



Fostering Self-Directed Praxis in Student Teachers: Investigating the Advantages of a Pedagogical Intervention for Augmenting Autonomy

Gideon Petrus van Tonder*, and Nicolaas van Deventer

Faculty of Education, Research Unit: Self-Directed Learning, North-West University, South Africa

Abstract

The 21st century requires students to develop information education and thinking skills, including creative and critical thinking and problem-solving skills. However, the current classroom culture does not encourage self-directed learning. A study was conducted with Baccalaureus Educationist (BEd) pre-service teachers from the North-West University in South Africa to investigate the effect of Habits of Mind, Thinking Maps, and Six Thinking Hats on the development of self-directed learning skills. A non-probability sampling method was employed to select a convenient and purposeful sample of 277 students who volunteered and specialised in Business Studies, Economics, Accounting, and History. The participants completed the Self-Rating Scale of Self-Directed Learning (SRSSDL) of Williamson's questionnaire to evaluate participants' self-direction in learning. A quantitative-descriptive survey and qualitative phenomenological research were used to triangulate the data. The study found that the self-directed learning awareness of first- and fourth-year student teachers marginally increased. The proposed model fit the data well; all variables contributed statistically and practically significant correlations. Quantitative analytical tools were employed to determine the reliability of all constructs by calculating the Cronbach Alfa values. The study also found that self-directed learning enhanced academic achievement in first- and fourth-year students. A Confirmatory Factor Analysis (CFA), using Structural Equation Modeling (SEM), was conducted on the pre-test data ($n = 277$) of this study to assess how well the proposed model fits the data. All the variables contribute statistical significance to the model (p -values of all the regression coefficients < 0.05), and all the correlations between the constructs are practically significant. Improvements in SRSSDL scores were investigated using dependent t -tests. The participants valued teaching strategies that accommodate varied learning requirements and provide flexibility and autonomy. The study highlights the importance of a nurturing learning environment that challenges and fosters individual growth. It also emphasises that self-directed learning does not occur in isolation but thrives in environments that offer coherence and independence. Overall, the study contributes to the understanding of

self-directed learning and provides insights for teachers on promoting and supporting this skill among pre-service teachers.

Keywords: e-learning, Habits of Mind, self-directed learning, Six Thinking Hats, Thinking Maps

1. Introduction

The education system needs to go beyond teaching basic skills and focus on developing critical thinking and self-directed learning (SDL) skills in students. This is important to address global issues, for example, individuals who can merely read, write, and count, and prepare students for the demands of the job market (Van Tonder et al., 2021). Teachers should act as facilitators and create a student-centred learning environment to promote self-directed learning. The ideal is for students to determine their needs and objectives and construct an environment, knowledge, and resources to assist them in self-assessment. The researchers selected three teaching strategies to enable a student-centred approach to encourage SDL, with the lecturers participating solely as facilitators.

2. Problem Statement

The COVID-19 pandemic has forced the education system to adopt remote online learning. This has led to changes in teaching and learning methods, focusing on synchronous and asynchronous online instruction (Romero-Ivanova et al., 2020). Self-directed learning has become an essential skill for lecturers to train their students, but the current classroom culture needs to encourage it (Holtz, 2017). The existing classroom culture is described as an "un-flipped paradigm" focusing on passive learning. In this traditional setup, students mainly record what lecturers teach and then demonstrate their understanding through tests, assignments, and essays rather than actively directing their own learning process. This approach to learning is in direct contrast to the principles of SDL, which emphasise autonomy and self-motivation in learning, thus posing a significant challenge in the education system.

To address this problem, a school-wide community of practice project was launched within the North-West University's School of Commerce and Social Studies in Education (SCSSE). The project utilised the Habits of Mind (HoM), Thinking Maps (TM), and Six Thinking Hats (STH) strategies.

The primary research question for this study was: What are the outcomes of implementing a school-wide community of practice initiative that centres on three teaching strategies to foster self-directed learning (SDL) skills among first to fourth-year Baccalaureus Educationist (BE) pre-service teachers specialising in various subjects within the School of Commerce and Social Studies in Education?

The secondary research questions were as follows:

- How self-directed are the student teachers before and after exposure to applying various teaching strategies that encourage SDL?
- How do the student teachers experience the distinct roles of Habits of Mind, Thinking Maps, and Six Thinking Hats as teaching strategies that potentially encourage SDL among the student teachers?
- How do the student teachers experience the training material used during the intervention to encourage their SDL?

This article subsequently deliberates the theory, strategical literature, methodology, research results, and discussions in the research.

3. Theoretical Framework

This study integrates Vygotsky's social constructivist theory and adult learning theory to investigate how scaffolding and social interactions within the Zone of Proximal Development (ZPD) can facilitate SDL among pre-service teachers. The ZPD represents the range between what a learner can do independently and what they can achieve with guidance (Bozkurt, 2017). Lecturers should cater to individual learning needs and recognise the importance of social interactions in promoting the transition from learning dependency to independence. The study aligns with adult learning theory, where SDL is fundamental. According to Knowles (1975), adults mature intellectually and cognitively, and SDL becomes an essential approach to adult learning. The classroom environment should be structured to encourage active knowledge sharing and real-world application to meet the learning needs of adult learners (Suhendi, 2018).

4. Literature Review

4.1. Self-Directed Learning

For this paper, the researchers' conceptualisation of SDL comprises five features that hinge on the comprehensive view of Williamson (2007) presented in the SDL scale used to collect data for the study: awareness, learning strategies, learning activities, evaluation, and interpersonal skills.

4.1.1. Awareness

According to Hutasuht et al. (2023), awareness is foundational for effective SDL. Candy (1991) emphasises the significance of self-awareness in autonomous learning, asserting that a reflective understanding of one's own cognitive processes enhances the capability to learn. Zimmerman (2002) describes self-awareness as the foundation of self-regulated learning – a closely related concept to SDL – suggesting that self-aware students are better equipped to set adaptive goals.

4.1.2. Learning Strategies

Encompass cognitive, metacognitive, and resource management tactics students employ (Weinstein & Mayer, 1983). As students become skilled in strategy deployment, they demonstrate adaptability and increased efficacy in diverse learning scenarios (Oxford, 1990).

4.1.3. Learning Activities

In the context of SDL, the ideal is that learning activities should involve self-initiated actions aimed at knowledge or skill acquisition (Johnson & Johnson, 2019).

4.1.4. Evaluation

Evaluation is pivotal in the SDL process. Schön (1983) introduced the concept of "reflective practice," emphasising the need for professionals to continually evaluate and reflect on their actions. Self-assessment is a distinctive feature of SDL (Boud, 2012). Effective SDL requires students to be adept at self-monitoring and adjusting based on feedback.

4.1.5. Interpersonal Skills

Interpersonal skills in SDL are essential for collaborative learning, which can be highly self-directive, wherein students share and challenge each other's understanding (Dillenbourg, 1999). Furthermore, interpersonal skills such as the capacity to work with others, communicate, and solicit feedback benefit from collaborative learning efforts and enrich the learning experience (Bunt & Van Tonder, 2021).

4.2 Habits of Mind

Developing habits of mind (HoM) through learning activities can lead to developing intelligence and character. Habits of Mind are intelligent behaviours that enhance learning and help solve everyday problems (Miliyawati, 2014). Costa and Kallick (2014) found that the HoM comprises 16 critical thinking skills for reasoning, persistence, creativity, and expertise. According to Grosser (2020), understanding and applying these habits can develop work skills and prepare individuals to achieve positive results. Students with good mental habits can balance knowledge, attitudes, and skills and develop mature and intellectual personalities. These habits are essential for effective teaching and learning and can enhance the educational journey for both teachers and learners (Van Tonder, Kloppers & Grosser, 2022). The researchers assume that if pre-service teachers commit to practising these habits regularly, they could become more skilled at self-directing and self-managing their learning efforts without needing external guidance.

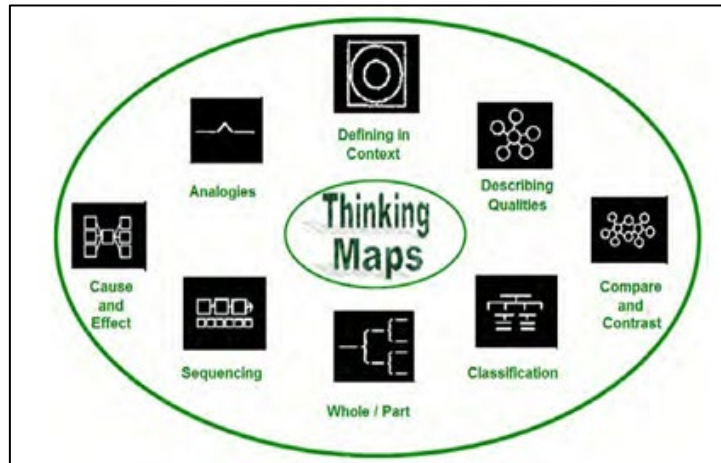
4.3. Thinking Hats

The Six Thinking Hats strategy, created by Edward de Bono (2017), helps groups approach problems from different perspectives to explore all aspects of an issue. The hats represent different viewpoints, such as facts, emotions, criticisms, benefits, creativity, and leadership (Gencel & Gencel, 2018). This strategy promotes reflective thinking, flexibility, and problem-solving skills in students (Kaya, 2013). It also encourages class participation, confidence, and critical thinking. There are no prescribed guidelines about the sequence in which students utilise the hats or the hats they choose to bypass or revisit, fostering student autonomy and self-assurance (Kivunja, 2015).

4.4. Thinking Maps

The Thinking Maps (TM) strategy is a visual language that enhances necessary thinking abilities for all ages and can be applied to any subject. The utilisation of TM aligns with how the mind works, develops, and improves perspectives, providing an excellent method to evaluate and organise information that leads to better comprehension (Grosser, 2020; Hyerle, 2014). Several types of maps can be used for different purposes (Santiago, 2011). Figure 1 illustrates the different types of thinking maps.

Figure 1: Eight Thinking Maps



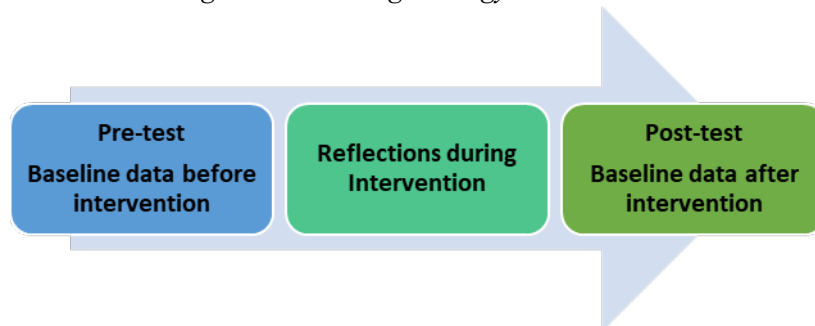
Source: (Santiago, 2011)

5. Research Methodology

5.1. Research Design

The study used an embedded mixed-method design, collecting quantitative and qualitative data using a quasi-experimental research strategy. The research's data collection was structured into three phases, as shown in Figure 2: a quantitative phase before and after the test and a qualitative phase concurrent with the intervention.

Figure 2: Teaching Strategy Intervention



Quasi-experimental research aims to evaluate interventions but does not use randomisation to select participants. A baseline assessment with the Self-Rating Scale of Self-Directed Learning (SRSSDL) (Williamson, 2007) was followed to measure the level of self-directedness in the learning process. After the intervention, the SRSSDL will be repeated as a post-test to establish whether improvement occurred between the first and last baseline data collection.

5.2. Participants and Ethical Considerations

Concerning limitations in time and logistics, a non-probability sampling method was employed to select a convenient and purposive sample of BEd students from the North-West University on the Vanderbijpark Campus. The study included BEd pre-service teachers specialising in Business Studies, Economics, Accounting, and History, ranging from the first to fourth year of their programme. The NWU's Research Ethics Committees (NWU-0128-20A2, NWU-GK-2020-042) approved the research. Before starting the study, participants provided informed

consent, ensuring their understanding of the study's risks, benefits, and voluntary nature. Of the 407 participants, 277 completed Williamson's questionnaire on SDL. This research targeted BEd pre-service teachers due to observed SDL limitations in their courses. The goal was to address these gaps during their studies before they became teachers. The research primarily aimed to identify teaching strategies that could potentially foster SDL among the student teachers.

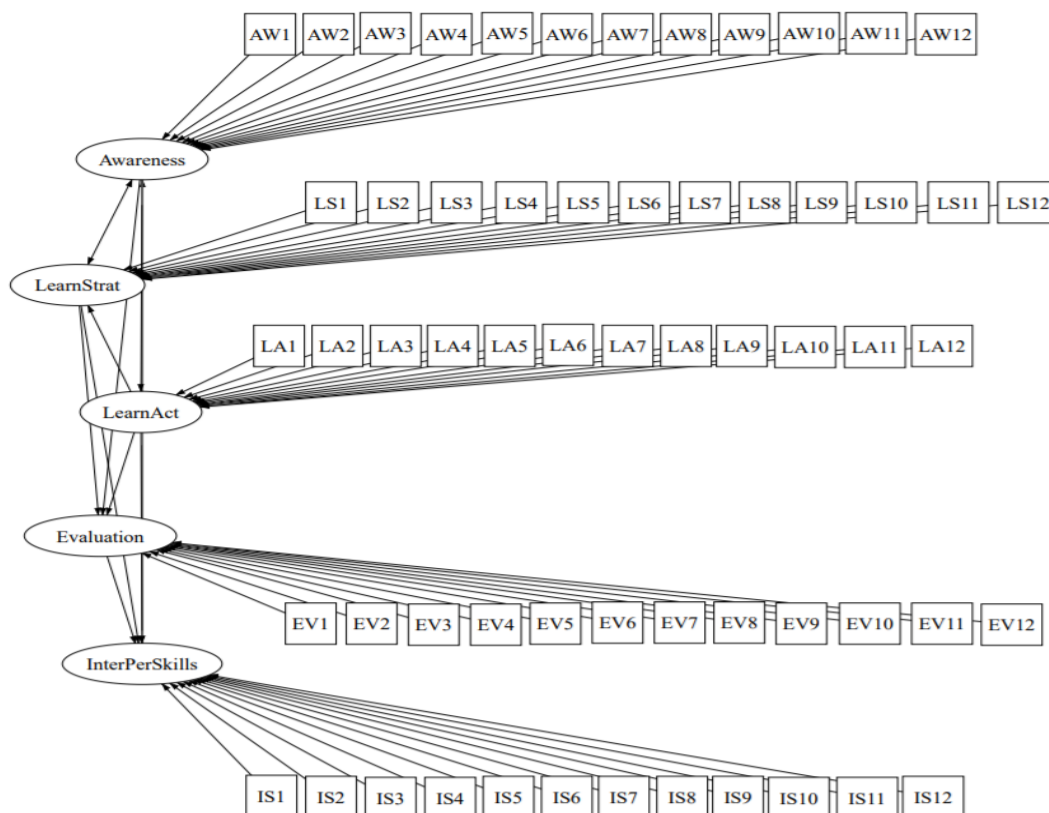
6. Quantitative Results

6.1. Confirmatory Factor Analysis

Hox and Becher (1999) explain that Structural Equation Modeling (SEM) assesses the relationships amongst theoretical constructs using regression or path coefficients and thus tests how well the theoretical model fits the data.

A Confirmatory Factor Analysis (CFA), using an SEM, was conducted on the pre-test data ($n = 277$) of this study to assess how well the proposed model fits the data (Figure 3). All the variables contribute statistical significance to the model (p -values of all the regression coefficients < 0.05), and all the correlations between the constructs are practically significant (correlations ranging between 0.45–0.92), seeing that a correlation of 0.5 is considered to be large or practically significant according to Pallant (2010).

Figure 3: SEM diagram of the theoretical model being tested



6.1.1. Model Fit Summary

Fit indices from three of the broad categories are reported and supported by Bester (2016, p.64), namely: “chi-squared test statistic divided by the Degrees of Freedom (CMIN/DF), Comparative Fit Index (CFI) and Root Mean Square Error Approximation (RMSEA) with a 90% confidence interval (LO 90 and HO 90).”

Table 1: SEM fit indexes (guidelines and reported values)

Broad category	Absolute Fit Measure	Relative Fit Measure	Non-Central Distribution
Fit index	CMIN/DF	CFI	RMSEA (LO90: HI90)
Guideline value	Near 1	>0.95	Around 0.05
Reported value	1.69	0.73	0.05 (0.047:0.053)

The reported value of CMIN/DF (chi-squared test statistic divided by the Degrees of Freedom) is 1.69 and higher than the guideline value of "Near 1". Typically, a CMIN/DF value closer to 1 indicates a better fit. A value of 1.69 suggests a reasonably good fit but not perfect. Values below three are usually considered to be an indication of an acceptable fit in SEM.

The reported CFI (Comparative Fit Index) value is 0.73, considerably below the guideline value of >0.95. The CFI measures the relative improvement in the fit of the researchers' model compared to a baseline model. Values close to 1 (or above 0.95) are desired to indicate a good fit. A value of 0.73 suggests that the model might not fit the data adequately.

The reported RMSEA (Root Mean Square Error Approximation) value is 0.05, which aligns with the "Around 0.05" guideline value (Lai & Chang, 2020, p.14). The RMSEA measures fit per degree of freedom, and values closer to 0 indicate a better fit. Additionally, the 90% confidence interval for RMSEA ranges from 0.047 to 0.053, a narrow range centred around the guideline value. This suggests that the model fit is acceptable in terms of RMSEA. Based on Blunch's (2008) guideline values, the model is acceptable for CMIN/DF and RMSEA. However, the CFI value suggests room for improvement in the model's fit to the data.

6.1.2. Descriptive Statistics

Mean and standard deviations were used as descriptive statistics to summarise the pre- and post-questionnaire data. The mean is simply the average, and the standard deviation supplies information regarding the spread of the data around the mean (Field, 2014).

The means for the constructs reported in Table 2 showed a range from 38.29 (SD = 5.24) to 40.66 (SD = 4.37) in the pre-test and from 39.56 (SD = 4.89) to 41.58 (SD = 4.11) in the post-test. Considering the total SRSSDL score, it changed from 197.80 (SD = 24.51) to 202.49 (SD = 23.27). These values reflect minor improvements between the pre-and post-tests.

The responses for each item were rated on a four-point scale instead of the usual five-point Likert scale. To ensure exact and correct participant responses, the researchers used a Likert scale to exclude students from choosing the option "sometimes," which corresponds to the third rating on the five-point scale. The pre-questionnaire scores are remarkably high, and it can be interpreted that the students might have overestimated their SDL abilities. According to the literature, students who are not fully aware of what SDL entails tend to make assumptions about their own levels of SDL (Petersen & Mentz, 2016).

Table 2: Descriptive statistics of constructs at pre and post-test

Construct	Pre-test		Post-test	
	Mean	Std. Deviation	Mean	Std. Deviation
Awareness	40.66	4.37	41.58	4.11
Learning Strategies	38.72	4.79	39.56	4.89
Learning Activities	38.29	5.24	40.05	4.91
Evaluation	40.13	4.82	40.40	4.97
Interpersonal Skills	39.99	5.30	40.87	4.37
Total Score	197.75	20.31	202.44	19.78

6.1.3. Dependent T-Tests

Improvements in SRSSDL scores were investigated using dependent t-tests. Field (2014) describes this analysis as testing whether two means collected from the same sample (pre- and post-) differ significantly. According to Mellis and Steyn (2006, p.173), the following guideline values are used for effect size interpretation: “~0.2 small effect or practically non-significant difference; ~ 0.5 medium effect or practically visible difference; ~ 0.8 large effect or practically significant difference.”

6.1.4. Differences: Total Sample

This part of the investigation considers the differences in the pre and post-test scores of the sample.

Table 3: Differences in the constructs of SDL between the pre-and post-tests based on the total sample

Construct	Test	Mean	N	Std. Deviation	Std. Error Mean	p-value	Effect Size
Awareness	Pre-test	40,66	132	4,37	0,38	0,05	0,21
	Post-test	41,58	132	4,11	0,36		
Learning strategies	Pre-test	38,72	132	4,79	0,42	0,17	0,18
	Post-test	39,56	132	4,89	0,43		
Learning activities	Pre-test	38,29	129	5,22	0,46	<0,01	0,34
	Post-test	40,05	129	4,91	0,43		
Evaluation	Pre-test	40,08	128	4,84	0,43	0,53	0,08
	Post-test	40,44	128	4,97	0,44		
Inter-personal skills	Pre-test	40,05	128	5,29	0,47	0,17	0,15
	Post-test	40,86	128	4,39	0,39		
Total score	Pre-test	197,75	132	20,31	1,77	0,04	0,23
	Post-test	202,44	132	19,78	1,72		

"Awareness" presents a p-value of 0.05 with a small practical effect ($d = 0.21$) when comparing post-test to pre-test results, placing it of statistical significance.

The "Learning activities" construct reveals a robust statistically significant difference, as evidenced by its p-value of less than 0.01, with a small practical effect ($d = 0.34$).

The “Total score” indicates a p-value of 0.04, signifying a statistically significant difference between pre-test and post-test results at the 0.05 level. The statistically significant differences observed for “Awareness,” “Learning Activities,” and the “Total score” confirm that the differences are not due to chance and could be linked to the impact of the intervention.

7. Qualitative Results

An inductive thematic analysis was used to analyse the data. To allow the subjective intent of the participants' answers to be reflected, emerging themes and sub-themes were found within the data (Willig & Rogers, 2017). Table 4 displays the key themes and sub-themes that emerged from the participants' reflections on their experiences with the training material. These reflections focused on their SDL growth during the intervention implementation, specifically using the HoM, TM, and STH strategies.

The results are accompanied by direct quotations to indicate where the patterns in the raw data were identified.

Table 4: Themes and sub-themes that emerged from the reflections

Themes	Sub-themes
Nurturing self-directed dispositions	• Independence • Individual responsibility • Adjusted thinking • Working in groups
Promotion of self-directed learning skills	• Problem-solving • Analysing problems • Creative thinking • Critical thinking • Structured learning
Strategies as self-directed learning tools	• Enhancing Lesson Planning • Incorporating the strategies in class • Diversifying assessments

7.1. Themes: HoM, TM & TH as Strategies for Learning

7.1.1. Sub-Theme: Independence

The participants reported a significant independence increase when approaching their work and learning.

‘It develops your skill to self directed learning because you have to be creative and think what the problem is and how can i solve and improve it.’ (TH, 3rd Year, Business Studies)

‘Being able to explore independently I will have the ability to take responsibility for my own work (actions).’ (HoM, 4th Year, Economics)

7.1.2. Sub-theme: Individual Responsibility

The participants became more responsible in their own learning, which facilitated motivation and self-discipline.

‘It helps to develop my skills in self directed learning in a way that it taught me self control and discipline.’ (TM, 1st Year, Accounting)

‘it has improved my skill because it has taught me not to give up.’ (TH, 1st Year, History)

7.1.3. Sub-theme: Adjusted Thinking

The participants reported adjusting their thinking to support the different teaching and learning strategies, showing them how to think.

'The thinking maps strategy was easy to understand and familiarise. It helped me to think outside the box by using different thinking styles.' (TM, Economics, 3rd Year)

7.1.4. Sub-theme: Working in Groups

The participants were more at ease doing group work due to being able to make more significant contributions to their groups and knowing that their group members would also have equal contributions.

'I learnt decision making techniques and effective group discussions. It organises thinking process in a detailed and coherise manner.' (TH, 2nd Year, Business Studies)

7.2. Theme: Promotion of Self-Directed Learning Skills

7.2.1. Sub-Theme: Problem-Solving

The participants' problem-solving abilities were enhanced when they employed the different strategies.

'Each thinking map represents a unique thinking perspective. This helps an individual to explore different viewpoints relating to a problem if they were to think from all maps.' (TM, 3rd Year, Economics)

7.2.2. Sub-Theme: Analysing Problems

The participants specifically noted that the strategies enhanced their capacity to analyse problems by exposing them to a variety of approaches to problem-solving.

'The thinking strategy Habits of mind makes it easier to break down the questions and makes it simpler to know what you working against or what to do next.' (HoM, 3rd Year, Economics)

7.2.3. Sub-Theme: Creative in Thinking

The participants expressed that the implemented strategies helped them enhance their creativity and think more innovatively.

'Allows me to think creatively without Restrictions.' (HoM, 3rd Year, Economics)

7.2.4. Sub-Theme: Critical Thinking

The participants expressed that the implemented strategies helped them enhance their critical thinking in various ways.

'it made me become more of a critical thinker in all I do and in also doing my work more effectively with ease.' (TM, 4th Year, Business Studies)

7.2.5. Sub-Theme: Structured Learning

The strategies enhanced the participants' ability to plan by helping them to organise their learning process more effectively.

'It taught me to arange my work and be able to work step by step not mixing my work.' (HoM, 1st Year, History)

'The thinking maps are very helpful with regard to completing tasks accurately as a person write the procedure and ways to start with the task.' (TM, 4th Year, Accounting)

7.3. Theme: Positivity towards the Three Teaching and Learning Strategies

7.3.1. Sub-Theme: Enhancing Lesson Planning

The participants further remarked that the strategies enhanced their capacity to plan lessons.

'The thinking hats are very helpful and would help in planning effective lesson.' (TH, 4th Year, Accounting)

7.3.2. Sub-Theme: Incorporating the Strategies in Class

The positive effect that the strategies had on the participants was reflected in their perceived usefulness in the classroom one day. The participants noted that the strategies will hold the same advantages for their future learners as they did for themselves.

'I can use it by applying it to my learners in the classroom to have better understanding on every topic.' (TH, 1st Year, History)

7.3.3. Sub-Theme: Diversifying Assessments

The participants noted that the strategies could be used to devise different learner assessments.

'I will integrate it in long questions assessments.' (TM, 3rd year, History)

8. Discussion

A comprehensive understanding of the student's learning experience emerges in synthesising the quantitative and qualitative results. The ability to employ strategies translates into adaptability and heightened effectiveness in diverse learning scenarios for students (Weinstein & Meyer, 1986; Oxford, 1990). The participants in this study notably improved their planning abilities by using these strategies, which enabled them to organise their learning process more effectively. Altan (2023) emphasises that fostering the Habits of Mind promotes an ongoing commitment to personal growth through consistent adaptation. The participants mentioned adjusted thinking due to following the methods of each teaching and learning strategy to think differently. Adaptation is necessary for a self-directed individual who benefits from the intervention. Thinking maps offer a precise approach to arranging and structuring concepts, visually representing ideas in larger, more cohesive frameworks (Long & Carlson, 2011). In addition, using the Six Thinking Hats allows individuals to formulate plans for different scenarios, enhancing planning effectiveness, as Mahoney et al. (2022) highlighted. Quantitatively, evidence suggests that the applied teaching strategies positively influenced several constructs of self-directed learning, with "Learning activities" showing the most significant change. This might indicate that the strategies employed directly impacted how students engage with learning activities, resulting in improved outcomes. The participants believed to be more open to employing other ways of thinking after their experience with the three teaching and learning strategies. Qualitatively, students reported increased independence, responsibility, motivation, and depth in their understanding. The researchers' findings correspond with Silen and Uhlin (2008) that individual thinking time is better directed through the strategies, with less lecturer input and fewer impulsive responses. As evident in the post-test scores, the participants tend to feel more in control of their learning and could have

benefited from the teaching strategies. In conclusion, when combining quantitative and qualitative data, there is compelling evidence to suggest that the teaching strategies employed were beneficial in promoting self-directed learning among the participants.

9. Conclusion

This study demonstrates the beneficial impact of a community of practice initiative emphasising diverse teaching strategies on the SDL growth of BEd pre-service teachers. The integration of Habits of Mind, Thinking Maps, and Six Thinking Hats augmented distinct dimensions of SDL and fostered a comprehensive enhancement in SDL proficiency. Adaptation is a necessary competence for a self-directed individual (Morris, 2019) who seemingly benefits from the intervention. These insights are crucial for developing effective teacher education programmes and underscore the need for diverse teaching strategies in promoting SDL.

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