



Causal Models Related to the Development of Self-Directed Learning Behaviour Among Undergraduate Students in Thailand

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ABSTRACT

Aim: The cultivation of self-directed learning behaviour involves nurturing learners' interests according to their goals and needs, empowering them to take ownership and determine their own approaches to learning. **Methods:** This method allows students to develop skills in managing themselves, monitoring their progress, and evaluating their own work, leading to enhanced academic performance. This study focused on examining the relationships, comparing, and analysing the path of self-directed learning behaviour among a sample of 400 undergraduate students. A multi-stage random

sampling method was utilised, and the sample size was determined using the G*POWER programme. Information was gathered using 11 psychometric rating scales, which had reliability levels ranging from 0.74 to 0.82. To assess their accuracy, a confirmatory factor analysis was conducted. **Results:** The results indicate that the model displayed structural relationships and provided support for all three hypotheses. The model fit indices were as follows: $\chi^2 = 16.173$, $df = 10$, $P\text{-Value} = 0.094$, $RMSEA = 0.027$, $CFI = 0.999$, $TLI = 0.995$, $SRMR = 0.012$. The coefficient of determination for self-directed learning was 0.812, indicating a strong correlation. **Conclusion:** Furthermore, there were strong correlations between goal setting and learning planning, as well as achievement motivation and self-directed learning behavior. At last, the researchers put forward guidelines for cultivating self-directed learning behaviour, which can lead to enhanced academic performance.

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Introduction

In order to navigate the ever-changing and challenging world, organisations have recognised the importance of educational development. This focus on learning and growth serves as a crucial building block for developing their human resources. Thus, it is crucial for those involved in education to reevaluate, modify, and enhance learning methods in order to provide learners with the essential skills and competencies needed to adapt to the ever-evolving global society and be prepared for current and future transformations. Educational institutions, with their vital role in developing human resources, need to

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redirect their attention towards the learning processes of students rather than just knowledge acquisition. One method emphasised for developing learning processes is self-directed learning (SDL).

SDL is a process in which learners take the initiative to analyse and determine what they need to learn. Afterwards, individuals establish learning objectives, determine strategies for achieving success, and assess their accomplishments and educational outcomes. SDL is an educational management approach that prioritises the needs and interests of students. It empowers learners to pursue their own goals and interests, rather than having their goals dictated by others. Students are responsible for directing and managing their own learning, according to Brookfield (2009). Thus, SDL is a crucial learning method that should be encouraged among learners. When individuals have a deep enthusiasm for studying based on their personal interests, it results in a constant pursuit of knowledge without the need for external motivation. This cultivates an unquenchable thirst for learning, ultimately leading to a lifelong commitment to education and personal growth.

Moreover, SDL improves learning outcomes by incorporating self-management, self-monitoring, and motivation, leading to increased academic success (Cazan & Schiopca, 2014). This finding aligns with prior research that highlights the positive influence of SDL on academic performance. It suggests that individuals who engage in SDL demonstrate enthusiasm, perseverance, and responsibility towards their learning. They also find enjoyment in self-study or studying with peers, and actively apply or experiment with the knowledge they have acquired. As a result, implementing SDL principles can be a valuable tool for enhancing knowledge, skills, and academic accomplishments, as well as future job performance (Rashid & Asghar, 2016).

Based on the above discussion, the focus of this study was to analyse the paths of influence of factors that impact the self-directed learning behaviour of undergraduate students. Through a thorough analysis of the influential factors, the researchers aimed to gain insight into the connections between the variables and determine the main and supporting factors, while also considering their alignment with prior studies. This information can help in the development of self-directed learning models for undergraduate students, which can lead to better academic achievement and provide policy recommendations for stakeholders involved.

Literature Review

The idea of self-directed learning stems from the theory of adult learning (Andragogy) (El-Amin, 2020). SDL is a learning approach where learners take charge of their own education. They actively plan, set objectives, choose methods, and evaluate their progress. This learning process is driven by the learners themselves, who take the initiative to acquire knowledge in areas where they feel they lack understanding. It is a self-directed approach, where learners determine what knowledge is essential for their own development. Teachers play a role as facilitators and co-learners, offering learners support and guidance in suitable learning environments (Murray, 2010). Self-directed learning (SDL) refers to a process where learners assess their learning needs, establish learning objectives, independently acquire knowledge from diverse sources, and adapt their behaviour accordingly. This approach enables learners to comprehend subjects of interest, potentially fostering lifelong learning. SDL is widely recognised as an effective and sustainable

method of learning. SDL, or self-directed learning, is an educational approach where learners assume a significant level of responsibility, exercise self-control, and engage in independent learning (Tekkol & Demirel, 2018).

SDL is associated with higher academic achievement. SDL learners demonstrate skills such as information retrieval, knowledge seeking, and exploration of personal interests. These traits contribute to the acquisition of knowledge, understanding, and the ability to explain and compare concepts, ultimately leading to the ability to draw conclusions and perform tasks (Kim & Lim, 2021). During the initial phases of SDL development, educators and parents have a vital role in serving as role models, offering guidance, fostering motivation, and establishing supportive learning environments to facilitate the SDL process.

As per the research conducted by Cazan et al. (2014), individuals with self-directed learning behaviour can be classified into three distinct types: 1) Taking the initiative to learn on one's own, shown through behaviours like displaying curiosity and eagerness to learn, engaging in voluntary learning driven by a thirst for knowledge, analysing personal learning needs, setting individual learning objectives, and choosing suitable learning methods and resources; 2) Exercising self-discipline, demonstrated through behaviours or characteristics that reflect responsibility, dedication to achieving goals, determination to complete tasks punctually, willingness to take ownership of work and personal growth, having a positive self-image, and having confidence in one's abilities to accomplish self-directed tasks; and 3) Developing strong skills in seeking knowledge and accessing desired learning is crucial. It involves selecting the right learning resources, evaluating the credibility of information sources, and actively working towards unlocking one's hidden potential.

Individuals with self-directed learning behaviour exhibit traits such as self-confidence, motivation, and the ability to diagnose and analyse their needs. The individuals demonstrate a strong inclination and drive to acquire knowledge and enhance their abilities. They possess an inherent motivation for learning that is not influenced by external factors. They have the autonomy to initiate their own self-directed learning. They display a keen interest in acquiring knowledge and are able to recognise and embrace their own unique characteristics. Furthermore, individuals possess self-reliance and self-awareness, demonstrating a strong commitment to cultivating their potential. They exhibit responsibility and possess the ability to effectively plan and manage their learning endeavours. Additionally, they exhibit strong interpersonal relationships with their peers, instructors, and advisors, and possess the ability to self-evaluate.

Personal Factors Consist of 4 Variables

Self-efficacy refers to an individual's belief in their ability to respond to a situation or perform a specific task. The process of linking knowledge with action leads to outcomes that vary based on the following components: The factors influencing behaviour performance include the difficulty level, self-efficacy, and the ability to apply previous successful experiences to new situations (Criu & Marian, 2014). Individuals with high self-efficacy are more inclined to engage in self-directed learning behaviour due to their ability to assess their own abilities in specific areas.

Learning habits are ingrained behaviours that develop through repeated actions, thoughts, speech, or simultaneous actions. Over time, these behaviours become patterns in an individual's learning process. Examples of habits that contribute to effective learning include perseverance, attentiveness, reading habits, and lifelong learning (Vilanova & Ponsa, 2011).

Achievement motivation refers to an individual's conscious and intentional drive to successfully accomplish goals at a high level, while adhering to high standards. The concept involves striving to meet and exceed standards in order to outperform others. The driving force behind behaviour is characterised by determination, ambition, enthusiasm in work, responsibility for duties, and perseverance in overcoming obstacles with the hope of success rather than the fear of failure. Individuals with high achievement motivation often exhibit high levels of self-directed learning (Bhanthumnavin, 2024; Sakdapat, 2024b; Singh, 2011).

The concept of Future Time Perspective and Self-Control refers to the behaviour of anticipating better future outcomes, also known as Delay of Gratification. Self-control is the result of an individual's capacity to make long-term predictions and recognise the significance of future consequences. The desire for improved future outcomes is greater than the desire for current ones. This leads individuals to strategically plan and exert self-control in order to effectively execute their plan towards the desired future objective (Bembenutty & Karabenick, 1998; Bhanthumnavin, 2024).

Environmental Factors Consist of 4 Variables

Peer relationships involve the way individuals connect with one another, which can be seen through their cooperation, sharing of opinions, acceptance of each other, and ability to collaborate. It encompasses the dynamic exchange of behaviour between individuals, fostering connection, empathy, and shared understanding. This leads to the development of relationships that promote social integration, embrace diversity, uphold others' rights, and encourage mutual support and reliance. The elements at play include: 1) consideration and support for one another, 2) reliance, 3) embracing differences, 4) active involvement and collaboration, 5) adaptability, and 6) understanding and compassion for others (Saeid & Eslaminejad, 2017).

The arrangement of the classroom environment plays a crucial role in promoting effective teaching and learning. It not only stimulates interest and desire to learn but also fosters discipline in learners (Sze-Yeng & Hussain, 2010). The key elements include: 1) a challenging environment, 2) a sense of freedom, 3) mutual respect, 4) a warm atmosphere, 5) a sense of control, and 6) a culture of achievement.

Developing a Sense of Accountability Role models involve being influenced by exemplary individuals who demonstrate responsibility in learning, successfully meeting set timeframes and goals, and accepting both positive and negative outcomes as lessons to improve one's actions (Greene & Isaacs, 1998). There are certain individuals who can be seen as exemplary figures to look up to: 1) Parents, 2) Teachers, 3) Peers or surrounding individuals, and 4) People in society and the social environment.

The teacher plays a crucial role in education, with a focus on nurturing 21st century skills in students. This involves prioritising learner-centeredness and adopting the Active Learning approach. The course content is designed to encourage learners to take ownership of their learning process and develop their own learning behaviours (van Hout-Wolters et al., 2000). The teacher's process focuses on developing learning innovation models that empower learners to apply knowledge in real-life situations, which kickstarts the formation of self-directed learning behaviours (Silen & Uhlin, 2008). Teachers can serve as role models for learners, guiding them to adopt and follow advice. They can also encourage learners to develop their own learning processes in specific subject areas. Additionally, teachers can create a positive motivation for learning, helping learners apply their knowledge in their daily lives. Lastly, teachers can show

attentiveness, promoting learners' development and exploration of their interests.

Learning Process Factors Consist of 2 Variables

Goal Setting and Learning Planning is a process initiated by learners themselves. Students carefully assess their learning requirements to align with their personal interests, establish clear learning objectives, organise learning materials, strategize the order of their learning activities, and understand the purpose and advantages of their learning endeavours. This provides learners with a clear sense of purpose and guidance for their learning journey (Hematian et al., 2017).

Execution and Evaluation involves implementing the learning plan to maximise learning potential. Students reflect on their progress towards their learning objectives and make adjustments to their methods or approaches in order to enhance their learning process (Brandt, 2020; Li et al., 2023).

Biological, social, and demographic Background factors include gathering information about students' general details, such as their gender, age, faculty, major, GPA, number of siblings, accommodation type, and parents' education levels, etc.

Hypotheses

The researcher combined the Theory of Planned Behaviour (TPB) (Ajzen, 1991), a psychological theory commonly used to analyse behaviour, with the Interactionism Model (Tett & Burnett, 2003), which examines behaviour by considering psychological causes and situational factors. The researcher utilised both concepts as the primary framework for selecting interrelated variable groups, drawing from theory and past research, with the following details:

H1: Personal factor groups have a direct influence on self-directed learning, and/or environmental factor groups have a direct influence on self-directed learning behaviour.

H2: Learning process factor groups have a direct influence on self-directed learning behaviour.

H3: Personal factor groups have an indirect influence through environmental factors and/or an indirect influence through learning process factors on self-directed learning behaviour.

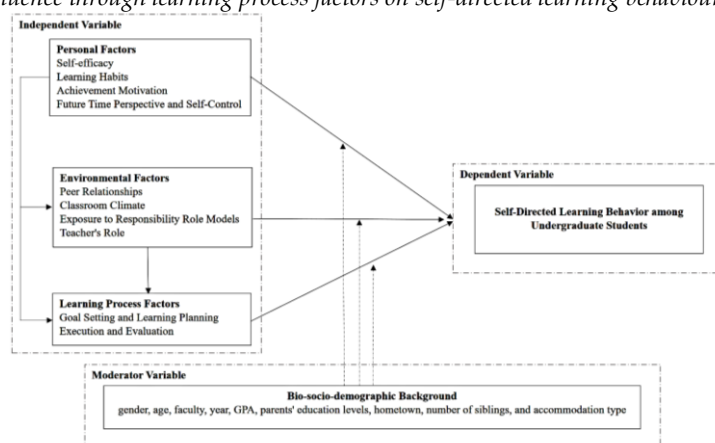


Figure 1: Conceptual Framework.

Methodology

Research Design

This study employs a quantitative research approach, utilising a comparative correlational design to examine the causal pathways of different factors. These factors encompass personal factors, environmental factors, learning process factors, mediating variables, and self-directed learning behaviour. The study utilised 11 summated rating scales, with participants providing self-reported responses. The scales were divided into three sets (A, B, and C), with the order of items randomised in each set to ensure accuracy and fairness in the data collection process.

Sample

The study included a group of undergraduate students. The sample size was determined using G*POWER (Faul et al., 2009), with an effect size of 0.05, a significance level of 0.05, and a power of 0.90. This calculation yielded a minimum sample size of 400 participants. A multi-stage sampling method (Wang et al., 2006) was used to ensure sufficient representation. The method involved the following steps: The study employs the following sampling procedures. 1) randomly selecting 6 public and 6 private universities, 2) selecting faculties from these universities, including Business, Humanities, Engineering, and Science, 3) selecting undergraduate students from years 1 to 4, 4) stratifying the students based on their GPA (high > 3.00 and low ≤3.00), and using simple random sampling within each GPA stratum, and 5) including students who are enrolled in courses that focus on the development of self-directed learning behaviour based on course descriptions and learning activities. Data collection occurred in the first and second semesters of the 2023 academic year.

Instruments and Ethical Considerations

The study employed 11 measurement instruments (Table 1), comprising of statements rated on a 6-point scale ranging from "completely true" to "completely untrue". The items were developed based on a comprehensive review of the literature, considering the unique attributes of each variable and building upon prior research studies. In order to ensure the face and content validity of the study, only items that demonstrated high discriminant validity were chosen. Additionally, the reliability of each instrument met the required statistical criteria. The instruments underwent pilot testing with a sample of 160 students similar to the target population. Confirmatory factor analysis was conducted, and each scale met at least 3 out of 5 criteria (Brown, 2015). The instruments obtained ethical approval from the University of the Thai Chamber of Commerce (Research Project Code IRB/A04046/2023).

Data Analysis

Correlation analysis (Gogtay & Thatte, 2017) was employed to investigate the associations between variables. Path analysis with a linear structural relationship model using latent variables (Lleras, 2005) was utilised to assess the hypothesis of model fit to the empirical data and to verify if the model fit indices meet the specified criteria.

Table 1*Quality of Measurement Instruments.*

Variable Name	No	α	Confirmatory Factor Analysis						
			χ^2	df	P-value ($p > 0.05$)	Rmsea (≤ 0.06)	CFI (≥ 0.95)	TLI (≥ 0.95)	SRMR (≤ 0.08)
1. Self-Directed Learning*	12	0.82	75.54	68	0.16	0.04	0.96	0.95	0.07
2. Goal Setting and Learning Planning*	12	0.81	62.47	57	0.21	0.03	0.96	0.96	0.06
3. Execution and Evaluation*	12	0.82	65.92	50	0.24	0.04	0.97	0.95	0.07
4. Self-Efficacy*	12	0.78	68.34	49	0.21	0.03	0.98	0.96	0.07
5. Self-Directed Learning Habits*	12	0.79	63.59	53	0.19	0.05	0.96	0.95	0.08
6. Achievement Motivation	12	0.80	62.68	45	0.22	0.04	0.97	0.95	0.08
7. Future Time Perspective and Self-Control	12	0.81	61.83	51	0.23	0.03	0.96	0.96	0.07
8. Peer Relationships*	12	0.80	62.48	49	0.25	0.04	0.97	0.96	0.07
9. Classroom Climate*	12	0.78	63.43	48	0.20	0.03	0.97	0.95	0.06
10. Exposure to Responsibility Role Models*	12	0.75	59.62	47	0.22	0.03	0.98	0.97	0.07
11. Teacher's Role*	12	0.74	42.84	51	0.21	0.04	0.97	0.96	0.07

Note: *Scales developed by the researcher **This research emphasizes t-values more than r-values. The criteria for item selection are $t \geq 2.00$ and $r \geq 0.20$, CFA passes 3 out of 5 criteria, especially when the χ^2 value is not statistically significant

Table 2*Means, Standard Deviations, Correlation Coefficients of Various Variables in the Total Group (N=400).*

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1.	65.545	8.252	1										
2.	62.635	7.585	.652	1									
3.	61.512	7.327	.591	.522	1								
4.	62.420	8.493	.534	.528	.625	1							
5.	59.654	7.258	.518	.458	.624	.528	1						
6.	61.375	7.691	.612	.532	.518	.515	.554	1					
7.	58.982	8.652	.285	.269	.263	.239	.285	.221	1				
8.	60.337	7.364	.384	.537	.378	.596	.658	.623	.532	1			
9.	59.684	7.481	.257	.219	.252	.227	.289	.259	.284	.201	1		
10.	60.862	7.652	.529	.523	.478	.492	.645	.641	.586	.582	.496	1	
11.	63.252	8.357	.218	.253	.312	.288	.259	.283	.285	.295	.269	.238	1

Note: * $p < .05$, ** $p < .01$, Variable: 1. Self-directed Learning Behavior 2. Goal Setting and Learning Planning 3. Execution and Evaluation 4. Self-Efficacy 5. Self-Directed Learning Habits 6. Achievement motivation 7. Future Time Perspective and Self-Control 8. Peer Relationships 9. Classroom Climate 10. Exposure to Responsibility Role Models 11. Teacher's Role

Table 3*Direct And Indirect Effects of Personal Factors, Environmental Factors, and Learning Factors on the Self-Directed Learning Variable.*

Independent Variable		Dependent Variable in Model					
		Learning Process Factors			Self-directed Learning Behavior		
		DE	IE	TE	DE	IE	TE
Learning Process Factors	β	----	----	----	2.020	----	----
	S.E.	----	----	----	3.553	----	----
	b	----	----	----	0.914	----	----
Environmental Factors	β	0.562	----	0.562	0.890	9.808	18.183
	S.E.	0.853	----	0.853	2.132	2.909	1.213
	b	0.876	----	0.876	2.743	5.525	12.183
Personal Factors	β	0.834	----	2.216	0.897	7.537	18.819
	S.E.	0.801	----	3.898	2.402	4.914	4.222
	b	0.925	----	0.925	2.402	5.571	21.320
R ²		0.720			0.812		

Note: all coefficients are significant, DE = direct effect, IE = indirect effect, TE = total effect, R² = correlation coefficient

Table 4

Parameter Estimates and Related Statistics for Testing the Validity of the Causal Relationship Model of the Self-Directed Learning Behavior Variable.

Independent Variable and Dependent Variable	Estimated Parameter Value			
	Factor Loading (b)	S.E.	Standard Factor Loading (ρ)	t
Measurement Models				
Self-Directed Learning	0.73	0.03	0.57	41.79***
Environmental Factors				
Peer Relationships	0.96	0.03	0.43	28.66***
Classroom Climate	1.63	0.17	0.55	42.18***
Exposure to Responsibility Role Models	1.18	0.14	0.50	33.28***
Teacher's Role	1.00	0.01	0.67	52.97***
Personal Factors				
Self-efficacy	1.00	0.02	0.44	66.02***
Learning Habits	1.00	0.01	0.32	78.62***
Achievement Motivation	0.67	0.03	0.68	24.63***
Future Time Perspective and Self-Control	1.00	0.01	0.13	9.39***
Learning Process Factors				
Goal Setting and Learning Planning	1.15	0.03	0.25	38.66***
Execution and Evaluation	0.91	0.04	0.50	35.00***
Structural Equation Modeling				
Personal Factors → Environmental Factors	6.19	1.59	0.98	15.36***
Environmental Factors → Learning Process Factors	7.74	0.26	0.87	4.20***
Personal Factors → Learning Process Factors	4.21	3.89	0.92	5.46***
Learning Process Factors → Self-Directed Learning	8.02	1.91	0.91	4.12***
Personal Factors → Self-Directed Learning	3.56	0.85	0.89	6.25***
Environmental Factors → Self-Directed Learning	8.83	1.80	0.89	5.75***

Note: *p<.05, ***p<.001

Table 5

Latent Model Fit Indices (Model Fit Information).

Statistics	Criteria	Model Fit Indices
Chi-Square Value	No Statistical Significance	16.173
Degrees of Freedom	No Statistical Significance	10
P-Value	No Statistical Significance	0.094
Root Mean Square Error of Approximation	≤ .06	0.027
Comparative Fit Index	≥ .95	0.999
Tucker - Lewis Index	≥ .95	0.995
Standardized Root Mean Square	≤ .08	0.012

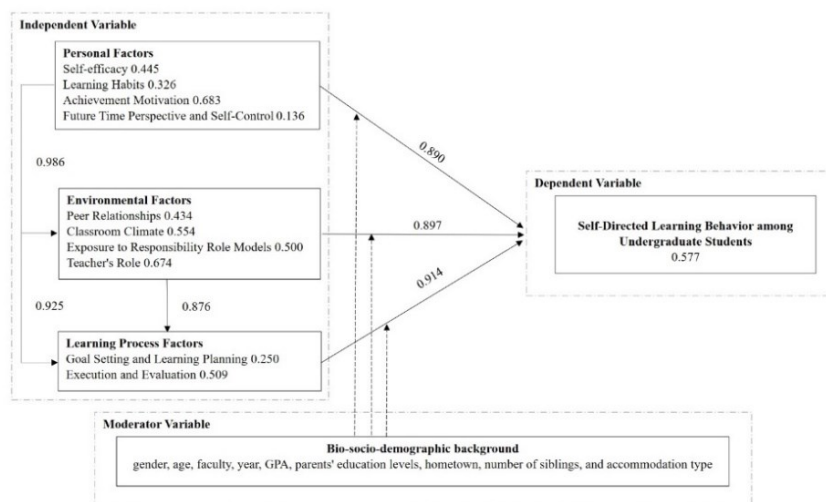


Figure 2: Results of Testing the Fit of Personal Factors, Environmental Factors, and Learning Process Factors Affecting Self-Directed Learning Behavior of Undergraduate Students.

(N=400, all influence coefficients and component weights are significant at .05 level)

Results

The study gathered data from a sample of 446 individuals, resulting in 400 valid responses after screening. Based on the preliminary sample characteristics, 52.25% of the participants were female. The average age of the participants was 20 years and 2 months (SD = 1.015). The majority of the participants (26.75%) were from engineering faculties. Most of the participants had high GPAs (GPAX>3.00, 74.00%). Additionally, 58.75% of the participants had siblings, while 43.26% lived with their parents. Furthermore, 53.00% of the fathers and 56.75% of the mothers had an education level lower than a bachelor's degree.

The correlation analysis results (Table 2) indicate that the goal setting and learning planning variable pair had the highest correlation coefficient of 0.652 ($p < .01$), followed by the achievement motivation variable pair at 0.652 ($p < .01$). The correlation coefficients between other variables related to self-directed learning behaviour ranged from 0.218 ($p < .01$) to 0.591 ($p < .01$).

The path analysis results indicated that the model demonstrated a structural relationship (Figure 2 and Table 4) and successfully fit the empirical data, as evidenced by the model fit indices meeting the specified criteria (Table 5). The study found that personal factor variables had a significant direct effect on self-directed learning behaviour ($\beta = 0.890$), providing support for Hypothesis 1. The achievement motivation variable had a significant influence ($\beta = .683$). The variable of future time perspective and self-control had a minimal influence ($\beta = .136$). The environmental factor variables had a significant direct effect on self-directed learning behaviour ($\beta = 0.897$), thus supporting Hypothesis 1. The teacher role variable had a significant influence ($\beta = .674$), followed by the learning atmosphere variable ($\beta = .554$). The variable of peer relationships had the least influence ($\beta = .434$).

The learning process factor variables significantly influenced self-directed learning behaviour ($\beta = 0.914$, $R^2 = 0.720$, Table 3). The variable of taking action and evaluation had a significant influence ($\beta = .509$), providing support for Hypothesis 2. This was followed by the variable of goal setting and learning planning ($\beta = .250$), which also supported Hypothesis 2. The personal factor variables had an indirect effect through the environmental factors ($\beta = 0.986$) and the learning process factors ($\beta = 0.925$). The study found that environmental factors had an indirect effect on learning process factors ($\beta = 0.876$), and this relationship was supported by a prediction coefficient (R^2) of 0.812 (Table 3), providing evidence for Hypothesis 3.

Conclusion and Discussion

This study examined the relationships between variables that affect the self-directed learning behaviour of undergraduate students. The study confirmed all three hypotheses by accurately verifying the direct and indirect influence paths of the variable groups. The findings align with previous research by Sitsira-at et al. (2024) and Sakdapat (2024a) that examined the influence paths of different behaviours, specifically the psychosocial causative factors of self-disciplinary behaviour in undergraduate students and the psychosocial causal model of creative problem-solving behaviour in Thai undergraduate students. Moreover, it identified key factors for practical application in policy design for promoting self-directed learning, resulting in improved academic performance. This research found the following important factors to develop:

Goal Setting and Learning Planning

According to [Li et al. \(2023\)](#), it is recommended that instructors, parents, or individuals with expertise assist learners in identifying goals. These goals can be categorised into four types: known knowns, known unknowns, unknown knowns, and unknown unknowns. The process can begin with identifying interests, aspirations, or desired areas of study. These can then be organised into main goals and sub-goals that can be periodically assessed. Sub-goals are established for short-term plans, while the main goal is addressed by long-term plans that encompass both broad and detailed components, organised in a sequential manner. Understanding goal setting and learning planning can lead to effective achievement. [Du \(2012\)](#) study supports the idea that improving learning efficiency can be achieved through the development of self-directed learning skills and setting clear goals for students. This may involve creating long-term learning plans with teachers acting as mentors to facilitate systematic learning. Furthermore, it is important to offer learners the chance to engage in discussions regarding their personal learning objectives, which can enhance their motivation.

Achievement Motivation

Teachers and parents have the responsibility to motivate students to work towards their goals. This can be done by setting standards of excellence that the learner aspires to, and providing them with empathy and support to achieve those standards. An alternative approach to various tasks could involve improving performance or providing independence training from a young age to enhance self-reliance and motivation for achievement. Periodic performance assessments may be necessary, and incentives focused on success could help strengthen motivation and satisfaction. [Bhanthumnavin \(2024\)](#) proposes a moral energy development approach that involves creating desires with defined scopes and timeframes, fostering goal commitment, and providing rewards for achievement to enhance morale and satisfaction. This is consistent with the findings of [Sakdapat \(2022\)](#) who investigated the work skills of undergraduate students in the new normal. The study identified achievement motivation as a significant innate characteristic that contributes to the development of work skills.

Teacher's Role

Teachers are responsible for setting an example of self-directed learning. Teachers should have a clear understanding of how to facilitate self-directed learning ([Tjakradidjaja et al., 2016](#)). The facilitator should possess knowledge of self-directed learning and actively engage in self-directed learning processes. In order to understand one's own learning process, it is essential to engage in self-review and self-assessment. This is because learners possess varying levels of self-directed learning ability, including obedience, interest, engagement, and self-direction. Teachers must assume various roles as necessary: as instructors or coaches, motivators or guides, facilitators, and advisors. Failure to identify learners' levels can lead to teachers assuming inappropriate roles, which can hinder learners' ability to engage in self-directed learning. This study supports the findings of [Komarraju et al. \(2010\)](#) that the relationship between students and faculty in motivating and fostering self-directed learning has a direct impact on students' academic performance. [Suknaisith \(2014\)](#) found that students achieved better learning outcomes, improved subject understanding, practical application, and guidance for future learning when teachers modified their teaching strategies to encourage self-directed learning through weekly performance evaluations.

Classroom Climate

Teachers should foster a self-directed learning environment through hands-on activities and facilitated self-study. In order to promote self-directed learning behaviours and knowledge production, teachers should clearly demonstrate their role as facilitators to help students fulfil their function. Teachers should promote positive attitudes towards self-directed learning through the use of challenging, socially relevant content delivery, creative teaching techniques, and enjoyable activities. This will help to cultivate students' interest and satisfaction with learning. Teachers should also encourage positive peer relationships by arranging group seating during group activities, promoting teamwork, and conducting out-of-class activities, which can stimulate discussion, experience sharing when travelling, and peer relationship development. This supports a study by [Robinson and Persky \(2020\)](#) on developing self-directed learning in higher education, which discovered that lecture-based classrooms without independent thinking opportunities or challenging activities impede self-directed learning development. The recommendation is to encourage learners to think independently according to their interests and engage in knowledge sharing to inspire their peers. [Brooks \(2007\)](#) emphasised the correlation between the environment and academic success in higher education. Specifically, the author noted that selecting friends is an environmental factor that can enhance academic achievement by fostering trust and friendship.

Perception of Self-Efficacy

Learners should assess their self-efficacy as part of their cognitive process, which connects learning and action and influences learning and behavioural changes. The development of self-efficacy perception should be guided by [Bandura \(2006\)](#) self-efficacy theory.

The researchers disseminated their research findings and policy suggestions to relevant policymakers, including the Ministry of Higher Education, Science, Research and Innovation, the Ministry of Education, and several universities. The researchers developed a toolkit to assess self-directed learning ability and promoted its use among interested individuals and the general public.

Recommendations

Establish training programmes for educators and parents to cultivate self-directed learning behaviours in learners and foster favourable attitudes towards teaching for the advancement of self-directed learning. In addition, it is important to create forums for teachers to share teaching methods and classroom activities. This will help to foster challenging, competitive, enjoyable, and ability-showcasing classroom environments that inspire learners to develop their learning processes.

Conduct a classroom-based study to compare the development of self-directed learning before and after instruction, and its influence on academic achievement. To identify the causal factors responsible for improving academic achievement, it is recommended to reuse the research instruments with the same target group one year later.

An investigation into self-directed learning adaptation through qualitative or experimental study could yield profound insights into the preparedness of students based on their diverse biosocial backgrounds. The guidelines for adaptation encompass self-

learning, deliberation prior to decision-making, discipline and responsibility training, choosing productive peer associations, and learning from accomplished individuals for self-application.

The conflicting statistical analysis results in this research may be attributed to various factors. In order to enhance the robustness and reliability of the findings, it is recommended to utilise alternative statistical methods for greater clarity and certainty.

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