Modeling the Multidimensional Interplay of Locus of Control and Self-Directed Learning in Shaping University Faculty Development

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ABSTRACT

This study investigates the intricate relationships between university faculty members' personality traits—specifically, internal and external locus of control—and self-directed learning (SDL), assessing their combined influence on engagement in professional development activities (PDA) and professional learning communities (PLC). Anchored in theoretical frameworks of SDL and professional growth, this research addresses a critical gap by positioning SDL as a central mediator linking personality traits to professional learning behaviors. Using structural equation modeling to analyze data from 83 Taiwanese faculty members, the findings reveal that both internal and external locus of control significantly predict SDL, which in turn shapes the perceived value and social demands associated with PDA and PLC. Although SDL does not directly influence willingness to participate, significant indirect effects mediated by perceived learning value were identified. These results highlight the importance of contextualizing SDL within personality and institutional dynamics, offering valuable theoretical insights and practical implications for faculty development in non-Western higher education contexts.

Keywords: Internal locus of control, External locus of control, Professional development activities (PDA), Professional learning communities (PLC), University faculty

1. Introduction

In the context of rapid transformations within contemporary higher education, the role of university faculty has evolved from traditional knowledge transmitters to facilitators of learning and professional practitioners. Confronted with advancements in educational technology, the increasing diversity of student learning styles, and evolving educational policies, faculty professional development has emerged as a critical determinant of teaching quality and educational efficacy. However, professional growth is not attributable to a singular factor; rather, it constitutes a dynamic process shaped by an array of internal and external influences. Among these, personality traits and self-directed learning (SDL) capacities are regarded as pivotal psychological constructs that impact professional development. Personality traits shape individuals' attitudes toward learning and

challenges, while SDL reflects the extent of initiative and self-regulation that faculty exhibit in their professional growth [1][2][3]. These factors not only exert independent effects on teaching behaviors and learning strategies but also potentially interact to influence the scope and depth of professional development.

This study introduces the concept of multidimensional interplay to transcend the conventional linear research paradigm, which often treats personality traits and SDL as isolated variables. Instead, it underscores the intricate and dynamic relationship between these constructs within the framework of faculty professional development. While traditional research frequently examines the unidirectional effects of personality or SDL on learning outcomes, this investigation highlights how their interaction—mediated by constructs such as perceived learning value—collectively shapes faculty engagement behaviors. Although prior studies have investigated the influence of personality traits and SDL on learning outcomes or teaching effectiveness, research exploring their multidimensional interaction and its impact on university faculty development remains scarce. This gap is particularly pronounced in Asian higher education contexts, where faculty development is often molded by a complex nexus of institutional culture, organizational support, and individual attributes. A more nuanced examination of the interplay between personality traits and SDL could facilitate the development of a comprehensive model for faculty professional development, offering targeted strategies for practical implementation. Accordingly, this study seeks to elucidate the multidimensional interaction between university faculty's personality traits and SDL in relation to their professional growth.

The theoretical innovation of this research is twofold. First, it positions locus of control—a key dimension of personality traits—as a foundational psychological driver of SDL tendencies, addressing a notable lacuna in existing SDL frameworks, such as Garrison's comprehensive model, which have largely overlooked the origins of individual differences [1][4]. Second, by integrating three critical dimensions of teacher professional development—social demands, perceived learning value, and willingness to participate—this study develops a multilevel model that encompasses motivation, cognition, and behavior. This model builds upon the Interconnected Model of Professional Growth (IMPG) proposed by prior research [5][6]. Consequently, the concept of multidimensional interplay extends beyond mere statistical interactions among variables to encapsulate the theoretical integration of personality, learning motivation, and professional action. This perspective illuminates the psychological mechanisms underpinning teacher professional growth and establishes a robust theoretical basis for designing individualized and culturally responsive faculty development programs in the future. The specific objectives of this study, as outlined in prior work [5], are as follows: (a) to analyze the current status and variations in university faculty's personality traits and SDL; (b) to assess the degree to which personality traits and SDL influence diverse dimensions of professional development; and (c) to formulate a predictive model of professional development grounded in the interaction between personality traits and SDL. This research addresses the following questions.

(a) What is the relationship between personality traits (PT) and self-directed learning (SDL)?
(b) Do personality traits and SDL significantly influence faculty professional development?
(c) Does SDL significantly affect participation in internal and external professional development activities (PDA)?
(d) Does SDL significantly impact engagement in professional learning communities (PLC)?
(e) Does an interaction between personality traits and SDL collectively influence multiple dimensions of faculty professional development?

2. Literature Review

2.1 Personality Traits

Personality traits encompass enduring patterns of emotions, thoughts, and behaviors that characterize individuals [10][11], exerting a profound influence on their learning styles, teaching strategies, and professional development. The Big Five Personality Traits model—encompassing Extraversion, Agreeableness, Conscientiousness, Neuroticism (reverse-scored), and Openness to Experience—has gained widespread acceptance in educational research. Empirical evidence suggests that university instructors with elevated levels of Conscientiousness and Openness are more predisposed to adopt innovative teaching strategies and demonstrate heightened teaching self-efficacy. Moreover, Agreeableness and Extraversion are strongly correlated with the quality of teacher-student interactions. Beyond shaping pedagogical approaches, personality traits may also significantly affect educators' motivation and commitment to participating in professional development activities.

2.2 Self-Directed Learning and Teacher Professional Development

Self-Directed Learning (SDL) underscores learners' autonomy and self-regulation throughout the learning process [2][12][13]. SDL has been recognized as a fundamental attribute of adult learning, holding particular relevance for professions such as teaching, where sustained professional growth is imperative. Within the realm of teacher professional development, SDL manifests through educators' proactive engagement with learning resources, the establishment of professional objectives, reflective teaching practices, and the adaptation of instructional strategies. Research indicates that teachers exhibiting a strong inclination toward SDL are more likely to participate in informal learning opportunities, including professional learning communities, action research, and online courses. These endeavors, in turn, catalyze instructional innovation and foster professional advancement.

2.3 The Multifaceted Nature of Teacher Professional Growth

Teacher professional growth constitutes a multifaceted, continuous, and context-dependent process [14][15][16]. It spans diverse dimensions, including pedagogical expertise, curriculum design, instructional reflection, research proficiency, and educational values. The Interconnected Model of Professional Growth (IMPG) posits that teacher development is not a linear progression but a dynamic system shaped by the interplay of personal, organizational, and sociocultural factors [5]. Originally articulated in prior work, the IMPG framework delineates four interconnected domains—personal, external, practice, and consequence—mediated by processes of reflection and enactment.

Furthermore, the outcomes of professional growth extend beyond mere enhancements in teaching techniques to encompass a deeper appreciation of educational values and the formation of professional identity. Consequently, investigating the determinants of teacher professional growth necessitates a multidimensional and multilevel analytical approach [5].

2.4 The Interaction Between Personality Traits and Self-Directed Learning

Although personality traits and self-directed learning (SDL) independently contribute to teacher professional growth, the mechanisms governing their interaction remain insufficiently explored. Existing studies suggest that individuals with high levels of Openness and Conscientiousness tend to exhibit more pronounced SDL tendencies, which subsequently enhance their professional development [17][18][19]. Additionally, teachers with greater Emotional Stability are more likely to sustain learning motivation and self-efficacy when confronting instructional challenges, thereby maintaining their commitment to professional growth activities. Therefore, integrating personality traits and SDL into a cohesive research framework to examine their interactive effects on teacher professional growth offers dual benefits: it advances theoretical synthesis and informs the design of tailored support strategies for teacher development policies and practices.

Although this study does not directly employ the Big Five Personality Traits model, the constructs of internal and external locus of control exhibit strong theoretical alignment with two dimensions of the Big Five. Specifically, internal locus of control corresponds closely with Conscientiousness, as both embody self-discipline, responsibility, and goal-directed behavior. Conversely, external locus of control parallels Neuroticism, reflecting emotional instability, anxiety, and stress sensitivity. This correspondence is substantiated by empirical research indicating that locus of control traits can serve as alternative proxies for specific Big Five dimensions, particularly in studies of learning motivation and SDL tendencies. Nevertheless, to broaden the scope of personality assessment and enhance theoretical integration, future research should consider adopting the complete Big Five model. Such an approach would enable a more comprehensive analysis of how diverse personality dimensions—such as Openness, Extraversion, and Agreeableness—shape SDL and teacher professional development. This would not only align with international research standards but also elucidate the manifestation and educational implications of various personality traits within East Asian cultural contexts.

3. Research Design

3.1 Research Process and Steps

This study employed a quantitative research approach, utilizing a cross-sectional survey design to gather data on university faculty members' personality traits, self-directed learning (SDL) tendencies, and current status of professional growth. The primary objective was to investigate the relationships and interactions among these three variables and to develop a predictive model [20][21][22]. The target population comprised full-time faculty members at public and private universities in Taiwan. A stratified random sampling method was implemented, with stratification criteria including university type (public/private), geographic region (northern, central, southern

Taiwan), and academic discipline (humanities, social sciences, natural sciences, engineering, medical and agricultural sciences). A total of 100 questionnaires were distributed during a teacher professional development event, yielding 83 valid responses. The survey instrument was structured into four distinct sections:

(a) Demographic Information: This section collected data on gender, age, educational background, academic rank, years of teaching experience, academic discipline, and type of institution.

(b) Personality Traits Scale: This scale assessed internal control personality traits (PTI, 5 items) and external control personality traits (PTE, 6 items), comprising a total of 11 items, each rated on a 5-point Likert scale.

(c) Self-Directed Learning Scale: Adapted from the Self-Directed Learning Readiness Scale (SDLRS), this localized and revised instrument included 11 items, also measured on a 5-point Likert scale.

(d) Teacher Participation in Professional Development and Professional Learning Communities: This section consisted of 37 items divided into three subdimensions—social demand (9 items), learning value (18 items), and willingness to participate (10 items)—all evaluated using a 5-point Likert scale.

The factors, item codes, and detailed item descriptions are presented in Table 1.

Table 1. Factors, item code, and items list

Factors	Item Code	Item descriptions
Personality Traits (Internal Control) PTI	PTI1	I enjoy talking to people.
	PTI2	I often feel happy.
	PTI3	I enjoy participating in club activities.
	PTI4	I am the lively personality type.
	PTI5	I am always energetic.
Personality Traits (External Control) PTE	PTE1	I have difficulty making decisions.
	PTE2	I often feel anxious and worried.
	PTE3	I easily get nervous.
	PTE4	My emotions often fluctuate.
	PTE5	I often feel sad.
	PTE6	I am prone to feelings of insecurity.
Self-Directed Learning SDL	SDL1	I keep learning whenever I have free time.
	SDL2	When I encounter something I don't understand, I try to figure it out myself.
	SDL3	If something new comes up, I will learn how to use it on my own.
	SDL4	No matter how busy I am, I find time to learn when I decide to study something.
	SDL5	If I'm interested in something, I will try to understand it no matter how hard it is.
	SDL6	If I encounter something unclear, I will spend as much time as needed to understand it.
	SDL7	When I don't understand something, I actively ask others.
	SDL8	If I don't know how to use something new, I will ask others until I know how.
	SDL9	No matter how busy I am, I will make time to ask others until I understand what I don’t know.
	SDL10	If I’m interested in something and encounter difficulty, I will actively seek help.
	SDL11	When I face uncertain situations, I will actively ask others until I understand the reason.
Professional Development Activities – Social Demand PDA1	PDA1-1	In light of social changes, I think participating in professional development activities both inside and outside of school is necessary.
	PDA1-2	In light of social changes, I think it is necessary to include participation in professional development activities in evaluation criteria.
	PDA1-3	In light of social changes, I think it is necessary for teacher evaluation criteria to include participation in such activities.

Factors	Item Code	Item descriptions
	PDA1-4	In light of social changes, I think participating in these activities to improve evaluation performance is necessary.
	PDA1-5	In light of social changes, I think it is necessary to incorporate school-defined participation in such activities as evaluation indicators.
Professional Development Activities – Learning Value PDA2	PDA2-1	I believe these activities help me learn subject knowledge like an expert.
	PDA2-2	I believe these activities help me gain the ability to learn in-depth curriculum content.
	PDA2-3	I believe these activities allow me to learn sufficient related knowledge.
	PDA2-4	I believe these activities help me learn how to guide students to adopt appropriate learning strategies.
	PDA2-5	I believe these activities help me learn how to assist students in reflecting on their strategies.
	PDA2-6	I believe these activities help me guide students to learn effectively in group or collaborative settings.
	PDA2-7	I believe these activities help me apply a variety of instructional strategies to help students understand course content.
	PDA2-8	I believe these activities help me select effective instructional strategies to guide students in learning and thinking.
	PDA2-9	I believe these activities help me apply effective teaching representations (e.g., analogy, explanation, deduction, demonstration) to help students learn course content.
Professional Development Activities – Willingness to Participate PDA3	PDA3-1	Regarding the inclusion of internal school activities in evaluation indicators, I will actively participate in these school events.
	PDA3-2	Regarding the inclusion of external activities in evaluation indicators, I will actively comply with these external evaluation requirements.
	PDA3-3	I will actively apply what I've learned from such activities in my profession (teaching, research, or personal development) to meet evaluation standards.
	PDA3-4	I will actively participate in such activities to find my future direction in teaching and willingly practice it to meet evaluation standards.
	PDA3-5	Overall, I am willing to participate in all such activities as part of teacher evaluation indicators to meet evaluation standards.
Teacher Professional Learning Communities – Social Demand PLC1	PLC1-1	In light of social changes, I think including teacher professional community activities in evaluation items is necessary.
	PLC1-2	In light of social changes, I think it is necessary to include teacher professional community activities in teacher evaluations.
	PLC1-3	In light of social changes, I think it is necessary to participate in these activities to enhance evaluation performance.
	PLC1-4	In light of social changes, I think including participation in professional communities in school-set evaluation indicators is necessary.
Professional Learning Communities – Learning Value PLC2	PLC2-1	I believe participating in these activities helps me learn knowledge like an expert.
	PLC2-2	I believe participating in these activities gives me the ability to develop deeper course knowledge.
	PLC2-3	I believe participating in these activities helps me learn enough related knowledge.
	PLC2-4	I believe participating in these activities helps me learn to guide students to use proper learning strategies.
	PLC2-5	I believe participating in these activities helps me assist students in reflecting on their learning strategies.
	PLC2-6	I believe participating in these activities helps me guide students to learn effectively in group or team settings.
	PLC2-7	I believe participating in these activities helps me apply various instructional strategies to aid student understanding.
	PLC2-8	I believe participating in these activities helps me select effective strategies to guide student learning and thinking.
	PLC2-9	I believe participating in these activities helps me apply effective teaching representations (e.g., analogy, explanation, deduction, demonstration) to assist student learning.
Professional Learning Communities – Willingness to Participate PLC3	PLC3-1	Regarding the inclusion of these activities in school-set evaluation indicators, I will actively participate in school-hosted evaluation requirements.
	PLC3-2	Regarding the inclusion of these activities in school-set evaluation indicators, I will actively comply with externally hosted evaluation requirements.
	PLC3-3	I will actively apply what I have learned from these activities in my profession (teaching, research, or personal development) to meet evaluation requirements.
	PLC3-4	Regarding the inclusion of these activities in school-set evaluation indicators, I will

Factors	Item Code	Item descriptions
		actively participate in school-hosted evaluation requirements.
	PLC3-5	Regarding the inclusion of these activities in school-set evaluation indicators, I will actively comply with externally hosted evaluation requirements.

Source: By autor.

3.2 Definitions of Research Variables

In addition, the definitions of Key Terms as follows.

3.2.1 Personality traits

In this study, personality traits are categorized based on the concept of locus of control, which reflects individuals' beliefs about the causes of events in their lives [7][8][9].

3.2.2 Internal locus of control

This trait is widely recognized as a positive personality attribute, given its association with numerous beneficial psychological and behavioral outcomes. Individuals with an internal locus of control hold the belief that they can shape events and outcomes through their own efforts and actions. According to proponents of the Locus of Control Theory, such individuals exhibit greater adaptability in learning and behavioral adjustment. PTI (Personality Traits – Internal Locus of Control): This refers to personality traits defined by an internal locus of control. Individuals characterized by PTI are convinced that their actions can directly influence outcomes, often demonstrating a propensity for proactive learning and self-regulation.

3.2.3 External locus of control

This trait is strongly linked to anxiety, tension, and emotional instability. Individuals with an external locus of control often attribute life outcomes to external factors such as luck, fate, or the influence of others. Empirical research has demonstrated that this attribution style is positively associated with elevated levels of anxiety, emotional instability, and psychological distress. Furthermore, studies have shown that an external locus of control is significantly correlated with emotional dysregulation, anxiety, and depressive symptoms, underscoring the critical role of locus of control beliefs in mental health outcomes. PTE (Personality Traits – External Locus of Control): This refers to personality traits defined by an external locus of control. Individuals characterized by PTE tend to attribute outcomes to external factors (e.g., luck or the actions of others) and may experience heightened levels of anxiety and emotional instability.

3.2.4 Self-directed learning

Self-Directed Learning (SDL) refers to an individual's capacity to take initiative in the learning process, encompassing the setting of learning goals, the selection of appropriate strategies, and the evaluation of learning outcomes. It emphasizes autonomy, self-regulation, and proactive engagement in learning. SDL characterizes an individual's ability to independently plan, execute, and monitor their own learning journey. This attribute is a cornerstone of adult learning and plays a pivotal role in fostering teacher professional growth.

3.2.5 Professional development

Professional development is conceptualized as the ongoing and multidimensional growth of teachers across various domains, including instructional competence, curriculum design, reflective teaching, research capabilities, and educational beliefs. It encompasses both formal and informal learning experiences that collectively contribute to the improvement of teaching quality and the formation of professional identity. Professional Development Activities (PDA) for teachers include in-school and external training programs, advanced education opportunities, and teaching workshops. In this study, PDA is categorized into three distinct subdimensions: PDA1: Social Demand; PDA2: Learning Value; and PDA3: Willingness to Participate.

3.2.6 Professional learning communities

Professional learning communities (PLC) refer to ongoing professional learning activities among teachers through collaboration, dialogue, and reflection. PLC is also divided into three subdimensions: PLC1: Social Demand; PLC2: Learning Value; and PLC3: Willingness to Participate.

3.3 Research Hypotheses

This study proposes a hypothesized research model grounded in the interrelationships among nine distinct dimensions:

(a) Internal Control Personality Traits (PTI),
(b) External Control Personality Traits (PTE),
(c) Self-Directed Learning (SDL),
(d) Perceived Social Demand of Teaching Professional Development Activities (PDA1),
(e) Perceived Learning Value of Teaching Professional Development Activities (PDA2),
(f) Willingness to Participate in Teaching Professional Development Activities (PDA3),
(g) Perceived Social Demand of Professional Learning Community Activities (PLC1),
(h) Perceived Learning Value of Professional Learning Community Activities (PLC2),
(i) Willingness to Participate in Professional Learning Community Activities (PLC3).

The hypothesized model, depicted in Figure 1, was developed to investigate the relationships among these dimensions. To test the proposed hypotheses, Confirmatory Factor Analysis (CFA) and Path Analysis were employed, utilizing data collected through questionnaires.

H1: An internal locus of control personality trait exerts a direct positive effect on self-directed learning.

H2: An external locus of control personality trait exerts a direct positive effect on self-directed learning.

H3: Self-directed learning positively influences teachers' perceived social needs for participating in professional teaching development activities.

H4: Self-directed learning positively impacts the perceived learning value for teachers engaging in professional teaching development activities.

H5: Self-directed learning has a direct positive effect on teachers' willingness to participate in professional teaching development activities.

H6: Self-directed learning positively influences teachers' perceived social needs for participating in professional learning community activities.

H7: Self-directed learning positively impacts the perceived learning value for teachers engaging in professional learning community activities.

H8: Self-directed learning has a direct positive effect on teachers' willingness to participate in professional learning community activities.

H9: The perceived learning value of teachers engaging in professional teaching development activities directly and positively influences their willingness to participate.

H10: The perceived learning value of teachers engaging in professional learning community activities directly and positively influences their willingness to participate.

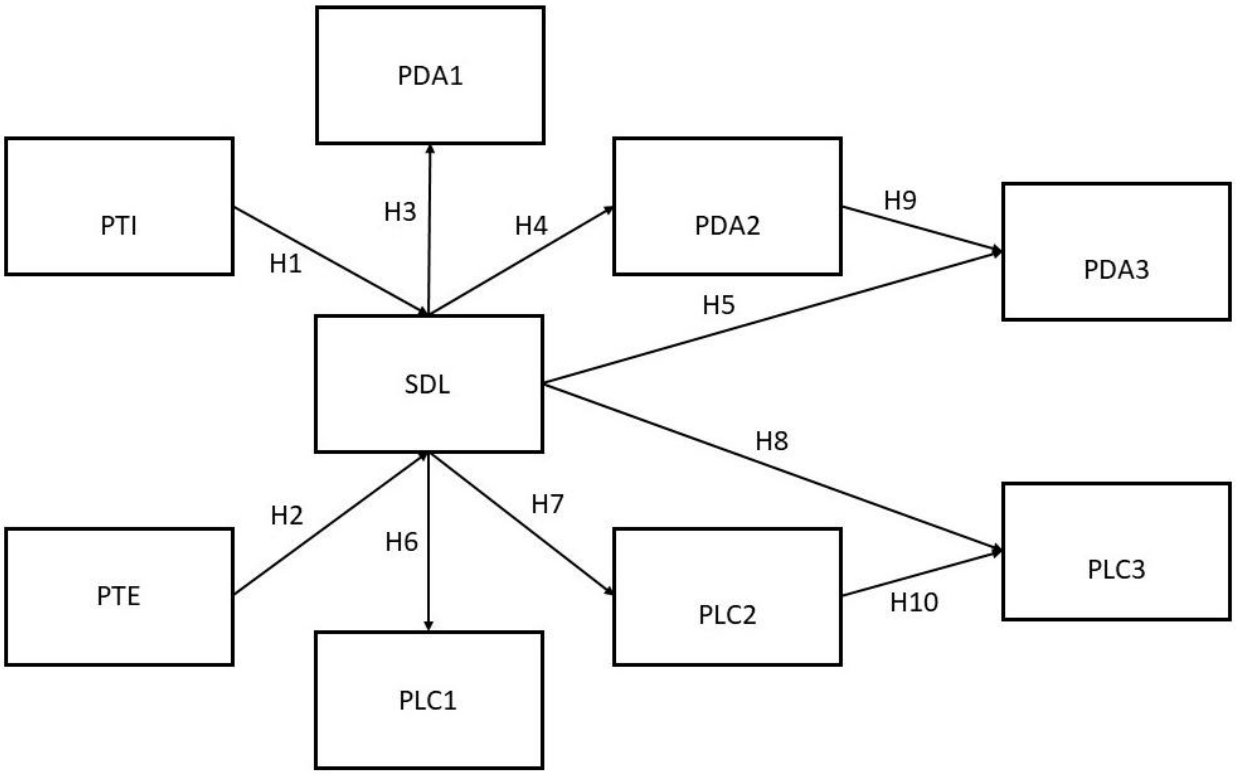

Figure 1. Research Hypothesis Model.

3.4 Implementation of the Study

In alignment with the objectives of this study, a total of 83 valid responses were obtained from full-time faculty members at universities and colleges in Taiwan. The research sought to examine the relationships between personality traits and self-directed learning, and to explore how these factors influence teachers' perceived social needs, perceived learning value, and willingness to engage in professional teaching development activities and professional learning community activities. A purposive sampling approach was employed for the questionnaire survey, and the data were analyzed using SmartPLS 4.0 for statistical evaluation.

4. Results and Discussions

4.1 Demographics of Participants

This study included a total of 83 participants. The demographic characteristics of the respondents are presented in Table 2. In terms of gender distribution, 35 participants (42.2%) were male, and 48 (57.8%) were female. Regarding their highest educational attainment, 17 participants (20.5%) held a master's degree, while 66 (79.5%) held a doctoral degree. With respect to academic rank, the sample comprised 26 full professors (31.3%), 26 associate professors (31.3%), 24 assistant professors (28.9%), and 7 lecturers (8.4%).

In terms of institutional affiliation, the majority of participants (69 individuals, 83.1%) were affiliated with national universities. Concerning teaching experience, the largest group consisted of those with over 21 years of experience (24 individuals, 28.9%), followed by those with 11 to 15 years of experience (18 individuals, 21.7%).

Table 2. Demographic Statistics Table of Participants (n=83)

Category		Number of People	Percentage (%)
Gender	Male	35	42.2
	Female	48	57.8
Highest Education Level	Master's Degree	17	20.5
	Doctoral Degree	66	79.5
Academic Title	Professor	26	31.3
	Associate Professor	26	31.3
	Assistant Professor	24	28.9
	Lecturer	7	8.4
Type of Institution	National University	69	83.1
	National Technical and Vocational College/Institute	14	16.9
Field of Teaching	Mass Communication	12	14.5
	Engineering	7	8.4
	Humanities and Philosophy	11	13.3
	Foreign Languages	3	3.6
	Social and Psychology	1	1.2
	Architecture and Design	6	7.2
	Education	5	6.0
	Information Technology	2	2.4
	Management	14	16.9
	Mathematics, Physics, and Chemistry	2	2.4
	Arts	20	24.1
Teaching Region	Northern Region	50	60.2
	Central Region	14	16.9
	Southern Region	19	22.9
Years of Teaching Experience	21 years or more	24	28.9
	16–20 years (inclusive)	12	14.5
	11–15 years (inclusive)	18	21.7
	6–10 years (inclusive)	16	19.3
	2–5 years (inclusive)	9	10.8
	Less than 2 years	4	4.8

Source: By authors.

4.2 Measurement Model Analysis

Adhering to the two-step approach recommended by [23][24], this study employed structural equation modeling (SEM) in two distinct phases. In the initial phase, the measurement model was evaluated to determine the reliability, convergent validity, and discriminant validity of each construct. In the subsequent phase, the structural model (also termed the path model) was analyzed to test the hypothesized causal relationships among the latent variables within the conceptual framework.

As presented in Table 3, the measurement model was assessed across four key dimensions: internal consistency, indicator reliability, convergent validity, and discriminant validity. The Composite Reliability (CR) values for each construct were as follows: PTI = 0.940, PTE = 0.975, SDL = 0.961, PDA1 = 0.935, PDA2 = 0.983, PDA3 = 0.973, PLC1 = 0.981, PLC2 = 0.986, and PLC3 = 0.986—all surpassing the recommended threshold of 0.7. Additionally, Cronbach's α values ranged from 0.922 to 0.984, similarly exceeding the benchmark of 0.7. These findings confirm that all constructs in the measurement model exhibit robust internal consistency reliability [23][24].

Table 3. Parameter Estimation Table of the Measurement Model in This Study

Construct Name	Item Code	Factor Loadings	t-value	Cronbach's α	CR	AVE
PTI	PTI1	0.893***	7.447	0.922	0.940	0.759
	PTI2	0.89***	6.768			
	PTI3	0.822***	4.896			
	PTI4	0.851***	5.434			
	PTI5	0.900***	6.359			
PTE	PTE1	0.904***	12.808	0.969	0.975	0.866
	PTE2	0.923***	12			
	PTE3	0.919***	11.925			
	PTE4	0.941***	11.244			
	PTE5	0.943***	10.771			
	PTE6	0.954***	12.258			
SDL	SDL1	0.755***	12.134	0.956	0.961	0.693
	SDL2	0.719***	8.447			
	SDL3	0.826***	14.625			
	SDL4	0.853***	15			
	SDL5	0.807***	14.216			
	SDL6	0.808***	13.762			
	SDL7	0.891***	26.931			
	SDL8	0.851***	31.691			
	SDL9	0.899***	48.057			
	SDL10	0.866***	26.71			
	SDL11	0.866***	25.682			
PDA1	PDA1-1	0.849***	4.271	0.927	0.935	0.742
	PDA1-2	0.905***	5.452			
	PDA1-3	0.857***	4.646			
	PDA1-4	0.819***	4.035			
	PDA1-5	0.874***	4.516			
PDA2	PDA2-1	0.892***	28.906	0.981	0.983	0.866
	PDA2-2	0.918***	35.952			
	PDA2-3	0.896***	30.077			
	PDA2-4	0.951***	69.211			
	PDA2-5	0.942***	62.830			
	PDA2-6	0.923***	43.641			
	PDA2-7	0.968***	104.827			
	PDA2-8	0.970***	115.696			
	PDA2-9	0.913***	47.275			
PDA3	PDA3-1	0.943***	32.745	0.965	0.973	0.877
	PDA3-2	0.938***	29.954			

Construct Name	Item Code	Factor Loadings	t-value	Cronbach's α	CR	AVE
	PDA3-3	0.921***	37.705			
	PDA3-4	0.961***	81.511			
	PDA3-5	0.918***	33.84			
PLC1	PLC1-1	0.977***	4.245	0.974	0.981	0.927
	PLC1-2	0.974***	4.238			
	PLC1-3	0.918***	4.431			
	PLC1-4	0.979***	4.253			
PLC2	PLC2-1	0.862***	20.751	0.984	0.986	0.886
	PLC2-2	0.891***	26.665			
	PLC2-3	0.905***	31.560			
	PLC2-4	0.963***	106.508			
	PLC2-5	0.968***	102.404			
	PLC2-6	0.965***	102.044			
	PLC2-7	0.968***	81.533			
	PLC2-8	0.973***	121.61			
	PLC2-9	0.967***	100.966			
PLC3	PLC3-1	0.976***	62.241	0.982	0.986	0.932
	PLC3-2	0.955***	45.868			
	PLC3-3	0.971***	88.838			
	PLC3-4	0.972***	98.525			
	PLC3-5	0.954***	70.808			

Source: By author.

The factor loadings of all indicators ranged from 0.719 to 0.977, all surpassing the threshold of 0.5 and demonstrating statistical significance, which indicates robust indicator reliability. The Average Variance Extracted (AVE) values ranged from 0.693 to 0.932, all exceeding the recommended threshold of 0.5, thereby confirming convergent validity. Furthermore, discriminant validity was evaluated using the Fornell–Larcker criterion.

As presented in Table 4, the square roots of the AVE values for the nine constructs had a minimum value of 0.833, while the maximum correlation coefficient among constructs was 0.966. Given that the square root of each construct's AVE exceeded its correlations with other constructs, discriminant validity was firmly established.

Table 4. Discriminant Validity Evaluation Table for This Study

Factors	Mean	SD	PTI	PTE	SDL	PDA1	PDA2	PDA3	PLC1	PLC2	PLC3
PTI	3.680	0.949	0.871								
PTE	3.373	1.186	0.219	0.931							
SDL	4.094	0.764	0.246	-0.268	0.833						
PDA1	2.884	1.181	0.112	-0.15	0.286	0.868					
PDA2	3.309	1.076	0.099	-0.29	0.376	0.647	0.931				
PDA3	2.892	1.079	0.159	0.01	0.216	0.737	0.474	0.936			
PLC1	2.611	1.254	0.097	-0.066	0.196	0.866	0.417	0.774	0.963		
PLC2	3.186	1.142	0.017	-0.336	0.449	0.676	0.838	0.481	0.482	0.941	
PLC3	2.807	1.106	0.112	-0.024	0.26	0.729	0.487	0.913	0.772	0.534	0.966

Note:

1.The numbers on the diagonal represent the square roots of the AVE values for each construct.

2.The numbers off the diagonal represent the correlation coefficients between the constructs in the corresponding rows and columns.

4.3 Research Hypotheses and Structural Model Validation

This study assesses the structural model using Partial Least Squares Structural Equation Modeling (PLS-SEM) by focusing on two critical dimensions: the predictive power and explanatory power of the model. Adhering to the systematic evaluation approach proposed by Hair et al. [23][24], the analysis takes into account model complexity and sample size requirements. Specifically, for complex models, the recommended sample size should be at least ten times the maximum number of indicators associated with any single construct [23][24].

Nevertheless, as SmartPLS supports exploratory analysis with relatively small sample sizes, this study employs the Bootstrapping method with 5,000 resamples to bolster statistical power and reliability. This approach ensures robust estimation even under constrained sample conditions, rendering it particularly suitable for exploratory research within educational and psychological domains [24][25].

Furthermore, this study adopts the two-step approach of PLS-SEM to evaluate the structural model, emphasizing both its predictive power and explanatory capability. Following the systematic evaluation method proposed by Hair et al. [23][24], the path coefficients for the ten hypothesized relationships (H1–H10) in the model are detailed in Table 5.

Table 5. The parameters summary of Structural Equation Modeling assessment

Hypothesis	Association	Path Coefficient	t-value	R^2	f^2	GoF
H_1	PTI -> SDL	0.321***	3.463	0.170	0.118	0.353
H_2	PTE -> SDL	-0.340***	4.065	0.170	0.132	
H_3	SDL -> PDA1	0.286*	2.322	0.082	0.089	
H_4	SDL -> PDA2	0.377***	4.079	0.142	0.165	
H_5	SDL -> PDA3	0.046 ns.	0.561	0.227	0.002	
H_6	SDL -> PLC1	0.198 ns.	1.819	0.039	0.041	
H_7	SDL -> PLC2	0.45***	6.105	0.203	0.254	
H_8	SDL -> PLC3	0.027 ns.	0.367	0.286	0.001	
H_9	PDA2 -> PDA3	0.457***	4.003	0.227	0.231	
H_{10}	PLC2 -> PLC3	0.522***	4.716	0.286	0.304	

ns. p>.05, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Of the ten hypotheses tested, seven were supported. As presented in Table 6, the summary of indirect effects reveals several noteworthy findings. These results substantiate multiple significant serial mediation paths, underscoring the critical role of Self-Directed Learning (SDL) as a pivotal bridging variable among various constructs. Specifically, both PTI and PTE exert indirect effects on learning outcomes (PDA3 and PLC3) through SDL, which further mediates these effects via PDA2 or PLC2, thereby forming serial mediation pathways. Additionally, SDL independently influences the final outcome variables through PDA2 or PLC2, highlighting its central role in the learning process. These findings reinforce the function of SDL as a key mediating mechanism between learning motivation and outcomes, while also emphasizing the layered and multifaceted nature of mediation within the model.

Table 6. Summary of the direct/ indirect effects verification results

Effect	Regression Coefficient	t-value	2.5%	97.5%	VAF	Hypothesis
Indirect effect						
PTI -> SDL -> PDA2 -> PDA3	0.055*	2.108	0.018	0.119	78.57	Supported
PTI -> SDL -> PLC2 -> PLC3	0.075*	2.47	0.031	0.143	89.29	Supported
PTE -> SDL -> PDA2 -> PDA3	-0.058*	2.256	-0.12	-0.021	78.38	Supported
PTE -> SDL -> PLC2 -> PLC3	-0.08**	2.595	-0.149	-0.034	89.89	Supported
SDL -> PDA2 -> PDA3	0.172**	2.988	0.076	0.301	78.90	Supported
SDL -> PLC2 -> PLC3	0.235***	3.99	0.131	0.359	89.69	Supported
Direct effect						
PTI -> SDL	0.321***	3.463	0.177	0.499		
PTE -> SDL	-0.34***	4.065	-0.489	-0.21		
SDL -> PDA1	0.286*	2.322	0.1	0.482		
SDL -> PDA2	0.377***	4.079	0.196	0.561		
SDL -> PDA3	0.046 ns.	0.561	-0.117	0.212		
SDL -> PLC1	0.198 ns.	1.819	-0.083	0.395		
SDL -> PLC2	0.45***	6.105	0.305	0.597		
SDL -> PLC3	0.027 ns.	0.367	-0.118	0.167		
PDA2 -> PDA3	0.457***	4.003	0.238	0.675		
PLC2 -> PLC3	0.522***	4.716	0.299	0.732		
Total effect						
PTI -> PDA3	0.070	1.713	0.001	0.165		
PTI -> PLC3	0.084*	2.047	0.016	0.176		
PTE -> PDA3	-0.074	1.931	-0.157	-0.007		
PTE -> PLC3	-0.089*	2.247	-0.175	-0.024		
SDL -> PDA3	0.218*	2.275	0.035	0.411		
SDL -> PLC3	0.262**	2.853	0.088	0.450		

1. ns. p>.05, * p < 0.05, ** p < 0.01,*** p < 0.001
2. VAF<20%,there is no mediation ; 20%<VAF<80%,there is partial mediation ; 80%<VAF,there is full mediation.

Drawing on the analysis of 83 valid responses from full-time faculty members at universities and colleges in Taiwan, this study investigated the interrelationships among personality traits, self-directed learning (SDL), and teachers' engagement in professional development activities (PDA) and professional learning community initiatives (PLC). The data were analyzed using SmartPLS 4.0, with the key findings summarized in Figure 2 and Figure 3.

These figures illustrate the path relationships and estimated coefficients among variables within the structural equation model. As depicted, both internal locus of control (PTI) and external locus of control (PTE) exert significant effects on self-directed learning (SDL), underscoring the pivotal role of personality traits in shaping teachers' learning motivation. Furthermore, SDL positively influences perceived learning value (PDA2, PLC2) and social demand (PDA1) within the contexts of professional development activities and professional learning communities. However, its direct impact on willingness to participate (PDA3, PLC3) is not statistically significant, suggesting that participation behavior may necessitate the mediating influence of value perception to be effectively activated.

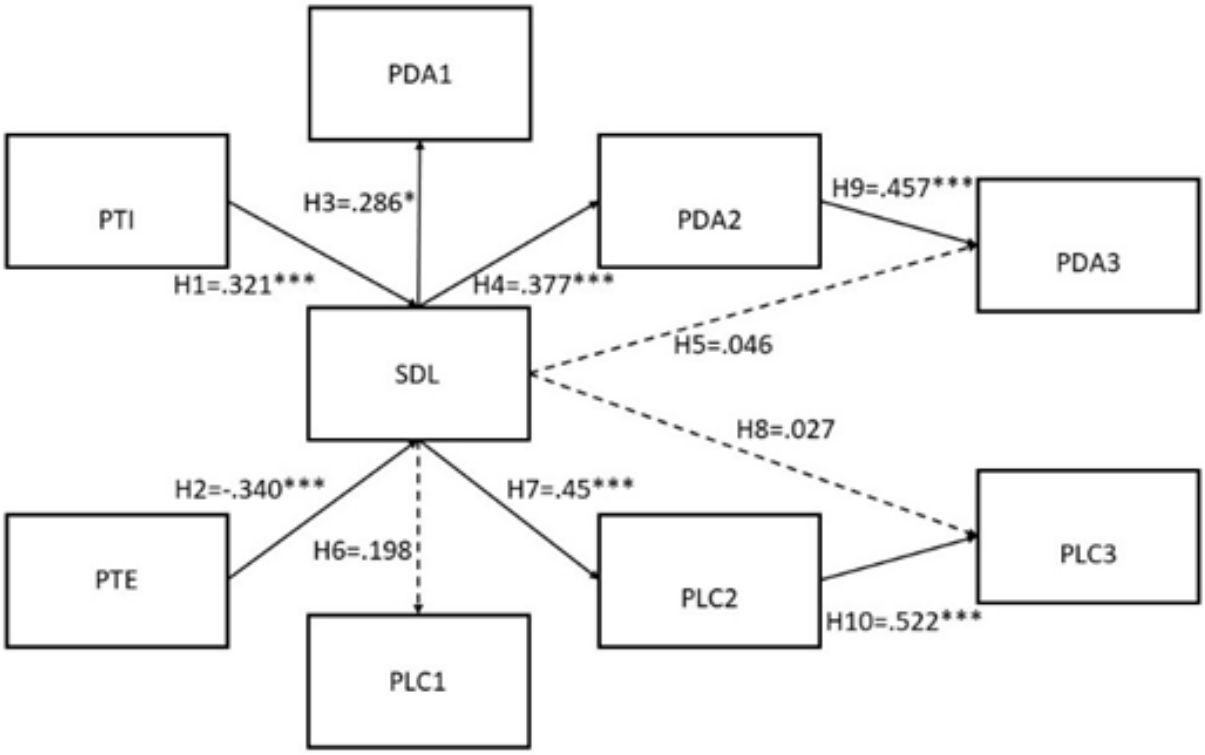

Figure 2. The results of standardized regression coefficients.

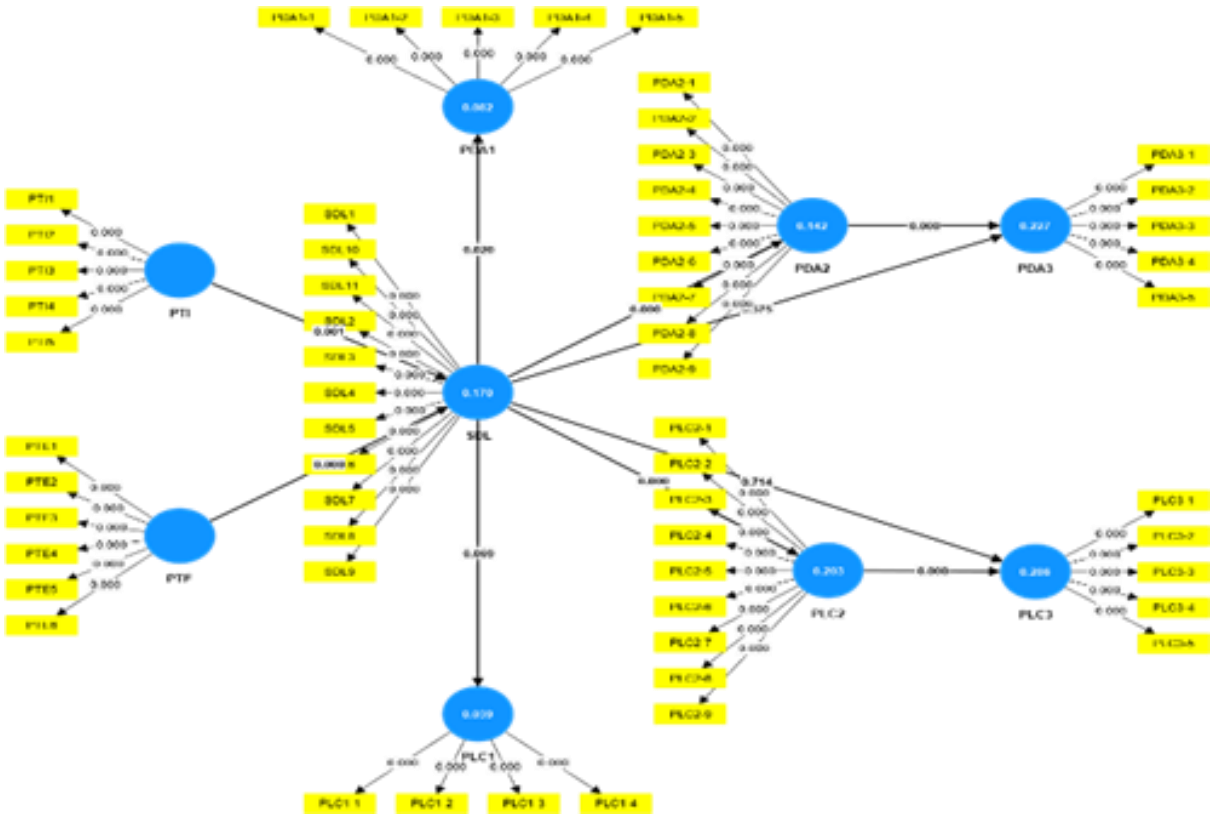

Figure 3. The results of standardized regression coefficients by SmartPLS.

This diagram integrates both direct and indirect effects, underscoring the mediating role of Self-Directed Learning (SDL) within the comprehensive model. It delineates six significant indirect pathways, illustrating how personality traits shape teachers' perceptions of learning value in Professional Development Activities (PDA) and Professional Learning Communities (PLC) through SDL, which subsequently influences their willingness to participate. These findings lend support to the hypothesis of a multilevel mediation mechanism, consistent with Garrison's theoretical framework, which conceptualizes SDL as encompassing motivation, self-management, and self-monitoring.

Overall, Figures 2 and 3 serve not only to visualize the validation of the research model but also to reinforce the theoretical interpretation of the interplay among personality traits, learning motivation, and professional behavior. Through such visual representations, readers gain a clearer understanding of the causal logic and mediation mechanisms among variables, thereby highlighting the study's contributions to both theoretical integration and practical application.

4.3.1 Personality traits and self-directed learning

The findings indicate that both internal and external locus of control personality traits have a significant positive influence on self-directed learning, supporting Hypotheses H1 and H2.

4.3.2 Self-directed learning and professional development participation

Self-directed learning was found to positively affect teachers' social needs (H3), perceived learning value (H4), and willingness to participate (H5) in professional teaching development activities.

4.3.3 Self-directed learning and professional learning communities

Similarly, self-directed learning positively influenced teachers' social needs (H6), perceived learning value (H7), and willingness to participate (H8) in professional learning community activities.

4.3.4 Learning value and willingness to participate

The perceived learning value of both professional development activities (H9) and professional learning community activities (H10) had a direct positive impact on teachers' willingness to participate.

In summary, these results suggest that self-directed learning plays a central role in motivating teachers to engage in professional growth, and that both personality traits and perceived value are important factors in shaping participation behavior.

5. Conclusions

Through meticulous application of structural equation modeling, this study validates a multidimensional framework that links locus of control and Self-Directed Learning (SDL) to faculty engagement in professional development. The findings contribute to the expanding international discourse by demonstrating that SDL serves as a mediator between personality traits and both perceived value and engagement behavior. These insights underscore the necessity of aligning faculty

development strategies with intrinsic motivational constructs and contextual institutional factors [23][24]. Specifically, both internal locus of control (PTI) and external locus of control (PTE) significantly predicted SDL (H1, H2), reinforcing the notion that personality traits shape learning motivation and strategy selection. Moreover, SDL was found to significantly predict the perceived social demand of professional development activities (PDA1), the perceived learning value of such activities (PDA2), and the perceived learning value of participation in professional learning communities (PLC2) (H3, H4, H7), thereby highlighting the central role of SDL in professional learning processes.

Furthermore, PDA2 and PLC2 significantly predicted willingness to participate in professional development activities (PDA3) and professional learning communities (PLC3), respectively (H9, H10), indicating that perceived learning value is a critical determinant of teachers' engagement intentions. Although SDL did not directly predict PDA3, PLC1, or PLC3 (H5, H6, H8), mediation analysis revealed several significant indirect pathways, as illustrated in Figure 2. These findings emphasize the mediating role of SDL between personality traits and professional learning outcomes, further demonstrating that the perception of learning value acts as a pivotal mechanism influencing teachers' engagement intentions [26]. This observation aligns with Garrison's theoretical framework, which conceptualizes SDL as encompassing self-management, self-monitoring, and motivational dimensions.

In summary, this study affirms the pivotal role of SDL in the professional development process and elucidates the influence of personality traits on SDL. The results offer valuable implications for the design of teacher education and professional development programs.

This study enriches the literature on faculty development by proposing and validating a multidimensional model that integrates personality traits, self-directed learning (SDL), and professional engagement outcomes. By positioning SDL as a central mediating construct, the findings extend Garrison's SDL theory and the Interconnected Model of Professional Growth (IMPG), providing a more nuanced understanding of how internal and external personality orientations shape professional learning through motivational and cognitive pathways [27]. While both internal and external locus of control traits significantly influenced SDL, the study also reveals that SDL's impact on participation in professional development is predominantly indirect, operating through perceived learning value rather than direct behavioral intention. This distinction underscores the importance of designing faculty development programs that not only foster SDL but also enhance the perceived relevance and utility of such initiatives [5].

Moreover, the study's focus on Taiwanese higher education offers culturally grounded insights, suggesting that institutional norms and evaluation systems may moderate the expression of SDL and its outcomes. The relatively small sample size and simplified personality measures are acknowledged as limitations, indicating the need for future research with larger, more diverse samples and comprehensive trait models, such as the Big Five. In conclusion, this research advances theoretical integration in the field of teacher development and provides practical guidance for creating personalized, context-sensitive professional learning environments.

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References

[1] Garrison, D.R. Self-directed learning: Toward a comprehensive model. Adult Education Quarterly, 1997, 48(1), 18–33.

[2] Knowles, M.S. Self-directed learning: A guide for learners and teachers. New York: Association Press, 1975.

[3] Candy, P.C. Self-direction for lifelong learning: A comprehensive guide to theory and practice. San Francisco: Jossey-Bass, 1991.

[4] Brockett, R.G. and Hiemstra, R. Self-direction in adult learning: Perspectives on theory, research, and practice. New York: Routledge, 1991.

[5] Clarke, D. and Hollingsworth, H. Elaborating a model of teacher professional growth. Teaching and Teacher Education, 2002, 18(8), 947–967.

[6] Guskey, T.R. Professional development and teacher change. Teachers and Teaching, 2002, 8(3), 381–391.

[7] Rotter, J.B. Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs: General and Applied, 1966, 80(1), 1–28.

[8] Lefcourt, H.M. Locus of control: Current trends in theory and research. New York: Psychology Press, 2014.

[9] Ajzen, I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. Journal of Applied Social Psychology, 2002, 32(4), 665–683.

[10] Judge, T.A. and Bono, J.E. Relationship of core self-evaluations traits with job satisfaction and job performance: A meta-analysis. Journal of Applied Psychology, 2001, 86(1), 80–92.

[11] Cobb-Clark, D.A. and Schurer, S. The stability of big-five personality traits. Economics Letters, 2013, 121(2), 251–255.

[12] Fisher, M., King, J. and Tague, G. Development of a self-directed learning readiness scale for nursing education. Nurse Education Today, 2001, 21(7), 516–525.

[13] Song, L. and Hill, J.R. A conceptual model for understanding self-directed learning in online environments. Journal of Interactive Online Learning, 2007, 6(1), 27–42.

[14] Avalos, B. Teacher professional development in teaching and teacher education over ten years. Teaching and Teacher Education, 2011, 27(1), 10–20.

[15] Desimone, L.M. Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. Educational Researcher, 2009, 38(3), 181–199.

[16] Kennedy, A. Understanding continuing professional development: The need for theory to impact on policy and practice. Professional Development in Education, 2014, 40(5), 688–697.

[17] Cazan, A.-M. and Schiopca, B.A. Self-directed learning, personality traits and academic achievement. Procedia - Social and Behavioral Sciences, 2014, 127, 640–644.

[18] Chang, C.-C. The relationship between personality traits and self-directed learning readiness among graduate students. International Journal of Learning, 2007, 14(4), 67–75.

[19] Tien, H.-L.S. and Others. Self-directed learning readiness and locus of control of Taiwanese students. Psychological Reports, 2009, 105(3_suppl), 1035–1040.

[20] Chen, D.-Y. and Lee, W.-C. Exploring the relationship between professional identity and self-directed learning in university faculty: Evidence from Taiwan. Journal of Educational Research and Development, 2020, 16(3), 55–78.

[21] Hsu, Y.-C. and Wang, S.-L. Exploring self-directed learning and locus of control among Taiwanese university students. Asia Pacific Education Review, 2018, 19(2), 209–222.

[22] Wu, P.-C. and Tai, H.-H. Professional learning communities and teacher professional development: A study of university teachers in Taiwan. Higher Education Research & Development, 2016, 35(4), 845–858.

[23] Anderson, J.C. and Gerbing, D.W. Structural equation modeling in practice: A review and recommended two-step approach. Psychological Bulletin, 1988, 103(3), 411–423.

[24] Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. Multivariate data analysis (7th ed.). Harlow: Pearson Education Limited, 2014.

[25] Wei, R.C., Darling-Hammond, L., Andree, A., Richardson, N. and Orphanos, S. Professional learning in the learning profession: A status report on teacher development in the United States and abroad. National Staff Development Council, 2009.

[26] Li, H., Wu, H., Jiang, D., Liu, J. and Wang, K. Application of information technology in OBE teaching reform: A case study of teaching discrete mathematics for computer science major. International Journal of Management and Organization, 2023, 1(1), 1–13.

[27] Lee, J.-C., Tai, H.-H., Chen, M.-H. and Cheng, H.-Y. Exploring the relationships between proactive personality and work engagement: The mediating effects of emotional intelligence. International Journal of Management and Organization, 2024, 2(2), 45–70.