Available online at
INSECTA
Integrative Science Education and Teaching Activity Journal
Journal homepage : https://jurnal.iainponorogo.ac.id/index.php/insecta

Article

The Role of Self-Directed Learning in Shaping Behavioral Learning Attitudes among Teacher Trainees at Pursat Provincial Teacher Training College

Sokhkhan Voeng[1*], Monika Cheng[2], Leakhena Kan[3], Udomphirun Heng[4], Sam Ol Kong[5]

[1,2,3]Pursat Provincial Teacher Training College, Cambodia
[4,5] Phnom Penh Teacher Education College (PTEC), Cambodia

**Corresponding Address: voeng.sokhkhan.pttc@moeys.gov.kh*

Article Info
Article history:
Received: March 15, 2025
Accepted: April 20, 2025
Published: May 31, 2025

Keywords:

Attitude;
Behavioral Learning;
Self-Directed Learning;
Teacher Trainee;
Teacher Training.

ABSTRACT

Self-directed learning is significant to empower learners to take ownership of their learning, particularly in fostering positive behavioral learning attitudes, enhancing autonomy, and improving academic performance. This study examines its impact on teacher trainees' behavioral learning attitudes by: (1) analyzing changes after self-directed learning intervention, (2) assessing its overall impact, and (3) exploring trainees' perceptions of their experiences. In the research, the study involved 83 first-year teacher trainees. Data were collected through pre- and post-tests, a questionnaire, and focus group discussions. Quantitative data were analyzed using a Paired-Sample T-Test and Multiple Regression, while qualitative data underwent Thematic Analysis. Findings shown a significant improvement in behavioral learning attitudes following self-directed learning with Self-directed learning was found to be a significant predictor ($B = .544$, $p < .001$), indicating that higher levels of self-directed learning led to higher post-test scores in behavioral learning attitudes. The approach strongly influenced overall behavioral learning attitudes, as teacher trainees perceived it as enhancing their self-regulation, learning engagement, persistence, proactive learning, and help-seeking behavior. The study concludes that self-directed learning is an effective instructional approach for fostering positive behavioral attitudes. These findings suggest integrating self-directed learning model into teacher training programs to promote autonomy and engagement. Future research should examine its long-term effects on professional development.

INTRODUCTION

Teacher trainees are key to shaping the next generation of educators, and thus must be equipped with 21st-century soft skills such as autonomy, critical thinking, and lifelong learning (Trilling & Fadel, 2009). Self-directed learning empowers learners to take initiative, set learning goals, and assess outcomes independently—enhancing learning quality (Knowles, 1975), promoting critical thinking (Garrison, 1997), and developing positive behavioral learning attitudes (Candy, 1991). However, its integration into teacher training programs in Cambodia remains limited, with many teacher trainees still reliant on traditional teacher-led

methods. This dependence restricts their ability to cultivate essential professional attitudes such as adaptability, responsibility, and reflective practice, which are critical for teaching success (Smith, 2020). Investigating the impact of self-directed learning on teacher trainees' behavioral learning attitudes is necessary to bridge this gap and align teacher training with modern educational approaches.

Both Allen Tough and Malcolm Knowles contributed significantly to the theory of self-directed learning, emphasizing learners' active role in managing their own learning experiences. Tough (1971) defined self-directed learning as a process where individuals take the initiative to assess learning needs, set goals, identify resources, and evaluate outcomes, with adult learning primarily occurring through "learning projects" motivated by intrinsic factors such as curiosity and specific needs. Tough (1979) further characterized self-directed learning as involving autonomy, self-motivation, and problem-solving skills, where learners take responsibility while seeking external support when necessary. Similarly, Knowles (1975) defined self-directed learning as a process in which individuals assess their needs, set goals, select strategies, and evaluate their progress, with a focus on adult learners' increasing autonomy and the relevance of their studies. Knowles also emphasized the role of facilitators in helping learners develop self-directed learning skills. Both theories laid the foundation for understanding adult education and lifelong learning, with significant implications for contexts such as workplace training and online learning.

Self-directed learning is a process where learners take the initiative in identifying their learning needs, setting goals, and managing their learning activities (Tough, 1971). It encompasses eight key aspects: identifying learning needs (Tough, 1971), setting goals (Knowles, 1975), planning and organizing (Tough, 1971), self-motivation (Knowles, 1975), resource management (Tough, 1971), learning strategies (Knowles, 1975), self-monitoring and reflection (Tough, 1971), and learning responsibility (Knowles, 1975). These elements foster autonomy and effective learning. Some researches highlighted that accurately identifying learning needs enables learners to set achievable goals and select efficient strategies (Garrison, 1997), while clear goal setting leads to better engagement and performance (Locke & Latham, 2002). Planning and organizing help break tasks into manageable steps (Garrison, 1997; Zimmerman, 2002), and self-motivation drives deeper engagement and persistence (Deci & Ryan, 1985). Effective resource management and the use of learning strategies improve self-efficacy and learning outcomes (Stone & McDonald, 2000; Weinstein & Mayer, 1986). Regular self-monitoring and reflection enable learners to adjust strategies and enhance self-regulation (Pintrich, 2000), while taking responsibility for learning fosters greater motivation and independence (Schunk, 1991). For teacher trainees, these characteristics are essential for developing autonomy, effective learning practices, and professional growth.

Behavioral learning attitudes encompass observable activities that reflect learners' commitment and methods toward the learning process, including learning engagement, persistence, proactive learning, and help-seeking behavior (Fredricks, Blumenfeld, & Paris, 2004). Learning engagement grounded in Self-Determination Theory (Deci & Ryan, 1985), emphasizes intrinsic motivation's role in engaging teacher trainees in learning tasks. Persistence, as defined by Grit Theory (Duckworth et al., 2007), highlights the importance of sustained effort despite challenges. Proactive learning, supported by Bandura's Social Cognitive Theory (1986), involves self-initiated actions aimed at acquiring knowledge and enhancing self-efficacy. Help-seeking behavior, based on Vygotsky's Zone of Proximal Development (1978), demonstrates the value of seeking support to bridge knowledge gaps. Research has shown that learning engagement, persistence, proactive learning, and help-seeking behavior significantly contribute to academic success. Engaged teacher trainees exhibit higher academic outcomes (Skinner, Kindermann, & Furrer, 2009) and greater persistence (Reeve & Tseng, 2011). Persistence fosters long-term learning success (Zimmerman & Schunk, 2011), while proactive learners take initiative in their development (Ashford & Cummings,

1983). Help-seeking behavior supports teacher trainees in overcoming academic challenges (Karabenick & Knapp, 1991; Ryan, Pintrich, & Midgley, 2001). Together, these four aspects provide a framework for understanding how learners actively engage with and sustain their learning efforts.

The setting of learning needs plays a crucial role in shaping behavioral learning attitudes such as learning engagement, persistence, proactive learning, and help-seeking behavior. Boud and Tennant (2006) found that adult learners who actively set their learning needs exhibited increased engagement and persistence in overcoming obstacles, highlighting the importance of learning needs in promoting self-directed learning. Similarly, Garrison (1997) emphasized the role of learning needs in his self-directed learning model, noting that learners who set their own requirements showed higher levels of engagement and responsibility. Saks and Haccoun (2010) further supported this by demonstrating that individuals who set their learning needs early on displayed persistence and proactive learning strategies. In the context of teacher training, Van den Berg and Dijkstra (2012) found that teacher trainees who set their own learning needs through self-assessment demonstrated more proactive behavioral learning attitudes and were more likely to seek help, reinforcing the idea that setting learning needs positively impacts behavioral learning attitudes like help-seeking and proactive learning.

Setting goals significantly influences teacher trainees' behavioral learning attitudes. Brown et al. (2017) found that clear goal setting positively impacts teacher trainees' behavioral learning attitudes and is a key element in effective teacher training. Moeller, Theiler, and Wu (2012) showed that teacher trainees who consistently set and tracked their goals achieved higher levels of language proficiency, highlighting the importance of sustainable goal-setting for learning engagement and academic success. Schunk and Usher (2013), in their exploration of self-regulated learning, concluded that goal setting motivates teacher trainees to engage proactively in their learning process. Cleary and Zimmerman (2012) examined the role of goal setting in self-regulation, finding that teacher trainees who set clear goals were more likely to seek help when needed, enhancing their academic outcomes. These studies collectively emphasize the crucial role of goal setting in fostering teacher trainees' engagement, self-regulation, and academic achievement.

Planning and organizing is crucial in shaping teacher trainees' behavioral learning attitudes, such as learning engagement, persistence, proactive learning, and help-seeking behavior. Li and Irby (2008) found that effective planning strategies significantly enhanced engagement and help-seeking behavior in teacher training programs. Similarly, Van den Boom et al. (2004) demonstrated that planning and reflection improved student engagement and effort in online learning settings. Parsons and Brown (2002) highlighted the long-term benefits of planning skills, showing that they maintained students effort and active behaviors in professional development. Hofmann and Mercer (2016) further confirmed that planning promoted student engagement and support-seeking behaviors, while Nakata (2010) found that systematic planning increased teacher trainees' willingness to seek help and overcome challenges. Finally, Farrell (2015) showed that detailed planning enhanced student engagement and responsibility for learning outcomes. These studies collectively emphasize the critical role of planning and organizing in fostering positive behavioral learning attitudes and supporting student success.

Self-motivation is a critical aspect of self-directed learning that influences key aspects of behavioral learning attitudes like learning engagement, persistence, proactive learning, and help-seeking behavior. Deci et al. (1991) found that self-motivated teacher trainees demonstrate persistence and engage in help-seeking behaviors, supporting adaptive behavioral learning attitudes. Vansteenkiste et al. (2004) showed that intrinsic motivation boosts teacher trainees' engagement and persistence in learning activities. Garrison (1997) highlighted that self-motivation helps teacher trainees maintain focus and effort, enhancing engagement in learning. Song and Hill (2007) demonstrated that motivated teacher trainees in online

environments initiate discussions and use resources effectively, fostering proactive learning. Finally, Hiemstra and Broockett (2012) emphasized that self-motivation drives teacher trainees to seek learning opportunities and take ownership of their education. These studies jointly underline the importance of self-motivation in promoting active, engaged, and proactive behavioral learning attitudes.

Resource management, which involves the efficient allocation and use of resources, plays a vital role in enhancing learning engagement, persistence, proactive learning, and help-seeking behavior. Pintrich and De Groot (1990) found that resource management positively influenced teacher trainees' ability to stay engaged in academic tasks, which was key to academic persistence and success. Zimmerman and Martinez-Pons (1990) demonstrated that effective resource management fostered both independent and collaborative behavioral learning attitudes, allowing teacher trainees to seek help when necessary. Tuckman (2003) extended this understanding, showing that resource management training enhanced teacher trainees' adaptability and resilience in academic contexts. Eilam and Aharon (2003) observed that teacher trainees who strategically managed resources displayed better coping mechanisms and help-seeking behaviors, which supported self-regulation in learning. Lynch, Hurford, and Cole (2002) highlighted that both material and social resource management significantly boosted engagement and promoted proactive learning strategies. Finally, Kitsantas and Zimmerman (2009) found that resource management played a key role in linking motivation to sustained learning engagement and persistence, underlining its importance in self-directed learning.

Learning strategies significantly influence teacher trainees' learning engagement, persistence, proactive learning, and help-seeking behavior. Lynch, Hurford, and Cole (2002) found that effective learning strategies of time and resource management enhanced teacher trainees' engagement and persistence in challenging learning environments. Similarly, Kramarski and Michalsky (2009) found that teacher trainees who used specific strategies such as self-monitoring and goal setting promoted greater persistence, proactive learning, and help-seeking behavior, particularly in technology-integrated learning settings. Tillema and Kremer-Hayon (2005) highlighted the importance of metacognitive strategies like self-reflection and critical thinking in helping teacher trainees overcome practicum challenges through proactive learning and problem-solving. Darling-Hammond et al. (2005) emphasized that inquiry-based learning strategies cultivate curiosity, enhance problem-solving skills, and encourage help-seeking behavior, all essential for effective classroom teaching. Postholm (2012) further underscored the role of collaborative learning strategies, such as peer feedback and group discussions, in enhancing engagement, persistence, and proactive learning. Collectively, these studies affirm that effective learning strategies are critical in developing persistence and engagement in teacher education programs.

Self-monitoring and reflection, key components of self-directed learning, are essential for fostering learning engagement, persistence, proactive learning, and help-seeking behavior. Research has shown that these aspects improve learners' ability to manage their learning, adapt to challenges, and achieve success. Kramarski and Michalsky (2009) found that self-monitoring demonstrated higher engagement and proactive learning among teacher trainees, especially in technology-based tasks. Cleary and Zimmerman (2012) highlighted the role of self-monitoring in maintaining motivation and persistence in challenging tasks. Paris and Winograd (2003) emphasized the importance of reflection, noting that reflective practices, such as journaling and peer discussions, promoted proactive learning and helped teacher trainees adapt to learning challenges. Karabenick and Knapp (1991) found that self-monitoring increased college teacher trainees' likelihood of seeking help, improving academic outcomes. Zimmerman and Schunk (2011) confirmed that self-monitoring encouraged engagement and that reflection enhanced persistence, making both strategies key for self-directed learning.

Learning responsibility plays a crucial role in enhancing learning engagement, persistence, proactive learning, and help-seeking behavior. Song and Hill (2007) found that in

online learning environments, learning responsibility led to increased engagement and persistence, especially in self-management activities. Similarly, Vansteenkiste et al. (2014) confirmed that fostering responsibility improved persistence and active class engagement. Huang (2008) showed that teacher trainees who took responsibility for their learning were more engaged in seeking additional resources and initiating peer discussions, emphasizing the importance of proactive behaviors in self-directed learning. Lopez and Snyder (2003) supported this by showing that teacher trainees well-prepared for self-directed learning exhibited greater engagement in both collaborative and independent activities. Furthermore, learning responsibility also promoted help-seeking behavior, with teacher trainees more likely to seek assistance when they took ownership of their learning (Caffarella & Barnett, 2000; Boyer et al., 2006). These studies cooperatively highlight that learning responsibility fosters essential behavioral learning attitudes, contributing to academic and professional growth in self-directed learning contexts.

The theoretical framework for this study combines the theories of Allen Tough and Malcolm Knowles, which identify influential aspects of self-directed learning. Four aspects of behavioral learning attitudes are integrated through four major theories: learning engagement via Self-Determination Theory (Deci & Ryan, 1985), persistence through Grit Theory (Duckworth, 2007), proactive learning via Social Cognitive Theory (Bandura, 1986), and help-seeking behavior through the Zone of Proximal Development (Vygotsky, 1978). The graphic below illustrates the theoretical framework for this study.

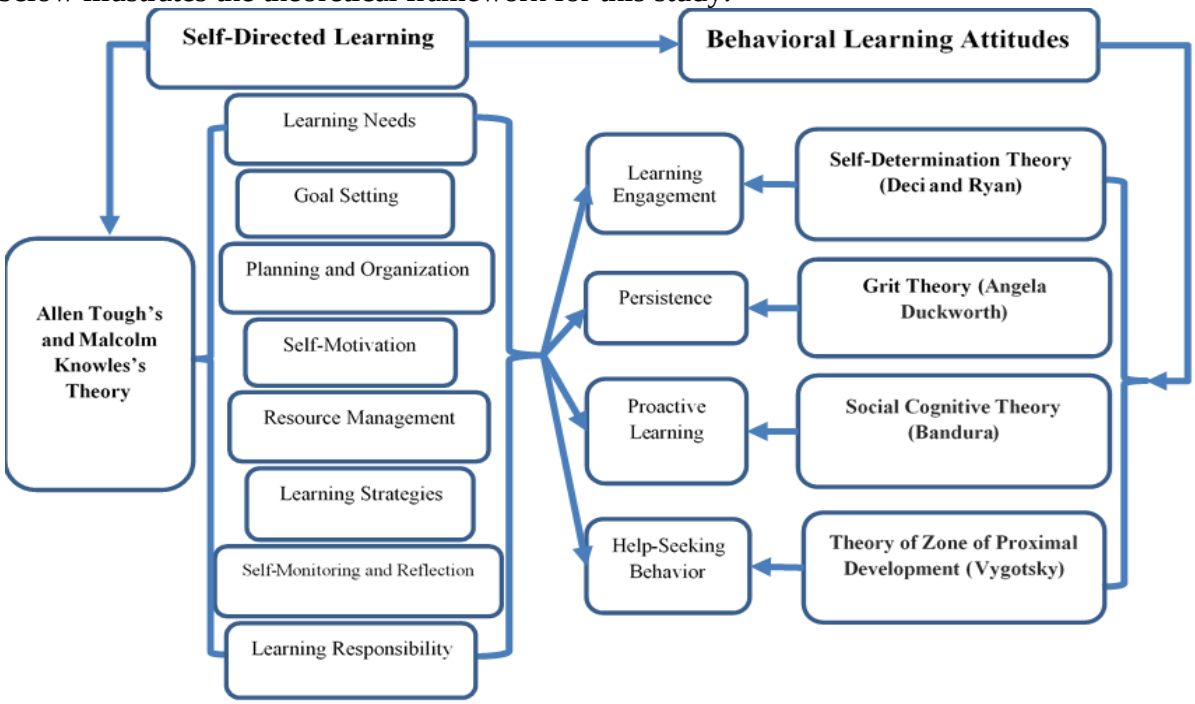

Figure 1. The Theoretical Framework of the Impact of Self-Directed Learning on Behavioral Learning Attitudes

The diagram illustrates how the eight aspects of self-directed learning influence the four aspects of behavioral learning attitudes, with arrows showing the impact of self-directed learning on fostering positive attitudes among learners. For instance, setting effective learning goals enhances persistence and engagement, while self-motivation promotes proactive learning and help-seeking behavior. The theoretical framework, based on the work of Allen Tough, Malcolm Knowles, Deci and Ryan, Duckworth, Bandura, and Vygotsky, provides a foundation for understanding how self-directed learning model shapes behavioral learning attitudes. It serves as a guide for analyzing the relationship between self-directed learning and behavioral learning attitudes, ultimately improving learners' behavioral learning attitudes and academic outcomes.

Promoting positive behavioral learning attitudes is essential in teacher training programs for developing competent teacher trainees. Self-directed learning has been recognized for fostering key behavioral learning attitudes such as engagement, persistence, proactive learning, and help-seeking behavior. While research on self-directed learning's impact is abundant internationally, studies in Cambodian teacher training colleges remain limited. Research at Battambang Teacher Education College shows that self-directed learning enhances student engagement and motivation (Bou et al., 2024), while a study on lifelong learning indicates that self-directed learning fosters critical thinking, independence, and active engagement, contributing to a positive behavioral learning attitudes (Neak & Ratana-Ubol, 2021) and learner autonomy study in Cambodia highlights its role in promoting critical thinking, independence, and problem-solving skills (Ngath, Eong, & Ly, 2024). However, there is a gap in theoretical discussions about its specific impact on behavioral learning attitudes in Cambodian teacher training colleges, particularly in four key aspects: learning engagement, persistence, proactive learning, and help-seeking behavior. This study seeks to address this gap by examining the impact of self-directed learning on behavioral learning attitudes among teacher trainees at the Provincial Teacher Training College in Pursat, providing insights to enhance teacher training programs.

This study has three main objectives to explore self-directed learning and its impact on teacher trainees' behavioral learning attitudes which are (1) to examine the extent of changes in teacher trainees' behavioral learning attitudes after the intervention of self-directed learning, (2) to investigate the impact of self-directed learning on teacher trainees' behavioral learning attitudes, and (3) to explore teacher trainees' perceptions of their experiences with self-directed learning in shaping their behavioral learning attitudes.

METHODS

This study adopts a mixed-methods action research, combining quantitative and qualitative data collection and analysis via participatory approach to comprehensively examine the impact of self-directed learning on teacher trainees' behavioral learning attitudes at Provincial Teacher Training College in Pursat, Cambodia. The participants consist of 83 first-year, second-semester teacher trainees from the 40th cohort, all of whom were purposively selected by using total population sampling due to the small cohort size. Quantitative data were collected through pre- and post-tests on teacher trainees' behavioral learning attitudes, and a Likert-scale survey questionnaire on self-directed learning while qualitative data were obtained from focus group discussions exploring their experiences with self-directed learning. Data analysis includes a paired sample t-test to assess changes before and after the intervention, multiple regression to analyze the survey data on the impact of self-directed learning, and thematic analysis for qualitative focus group data on perceptions self-directed learning experiences. Ethical considerations ensure informed consent, confidentiality, and voluntary participation, allowing participants to withdraw at any time without consequences.

RESULTS AND DISCUSSION

The analysis result of reliability for the self-directed learning scale, which measures eight aspects showed an excellent internal consistency with a Cronbach's Alpha of α=0.96 based on data from 83 first-year teacher trainees. Pair-Sample T-Test and Multiple Regression were performed, and reliability analysis for the behavioral learning attitudes scale, with a Cronbach's Alpha of α= 0.96, confirmed its consistency in measuring learning engagement, persistence, proactive learning, and help-seeking behavior.

Study Results of Changes in Behavioral Learning Attitudes through Pre-test and Post-test

To measure changes in teacher trainees' behavioral learning attitudes after the intervention of self-directed learning, the Paired-Sample T-Test was conducted to examine the

changes in behavioral learning attitudes after the self-directed learning intervention. The table below shows the results of the descriptive statistical analysis for the pre-test and post-test.

Table 1. Mean Distribution of Pre-test and Post-test

Test		Number of Teacher Trainees	M	S.D
Pair 1	Post-Test	83	3.89	.51
	Pre-Test	83	2.46	.74

Table 1 shows that the mean score of post-test scores of teacher trainees' behavioral learning attitudes (M=3.89, SD=0.51) is higher than the mean score of the pre-test of teacher trainees' behavioral learning attitudes (M=2.46, SD=0.74). This result indicated that teacher trainees' behavioral learning attitudes improved significantly after the intervention.

Table 2. Comparison of Variance in Teacher Trainees' Behavioral Learning Attitudes Before and After the Intervention

Variance		M	S.D	t	df	Sig.	Cohen's d
Pair 1	Post-Test-Pre-Test	1.44	.87	14.96	82	.000	1.64

Table 2 shows that teacher trainees' behavioral learning attitudes improved following the intervention of self-directed learning, t (82)=14.96, p <.001, d=1.64. According to Cohen (1988), a d=0.2 is considered a small effect of change, d=0.5 is a medium effect of change, and $d \geq 0.8$ is considered a large effect of change. However, the effect size of change obtained from this analysis (d= 1.64) indicates a very strong effect of change. The results of this study suggest a substantial improvement in teacher trainees' behavioral learning attitudes after self-directed learning intervention.

Study Results of the Impact of Self-Directed Learning through a Questionnaire Survey

Multiple Regression analysis was conducted to examine the relationship between self-directed learning as the predictor and post-test scores of behavioral learning attitudes. This analysis was necessary to assess the impact of self-directed learning in predicting teacher trainees' behavioral learning attitudes, while controlling for the influence of the pre-test scores.

The Model Summary table below provides the predictive model, which offers information on how well self-directed learning explains the variation in post-test scores of behavioral learning attitudes. It includes the strength of the relationship between post-test scores of behavioral learning attitudes and the predicted values generated by the predictive model (R), the coefficient of determination (R^2), which indicates the variance explained by self-directed learning, the adjusted R^2 that accounts for the number of predictors in the model, and the standard error of the estimate, which shows the accuracy of the predictions made by the model.

Table 3. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.566[a]	.320	.311	.424

a. Predictors: (Constant), Self-Directed Learning

Note. R = Multiple correlation coefficient; R^2= Coefficient of determination; Adjusted R^2= Adjusted coefficient of determination

Table 3 shows that the predictive regression model explains the variance of post-test scores of behavioral learning attitudes (R^2=0.320, Adjusted R^2=0.311), indicating that 32% of the variance in post-test scores of behavioral learning attitudes is explained by the self-directed learning model. The Std. Error of the Estimate=0.424 indicates the average level of prediction error.

To determine if the overall regression model truly predicts the impact on post-test scores of behavioral learning attitudes, it is necessary to examine the F-test value, which compares the variance explained by self-directed learning with the variance not yet explained by the regression model. The significant p-value (p< .05) indicates that this regression model is appropriate for data analysis.

Table 4. ANOVA[a]

Model		Sum of Squares	df	Mean of Squares	F	p-value
1	Regression	6.862	1	6.862	38.10	.000[b]
	Residual	14.592	81	.180		
	Total	21.454	82			

a. Dependent Variable: Post_Test

b. Predictors: (Constant), Self-Directed Learning

Table 4 shows that the prediction model is statistically significant, $F(1, 81)=38.10$, $p< .001$. According to Cohen (1988), effect sizes of $f^2=0.02$ (small), $f^2 =0.15$ (medium), and $f^2 = 0.35$ (large) suggest that the F value of 38.10 corresponds to an effect size of $f^2=0.32$ indicating a large effect. This demonstrates that self-directed learning strongly predicts post-test scores of the teacher trainees' behavioral learning attitudes, highlighting its significant impact.

Table 5. Regression Coefficients [a]

Predictors		B	SE	β	t-value	p-value
1	(Constant)	1.935	.320		6.040	.000
	Self-Directed Learning	.544	.088	.566	6.172	.000

a. Dependent Variable: Post_Test

Note. B= unstandardized coefficient, SE= standard error, β= standardized coefficient

Table 5 of the Regression Equation Model shows that self-directed learning is a significant positive predictor of post-test scores in behavioral learning attitudes (B=.544, SE=.088, β=.566, t= 6.172, p<.001). This result indicates that for each unit increase in self-directed learning, post-test scores in behavioral learning attitudes increases by 0.544 units, while controlling for the pre-test scores in behavioral learning attitudes.

The Multiple Regression analysis demonstrated that this regression model significantly predicted post-test scores in behavioral learning attitudes of teacher trainees ($F(1, 81) = 38.10$, $p < .001$). This model explained 32% of the variance in post-test scores in behavioral learning attitudes ($R^2= .320$). Self-directed learning was found to be a significant predictor (B= .544, $p < .001$), indicating that higher levels of self-directed learning led to higher post-test scores in behavioral learning attitudes.

Thematic Analysis was conducted on a focus group of 11 participants, including 8 female teacher trainees, to examine their perceptions on experiences of self-directed learning in shaping behavioral learning attitudes. Audio recordings were transcribed into 17 pages, allowing themes to emerge naturally and providing in-depth insights (Braun & Clarke, 2006). The analysis involved key steps, including familiarization with the data, coding key responses, and identifying and refining themes that reflect participants' perspectives.

Teacher Trainees' Perceptions on Their Experiences of Self-Directed Learning in Shaping Behavioral Learning Attitudes

The focus group discussions revealed five key themes regarding the impact of self-directed learning on behavioral learning attitudes. First, teacher trainees developed greater self-management, demonstrating increased self-discipline in organizing their studies and taking responsibility for their progress. They reported setting clear learning goals and seeking solutions independently rather than relying solely on teachers. One teacher trainee shared that before participating in the self-directed learning intervention, they often studied without clear objectives. After the intervention, however, they reported being able to set clear learning goals and organize their studies more effectively. Another trainee reflected that before, they relied on teachers to guide their learning, but after the intervention, they could independently find solutions without waiting for teacher support. This change demonstrates that self-directed learning encouraged teacher trainees to take control of their own learning (Garrison, 1997).

Second, self-directed learning fostered help-seeking behavior, as teacher trainees who were previously hesitant to ask for assistance became more confident in seeking help from

teachers, peers, and online resources like Google and ChatGPT. While they used digital tools, they still valued human explanations for better understanding. One trainee shared that they used to avoid asking questions or messaging their teachers but now felt more confident. Another noted a shift from relying solely on peers to independently exploring answers using tools like Google and ChatGPT before seeking help. The other trainee said that when ChatGPT provided answers unclear or too formulaic, they turned to peers or teachers for clearer, strategy-based explanations. This emphasizes that self-directed learners actively seek support to enhance their learning process (Knowles, 1975; Deci & Ryan, 2000).

Third, the study highlighted persistence in learning, as teacher trainees showed greater persistence when facing academic challenges. They actively sought solutions, researched step by step, and persisted until they found answers, leading to a sense of accomplishment. One trainee noted that self-directed learning strengthened their learning persistence; despite considering a topic change due to difficulty, they continued researching and completed it successfully. Another shared that when struggling with a math exercise, they kept trying, searched online for solutions, and felt proud after finally solving it. As Garrison (1997) noted, persistent self-directed learners are more likely to achieve their learning goals.

Fourth, self-directed learning promoted active learning engagement, encouraging teacher trainees to engage more in both academic and extracurricular study activities. They recognized the need for careful planning and research to effectively complete their studies. One trainee explained that self-directed learning improved their focus and motivated them to take an active role in planning and carrying out their own research project. Another added that it encouraged participation in out-of-class activities, such as compiling a math book through independent research. This indicates that self-directed learners participate actively in learning activities, focus attention, and put the effort into understanding and completing their academic tasks (Fredricks, Blumenfeld, & Paris, 2004).

Finally, the findings emphasized proactive learning, with teacher trainees taking initiative by using learning strategies such as note-taking, summarizing key content, and researching lessons in advance. Some even expanded their learning beyond the curriculum, exploring new languages and complex grammatical concepts. One trainee said self-directed learning improved their study habits by helping them focus on key points and research unclear areas, and another emphasized summarizing lessons as necessary for understanding while the other noted that reviewed lessons in advance to better follow in class. According to Ashford and Cummings (1983), proactive learners engage in self-initiated exploration and problem-solving, which enhances their adaptability and performance.

Overall, the study demonstrates that self-directed learning positively impacts teacher trainees' autonomy, learning engagement, persistence, proactive learning, help-seeking behavior, and fostering essential skills for academic success and lifelong learning.

The Level of Change in Teacher Trainees' Behavioral Learning Attitudes after Self-Directed Learning Intervention

The Pair-Sample T-Test results showed a significant increase in post-test scores of teacher trainees' behavioral learning attitudes compared to pre-test scores, $t(82) = 14.96$, $p < .001$. The post-test means ($M = 3.89$, $SD = .51$) was higher than the pre-test means ($M = 2.46$, $SD = .74$), indicating improvements in learning engagement, persistence, proactive learning, and help-seeking behavior. The strong effect size (Cohen's $d = 1.64$) highlights the magnitude of the change.

These findings align with previous studies showing teacher trainees with positive behavioral learning attitudes in learning engagement are more likely to engage in proactive learning activities, increase their enthusiasm, and make greater efforts to understand their studies (Fredricks, Blumenfeld, & Paris, 2004; Deci & Ryan, 1985). Learning engagement leads to higher academic outcomes (Skinner, Kindermann, & Furrer, 2009) and promotes ownership of one's learning (Reeve & Tseng, 2011). Additionally, positive behavioral learning

attitudes in persistence reflects sustained effort and focus when faced with challenges (Zimmerman & Schunk, 2011). Persistence is essential for academic success (Duckworth, Peterson, Matthews, & Kelly, 2007) and helps in achieving learning goals (Garrison, 1997), with high levels of persistence being crucial for effectively solving problems when faced with obstacles (Wolters & Hussain, 2015).

Furthermore, positive behavioral learning attitudes in proactive learning involves teacher trainees initiating ideas to seek new knowledge and skills (Knowles, 1975), increasing their self-efficacy in promoting active behaviors (Bandura, 1986), and engaging in problem-solving and exploration initiated by themselves (Ashford & Cummings, 1983). Finally, positive behavioral learning attitudes also emphasizes help-seeking behavior, which refers to teacher trainees' desire and ability to seek assistance when necessary (Newman, 1994). Proactive learning is an important social interaction in education (Vygotsky, 1978), and seeking help and self-regulation strengthen each other, leading to academic success (Karabenick & Knapp, 1991), while seeking help as a strategy helps overcome learning challenges and promotes deeper understanding (Ryan, Pintrich, & Midgley, 2001).

However, unlike previous research studies that examined the impact of self-directed learning on specific aspects of behavioral learning attitudes such as engagement, self-regulation, and effort management (Schunk & Zimmerman, 2012; Pintrich, 2004), this study provides a comprehensive evaluation of behavioral learning attitudes as a whole. The findings suggest that the positive changes in behavioral learning attitudes are more overall, rather than reflecting any specific aspect that has changed the most.

The positive changes in teacher trainees' behavioral learning attitudes may be attributed to the nature of self-directed learning, which encourages teacher trainees to take ownership of their learning process. According to self-determination theory (Deci & Ryan, 1985), when teacher trainees are given autonomy in their learning, they are more likely to demonstrate higher levels of engagement and persistence. In this study, self-directed learning interventions provided teacher trainees with the opportunity to set their learning needs, establish learning goals, manage their learning process, reflect on their learning, and take responsibility for their studies, all of which likely contributed to the improvement in their behavioral learning attitudes.

Another possible explanation for the positive changes in teacher trainees' behavioral learning attitudes is that self-directed learning stimulates metacognitive awareness, enabling teacher trainees to recognize the value of persistence, proactive learning, and help-seeking behavior in overcoming challenges (Garrison, 1997). This aligns with Duckworth's Grit Theory (2007), which emphasizes that persistence and sustained effort are critical to learning success. By developing grit, teacher trainees are more likely to persevere through learning difficulties. Moreover, Social Cognitive Theory (Bandura, 1997) highlights the role of proactive learning, suggesting that self-efficacy—the belief in one's ability to succeed—drives teacher trainees to take initiative, engage actively, and remain committed to their learning goals. Furthermore, Vygotsky's Zone of Proximal Development (1978) emphasizes the importance of help-seeking behavior, as learning is most effective when teacher trainees seek support for tasks within their ZPD, facilitating cognitive development. This suggest that self-directed learning strengthens persistence, proactive learning, and help-seeking behavior, ultimately leading to improved learning outcomes.

While this study confirms the effectiveness of self-directed learning in enhancing behavioral learning attitudes, it differs from previous research that focused on specific teaching strategies within self-directed learning (Loyens et al., 2008). This study examined the overall change in behavioral learning attitudes without isolating the specific impacts of self-directed learning. Future research could further explore which aspects of behavioral learning attitudes are most influenced by self-directed learning.

The Impact of Self-Directed Learning on Teacher Trainees' Behavioral Learning Attitudes

The Multiple Regression analysis showed that self-directed learning predicted post-test scores of behavioral learning attitudes, while controlling for the pre-test scores. The predictive model revealed that self-directed learning is a strong predictor of positive change in behavioral learning attitudes with β= .566, indicating a medium to strong relationship. This predictive model explained about 32% of the variance in the pre-test scores of behavioral learning attitudes, showing that self-directed learning plays a significant role in changing teacher trainees' behavioral learning attitudes.

The results of this study demonstrate the overall impact of self-directed learning on behavioral learning attitudes, indicating that self-directed learning has a strong effect on teacher trainees' overall behavioral learning attitudes. This study contrasts with previous research, which mainly examined the relationship between self-directed learning and behavioral learning attitudes at the level of aspects rather than the whole. Previous studies detailed eight aspects of self-directed learning, including: identifying learning needs, setting learning goals, planning and organizing, self-motivation, resource management, learning strategies, self-monitoring and reflection, and learning responsibility. Similarly, earlier studies on behavioral learning attitudes focused on aspects such as: learning engagement, persistence, proactive learning, and help-seeking behavior, rather than the whole. The following discussion presents previous research that explored the aspects of self-directed learning and their impact on the aspects of teacher trainees' behavioral learning attitudes.

These studies have found that identifying learning needs in self-directed learning impacts behavioral learning attitudes, such as learning engagement, persistence, proactive learning, and help-seeking behavior (Boud & Tennant, 2006; Saks & Haccoun, 2010; Garrison, 1997; Van den Berg & Dijkstra, 2012). Setting learning goals in self-directed learning impacts behavioral learning attitudes (Brown et al., 2017), including learning engagement (Moeller, Theiler, & Wu, 2012), proactive learning, and self-regulation (Schunk & Usher, 2013), and help-seeking (Cleary & Zimmerman, 2012). Other studies have shown that planning and organizing in self-directed learning influences behavioral learning attitudes, such as promoting positive behavioral learning attitudes in teacher trainees (Li & Irby, 2008; Van den Boom et al., 2004), encouraging learning engagement (Farrell, 2015), fostering persistence and proactive learning (Parsons & Brown, 2002), encouraging active engagement and seeking necessary support (Hofmann & Mercer, 2016), and seeking support and persistence (Nakata, 2010). Similarly, the self-motivation aspect in self-directed learning affects behavioral learning attitudes, such as persistence and help-seeking (Deci et al., 1991), proactive learning and persistence (Vansteenkiste et al., 2004), active engagement (Garrison, 1997), and help-seeking behavior (Hiemstra & Broockett, 2012).

Some studies have also shown that resource management positively influences teacher trainees' behavioral learning attitudes, including their learning engagement activities, persistence, and success (Pintrich & De Groot, 1990). It encourages both independent behavioral learning attitudes and cooperative behavior, allowing teacher trainees to actively seek academic help when necessary (Zimmerman & Martinez-Pons, 1990). This leads to adaptation and resilience in competitive learning contexts (Tuckman, 2003), overcoming obstacles and seeking help as a learning strategy (Eilam & Aharon, 2003), which significantly increases learner engagement and promotes proactive learning approach (Lynch, Hurford, & Cole, 2002). Resource management is a key element of self-directed learning, leading to learning persistence (Kitsantas & Zimmerman, 2009).

Learning strategies have been found to influence teacher trainees' learning engagement (Lynch, Hurford, & Cole, 2002). Specific learning strategies, such as self-monitoring and goal-setting, demonstrate increased learning persistence and active engagement in their learning (Kramarski & Michalsky, 2009). Additionally, inquiry-based learning strategies encourage

proactive behavioral learning attitudes among teacher trainees (Darling-Hammond et al., 2005), while discussion-based learning strategies are crucial in enhancing engagement and promoting persistence (Postholm, 2012). Furthermore, a study has shown that learning strategies truly enhance proactive learning, persistence in overcoming difficulties, and continued learning engagement (Tillema & Kremer-Hayon, 2005).

Self-monitoring and reflection have significant positive effects on teacher trainees' behavioral learning attitudes, especially in terms of learning engagement and proactive learning, particularly when learning integrates technology (Kramarski & Michalsky, 2009). These aspects also strengthen persistence and attention in response to the demands of the educational environment (Cleary & Zimmerman, 2012). Paris and Winograd (2003) found that reflection encourages teacher trainees to actively seek additional resources and adjust their strategies to solve academic challenges. Karabenick and Knapp (1991) found that self-monitoring motivates teacher trainees to actively seek support, while Zimmerman and Schunk (2011) encourage active engagement.

A study by Song and Hill (2007) showed that learning responsibility increased engagement and persistence, while Vansteenkiste et al. (2014) demonstrated that teacher trainees were more persistent in completing assignments and participating more actively in classroom activities. Huang (2008) found that teacher trainees with learning responsibility tended to participate more actively by seeking additional resources. Research by Lopez and Snyder (2003) showed that learning responsibility contributed to greater engagement in both cooperative and independent learning. Caffarella and Barnett (2000) found that learners who took responsibility for their learning were more likely to seek help from mentors and peers when facing challenges. In contrast, active responsibility in managing schedules and resources demonstrated higher persistence in completing challenging modules (Boyer et al., 2006).

The methods chosen for this study are comprehensive and provide a deeper understanding of the relationship between self-directed learning and behavioral learning attitudes. The evidence indicates that self-directed learning is a broad learning model that promotes positive changes in teacher trainees' overall behavioral learning attitudes. This study shows that self-directed learning not only enhances specific aspects of behavioral learning attitudes but also contributes to a broader transformation in teacher trainees' overall behavioral learning attitudes.

The difference in scope between this study and previous research may explain variations in the study results. While earlier research has provided valuable insights into the role of specific aspects of self-directed learning in shaping aspects of behavioral learning attitudes, this study demonstrates the combined impact of self-directed learning when considered as a whole. This broader perspective shows that interventions designed to promote self-directed learning can have a wider impact on teacher trainees' overall behavioral learning attitudes rather than just specific aspects of their academic conduct.

Future research may expand on these findings by examining the combined effects of self-directed learning, comparing it with the effects of each of its specific aspects. Investigating whether specific aspects of self-directed learning significantly contribute to particular aspects of behavioral learning attitudes will provide clearer insights into their interactions and guide the development of self-directed learning interventions to be integrated into teacher education programs.

Teacher Trainees' Perceptions on the Experience of Self-Directed Learning in Shaping Their Behavioral Learning Attitudes

The results of the qualitative data analysis reveal that teacher trainees perceive self-directed learning as a tool for organizing their behavioral learning attitudes, particularly in strengthening self-management, learning engagement, persistence, proactive learning, and help-seeking behavior. These perceptions align with existing research that underscores self-directed learning as a transformative method that stimulates autonomy and motivation among

learners (Garrison, 1997). Many teacher trainees reported that self-directed learning improved their ability to set learning goals, track progress, and manage their time effectively, in line with Zimmerman's (2002) self-directed learning model, highlighting the role of goal-setting and self-monitoring in the success of learning.

Furthermore, teacher trainees showed increased engagement in their learning processes, actively engaging in discussions and seeking additional resources beyond prescribed materials. This supports Deci and Ryan's (2000) work, which asserts that self-determination enhances motivation and engagement. Likewise, persistence in learning tasks emerged as a recurring theme in student responses, illustrating that self-directed learning facilitates resilience and persistence, in line with Tough's (1979) study on adult learners who persevere despite challenges in managing their own learning.

Another significant theme was proactive learning, with teacher trainees describing a shift from passive reception of knowledge to actively seeking knowledge. This finding is supported by Candy (1991), who argues that self-directed learners demonstrate high levels of curiosity and independent problem-solving. Moreover, help-seeking behavior significantly improved as teacher trainees became more confident in seeking guidance from peers and instructors, aligning with Vygotsky's (1978) Zone of Proximal Development, which highlights the role of social interaction in learning.

These qualitative findings suggest that self-directed learning not only promotes independence but also enhances social learning interaction, contributing to positive behavioral learning attitudes. Compared to previous studies, which often focused separately on specific aspects of self-directed learning and behavioral learning attitudes (Knowles, 1975), this study provides a comprehensive perspective on how self-directed learning impacts various aspects of teacher trainees' behavioral learning attitudes. The findings reinforce the importance of integrating self-directed learning model into teacher training programs to cultivate lifelong learning skills essential for professional development.

CONCLUSION

The results of the study demonstrated the significant impact of self-directed learning on teacher trainees' behavioral learning attitudes, improving engagement, persistence, proactive learning, and help-seeking behavior. Teacher trainees perceived self-directed learning as valuable for academic growth, reinforcing its role as both a teaching method and a developmental tool. These findings align with previous research on its benefits for long-term study skills and self-regulation, emphasizing the need to integrate it into teacher training programs to cultivate lifelong learning skills essential for professional development. Moreover, the study highlights self-directed learning as a powerful intervention for fostering self-management, engagement, and responsibility in learning. Mainly, the result indicated that the teacher trainees perceived it as valuable for their academic growth, reinforcing its role as both a teaching method and a developmental tool. This instructional model supports national policies on teacher career pathways, particularly continuous professional development (CPD). In addition, the approach strongly influenced overall behavioral learning attitudes, as teacher trainees perceived it as enhancing their self-regulation, learning engagement, persistence, proactive learning, and help-seeking behavior. The self-directed learning is also an effective instructional approach for fostering positive behavioral attitudes. The findings suggest integrating self-directed learning model into teacher training programs to promote autonomy and engagement. While the study highlights self-directed learning as an effective approach for fostering autonomy and engagement, it acknowledges limitations such as a small sample size, short intervention duration, and potential self-reporting biases. Future research should further explore learning strategy, self-motivation and reflection, and learning responsibility in more depth to strengthen theoretical frameworks and validate findings. Particularly, its long-term

effects and teacher trainees' perceptions should be compared with a larger scale of other teacher training institutions.

AKNOWLEDGMENT

I would like to express my sincere appreciation to the MoEYS of Cambodia and UNICEF for contributions and support have greatly enhanced the quality and rigour of this research through training workshop.

First and foremost, I am grateful to my primary advisor Sam Ol Kong and Udomphirun Heng for unwavering guidance, insights, and constant encouragement throughout the research and training period. This expertise and wisdom were an invaluable asset to this study.

I am grateful to the PPTTC for offering opportunities, facilities, and resources for this project. This support facilitated the smooth execution of the research study.

I extend my appreciation to my team, friends and colleagues, who have been supportive throughout and provided a stimulating academic environment. Their encouragement was immensely motivating during my challenging research and training journey.

Lastly, I am thankful to my family for their understanding, encouragement, and support.

REFERENCES

Ashford, S. J., & Cummings, L. L. (1983). Feedback as an individual resource: Personal strategies of creating information. *Organizational Behavior and Human Performance, 32*(3), 370-398.

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Prentice-Hall.

Bou, D., Sran, L., Teu, S., Tep, C., Kheuy, S., Vy, S., & Dul, V. (2024). Examining self-assessment of teacher trainees' self-directed learning: A case study at Battambang Teacher Education College, Cambodia. *Education Quarterly Reviews*, *7*(4), 118-135.

Boud, D., & Tennant, M. (2006). The importance of identifying learning needs in adult education. *Journal of Adult Education*, *32*(2), 85-98.

Boyer, N. M., Maher, P. A., & Kirkman, D. (2006). The impact of learner responsibility on persistence in online education. *Online Journal of Distance Learning Administration*, *9*(4), 1–7.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brown, A., Smith, J., & Taylor, K. (2017). Goal Setting and Its Impact on Behavioral learning attitudes. *Journal of Teacher Education*, *45*(2), 123-136.

Caffarella, R. S., & Barnett, B. G. (2000). Teaching doctoral teacher trainees to become scholarly writers: The importance of giving and receiving critiques. *Studies in Higher Education*, *25*(1), 39–52.

Candy, P. C. (1991). *Self-direction in learning: A comprehensive guide to theory and practice*. Jossey-Bass.

Cleary, T. J., & Zimmerman, B. J. (2012). A cyclical self-regulatory account of student engagement: Theoretical foundations and applications. In S. L. Christenson, A. L. Reschly, & C. Wylie (Eds.), *Handbook of research on student engagement* (pp. 237–257). Springer. https://doi.org/10.1007/978-1-4614-2018-7_11

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Routledge.

Darling-Hammond, L., Bransford, J., LePage, P., Hammerness, K., & Duffy, H. (2005). *Preparing teachers for a changing world: What teachers should learn and be able to do*. Jossey-Bass.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. Springer.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11*(4), 227–268.

Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). A motivational model of self-determination and persistence. Journal of Personality and Social Psychology, 60(4), 593–604.

Duckworth, A. L., Peterson, C., Matthews, M. D., & Kelly, D. R. (2007). Grit: Persistence and passion for long-term goals. *Journal of Personality and Social Psychology*, *92*(6), 1087–1101.

Eilam, B., & Aharon, I. (2003). Teacher trainees' planning in the process of self-regulated learning. *Contemporary Educational Psychology*, *28*(3), 304–334.

Farrell, T. S. C. (2015). Reflective practice in teacher education: The role of planning and organization. *TESOL Quarterly, 49*(2), 366–387.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59-109.

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

Hiemstra, R., & Brockett, R. G. (2012). Reframing the meaning of self-directed learning to enhance motivation. In M. C. Smith & M. C. Baruch (Eds.), *The Handbook of Adult and Continuing Education* (pp. 153-171). Routledge.

Hofmann, J., & Mercer, S. (2016). The impact of planning on teacher trainees' professional development. *Journal of Teacher Education, 67*(1), 34–50.

Huang, H. M. (2008). Proproactive learning strategies in self-directed learning environments. *Educational Technology & Society*, *11*(3), 44–58.

Karabenick, S. A., & Knapp, J. R. (1991). Relationship of academic help-seeking to the use of learning strategies and other instrumental achievement behavior in college teacher trainees. *Journal of Educational Psychology, 83*(2), 221-230.

Kitsantas, A., & Zimmerman, B. J. (2009). College teacher trainees' homework and academic achievement: The mediating role of self-regulation and motivation. *Journal of Educational Psychology*, *101*(2), 391–405.

Knowles, M. S. (1975). *Self-directed learning: A guide for learners and teachers*. Chicago: Follett.

Knowles, M. S. (1980). *The modern practice of adult education: From pedagogy to andragogy*. Cambridge Books.

Kramarski, B., & Michalsky, T. (2009). Investigating self-regulated learning in teacher education: Integrating learning from problems and reflection. *Teaching and Teacher Education*, *25*(5), 759–767. https://doi.org/10.1016/j.tate.2009.02.010

Li, L., & Irby, B. (2008). The role of organization in self-directed learning among pre-service teachers. *International Journal of Teaching and Learning in Higher Education, 20*(2), 235-245.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation. *American Psychologist*, *57*(9), 705-717.

Locke, E. A., & Latham, G. P. (2006). New directions in goal-setting theory. *Current Directions in Psychological Science, 15*(5), 265–268. https://doi.org/10.1111/j.1467-8721.2006.00449

Lopez, L. M., & Snyder, A. D. (2003). The influence of self-directed learning readiness on student engagement. *Journal of Educational Research*, *97*(5), 269–279.

Loyens, S. M. M., Magda, J., & Rikers, R. M. J. P. (2008). Self-directed learning in problem-based learning and its relationships with self-regulated learning. *Educational Psychology Review, 20*(4), 411-427. https://doi.org/10.1007/s10648-008-9082-7

Lynch, S., Hurford, D., & Cole, P. (2002). The impact of resource management and learning strategies on learning engagement. *Journal of Educational Psychology*, *94*(2), 380-390. https://doi.org/10.1037/0022-0663.94.2.380

Moeller, A. J., Theiler, J. M., & Wu, C. (2012). Goal setting and student achievement: A longitudinal study. *Modern Language Journal*, *96*(2), 153–169. https://doi.org/10.1111/j.1540-4781.2011.01231.x

Nakata, Y. (2010). Motivational and organizational factors in teacher education: Enhancing planning skills. *Teacher Development, 14*(2), 219–232.

Neak, P., & Ratana-Ubol, A. (2021). Lifelong learning attitudes: Current levels and strategies to promote lifelong learning of Cambodian university teacher trainees. *International Journal of Education Humanities and Social Science*, *4*(5), 141-160.

Newman, R. S. (1994). Adaptive help seeking: A strategy of self-regulated learning. In B. J. Zimmerman & D. H. Schunk (Eds.), *Self-regulation of learning and performance: Issues and educational applications* (pp. 283-301). Lawrence Erlbaum Associates.

Ngath, S., Eong, D., & Ly, S. (2024). Assessing the impact of technical, psychological, political, and sociocultural factors on learner autonomy among high school teacher trainees in Hun Sen Krong Tep Nimith Pailin High School, Cambodia. *International Journal of Research Publication ad Reviews*, *5*(8), 2621-2641.

Paris, S. G., & Winograd, P. (2003). The role of self-regulated learning in contextual teaching: Principles and practices for teacher preparation. In J. W. Guthrie (Ed.), *Encyclopedia of education* (2nd ed., pp. 365-372). Macmillan.

Parsons, R. D., & Brown, K. S. (2002). Teacher planning in professional development programs. *Educational Research Quarterly, 26*(3), 25–34.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation* (pp. 451-502). Academic Press.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college teacher trainees. *Educational Psychology Review, 16*(4), 385-407. https://doi.org/10.1007/s10648-004-0006-x

Pintrich, P. R., & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. Journal of Educational Psychology, 82(1), 33–40.

Postholm, M. B. (2012). The impact of collaborative learning on teacher trainees' learning attitudes: A case study. *Teaching and Teacher Education, 28*(5), 762-769. https://doi.org/10.1016/j.tate.2012.02.004

Reeve, J., & Tseng, C. M. (2011). Agency as a fourth aspect of teacher trainees' engagement during learning activities. *Contemporary Educational Psychology, 36*(4), 257-267.

Ryan, A. M., Pintrich, P. R., & Midgley, C. (2001). Avoiding seeking help in the classroom: Who and why? *Educational Psychology Review, 13*(2), 93-114.

Saks, A. M., & Haccoun, R. R. (2010). The influence of self-directed learning on training outcomes. *International Journal of Training and Development, 14*(4), 211-230.

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26*(3-4), 207-231.

Schunk, D. H., & Usher, E. L. (2013). Barry J. Zimmerman's theory of self-regulated learning. In H. Bembenutty, T. J. Cleary, & A. Kitsantas (Eds.), *Applications of self-regulated learning across diverse disciplines: A tribute to Barry J. Zimmerman* (pp. 1–28). Information Age Publishing.

Schunk, D. H., & Zimmerman, B. J. (2012). *Motivation and self-regulated learning: Theory, research, and applications.* Routledge.

Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection. *Educational and Psychological Measurement, 69*(3), 493–525. https://doi.org/10.1080/00223890902794236

Smith, J. (2020). *Developing professional attitudes in teaching: Adaptability, responsibility, and reflection.* Routledge.

Song, L., & Hill, J. R. (2007). The role of motivation in online learning environments. *Journal of Educational Computing Research, 37*(2), 219-236.

Stone, M., & McDonald, M. (2000). Self-directed learning in the context of professional development. *Studies in Continuing Education, 22*(1), 87-101.

Tillema, H. H., & Kremer-Hayon, L. (2005). Teacher educators' use of metacognitive strategies in teacher education. *Teaching and Teacher Education, 21*(5), 511-527. https://doi.org/10.1016/j.tate.2005.03.003

Tough, A. (1971). *The adult's learning projects: A fresh approach to theory and practice in adult learning*. Toronto: Ontario Institute for Studies in Education.

Tough, A. (1979). The adult learner: A critical review of self-directed learning. *Adult Education Quarterly, 29*(2), 75-82.

Trilling, B., & Fadel, C. (2009). *21st Century Skills: Learning for Life in Our Times.* Jossey-Bass.

Tuckman, B. W. (2003). The effect of learning and motivation strategies training on college teacher trainees' achievement. *Journal of College Student Development, 44*(1), 430–435.

Van den Berg, D., & Dijkstra, M. (2012). Identifying learning needs in teacher training programs: The role of self-assessment. *Teaching and Teacher Education, 28*(6), 973-979.

Van den Boom, G., Paas, F., van Merriënboer, J. J., & van Gog, T. (2004). Effects of planning and reflection on teacher trainees' self-directed learning in online environments. *Computers in Human Behavior, 20*(4), 499-513.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2004). Motivating learning, performance, and persistence: The synergistic role of intrinsic goal contents and autonomy-supportive contexts. *Journal of Personality and Social Psychology, 87*(3), 246-260.

Vansteenkiste, M., Simons, J., Lens, W., Sheldon, K. M., & Deci, E. L. (2014). Motivational determinants of responsibility in learning: An experimental analysis. *Motivation and Emotion, 38*(1), 36–49.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Weinstein, C. E., & Mayer, R. E. (1986). The teaching of learning strategies. In M. Wittrock (Ed.), *Handbook of research on teaching* (pp. 315–327). Macmillan.

Wolters, C. A., & Hussain, M. (2015). Investigating grit and its relations with college teacher trainees' self-regulated learning and academic achievement. *Metacognition and Learning, 10*(3), 293–311. https://doi.org/10.1007/s11409-014-9128-9

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, *41*(2), 64–70. https://doi.org/10.1207/s15430421tip4102-2

Zimmerman, B. J., & Martinez-Pons, M. (1990). Student differences in self-regulated learning: Relating grade, sex, and giftedness to strategy use. *Journal of Educational Psychology*, *82*(1), 51–59.

Zimmerman, B. J., & Schunk, D. H. (2011). *Self-regulated learning and academic achievement: Theoretical perspectives*. Routledge.