mechanisms driving academic outcomes. In addition, the study also does not consider moderating variables that might influence the relationship between self-leadership behavior-focused strategies and academic performance. Gender, cultural background, socioeconomic status, and learning styles could be significant in moderating this association. Future research should investigate these variables to identify potential subgroup differences, ensuring the development of more tailored and effective interventions.

Moreover, this study focuses exclusively on behavior-focused strategies, leaving other components of self-leadership underexplored. Self-leadership comprises three core strategies: behavior-focused strategies, natural reward strategies, and constructive thought pattern strategies. Future research should examine the contributions of natural reward and constructive thought pattern strategies to academic performance, potentially offering a more comprehensive framework for enhancing student performance. Finally, while the study emphasizes academic performance, it overlooks the broader impact of self-leadership strategies on student well-being. Subsequent research could investigate how these strategies influence mental health, resilience, and life satisfaction among higher education students. This holistic approach would provide valuable insights into fostering both academic success and overall well-being.

Addressing these limitations will enrich the understanding of self-leadership strategies in academic settings. Future research incorporating mediating and moderating variables broadens the scope of self-leadership strategies and explores interdisciplinary comparisons will not only strengthen the empirical foundation of this field but also provide actionable insights for educators and policymakers. This broader perspective will help create supportive environments where students can thrive academically and personally.

INSTITUTIONAL REVIEW BOARD STATEMENT

The Ethical Committee of the [Faculty of Education, Universiti Malaya], MALAYSIA has granted approval for this study on DATE July 04, 2024 (Ref. No. UM.P/PTD(IT)/6441/1).

REFERENCES

Adamuti-Trache, M., Bluman, G., & Tiedje, T. (2013). Student success in first-year university Physics and Mathematics courses: Does the high-school attended make a difference? *International Journal of Science Education*, *35*(17), 2905–2927. https://doi.org/10.1080/09500693.2012.667168

Arnhold, N. (2021, October 22). *Higher education*. World Bank.

Bacon, D. R., & Bean, B. (2006). GPA in research studies: An invaluable but neglected opportunity. *Journal of Marketing Education*, *28*(1), 35–42. https://doi.org/10.1177/0273475305284638

Bjerke, R. (2024). The multiple advantages of self-leadership in higher education: The role of health-promoting self-leadership among executive MBA students. *Administrative Sciences, 14*(9), 1 - 21. https://doi.org/10.3390/admsci14090211

Boonyarit, I. (2021). When learners lead themselves: A psychometric investigation of the revised self-leadership questionnaire in Thais. *PsyCh Journal*, *10*(3), 478–490. https://doi.org/10.1002/pchj.435

Carver, C. S. (2001). Affect and the functional bases of behavior: on the dimensional structure of affective experience. *Personality and Social Psychology Review*, *5*, 345–356.

Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation: A control theory approach to human behavior*. Springer-Verlag.

Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. Cambridge University Press.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences second edition* (Second). Erlbaum.

Coronella, T. (2022). Work in progress: Effect of pre-college academic activities on the sense of belonging of first-year engineering students. *2022 ASEE Annual Conference & Exposition*, 1–15. https://www.slayte.com

De Clercq, M., Parmentier, M., & Van Meenen, F. (2022). Fair enough?! Investigating the specific challenges of diverse university first-year students. *Research Papers in Education*, *39*(1), 113–133. https://doi.org/10.1080/02671522.2022.2089214

EPRD. (2023). *2023 Malaysia educational statistics*. https://www.moe.gov.my/menumedia/media-cetak/penerbitan/buku-perangkaan-pendidikan-malaysia

García-Ros, R., Pérez-González, F., Cavas-Martínez, F., & Tomás, J. M. (2019). Effects of pre-college variables and first-year engineering students' experiences on academic achievement and retention: A structural model. *International Journal of Technology and Design Education*, *29*(4), 915–928. https://doi.org/10.1007/s10798-018-9466-z

Geisler, S., & Rolka, K. (2021). "That wasn't the Math I wanted to do!"—Students' beliefs during the transition from school to University Mathematics. *International Journal of Science and Mathematics Education*, *19*(3), 599–618. https://doi.org/10.1007/s10763-020-10072-y

Göksoy, S. (2015). Distributed leadership in educational institutions. *Journal of Education and Training Studies, 3*(4), 110–118. https://doi.org/10.11114/jets.v3i4.851

Hair, J., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (Eight). Cengage Learning.

Hair, J. F., Howard, M. C., & Nitzl, C. (2020). Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research*, *109*, 101–110. https://doi.org/10.1016/j.jbusres.2019.11.069

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). *A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (3rd ed.). SAGE Publications.

Hair, J. F., Hult, T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) using R: A workbook*. Springer Nature.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice*, *19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Haisten, J. M. (2008). *Self-leadership skills in academically underprepared students in a Florida Community College setting*. Walden University. https://www.proquest.com/openview/791c3a3870136769a3830a63e68208e5/1?pq-origsite=gscholar&cbl=18750

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review*, *94*(3), 319–340. https://doi.org/10.1037/0033-295X.94.3.319

Higgins, E. T. (1989). Self-discrepancy theory: What patterns of self-beliefs cause people to suffer? *Advances in Experimental Social Psychology*, *22*, 83–136. https://doi.org/10.1016/S0065-2601(08)60306-8

Higgins, E. T. (1996). Knowledge activation: Accessibility, applicability, and salience. In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 133–168). Guildford.

Higgins, E. T. (1998). Promotion and prevention: Regulatory focus as a motivational principle. *Advances in Experimental Social Psychology*, *30*, 1–46. https://doi.org/10.1016/S0065-2601(08)60381-0

Houghton, J. D., & Neck, C. P. (2002). The revised self-leadership questionnaire: Testing a hierarchical factor structure for self-leadership. *Journal of Managerial Psychology*, *17*(8), 672–691. https://doi.org/10.1108/02683940210450484

Houghton, J. D., Dawley, D., & DiLiello, T. C. (2002). The abbreviated self-leadership questionnaire (ASLQ): A more concise measure of self-leadership. *International Journal of Leadership Studies*, *7*(2), 216-232. https://doi.org/10.1108/02683940210450484

Hulland, J. (1999). Use of partial least squares (PLS) in strategic management research: A review of four recent studies. *Strategic Management Journal*, *20*(2), 195–204. https://doi.org/10.1002/(SICI)1097-0266(199902)20:2<195::AID-SMJ13>3.0.CO;2-7

Ioannis, P. (2019). Factor validity and reliability of the revised self-leadership questionnaire in a Greek sample. *Journal of Physical Education and Sports Management*, *6*(2), 41–48. https://doi.org/10.15640/jpesm.v6n2a5

Kim, J.-I. (2018). The effects of emotional intelligence, self-leadership, psychological well-being to academic achievement of nursing college student. *Journal of the Korea Academia-Industrial Cooperation Society*, *19*(12), 574–583. https://doi.org/10.5762/KAIS.2018.19.12.574

Kokaua, J., Sopoaga, F., Zaharic, T., & Van der Meer, J. (2014). The development of a pre-enrolment screening tool to inform targeted support services in the first year in health sciences. *The International Journal of the First Year in Higher Education*, *5*(1), 55–66. https://doi.org/10.5204/intjfyhe.v5i1.205

Kosiol, T., Rach, S., & Ufer, S. (2019). (Which) Mathematics interest is important for a successful transition to a university study program? *International Journal of Science and Mathematics Education*, *17*(7), 1359–1380. https://doi.org/10.1007/s10763-018-9925-8

Krejcie, R. V, & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*, 607–610.

Kroshus, E., Hawrilenko, M., & Browning, A. (2021). Stress, self-compassion, and well-being during the transition to college. *Social Science and Medicine*, *269*, 113514. https://doi.org/10.1016/j.socscimed.2020.113514

Lin, S., Mastrokoukou, S., Longobardi, C., Bozzato, P., Gastaldi, F. G. M., & Berchiatti, M. (2023). Students' transition into higher education: The role of self-efficacy, regulation strategies, and academic achievements. *Higher*

Education Quarterly, *77*(1), 121–137. https://doi.org/10.1111/hequ.12374

Ling, X., Bai, Y. J., Li, B. B., & Yang, Z. (2023). The application of distributed leadership in middle school classroom. *Frontiers in Education, 8* (1200792). https://doi.org/10.3389/feduc.2023.1200792

Liu, C., & Huang, J.-H. (2023). The impact of college students' perceived transformational leadership on learning outcomes: The serial mediating role of academic self-efficacy and achievement goal orientation. *Higher Education Studies, 13*(4), 1–14. https://doi.org/10.5539/hes.v13n4p1

Marshall, G., Kiffin-Petersen, S., & Soutar, G. (2012). The influence personality and leader behaviours have on teacher self-leadership in vocational colleges. *Educational Management Administration and Leadership*, *40*(6), 707–723. https://doi.org/10.1177/1741143212456910

Matriculation Division. (2022). *Pelan transformasi program matrikulasi Kementerian Pendidikan Malaysia 2021 - 2025*.

Milienos, F. S., Rentzios, C., Catrysse, L., Gijbels, D., Mastrokoukou, S., Longobardi, C., & Karagiannopoulou, E. (2021). The contribution of learning and mental health variables in first-year students' profiles. *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.627118

Moss, S. A., Dowling, N., & Callanan, J. (2009). Towards an integrated model of leadership and self-regulation. *The Leadership Quarterly, 20*(2), 162–176. https://doi.org/10.1016/j.leaqua.2009.01.005

Napiersky, U., & Woods, S. A. (2018). From the workplace to the classroom: Examining the impact of self-leadership learning strategies on higher educational attainment and success. *Innovations in Education and Teaching International*, *55*(4), 441–449. https://doi.org/10.1080/14703297.2016.1263232

Napitupulu, H., Sudibjo, N., Sinaga, P., & Antonio, F. (2024). Behavioral-focused strategy: Mediating the effect of motivation on research performance. *International Journal of Religion, 5*(11), 2083–2095. https://doi.org/10.61707/h36w4p43

Neck, C. P., & Houghton, J. D. (2006). Two decades of self-leadership theory and research: Past developments, present trends, and future possibilities. *Journal of Managerial Psychology*, *21*(4), 270–295. https://doi.org/10.1108/02683940610663097

Neck, C. P., & Manz, C. C. (1992). Thought self-leadership: The influence of self-talk and mental imagery on performance. *Journal of Organizational Behavior*, *13*, 681–699.

Neck, C. P., & Manz, C. C. (2004). *Mastering self-leadership: Empowering yourself for personal excellence* (3rd ed.). Pearson Prentice Hall.

Neck, C. P., Manz, C. C., & Houghton, J. D. (2017). *Self-leadership: The definitive guide to personal excellence*. Sage Publications.

Parker, J. D. A., Saklofske, D. H., & Keefer, K. V. (2017). Giftedness and academic success in college and university: Why emotional intelligence matters. *Gifted Education International*, *33*(2), 183–194. https://doi.org/10.1177/0261429416668872

Powers, W. T. (1973). *Behavior: The control of perception*. Aldine Press.

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin*, *138*(2), 353–387. https://doi.org/10.1037/a0026838

Sampl, J., Maran, T., & Furtner, M. R. (2017). A randomized controlled pilot intervention study of a mindfulness-based self-leadership training (MBSLT) on stress and performance. *Mindfulness*, *8*(5), 1393–1407. https://doi.org/10.1007/s12671-017-0715-0

Sarstedt, M., Hair, J. F., Ringle, C. M., Thiele, K. O., & Gudergan, S. P. (2016). Estimation issues with PLS and CBSEM: Where the bias lies! *Journal of Business Research*, *69*(10), 3998–4010. https://doi.org/10.1016/j.jbusres.2016.06.007

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial least squares structural equation modeling. In C. Homburg, M. Klarmann, & A. Vomberg (Eds.), *Handbook of market research* (pp. 1–40). Springer International Publishing. https://doi.org/10.1007/978-3-319-05542-8_15-1

Shava, G. N., & Tlou, F. N. (2018). Distributed leadership in education: Contemporary issues in educational leadership. *International Journal of Educational Sciences, 21*(1-3), 1–10.

UNDP. (2023). *Goal 4: Quality Education*. United Nations Development Programme (UNDP).

https://www.undp.org/sustainable-development-goals/quality-education?gclid=CjwKCAiA3pugBhAwEiwAWFzwdXWVZpUNP6eHhWwwEpQF3pynzHAHpkSzwri78aVJdTVfx8h1U6SjKxoCdWkQAvD_BwE

UNESCO. (2022a). *Policy brief: The contribution of higher education institutions to lifelong learning*. https://unesdoc.unesco.org/ark:/48223/pf0000381924

UNESCO. (2022b, May 18). Higher education global data report (summary). *World Higher Education Conference*.

Uzman, E., & Maya, İ. (2019). Self-leadership strategies as the predictor of self-esteem and life satisfaction in university students. *International Journal of Progressive Education*, *15*(2), 78–90. https://doi.org/10.29329/ijpe.2019

Vaeazi, M., Mazari, E., Khabareh, K., Zadeh, M. A., & Shalbaf, A. (2016). Factor analysis of student's self-leadership strategies and their relationship with academic performance (Case: Birjand University students of Science and Literature). *New Educational Approaches*, *10*(2), 1–20.

Wilcox, G., & Nordstokke, D. (2019). Predictors of university student satisfaction with life, academic self-efficacy, and achievement in the first year. *Canadian Journal of Higher Education*, *49*(1), 104–124.

Woods, S. A., Napiersky, U., & Rivkin, W. (2022). Learning to self-lead: Examining self-leadership strategies, personality traits, and learning attainment. *Applied Psychology, 72*(3), 1324–1338. https://doi.org/10.1111/apps.12422

Wu, M. J., Zhao, K., & Fils-Aime, F. (2022). Response rates of online surveys in published research: A meta-analysis. *Computers in Human Behavior Reports*, *7*. https://doi.org/10.1016/j.chbr.2022.100206

Yusoff, M. S. B. (2019). ABC of content validation and content validity index calculation. *Education in Medicine Journal*, *11*(2), 49–54. https://doi.org/10.21315/eimj2019.11.2.6

Yüner, B. (2020). Transformational teaching in higher education: The relationship between the transformational teaching of academic staff and students' self-efficacy for learning. *Educational Policy Analysis and Strategic Research, 15*(4), 350–366. https://doi.org/10.29329/epasr.2020.323.20

Zakir, S., Khan, S., & Siraj, D. (2023). Relationship between self-leadership and academic performance of students: Empirical evidence from public sector universities in AJ&K. *Pakistan Journal of Humanities and Social Sciences*, *11*(4), 4598–4604. https://doi.org/10.52131/pjhss.2023.v11i4.1914

Zheng, R. X., Everett, B., Glew, P., & Salamonson, Y. (2014). Unravelling the differences in attrition and academic performance of international and domestic nursing students with English as an additional language. *Nurse Education Today*, *34*(12), 1455–1459. https://doi.org/10.1016/j.nedt.2014.04.021