The Efficacy of Habits of Mind in the Inculcation of Self-Directed Learning Skills in Pre-Service Teachers

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Abstract. The purpose of this research was to determine the extent to which pre-service teachers were self-directed before implementing habits of mind as a teaching strategy. The researchers purposively focused on first to fourth-year BEd students. The sample consisted of 277 students who volunteered. A concurrent mixed-method triangulation approach was applied. Even though the students overestimated themselves in Williamson's self-rating scale of self-directed learning, the habits of mind positively affected developing various aspects of the self-directed learning process. Pre-service teachers recognised the importance of applying habits of mind, which will help them use their new knowledge in classroom practices and promote self-directed learning. Therefore, it is recommended that the future training of pre-service teachers be scaffolded around the habits of mind that will contribute to developing the teachers' ways of thinking, self-directed learning, and competencies. In addition, several habits of mind will support teachers in utilising and/or adjusting their prior learning to be open to or contribute to the construction of new knowledge. It is also recommended that habits of mind be infused into the current BEd curriculum in order to foster self-directed learning.

Keywords: self-directed learning; digital online learning; habits of mind

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1. Introduction

The changeable and demanding twenty-first century world requires not only the teaching of knowledge, but also the nurturing of thinking skills and particularly well-developed dispositions – in short, behavioural and thought competencies (Costa & Kallick, 2009; Eyre, 2016; Pink, 2006). The world faces interconnected global challenges that require global solutions. It is, therefore, essential that teaching moves beyond the development of individuals who can read, write, and count. Teaching has to be innovative, create universal ideals, foster an active concern, and be accessible to everyone (Barell, 2010; Costa & Kallick, 2009; Eyre, 2016; Gardner, 2006; Serdyukov, 2017).

Teacher-training institutions face a challenge to turn the tide and make teacher training more effective so that teachers will be able to provide cognitive education to learners at schools in conjunction with what the twenty-first century expects of learners. These school leavers ought to be creative thinkers and problem-solvers equipped with tools that can be utilised whenever they learn, think, and make decisions. South African teachers should acquire practical tools and strategies suitable for the South African teaching-and-learning context in order to transform classroom practices. This means pre-service teachers (students) can be guided and supported to actively and specifically initiate the thinking skills necessary to achieve the goals of the Curriculum and Assessment Policy Statement (CAPS). CAPS, which guides the implementation of education in South Africa, requires learners to "organise and manage themselves and their activities responsibly and effectively" as part of the critical cross-field outcomes (Department of Basic Education, 2011, p.5). These outcomes require that teachers' classroom practices should promote self-directed learning in all subject fields.

According to the researchers, self-directed learning is a deliberate learning process that is designed and evaluated by the learner. The researchers' view self-directed learning as imperative for tertiary education, and thus the focus of this article is to take the initiative to improve self-directed learning using the 16 habits of mind and digital online learning in tertiary education. Brookfield (2009) describes self-directed learning as the learning method with which individuals take the initiative to identify their learning needs, define learning objectives, determine human and material resources for learning, select and adopt appropriate learning strategies, and analyse learning outcomes, with or without the guidance of others.

Habits of mind are groups of intellectual resources that must be developed purposefully and intentionally. When individuals are faced with challenging tasks, these resources ensure that the tasks are completed successfully and effectively and that high-quality results are reached. These habits are not learned and then forgotten – a habit develops from regular practice. Effective habits of mind become behaviours that are activated automatically and predictably without considerable effort and describe what thoughtful people do when faced with complex challenges (Costa & Kallick, 2014).

This article explains why the researchers undertook this study by elaborating on the theoretical and conceptual framework that underpin this study. Furthermore, the research methodology, data collection methods and analysis and the outcomes of the mixed-method approach are discussed. Thereafter, recommendations for future research, the limitations of the study and the conclusion are discussed.

2. Problem statement

A school-wide community-of-practice project was launched by focusing on teaching various strategies to develop self-directed learning among first to fourth-year BEd pre-service teachers in different subjects within the School of Commerce and Social Studies in Education. The habits of mind teaching strategy is not a widely known or implemented approach to developing teacher education programmes. This community-of-practice project was launched in 2020 by the corresponding author, Van Tonder, within the School of Commerce and Social Studies in Education at the North-West University.

The COVID-19 pandemic affected the teaching and learning mode of delivery, which changed to remote online learning across the globe. During the COVID-19 pandemic, large-scale national attempts to use technology in support of remote learning (asynchronous), distance education (asynchronous and synchronous) and online learning (synchronous) were emerging and developing rapidly. Romero-Ivanova et al. (2020, p. 81) explain that due to COVID-19 new expectations developed during the first semester and transformed the lives of individuals towards a "new normal". Higher education institutions with lecturers and students transitioning to online synchronous and asynchronous teaching and multimedia activities were impacted by these changes (Romero-Ivanova et al., 2020). Self-directed learning is a significant field of study for twenty-first century educationalists, and according to Holtz (2017), the self-direction for which teachers are preparing our learners is an essential skill. However, the inherited classroom culture is not planned around self-direction and tends more towards compliant consumption, an "un-flipped paradigm" (Holtz, 2017), in which learners record what teachers say and redefine it through tests, assignments and essays to indicate understanding. The problem occurred when the school-wide community-of-practice project was launched during this "new normal" to prepare pre-service teachers with the essential skill of self-direction.

With the above in mind, the primary research question for this study is the following: What are the consequences of a school-wide community-of-practice project focusing on various teaching strategies on the development of self-directed learning among first to fourth-year BEd pre-service teachers in different subjects within the School of Commerce and Social Studies in Education?

The secondary research questions of this investigation were as follows:
- How self-directed was the first to fourth-year pre-service teachers before the intervention?
- What role did the habits of mind play in developing self-directed learning?

- What are the participants' perceptions regarding the development of self-directed learning through the use of habits of mind?

The primary aim of this article focuses on *habits of mind* as one of the various teaching strategies on the development of self-directed learning among first to fourth-year BEd pre-service teachers in different subjects within the School of Commerce and Social Studies in Education.

The secondary objectives of this investigation were as follows:
- To determine the self-directed learning levels of the first to fourth-year pre-service teachers before the intervention.
- To established what role the habits of mind played in developing self-directed learning.
- To explore the participants' perceptions regarding the development of self-directed learning through the use of habits of mind.

The article subsequently focuses on the theoretical and conceptual framework adopted in the research.

3. Theoretical-conceptual framework
3.1 Theoretical framework
Vygotsky's (1980) approach of the social constructivist theory was used as a lens to explore the impact of the Zone of Proximal Development (ZPD) and scaffolding of learning with students with the focus on various teaching strategies on the development of self-directed learning. According to Shabani, Khatib and Ebadi (2010), the primary purpose of scaffolding (techniques used to move students progressively toward more robust understanding and, ultimately, greater independence in the learning process) in teaching and learning is to assign responsibility for the assignment to the student. Self-directedness, however, does not mean learning is individualised, and an adult learner should work in isolation (Brookfield, 2009). The project focused on social constructivist theory, which relates to collaborative learning and social interaction to intensify self-directedness (Geduld, 2014). Individuals develop knowledge through social experiences and mutual learning, which increase cognitive levels (Bozkurt, 2017).

This research concentrates on the following key concepts: self-directed learning, digital online learning and habits of mind.

3.2 Conceptual background
3.2.1 Self-directed learning
Self-directed learning has been researched, theorised, and practised for over 45 years (Knowles, 1975). Brockett and Hiemstra (2012), as well as Tough (1978), have classified self-directed learning as a personal attribute that allows individuals to be independent and highly self-directed in their learning, or as a process with which to organise instruction. As a personal attribute, self-directed learning refers to individual predispositions towards this type of learning and autonomous

engagement in the learning process. Self-directed learning is a learning approach that the learner controls. Knowles (1975, p. 18) defines self-directed learning as

> *"a process in which individuals take the initiative, with or without the support of others, to identify their learning needs, formulate learning goals, identify human and material resources for learning, select and implement appropriate learning strategies, and assess learning outcomes"*.

Self-direction is an ongoing exercise of reliable control by the student over all learning-related choices, as well as the skill to gain admission to, and choose from, a full range of available and appropriate resources (Knowles, 1975).

Self-directed students exhibit several specific and observable characteristics. Intrinsic motivation, the capacity to choose personal goals, self-discipline, self-assessment ability, and metacognitive skills are key features of self-directed students (King, 2011). Intrinsic motivation is the force that inspires students to pursue self-directed, independent learning. One of the most relevant basic educational objectives could be to build circumstances that contribute to intrinsic motivation and a mindset of self-directed learning. Rogers (2004) recommends that self-directed students pursue their own learning by defining what they need to know and how to do so by planning and monitoring their learning through a variety of tools and strategies and by working with peers and teachers to assist in their learning.

Self-directed learning has been examined from distinct perspectives and with distinct techniques and has delivered some promising results. It has been found that self-directed learning has several benefits: it enhances students' choices, self-confidence, freedom, motivation, and also the development of numerous lifelong learning skills (O'Shea, 2003). In order to encourage self-directed learning, it seems like several diverse teaching solutions can be used (Aleman, de Gea & Mondéjar, 2011; Horne et al., 2007). There is also sufficient evidence of the quality that shows a modest improvement in knowledge, but there is little difference in student skills or attitudes when comparing self-directed learning and conventional methods of learning (Murad et al., 2010). The purpose of this paper is to review the implication of habits of mind as a teaching strategy on the self-directed learning of the pre-service teachers at North-West University (NWU).

3.2.1 Digital online learning

Anyone who has ever worked in a conventional classroom setting as a teacher or facilitator knows first-hand that with different classes or individual learners, the same content will never yield the same results (Shahabadi & Uplane, 2015). In addition, information may be relevant to the learning style of an individual, while the same information may be worthless in fulfilling the learning goals in the case of another individual (Masie, 2002; Zenger & Uehlein, 2001). The researchers can suggest the following argument from this empirical reality and from considering its ramifications for any means of delivering teaching materials through an online platform: in the end, it is the behavioural indicators of students that need to be considered when creating

and implementing e-learning programmes to develop self-directed learning (Shahabadi & Uplane, 2015). Consequently, the researchers agree with Codreanu and Vasilescu (2013) that the emphasis is on the student and their needs and requirements, and given the point of this study which is to focus on developing self-directed learning through habits of mind, it is crucial to evaluate the effect on any programme developed and delivered through digital online learning platforms. From this point on, the researchers will use the broad term of e-learning.

Today, the bulk of e-learning is asynchronous in nature. Shahabadi and Uplane (2015, p. 132) describe *"asynchronous e-learning as a learner-centred process, which uses online learning resources to facilitate information sharing regardless of the constraints of time and place among a network of people"*. Asynchronous e-learning has the benefits of computer-mediated communication (CMC) *"to achieve the promises of learning anytime and anywhere through asynchronous online discussions, which is based on the constructivist theory, a learner-centred approach that emphasises the importance of peer-to-peer interactions"* (Shahabadi & Uplane, 2015, p. 132). The researchers argue that in order to develop self-directed learning in an online environment, the system needs to cater for learner-centeredness, which is embedded in constructivist theory, as alluded to above. The researchers utilised this asynchronous method in this project, by using screencasting or interactive PDFs and PowerPoints of study units, which has been pre-recorded for students. This learner-centred method was difficult to follow due to a lack of infrastructure and experience at the beginning of the semester. However, after gaining experience with these approaches, it became easier to implement. Comer and Lenaghan (2013) argued that asynchronous online learning offers an excellent probability of building a learning-centred surrounding that stimulates rich interactions between lecturers and students.

3.2.3 *Habits of mind*
Habits of mind are important cognitive resources for effectively completing tasks, coping with challenges, and solving problems. Habits of mind are based on a process that involves mindful thinking (Costa & Kallick, 2008) that increases learners' eagerness to act with intellect when faced with problems, and it may lead to answers that are not immediately apparent.

The term 'habits of mind' was first introduced by Costa (1985) in his article on hierarchy of thinking and further established by Marzano (1992) and Marzano, Pickering and McTighe (1993). Habits are characterised as almost instinctive behaviours that create a mindset for problem solving while not requiring a particular form of thinking to be applied. Habits have also been described as a collection of dispositions learned and practised before a person can almost effortlessly accomplish a specific task (Costa & Kallick, 2000). Costa and Kallick (2000) proposed 16 habits that could empower students to make intelligent decisions both inside and outside the classroom, while Marzano divided habits of mind into three categories. These three categories are (i) self-organisation, (ii) creative thinking, and (iii) critical thinking (Marzano, 1992). According to Costa and Kallick (2008), mental patterns are

a combination of many desired abilities, habits, signals, past experiences, and ambitions. This means that there exists an empirical behavioural pattern that an individual uses at a particular time. Being able to think intelligently was important, as it allowed students to find ways to address specific problems. Students should therefore be conscious of their behaviour and should have habits of mind in order to solve problems (Gloria & Indriyanti, 2017).

Several studies related to habits of mind have been conducted. These studies developed different developmental lessons that could shape or strengthen habits of mind. Yandari's study (2019) emphasised that the habit of mind's strength is students' ability to practice the skill of determining solutions to a problem, so habits of mind can be interpreted as having an impact on problem-solving skills. Research by Sriyati, Rustaman and Zainul (2010) indicated that formative assessment led to the development of habits of mind. Additionally, it also clarified that habits of mind could be learnt. Hew and Cheung's research (2011) found that online learning could explore self-awareness and open-mindedness as indicators of habits of mind. Various researchers provide their views of the strengths of the 16 habits of mind with regards to improving cognitive development and self-directed learning. A short review of the 16 habits of mind follows.

1. *Persisting: never give up.*
Persistence means trying something else when one encounters an obstacle instead of simply giving up. In a continuously changing education environment, teachers have to lay a foundation for persistence that encourages learners to focus on work at hand and to persevere in spite of distraction to ensure that the work gets done (Adeyemo, 2003; Seif et al., 2011). Feuerstein and Hoffman (1995, p. 33) developed the elements of a plan as a tool for persistence, which supports learners who find it difficult to use this tool and following the next steps in order to continue:
- Step 1: Define my goal.
- Step 2: Look at what I have/know.
- Step 3: What strategy/skill do I need to apply?
- Step 4: Where will I start?
- Step 5: What are the rules/criteria?
- Step 6: Check my work

2. *Managing impulsivity: taking time to deliberate before acting.*
According to Costa and Kallick (2008, p. 274), managing impulsivity means that you "*[t]ake your time. Think before you act. Remain calm, thoughtful, and deliberate*". It is therefore not a reference to working faster, but rather more determinedly and thoughtfully. Al-Assaf (2017) maintains that managing impulsivity is the ability to contemplate and listen to alternative points of view and instructions, to consider and think before creating a vision or establishing a work plan for a task. Further, it includes the ability to reflect and focus on options and results from various perspectives, and then constructing plans to comply with the task and to delay making decisions. This method often implies the deliberation and analysis of

problem-solving before making decisions on a particular idea. People must also consider multiple alternatives and findings before they realise that they understand the dimensions of such problems entirely.

3. *Listening with understanding and empathy: understanding the viewpoints of others.*
Human beings spend about 55% of their lives listening, but listening is one of the least taught skills in schools (Costa & Kallick, 2009). Beall et al. (2008, p. 130) suggest that teachers should be *"aware of listening and trained to be better listeners to begin making a difference in learners' listening competence"*. Possible strategies the researchers envisage to improve students' listening skills are to paraphrase what another student has said before they add to what was said or offer their own comments, or to ask students to repeat what was said while they were listening.

4. *Thinking flexibly: being mindful of numerous viewpoints and perspectives.*
For teachers to think flexibly, they need to look at things in another way, and they should be able to change perspectives and generate alternatives (Seif et al., 2011). When confronting a situation or addressing a specific issue, the person who thinks flexibly has the opportunity to alter their mental state. This practice often involves looking at old ideas with a fresh vision and creative imagination and proposing different approaches while solving a problem (Al-Assaf, 2017).

5. *Thinking about own thinking (metacognition): understanding your own thoughts.*
Metacognition is an essential skill that all teachers have to learn. They have to become self-aware of their ways of thinking (Costa & Kallick, 2009). According to Grosser and Brettenny (2014), different techniques can be implemented to improve students' metacognition: let students think aloud not only by presenting responses or solutions to problems, but also by exploring the procedures, steps, and methods used to get a response or solve a problem. Keeping a running record of their thought processes, plans, and actions will help them with metacognition. It allows students to recognise errors and self-correct these same errors by focusing on processes, measures, and strategies. Let students describe what they have accomplished and what has challenged them. Encourage students to get their peers' input.

A variety of questions can promote metacognition:
- How do you know if you are correct?
- How do you prove you are right?
- How did you know where to start?

Do not provide students with responses, but instead say:
- I assume that you did not read the question well, so your argument is incorrect.
- Read the question once again, please.
- Your addition has to be reviewed.

6. *Striving for accuracy: acting according to higher norms.*
Learners who strive for accuracy can figure things out, clarify problems, gather data,

and recheck information (Adeyemo, 2003). Accuracy is valuable in the classroom and real life. Do not correct students' errors. Indicate 'You have five spelling errors, please correct them.' No task can be submitted unchecked to a lecturer – self-assessment or peer assessment should take place before submission. This can be achieved by instructing students to complete checklists that show how the work was reviewed. Uncontrolled work should be graded by deducting marks from the final mark. By applying this method, students will learn the skill of accuracy and fewer mistakes might occur (Grosser & Brettenny, 2014).

7. *Questioning and problem posing: finding problems to resolve.*
According to Costa and Kallick (2009), one of the attributes that defines humans is our tendency for and capacity to resolve issues. Successful problem solvers understand how to pose questions to bridge the gap between what they know and what they do not really know. Kowalski (2009, p. 344) states that "*when teaching, the most powerful tool teachers have is the ability to engage the learners by asking questions*". Learners prefer to speak instead of listening, and asking questions makes it easier to communicate. Questioning enables both learners and teachers to clarify their thinking, and it can challenge learners and teachers to solve complex problems that are in line with the core competencies for the future (European Union, 2019).

8. *Applying past knowledge to new situations*
According to Costa and Kallick (2009), people who are intellectual learn from their mistakes. They can rely on prior experiences when faced with a new and perplexing problem. Ştefănică et al. (2017) indicate that subject-specific prior knowledge is the primary predictor for the development of professional competence.

9. *Thinking and communicating with clarity and precision: attempts to transmit information correctly.*
Clear and precise communication ensures that information is not lost between parties and contributes to a better understanding among different individuals. Without effective communication among stakeholders, learning becomes less structured and effective (Seif et al., 2011). Therefore, effective communication is a crucial skill every teacher should practice to enhance effective communication and collaboration with all stakeholders.

10. *Gather data through all senses*
Most learning relies on learners' auditory and visual senses. Hearing and sight are often viewed as the gateway to learning. However, this narrow view excludes several other senses that can contribute to learners' learning and understanding, such as olfactory (smell), tactile (touch), or kinaesthetic (movement) senses (Costa & Kallick 2009). These other senses may be used when learners work with three dimensional models relating to the subject content, where group projects require building or constructing models (tactile and kinaesthetic) that will contribute to a much richer learning experience for learners.

11. *Creating, imagining, and innovating: generating modern and ground breaking strategies.*

Generating new and innovative methods and solutions are key ways of thinking to support teachers to create positive mindsets. Creativity is a skill that is included in several of the key competencies that learners will need in the future (EU, 2019).

12. *Responding with wonderment and awe: being intrigued by the universe.*

According to Costa and Kallick (2009), teachers want their learners to be curious, to interact with the environment around them, to consider the transforming of a cloud, to be enchanted by the opening of a flower, and to value the rational of mathematical logic. According to Eisner (1991, p. 11), "*[o]ne important aim of schooling should be to create a climate that evokes learners' sense of wonder and inspires their imaginations to soar*". Further, Eisner (199, p. 115) emphasises that "*in classrooms, it also counts to teach the learners the importance of wonder*".

13. *Taking responsible risks: take chances without knowing the outcomes.*

Costa and Kallick (2009) assert that flexible people seem to have an almost uncontrollable desire to push boundaries. They are uncomfortable with their level of comfort; they live on the edge of their ability. Teachers are expected to take chances and explore new teaching methods in their classrooms (Adeyemo, 2003), but they need to be trained how to do it effectively. High-risk experiences teach individuals that they are far more capable of taking action than they previously believed. Risk-taking is often a convergence of intuition, experience, and a sense of taking on new challenges (Vazquez, 2020).

14. *Finding humour: create laughing and fun.*

Humour has been found to have mental health benefits, according to Costa and Kallick (2009). It encourages higher-level cognitive skills including analysing, discovering innovative relationships, visual imaging, and creating analogies. Lei, Cohen and Russler, (2010, p. 331) found that "*the use of humour can increase learners' interest, attention, motivation and comprehension of the course material*".

15. *Thinking interdependently: working in teams.*

Learners should be able to communicate constructively in different environments, collaborate in teams, and negotiate as part of personal, social, and learning-to-learn competencies that are required for modern educational contexts (EU, 2019).

16. *Remaining open to continuous learning: continually learning new things and striving for growth.*

According to Costa and Kallick (2009), continuous learning is a constant mode for intelligent people. The pursuit of lifelong learning energises them. Their trust, combined with their intellectual curiosity, enables them to continually explore new and better ways. Teachers should become lifelong learners and be receptive for continuous learning (Hayat et al., 2019).

According to Anderson (2010) and Costa (2009), the only way to get better at applying

habits of mind is to become more attentive to situations that call for the application of these habits. Students need to apply these habits more often without the lecturers' direction. The researchers believe that if students commit to practising these habits daily, they can effectively self-assess, self-direct, and self-manage their development of habits of mind without being externally directed.

4. Methodology

4.1 Participants

In this study, the researchers used non-probability sampling methods, which means that not everybody in the population has a fair chance of taking part in the research (Maree & Pietersen, 2020). The researchers purposively focused on first to fourth-year BEd pre-service teachers in Business Studies, Economics, Accounting and History from the NWU on the Vanderbijlpark campus within the School of Commerce and Social Studies in Education. BEd pre-service teachers have been chosen because possible deficiencies and weaknesses in relation to the development of self-directed learning could be identified during their studies at higher-education level, and action plans to address these deficiencies and weaknesses during their four years of study can be implemented before they complete their studies and enter their teaching careers. The sample could also be considered convenient, as the participants were located on the same site where the researchers work. An independent person added an announcement on the researchers' communication sites to recruit participants and informed them about the purpose of the study to ensure that the participants were not confused or misunderstand their involvement in the research. The online questionnaire contained an embedded consent form where the participants were informed that participation was voluntary and that they could discontinue the survey at any time by simply closing their browser. Anonymity and confidentiality were ensured without penalty at all stages. The participants completed the reflections anonymously and were identified by means of numbers. Although 407 students enrolled for the school-based project only 277 of them completed Williamson's questionnaire (the school-based project was compulsory as part of the course; however, it was not compulsory to complete the questionnaire and the reflections on the different teaching strategies). The purpose of this research was to focus on effective teaching strategies which may support the development of self-directed learning.

4.2 Research design

The researchers followed a concurrent mixed-method triangulation approach, where both quantitative–descriptive survey-research strategies and qualitative–phenomenological research strategies were employed to collect data to determine whether habits of mind may support the development of the participants' self-directed learning (Creswell & Plano Clark, 2018). During the implementation of the quantitative method, Williamson's (2007) self-rating scale of self-directed learning questionnaire was distributed to test the participants' self-directed learning. After the implementation of the strategy, qualitative data were collected in the form of the participants' written reflections on the benefits that the habits of mind strategy held

to support their development of self-directed learning. An independent person, who had signed a confidentially clause and had no conflict of interest in the project, administered the collection of data.

4.3 Quantitative methods and instruments

As mentioned in the previous section, participants were required to complete Williamson's (2007) self-rating scale of self-directed learning (SRSSDL) in higher education questionnaire. The questionnaire comprised 60 items categorised under five distinct areas of self-directed learning, namely awareness, learning strategies, learning activities, evaluation, and interpersonal skills. Statistical analysis included the use of both descriptive (frequency and percentages) and inferential statistics (confidence intervals). Responses for each item were rated by using a four-point scale instead of a five-point Likert scale. The researchers have modified the Likert scale to prevent students from choosing option three in the five-point scale, namely 'sometimes', in order to get clear and precise answers from participants. The modified Likert scale was statistically approved by a qualified statistician from the statistical consultation services of the NWU.

4.4 Qualitative method and instruments

Participating students were requested to write reflections on their experiences of the new teaching approach that was incorporated with the purpose to support their development of self-directed learning. They also had to state whether they thought they would be able to apply this approach in their own learning and future teaching.

5. Results

Both quantitative and qualitative results are outlined in this section.

5.1 Quantitative results

Table 1 indicates the number of participants and the variation of subject areas the participants were exposed to in the different teaching strategies.

Table 1: Subject area

Subject area	Frequency	Percent
Accounting	41	14.8
Business Studies	109	39.3
Economics	60	21.7
History	67	24.2
Total	**277**	**100.0**

The largest group of participants represent the Business Studies subject area (39. 3%). History is the second largest group (24.2%) with Economics (21.7%) as the third largest, while Accounting had the lowest percentage of participants (14.8%).

According to participants' answers on the Likert-type scale of one to four for the 60 questions, the total scores were determined based on Williamson's questionnaire. The participants were divided into three distinct groups regarding their self-directed learning as perceived by themselves, namely: low (48–112), moderate (113–176) and high (177–240). This grouping was categorised using a standardised statistical procedure. Table 2 shows the number of student participants divided into the three specific groups of self-directed learning according to the questionnaire. This research focused on the results obtained for the moderate and high groups, as there were no participants in the low group.

Table 2: Number of participants grouped according to their level of self-directed learning

	Frequency	Percent
Moderate (113–176)	36	13
High (177–240)	241	87
Total	**277**	**100**

The majority of the participants, according to Table 2, fall into the group that indicated a high rate of self-directing skills before the application of the habits of mind teaching strategy. This was interpreted that the students overrated or overestimated their own self-directed learning abilities.

Table 3: Construct reliability for each section

Construct	Questions	Cronbach's alpha	Mean	Standard deviation
Awareness	Q1.1–Q1.12	0.755	40.15	4.24
Learning strategies	Q2.1–Q2.12	0.714	38.60	4.33
Learning activities	Q3.1–Q3.12	0.800	38.57	4.73
Evaluation	Q4.1–Q4.12	0.749	39.85	4.44
Interpersonal skills	Q5.1–Q5.12	0.806	39.71	4.80
SRSSDL	Q1.1–Q5.12	0.867	196.87	18.18

According to Taber (2018), Cronbach alpha values of 0.7 or higher indicate an acceptable internal reliability. Table 3 indicates that all the reported Cronbach alpha values were above the guideline value of 0.7, which indicate that they are reliable. As part of a bigger research project, the self-rating scale of self-directed learning

(SRSSDL) has already been used at the NWU (N=403), and they obtained Cronbach's alpha coefficients between 0.76 and 0.88 for the SRSSDL for the five categories of the questionnaire indicating the SRSSDL was reliable in the South African context (Petersen & Mentz, 2016). The means of the resulting factors ranged between 38.57 (SD = 4.73) and 40.15 (SD = 4.24) and the reported means of the overall SRSSDL score is 196.87 (SD = 18.18) indicating that participants' self-directed learning is high.

5.2 Qualitative results

Only 115 students who enrolled for the school-based project completed the reflections. The number of students per year group and subject are indicated in Figure 1.
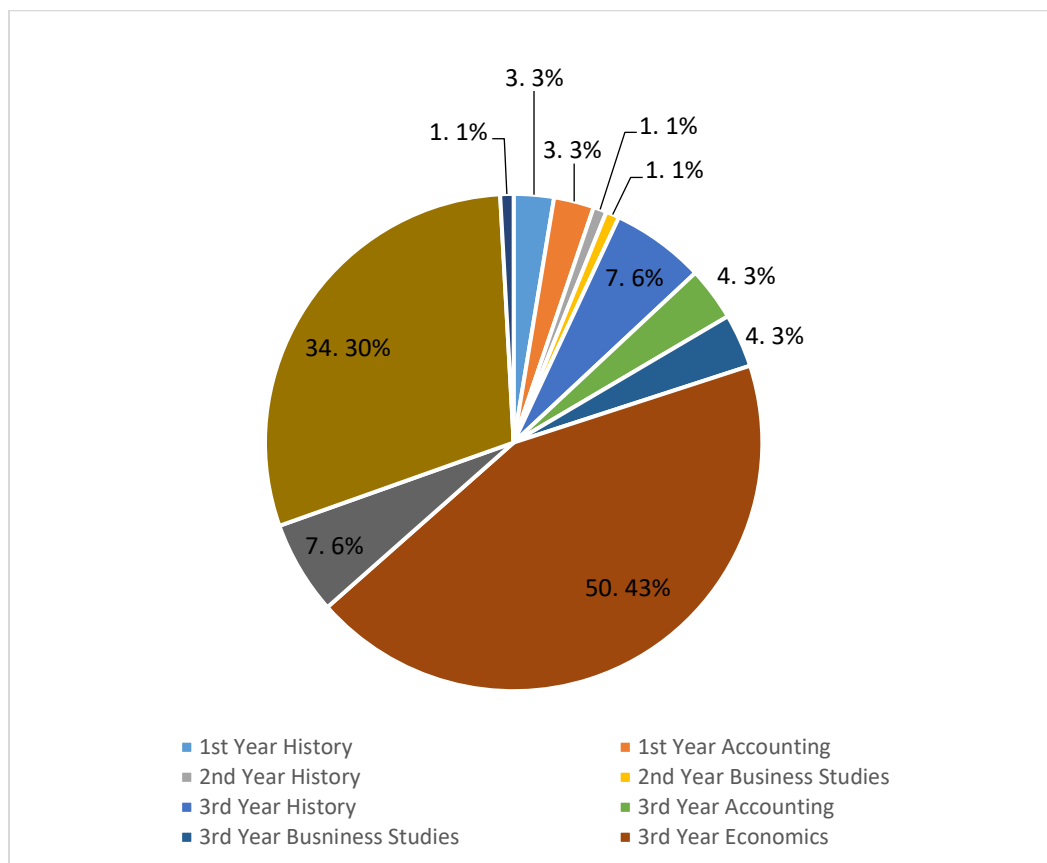
Figure 1: Reflections completed

The student reflections on habits of mind were analysed by means of inductive thematic analysis. From the data, meaningful parts were grouped under initial codes followed by grouping the initial codes under categories. From the categories, the themes emerged (Nieuwenhuis, 2020). The categories under each theme (Table 4) will be supported by verbatim quotes from the various year groups.

Table 4: themes and categories

Themes	Categories
The effect that habits of mind have on self-directed learning skills	• Individual responsibility and ability • Planning, implementing, and monitoring own learning • Variation in own learning
Usefulness of habits of mind	• Subject content knowledge and skills • Pedagogical content knowledge and skills
Willingness to incorporate habits of mind	• Motivation

5.2.1   The effect that habits of mind have on self-directed learning skills
The habits of mind had a positive impact on self-directed learning skills. In general, by applying the habits, the participants realised that their own learning is not the sole responsibility of the lecturer. By identifying their personal responsibility in their own learning, the participants identified that the habits enabled them to be independent in various aspects of the learning process.

• *Individual responsibility and ability*
Participants identified the responsibility that they had in their own learning, and they indicated that their own ability to be independent in various aspects of the learning process also improved.

> *"It teaches one to be self-independent, being able to think out of the box without any assistance".* (3rd Year, Economics)

> *"They help me to be a responsible student, take charge for everything I do and also come up with ideas that will help me in this difficult time".* (4th Year, Business Studies)

> *"Made me take charge of my own learning".* (4th Year, Accounting)

• *Planning, implementing, and monitoring own learning*
Participants indicated specific functions of the learning process that they can implement on their own with their improved abilities.

> *"It guides me as a first year through varsity studies as I'm not familiar with it and I can positively reflect on my work and strategies on how to do my academic work effectively".* (1st Year, Accounting)

> *"I identify learning goals, question the significance of the theme, monitor my self-learning process, start the background on the theme".* (3rd Year, Economics)

"It develops self-directed learning in terms of highlighting what outcome I can get if I apply certain habits of mind and it allows me to be patient enough in applying those strategies and remembering that to each work there's a certain strategy that I can apply and that with the work dynamic I may face either it be I'm working with a group or as an individual there's strategies that I can apply". (4th Year, Business Studies)

- *Variation in own learning*

Participants specified that they could adapt specific functions of the learning process that they can implement on their own.

"The habits of minds provide new ways of handling problems based on the content of that particular module. they also helped in a way that they opened up my mind, by so saying I mean that i have adapted to finding more than one way to deal with problem, this helped me understand what i was doing much more efficiently". (1st Year, Accounting)

"It also develops my self-directed learning in a way that each and everything that i do, i must first reflect on how I will approach it and what are the outcomes going to be. This helps to monitor each and every activity that I do that I must do reflection and also I must be persistent enough to myself then I will get everything in order". (3rd Year, Economics)

"Habits of mind increases the ability for one to solve problems, not only activities or assignments but also real life situations". (4th Year, Business Studies)

5.2.2 Usefulness of habits of mind

Participants recognised the utility of the habits of mind, and they focused most on its unlimited application for learning and teaching the habits of mind themselves.

- *Subject content knowledge and skills*

Most of the participants indicated that the habits of mind improved their general and specific thinking skills and understanding their own thinking, which resulted in improved learning in the area of subject-content knowledge and skills.

"It helps me to be able to make my work much easier and more simpler than before. The strategy is abroad and develops a persons thinking skills". (2nd Year, Business Studies)

"It has enhanced my critical thinking as I no longer think narrow it made me to think abroad and to ask or question other things". (3rd Year, Accounting)

"It has helped me to really study the content with understanding and draw my own aims for the content that I'll be working on." (4th Year, Business Studies)

- *Pedagogical content knowledge and skills*

The majority of the participants were willing to apply the habits of mind as a teaching-and-learning strategy; their reflections indicated that they are able to initiate the planning and development of such teaching-and-learning strategies.

> *"As a teacher you have to have different learning styles, habits of mind and apply them on different activities in order to see, which one is the best to use for your learners".* (3rd Year, Business Studies)

> *"By being patient and willing to learn from learners. By also encouraging learners to always be positive and not be impulsive. Applying pre knowledge to current knowledge."* (3rd Year, History)

> *"Giving learners case studies to work in groups to solve the problems in the case study, were they will apply their thinking and different viewpoints so that other can understand or learn from certain perspective."* (3rd Year. Accounting)

5.2.3 Willingness to incorporate habits of mind

Most of the participants indicated that the habits of mind had a positive influence on their overall learning, which resulted in a positive perception about the habits of mind, which in turn resulted in the participants being more willing to apply it in their own learning and teaching in the future.

- *Motivation*

> *"That is good development that could be implemented in classroom situation and it has good advantages to learners as well to teachers".* (3rd Year, Business Studies)

> *"I feel very positive about habits of mind they help an individual to have confidence in themselves and work, think more about a situation and solve problems. I would use them both for myself and my learners".* (4th Year Business Studies)

The small minority of participants that reflected negatively about the habits of mind were unwilling to incorporate them. These participants were mostly overwhelmed by the extra work it took to incorporate the habits of mind.

> *"It is time consuming and adding extra work on the work that we have to do.'*
> *Its interesting but its too much".* (4th Year, Business Studies)

6. Discussion

The School of Commerce and Social Studies in Education at the Vanderbijlpark campus of the NWU follows a project-based approach with an online teaching-and-learning strategy followed by most educational institutions due to the COVID-19 pandemic. The school-based project aimed to implement learning strategies to enhance self-directed learning to support pre-service teachers to think and work independently without direct instructions from the lecturers. Although the project-

based approach was a compulsory part of the course, it was not mandatory to complete Williamson's questionnaire and the reflections on the different teaching strategies, and 277 participants out of 407 (68%) took part in this study. According to Table 1, Business Economics generally attracts more students than any other subject area because it has no admission requirements. At the same time, the low percentage of participants from Accounting (14.8%) was a reflection of the scarcity of education students who met the admission requirements for the subject.

With reference to the quantitative results based on Williamson's questionnaire, the majority of the participants (Table 2) indicated a high level of self-directedness when starting with the project. The findings showed that none of the participants fell in the low self-directed learning bracket.

The literature predicted that the students would overestimate their own self-directedness, as students who are not fully aware of what self-directed learning entails tend to make assumptions regarding their own levels of self-directed learning (Petersen & Mentz, 2016). The prediction came to fruition when the qualitative and quantitative findings were compared, as the qualitative results were often in complete contradiction to what was found in the quantitative results. In this study, when comparing the qualitative data analysis results to the quantitative results, the qualitative results showed that the participants might have overestimated their own self-directedness; however, the qualitative findings also show potential in terms of self-directed learning abilities. This could indicate that the Williamson self-rating scale only captures self-directed learning at a specific moment in time and is subjective. However, these results also indicated that they recognised the benefits of applying the habits of mind when it comes to their own learning. These 115 participants could see the value of working with habits of mind as their learning improved. This resulted in the students improving in multiple aspects of the self-directed learning process, as indicated by themselves. A student with a high level of self-directedness should, for example, be independent in their own learning from the start, an aspect that clearly only improved after the habits of mind were applied. Even though the students overestimated themselves (according to Williamson's questionnaire), the habits of mind had a clear and positive effect on developing various aspects of the self-directed learning process. In their reflections, the participants reported the following on the 16 habits:

1. *Persisting*
The elements of a plan was an excellent tool for the participants to utilise when they could not continue with a task. According to Feuerstein and Hoffman (1995), this plan supports students in following certain steps instead of giving up. The students reflected that they become more persistent by applying the elements of a plan. One participant said, *"help to follow a plan to persist in that way i wont give up when completing tasks"*. The participants explored multiple ways of solving problems when applying the habit of persistence during practical teaching by allowing learners to work together to explore solutions with their peers.

2. *Managing impulsivity*

To schedule and plan, participants need to think before acting, realising that they had to take responsibility of the outcome of their thinking process, staying calm if things do not work out as planned, being cautious, and taking calculated risks when necessary. The deliberation and analysis of problem solving before making decisions was one of the skills the students mentioned that did improve: "*It develop problem solving skills, to interact with others, understand other peoples view points*".

3. *Listening with understanding and empathy*

In the case of listening with understanding and empathy, the participants experienced that the suggestions of the lecturers and their peers helped them to develop their comprehension and appreciation skills, and understanding the viewpoints of others. Group work was a favourite activity where students collaborated through technology. In this instance, one of the participants mentioned that "*It helps a person to solve problems critically and be able to listen to other people's ideas*".

4. *Thinking flexibly*

Through heterogeneous teams the participants assessing several other senses that can contribute to learners' learning and understanding, such as olfactory (smell), tactile (touch), or kinaesthetic (movement) senses they were not familiar with, and succeeded to think out of the box. Seif et al. (2011) and findings emphasised flexibility, as reflected in the words of one participant: "*I learnt that there are many ways to teach learners since they are all different*".

5. *Thinking about own thinking (metacognition)*

By practising metacognition, the mindset of the students evolved, which allowed them to select a teaching method that best suited a particular topic. They also reflected on their teaching during and after a presentation, which enabled them to improve for their next lessons. From the findings, it is evident that students also discovered that the way they think would transform their minds and steer them in the right direction to reflect on their thoughts. One of the participants mentioned the following: "*… it leads individuals to reflect on, evaluate, modify and carry forth my learnings to future applications*". In this way, students developed the habit of reflecting on their own work and seeing where they could improve, which improved their metacognition.

6. *Striving for accuracy*

Students who strived for accuracy could figure things out, clarify problems, gather data, and recheck information. The participants noticed that accuracy is extremely valuable in class and real life.

7. *Questioning and problem posing*

Participants could engage the skills to raise relevant questions to get answers for problems when working with peers. From the findings, participants reported that their critical thinking increased as a result of posing questions, because now, before they ask a question, they have to consider whether the question is appropriate. Others remarked that their thinking broadened when someone else asked them questions: "*I*

no longer think narrow . . .".

8. *Applying past knowledge to new situations*
This habit contributes to participants' ability to construct new knowledge effectively, based on prior knowledge to link to real-life situations. Participants could apply this habit to contribute to a broader learning experience. The participants indicated that the application of this habit could be used effectively in class, especially when doing assignments that required examples from real-life experiences:
> *"It will help learners channel their minds in the right direction in order to give out the relevant examples. It will make it easy for them to incorporate real life experiences with classroom based content".*

9. *Thinking and communicating with clarity and precision*
Communication is embedded in and threaded through most of the key competencies for the future, making it vital for the participants to communicate with society*:*
> *"Learners will work in groups to complete some activities which will enhance the communication skills, learners will be open minded and actually learn from other learners".*

10. *Gather data through all senses*
Students also fall into the habit of using only visual data copied from the internet or textbooks. Talking and listening to people became a vital data gathering source that contributed to a broader and richer learning experience. The participants noticed that they needed to use all their senses to obtain information for their assignments.

11. *Creating, imagining, and innovating*
Creativity, imagination, and innovation are foundational skills that enabled participants to facilitate similar learning in their learners in order to expand their thinking: *"I developed a skill of creativity and made me to the right thing".*

12. *Responding with wonderment and awe*
Participants experienced that changing to teaching methods that incorporated play activities engaged learners better, and made them feel satisfied and eager to learn more.

13. *Taking responsible risks*
The responses of the participants to this habit were to try new and innovative methods for which there existed a risk of failure. It was essential to challenge learners and to make the new learning process inspiring: *"Fostering optimism in students' ability to take responsible risks".*

14. *Finding humour*
By implementing humour in lessons, participants found that learners felt more comfortable and free to ask questions:
> *"They were able to help me to be more creative in my work and be able to think outside of the box by finding humour and being innovative in my work, it*

allows me to go beyond the knowledge I've already accumulated".

15. *Thinking interdependently*

Participants found value in the reciprocal approach to interdependent thinking, which benefitted everyone when working in groups. The participants agreed with the consequent co-construction of knowledge benefits that all learners were involved and it was therefore not one-sided, which motivated learners.

16. *Remaining open to continuous learning*

Participants realised that they need to be lifelong learners and strive to improve their own learning, in which case learners will benefit from their updated knowledge:

> *"Using the habits of mind strategies helps one to learn easier as they understand the importance of self learning and become involved in long term understanding of the content".*

7. Recommendations

It is recommended that future training of pre-service teachers be scaffolded around the habits of mind that will contribute to developing the teachers' ways of thinking, self-directed learning, and competencies. In addition, several habits of mind will support teachers in utilising and/or adjusting their prior learning to be open to or contribute to the construction of new knowledge. It is also recommended that habits of mind be infused into the current BEd curriculum in order to foster self-directed learning.

8. Limitations

It is essential to note that this study was by no means without limitations. One of these is that the study was confined to only one school in the Faculty of Education and only at one of the university's three campuses. As a result, the findings based on this research study might be construed by some critics to be one-sided and not representative of the views of the majority of pre-service teachers in South Africa. However, the data support and add to the findings of large-scale studies conducted in South Africa and abroad.

9. Conclusion

The participants frequently experienced various difficulties in learning practices, both in class and in practice activities. They had problems with varying degrees of complexity, but they were usually expected to have reasoning ability and high-level thinking skills. Pre-service teachers who had these habits of mind revealed behaviours such as persistently searching for unique and innovative ways to improve, evolve, learn, change, and enhance themselves. It can be concluded that these new and innovative learning methods have the potential to lead to self-directed learning, an ongoing learning improvement process. Another positive result for pre-service teachers was that they recognised the importance of applying these habits of mind that will support them in utilising their new knowledge in classroom practices, which will in turn promote self-directed learning that will equip learners with the

tools necessary to become self-directed critical thinkers and problem solvers.

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Availability of data and materials: We are sure that all data support our published claims and comply with field standards.

Authors' contributions: All authors contributed to the study conception and design. All authors performed the literature search and review, material preparation, data collection and analysis. The corresponding author wrote the manuscript and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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