

DEVELOPMENT OF SANDWICH INSTRUCTIONAL MODEL TO ENHANCE SELF-DIRECTED LEARNING ABILITY OF VOCATIONAL STUDENTS



¹Chen Yulin, ²Areewan Iamsa-ard and ³Wapee Kong – In

Bansomdejchaopaya Rajabhat University, Bangkok, Thailand

¹chenyulin.bsru@hotmail.com

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Abstract

The aim of these research were 1) to examine the factors affecting self- directed learning ability of vocational students at Guangxi University of Chinese Medicine 2) to develop sandwich instructional model to enhance Self-Directed ability of vocational students at Guangxi University of Chinese Medicine and 3) to study the results of implementing sandwich instructional model to enhance Self-Directed ability of vocational students at Guangxi University of Chinese Medicine. This study consists of three Phases. The sample group consisted of 120 former freshmen from 3 sections of students who major in Nursing who enrolled Physiology course at Guangxi University in Phase 1. Phase 2 was to develop instructional model and verify the feasibility of the instructional model by 5 specialists. There were 50 students from Guangxi University were cluster random sampling In the Phase 3. The instruments were (1) a set of questionnaires of students and lecturers (2) a set of questionnaires for confirming sandwich instructional model (3) lesson plans and (4) Scoring Rubric. Data were statistically analyzed by frequency, percentage, mean standard deviation.

The findings were revealed that the factors affecting self- directed learning ability of vocational students at Guangxi University include internal factors and external factors from the students and the lecturers, and Following interviews with three lecturers, key factors influencing the Self-Directed Learning Ability of Vocational Students in Guangxi Province were identified. Internal factors highlighted the significance of teachers' professional knowledge, teaching abilities, continuous training, and the impact of their physical and mental well-being on cultivating students' independent learning skills. Teachers' personal beliefs, attitudes, and views on education also played crucial roles. External factors focused on effective course design, teaching techniques, and strategies, with the sandwich teaching model being mentioned as a tool to enhance independent learning. Diverse teaching materials, classroom environment, and the influence of family and social surroundings were underscored as pivotal elements for improving students' self-directed learning abilities.

Keywords: Sandwich Instructional Model, Self-Directed Learning Ability, Vocational Students

¹Student in Curriculum and Instruction Program, Bansomdejchaopaya Rajabhat University, Bangkok, Thailand

² Associate Professor, Dr., in Curriculum and Instruction Program, Bansomdejchaopaya Rajabhat University, Bangkok, Thailand

³ Assistance Professor, Dr., in Curriculum and Instruction Program, Bansomdejchaopaya Rajabhat University, Bangkok, Thailand

Introduction

The importance of physiology as a mandatory course for vocational nursing students is well-documented, as it prepares them for subsequent courses and clinical subjects. Mitchell and Ford (1984) emphasize that physiology develops skills of observation, deduction, and interpretation of data, crucial for courses like pharmacology and pathophysiology. Jing, Liu, and Sun (2020) also highlight physiology's role in preparing students for these advanced subjects. Mahaffey (2019) discusses the importance of physiology in understanding molecular structure-function topics, which are fundamental for health professions students. Arslanian-Engoren, Sullivan, and Struble (2011) and Saeki (2018) both affirm that physiology is essential for vocational nursing students to prepare for advanced courses and clinical practice. Mahaffey (2018) further notes that concepts in human physiology lay the foundation for courses like pathophysiology. Patillo (2006) points out that a sound background in physiology is necessary for nursing students to master information concerning drug actions and interactions. Taylor and Littleton-Kearney (2011) suggest that concept mapping in physiology can maximize critical thinking and learning retention. Song (2010) and Mahaffey (2022) discuss innovative teaching methods in physiology that enhance practical and creative abilities, and aid in memorization of complex concepts. Harris, Hannum, and Sat Gupta (2004) find that success in physiology courses correlates with success in state licensure examinations. Schwartz, Piano, Kleinpell and Johnson (1997) emphasize that pharmacology courses aim to provide nursing students with knowledge for rational pharmacologic management of patients. Johnston et al. (2015) and Kagan, Stukalin, Sommer and Ezra (2021) highlight the importance of anatomy and physiology in predicting success in nursing certification tests. Sharpnack and Madigan (2012), Haraldseid, Friberg, and Aase (2015), Dalton, Gee, and Levett-Jones (2015), and Banning (2004) discuss various teaching methods and student experiences in nursing education. Bingen, Steindal, Krumsvik, and Tveit (2019) explore the challenges nursing students face in studying physiology off-campus within a flipped classroom. Self-directed learning significantly influences students' mathematical problem-solving abilities, particularly in problem-based learning (PBL) environments enhanced by technological assistance, as noted by Amidi (2021). However, students often exhibit only moderate self-efficacy in subjects like physics, suggesting a need for more effective learning processes, such as PBL (Zaenudin, 2017). In online learning contexts, instructors face challenges in monitoring and providing timely feedback to learners, although certain models can foster improved self-learning and discipline (Yi and Yu, 2019). While PBL has been shown to positively influence academic achievement, its superiority over traditional instruction methods lacks sufficient evidence (Wilder, 2015). In fields like nursing, self-directed learning readiness has been found to positively affect critical thinking skills (Elmoghith, 2018), and students have shown significant improvements in problem-solving and written communication skills through PBL (James and Aragh, 2016). The meta-cognitive ability of students in PBL environments is crucial for developing self-regulated, autonomous learning habits (Venkatachary and Kumar, 2005). The role of tutors in PBL settings is a subject of debate, particularly regarding their participation, content knowledge, and involvement in student evaluation (Neville, 1999). Business teachers, who are moderately-strong self-directed learners, suggest that integrating self-directed learning within the curriculum could be beneficial (Bartlett and James 1999). Students' perceptions of self-directed learning undergo significant changes during a semester in professional courses that implement PBL (Ryan, 1993). However, the adoption of self-directed learning methods in higher education is limited, with only a small percentage of students in colleges and universities employing these methods (Xia, 2021). Finally, teachers' involvement in the learning process and the provision of opportunities for students' inquiring approach are crucial for developing a deeper understanding of self-directed learning (Silén and Uhlin, 2008). The Sandwich Instructional Model has been recognized for its effectiveness in enhancing self-directed learning among vocational students through various mechanisms.

Pham (2011) highlights its focus on complex information processing, while Billore (2021) emphasizes the integrated pedagogy of theory and practice. Lu (2010) notes the integration of work-related skill training in British higher vocational education. Jeanguiot (1999) discusses the model's facilitation of the link between theory and practice. Hu (2014) points out the enhancement of self-study and motivation, and Chang (2017) observe improvements in clinical thinking ability. Mbagwu, Chukwuedo, and Ogbuanya (2020) emphasize its role in promoting lifelong learning and vocational skills. Finally, Katsioudi and Kostareli (2021) report on the model's success in improving learning gain, student engagement, and satisfaction. These studies collectively underscore the Sandwich Instructional Model's capacity to effectively blend academic learning with practical experience, thereby fostering a more comprehensive and self-directed learning environment for vocational students.

The Sandwich Instructional Model has been extensively studied for its effectiveness in enhancing self-directed learning in vocational education. Hu (2014) highlighted its role in improving self-study, knowledge of radiology, and motivation in psychiatry clinical teaching. Wehmeyer (2000) explored the Self-Determined Learning Model of Instruction, emphasizing its promotion of self-determination and satisfaction. Lu (2010) analyzed the model's integration of work-related skill training in Britain's higher vocational education. Mbagwu, Chukwuedo, and Ogbuanya (2020) found that the model increased self-directed learning skills and lifelong learning tendencies. Chang (2017) reported its effectiveness in improving interest in self-learning and clinical thinking ability in surgery teaching. Lastly, Heusdens, Baartman, and de Bruijn (2019) discussed the development of vocational knowledge through contextualizing in professional performance. These studies collectively underscore the Sandwich Instructional Model's capacity to blend academic learning with practical experience, fostering a comprehensive learning environment for vocational students.

As the rationale shown above, the author realizes the importance of studying “Development of Sandwich Instructional Model to Enhance Self-Directed Ability of Vocational Students.”

Objectives

1. To examine the factors affecting self- directed learning ability of vocational students in Guangxi Province.
2. To develop Sandwich Instructional model to enhance Self-Directed ability of vocational students at Guangxi University of Chinese Medicine.
3. To study the results of implementing sandwich instructional model to enhance Self-Directed ability of vocational students at Guangxi University of Chinese Medicine.

Material and Method

Literature review

Sandwich Instructional Model

Tracing the origins of the sandwich curriculum implementation poses a challenging task. According to Little (2006), the emergence of sandwich courses can be attributed to the incorporation of practical experiential learning inside apprenticeships. The Integrated Sandwich Course was established by the Association of British Universities in 1972. Its primary objective was to facilitate collaboration and facilitate the exchange of ideas among universities in the provision of sandwich courses. The establishment of the Committee Sandwich Course of Polytechnic Institute in 1976 was to foster the advancement of sandwich courses within the institution. The establishment of the Association of Sandwich Courses and Education (ASET) in 1979 was driven by the recognition that the integration of employment organizations and academic institutions could significantly contribute to the advancement of sandwich courses. ASET was formed with the aim of bringing together companies, educators, and students who share a strong interest in sandwich courses, thereby creating a dedicated

organization. The organization releases a yearly publication that presents statistical data on sandwich education in the United Kingdom and explores diverse viewpoints on the sandwich curriculum. During the 1980s and 1990s, the sandwich course gained significant international prominence. During that period, scholars in the field of international cooperative education research, including Kenneth (1987) and others, recognized the sandwich course as a prominent aspect of cooperative education in British colleges and universities. Additionally, Chen (2002), a Chinese scholar, provided an analysis of British sandwich courses within the framework of cooperative education. The curriculum explicitly associates the sandwich curriculum with cooperative education. Subsequently, the School of Medicine at the University of Heidelberg in Germany implemented this approach in classroom instruction. It involved the incorporation of student groups, segmented discussions, and individual study reports, among other methods. This facilitated enhanced communication and expression between teachers and students, as well as among students themselves, ultimately leading to improved classroom efficiency. There exist variations in sandwich teaching approaches, including the utilization of alternating instructional formats such as "theory-practice-theory" or "individual study-group study-individual study". Nevertheless, the "flexible, novel, and changeable" sandwich teaching technique still encompasses the following primary requisites: The sandwich teaching method's design is intricately linked to the syllabus. Hence, the implementation of various teaching methodologies, the enhancement of each instructional component, and the cultivation of students' motivation, initiative, and attentiveness are all reliant on teachers investing time and effort in curriculum analysis and research.

Furthermore, the implementation of the sandwich teaching approach requires educators to possess a significant level of pedagogical proficiency. Teachers often face challenges in achieving a professional level of proficiency in various aspects of their work, including classroom time allocation, providing feedback on summary reports, and handling classroom emergencies.

Additionally, the arrangement of classroom desks is a crucial consideration for the sandwich teaching approach. The use of circular desks proves advantageous for educators in facilitating group discussions, a task that presents evident challenges in certain educational institutions.

Moreover, the sandwich teaching style is predominantly employed in smaller to medium-sized classes. In some regions, there is often a considerable number of courses, posing a challenge to ensuring equitable student engagement and accommodating individual variances within the context of large class instruction.

In 2006, the sandwich teaching approach was initially implemented in Tongji Medical College of Huazhong University of Science and Technology in my country for the purpose of teacher training. Subsequently, trial applications of this method were conducted in selected courses within the field of medical education. Following this, a pedagogical approach emerged that incorporated collective learning through bifurcation discussion and group discussion, alongside individual learning methods such as student reports, teacher summaries, and self-feedback. This instructional method is commonly referred to as the sandwich teaching method and comprises seven distinct stages: task assignment, group discussion, cross-discussion, group re-discussion, "goldfish bowl" discussion, group report, and teacher feedback. The interlocking and captivating nature of the educational environment fosters inquiries among teachers and students, as well as among students themselves. These inquiries serve to cultivate a solid foundation for independent learning and the development of effective learning strategies among students. According to Gong (2006), the sandwich course can be traced back to certain courses offered by the University of Glasgow in 1840 and the University of Bristol in 1878. The year 1903 marks an important milestone in history. Sunderland Technical College offers a sandwich course within its engineering and naval construction programmes, as evidenced by its documented records. In the 1950s, there was a significant increase in the adoption of sandwich courses by advanced skills colleges (Ryder and Wilson,

1987). The current curriculum being implemented mostly focuses on higher education institutions, such as colleges and universities. During the 1970s, there was a significant surge in the popularity of locally based engineering sandwich courses. However, as the 1980s unfolded, university-based sandwich courses gained prominence and became the prevailing choice. Sandwich programs are primarily employed within engineering and technical disciplines and have since been extended to fields like as commerce, hotel management, nursing, as well as mathematics, physics, and other academic domains.

The sandwich teaching approach has been extensively researched and implemented in various domains, including education and teaching in China, as well as medicine and other fields. Domestic studies on the application of this method have yielded promising outcomes. Some examples of academic subjects include Mao Zedong Thought and Society with Chinese Characteristics, the reform of the Medical Chemistry curriculum (Zheng, Zhao, and Huang, 2020), the field of Clinical Oncology (Li, Liu, Chen and Gao, 2020), courses on Antenna Theory and Design (Zhang, Zhan, Li, Qin and Cao, 2020), as well as subjects such as junior high school mathematics, auto repair, orthopedics, and mechanics. Furthermore, this instructional approach is well-suited for delivering lessons in small to medium-sized classrooms characterized by a limited number of individuals.

In the context of big class instruction, the sandwich teaching approach involves the organization of numerous students into various groups, resulting in heightened student engagement and participation. According to Xue (2019), students can engage in discussions, communicate with one another, and voice their thoughts, which can enhance their motivation for active learning. Hence, it is crucial to thoroughly investigate the flexible sandwich teaching approach, as it has significant importance. It is commendable to explore this method with a willingness to experiment and a commitment to maintaining the integrity of the original research.

Theory

The pedagogical approach referred to as Sandwich teaching integrates communal and individual learning phases in a sequential fashion, hence recognizing the significance of personalized learning (Bock et al., 2020). The phase of group learning is generally characterized by a passive instructional style that has resemblance to traditional lecture formats. These sessions typically span a duration of 20 to 25 minutes, which matches with the average attention span observed among students (Bunce et al., 2010). The phase of individual learning entails the active engagement of learners in using their pre-existing knowledge to successfully accomplish designated tasks, such as engaging in collaborative discussions with peers, conducting interviews with partners, or participating in activities within small groups. The incorporation of both collective and individual learning phases enables a progressive shift from passive to active learning. The utilization of the Sandwich teaching style, known for its emphasis on student-centeredness and its applicability to small-class teaching, has been observed in the pedagogy of several medical courses (Sun et al., 2014; Shi et al., 2016; Wang et al., 2018; Ling et al., 2019). Numerous benefits have been noted in relation to the improvement of learning outcomes. Furthermore, empirical evidence has demonstrated that the incorporation of Sandwich teaching approaches can significantly augment the scholastic aptitude and applied competencies of students across several medical fields.

This study employs three theoretical frameworks.

Constructivist Learning Theory

Constructivism, as a novel and evolving philosophy of learning, is considered "a revolution in pedagogy". Constructivism was founded by the well-known Swiss psychologist Piaget. Later, the theory was developed further and created a comprehensive theoretical system with the help of Bruner, Vygotsky, and other influential figures (Yang, Chen, He, Deng, Wei, and Zhao, 2010). Its core point of view is that knowledge is actively constructed by students, and individuals start from their own specific experience background, that is, on the basis of students' original knowledge and experience, under the influence of social culture, in a certain situation, through interaction with Cooperate with others, use necessary learning

materials, process new information, constantly adjust and reorganize their own knowledge, and finally construct new knowledge (Liu and Zhang, 2012). This indicates that students are the primary source of information processing, and that learning is an interactive, collaborative, communicative, and active construction process. The constructivist educational concept places a strong emphasis on the dominant role of the student. Instruction should be student-centered, with teachers supporting and assisting students as needed. Teachers should also create a lively, informal, and enjoyable learning environment and encourage students to take the initiative to finish new assignments. knowledge development. Contrarily, the constructivist education perspective holds that communication, collaboration, and mutual aid between educators and learners as well as between learners themselves can advance learning, allow for the sharing of diverse knowledge systems, and fulfil the goal of information resources and knowledge exchange (Chen, 2009).

A type of classroom instruction known as the Sandwich teaching technique incorporates learning reports, cross-learning, student group discussions, and other links. In actuality, the entire implementation process demonstrates a method of building learners' cognitive learning framework. Using the sandwich teaching approach, the class is divided into two groups. Each group works on an issue from the first group, and the second group is then split up into groups once the students have reached an agreement on the problem. To achieve knowledge sharing and make students the real subject of the classroom, students regroup and share with other students the problems discussed in each group during the first grouping. Additionally, it is a form of cooperative learning, which is consistent with constructivist learning theory. It is the role of teachers to mentor and support students throughout the entire teaching process; this is a collaborative effort between educators and learners. Through constant communication between teachers and students as well as between students themselves, this teaching approach helps students acquire knowledge more thoroughly and abundantly. It also maximizes the teaching and learning potential of course participants (students and teachers).

Humanistic Learning Theory

The application of my nation's current education reform and high-quality education are significantly impacted by the learning theory of Rogers, a significant humanistic psychologist (Lu, Zhang, Huang, Wu and Cao, 2011). According to the educational perspective of humanistic learning theory, emotion and cognition are interwoven with each other and form an integral element of the learner's spiritual world during the teaching and learning process (Chen, Peng, Huang, Li and Jiang, 2009). Teaching and learning involve more than just instructors giving students knowledge and directing the sequence in which it appears; it also involves students and teachers' spiritual worlds communicating and comprehending one another. Maslow, the creator of humanistic psychology, holds that all people have the capacity for growth and that education should be used to help students reach their full potential by stimulating their learning potential and offering a secure, liberating, and peaceful learning environment. Allow self-realization to flourish (Jiang, Li, Zhang, Han, Guan and Wu, 2011). As a result, teachers merely use "cradle ducks" in the classroom to impart knowledge and disseminate information, which stunts students' ability to reach their full potential and achieve self-realization. The humanistic learning theory's backing is integral to the Sandwich teaching method's features. The traditional teacher-centered teaching approach has been replaced with a classroom model where students take center stage. They actively think, actively express, and actively seek solutions while working with the teacher. Along with gaining knowledge, students also build their cognitive skills and curiosity during this teaching and learning process, which enables them to progressively learn how to study and actively develop.

The theory of zone of proximal development

There are two levels of student development, according to the "Recent Development Zone Theory" of former Soviet educator Vygotsky. The first level is the current level of students, which is the level that students can reach in independent activities. The first is the

students' problem-solving ability; the second is their potential for growth because of their education; the distinction between the two is the most recent area of development.

Based on the sandwich teaching approach, the "Physiology" classroom emphasizes the research object's proximal growth zone. Prepare the questions ahead of time, assign challenging questions to the research objects throughout the lesson, and pay close attention to the directions. For instance, what components go into making up blood pressure? To advance to the next development stage and, from there, to the development of the next development area, you can also learn more about the pertinent preventive and treatment methods for hypertension that students are aware.

Self-directed learning ability

There are many terms related to self-directed learning ability used abroad, such as self-regulated learning, active learning, self-education, self-planned learning, and self-directed learning. self-directed learning, self-monitored learning, and so on. Because different researchers have different theories and perspectives on self-directed learning ability research, there is no unified definition of self-directed learning ability.

Bandura (2014) defined that the basic idea of self-directed learning ability theory is based on the logical system of social cognitive learning theory, which includes three relatively independent theories: observational learning theory, triple determinism, and self-efficacy theory. He believes that self-directed learning ability is the ability to set and gradually achieve individual goals and self-generate thoughts, emotions, and behaviors.

Butler and Winne (1995) defined that by viewing self-directed learning ability as a process in which learners set learning goals for a given task, use various strategies to achieve those goals, and supervise their own learn and evaluate task progress.

Boekaerts (1999) defined that self-directed learning ability is a collective ability, which integrates the skills, knowledge and motivation that learners need to use.

Pintrich (2000). defined that self-directed learning is described as an effective and useful construction process, in which students set learning goals and try to monitor, regulate and control their cognition, motivation and behavior, and through the goal and the situational characteristics of the environment to guide and constrain.

Zimmerman (1997) defined that self-directed learning ability and concluded that they have three common features: 1) emphasizing the use of self-regulation strategies in metacognition, motivation, and behavior; 2) emphasizing self-directed feedback Circular process; 3) Emphasis on how to use learning strategies.

All in all, different scholars have different understandings of the concept of Self-Directed ability. By comparing the views of different scholars, the concept of Self-Directed ability in this study is more in line with the concept of Self-Directed ability proposed by Zimmerman and Pang. They pointed out that Self-Directed ability is not only a kind of ability, but also a process of learning, and self-directed learning ability can be developed in the process of self-directed learning ability. Self-directed learning is not only a process in which learners use their own learning methods, adjust their learning behavior, interact with the environment and adaptability, but also a process in which students select learning materials, determine learning strategies, and arrange learning activities in the learning environment at their own pace. As well as the process of evaluating and understanding student academic achievement. The focus of this study is that self-directed learning ability is an active construction process in the learning environment, and learners develop their own self-directed learning ability while learning construction and regulation.

Material and Method

This research used Mixed Method of Research. This research is divided into 3 phases, based adapt from some literature journal from previous research,

Phase 1 was conducted to answer research objective 1: To examine the factors affecting self- directed learning ability of vocational students in Guangxi Province.

Table 1 Summary how to conduct research from Phase 1

Topics	Details
Research process	Analyzed the documents of Part 1-3
Research objective	To examine the factors affecting vocational students' self-directed learning ability.
Conduct research	Designing instrument 1-2 Assess the validity by 5 experts
Target group	Group 1: 150 freshmen from 3 sections of students who major in Nursing who enroll Physiology course at Guangxi University of Chinese Medicine
Instrument	Questionnaire for students Part 1: Common data of the respondent Part 2: Internal Factors Part 3: External Factors Interviews for the lecturers Part 1: Common data of the respondent Part 2: Questions
Data analysis	Descriptive Statistics i.e., Frequency, mean (μ) standard deviation (S.D.) for questionnaires. And contents analysis from lecturers
Output	The result of the internal factors and external factors to promote self-directed learning ability for undergraduate students from the former students and lecturers

Phase 2 was conducted to answer research objective 2: To develop Sandwich Instructional model to enhance Self-Directed ability of vocational students at Guangxi University of Chinese Medicine.

Table 2 Summary how to conduct research from Phase 2

Topics	Details
Research process	Development sandwich instructional model to improve students' self-directed learning ability.in terms of accuracy standards, propriety standards, feasibility standards, and utility standards
Research objective	To develop sandwich instructional model to improve students' self-directed learning ability
Conduct research	Designing instrument (the questionnaire on confirming the appropriateness of the curriculum model Assess the validity by 3 experts
Target group	3 experts
Instrument	Questionnaire for experts Part 1: 5 items of Utility Standards Part 2: 5 items of Feasibility Standards Part 3: 5 items of Propriety Standards Part 4: 5 items of Accuracy Standards Part 5: Suggestion
Data analysis	Descriptive analysis i.e. frequency and percentage.
Output	The result from sandwich instructional model to improve students' self-directed learning ability, the appropriateness of which is confirmed by experts for further implementation.

Phase 3 was conducted to answer research objective 3: To study the results of implementing sandwich instructional model to enhance Self-Directed ability of vocational students at Guangxi University of Chinese Medicine.

Table 3: Summary how to conduct research from Phase 3

Topics	Details
Research process	Phase 1: was conducted to answer research objective 3
Research objective	To examine the factors for Enhance Self-Directed Learning Ability of Vocational Students.
Conduct research	Designing instrument 1 (The questionnaire for students) Designing instrument 2 (The interview for the lecturers) Assess the validity by 5 experts
Target group	1: The former 150 from 3 sections of students who enroll in Physiology Course in semester I of academic year 2022 from Guangxi University of Chinese Medicine. 2: The lecturers who are teaching Physiology course from Guangxi University of Chinese Medicine.
Instrument	1.Questionnaire for students Part 1 is about Common data of the respondent in overall (N=120)
Instrument	Part 2 Internal factors 15 numbers, external factors 15 numbers Part 3 suggestion 2.10 questions to interview for lecturers. Part 1: is about Common data of the respondent in overall (N=3) Part 2:10 Questions both Internal factors and external factors Part 3 suggestion
Data analysis	1.Descriptive Statistics i.e., Frequency, mean (μ) standard deviation (σ) for questionnaires 2.Content analysis for interview
Output	The result factors affecting

Results

In the study findings derived from the fieldwork procedures outlined previously, focusing on data collection crucial to this study. The objectives, outlined in Chapter I, serve three primary purposes.

To examine the factors affecting self- directed learning ability of vocational students at Guangxi University of Chinese Medicine.

The Common data of the respondent in overall (N=75)

The common data of the respondent in overall that the most gender is female, 96.00% of the total. The male respondents make up 4.00% of the total. The age was concentrated in 18-20 years old, accounting for 100% of the total, 21-23 years old accounting for 0%, and over 23 years old, accounting for only 0% of the total.

The result of questionnaire from students in overview (N=75)

Indicates that internal factors affecting self- directed learning ability of vocational students at Guangxi.

Internal Factors Analysis:

Prior Knowledge of Physiology (Mean: 4.48, SD: 0.564, Rank: 5). High score indicates students value prior knowledge for applying and internalizing classroom content. Relatively moderate SD suggests a general agreement among students about this factor's importance.

Metacognitive Skills (Mean: 4.507, SD: 0.621, Rank: 4). High score highlights the significance of skills like self-regulation and monitoring learning processes. The highest SD among internal factors, indicating diverse opinions on its impact.

Intrinsic Motivation (Mean: 4.547, SD: 0.499, Rank: 2). One of the highest scores, underscoring the impact of motivation on learning independently. Lower SD reflects a common understanding of its importance among students.

Emotional State and Mental Health (Mean: 4.373, SD: 0.608, Rank: 6). Lower mean score compared to others, suggesting it's seen as slightly less influential. Higher SD indicates varied opinions on how emotional state impacts learning.

Importance of Self-Directed Learning (Mean: 4.673, SD: 0.471, Rank: 1). Highest mean score, indicating students highly value self-directed learning for growth and career development. Lowest SD reflects strong consensus on its importance.

Participation in Classroom Interactions (Mean: 4.527, SD: 0.552, Rank: 3). High mean score, reflecting the perceived benefit of active classroom participation. Moderate SD indicates general agreement, with some variability in opinions.

External Factors Analysis:

Course Design (Mean: 4.3, SD: 0.553, Rank: 6). Lower mean score suggests potential for improvement in course structure and relevance. Moderate SD reflects a consensus with some differing views.

Teaching Strategies (Mean: 4.527, SD: 0.501, Rank: 2). High mean score, highlighting the importance of effective teaching methods. Lower SD indicates common views among students on this aspect.

Richness of Materials (Mean: 4.433, SD: 0.561, Rank: 3). Moderate mean score, suggesting materials are important but could be improved. Moderate SD indicates varying opinions on material quality.

Resource Availability (Mean: 4.533, SD: 0.514, Rank: 1). High mean score, signifying the importance of access to resources for learning. Lower SD suggests a common perspective on the necessity of these resources.

Classroom Environment (Mean: 4.36, SD: 0.648, Rank: 5). Slightly lower mean score, indicating the need for enhancing the learning environment. Highest SD among external factors, reflecting varied experiences and perceptions.

Family Support and Social Emphasis (Mean: 4.4, SD: 0.714, Rank: 4). Moderate mean score, highlighting the role of family and social context in learning. Highest SD overall, indicating the most variability in student views on this factor.

Overall Summary:

Internal factors generally scored higher than external factors, with self-directed learning's importance and intrinsic motivation being highly valued. External factors like resource availability and teaching strategies also received high scores, but there was notable variability, especially in perceptions of family support and classroom environment. This analysis suggests areas of focus for enhancing self-directed learning abilities among students, considering both internal mindsets and external support systems.

The lecturers interview analysis results

The interviewees include three lecturers who taught the "Application of Modern Educational Technology" course in the semester 2 of the 2023 academic year. They are from the School of Information Engineering at Baise College, the School of Educational Science at Yulin Normal University, and the Faculty of Education at Guangxi Normal University, with one lecturer from each university.

Common data of the respondents in overall (N =3)

The common data of the respondents in Nanning city. The most gender is Male, 66.7%, the most Experience teaching is over 10 yrs., 66.7%, the most age is over 35 yrs., 66.7%.

Interview Lecturers Results

After the results from interview with the 3 lecturers, the factors affecting Self-Directed Learning Ability of Vocational Students at Guangxi Province can be concluded as follows.

Summary of internal factors

Teachers generally believe that teachers' professional knowledge and teaching ability are crucial to cultivating students' independent learning abilities, emphasizing the role of teachers' in-depth understanding of physiology and effective teaching methods in stimulating students' interest and independent learning motivation. They also agreed that teachers should continue to receive training in the latest teaching knowledge and skills to keep teaching

content modern and effective. In addition, teachers' physical and mental health, family responsibilities and work-life balance are considered to have a significant impact on the cultivation of students' independent learning abilities. Teachers' personal beliefs and attitudes, including their views on education, learning and their own roles, as well as their attitudes towards classroom teaching and students, are considered key factors in cultivating students' independent learning abilities.

Summary of external factors

In terms of external factors, teachers emphasized the importance of course design and teaching techniques and strategies in physiology courses, believing that these can stimulate students' interest, promote in-depth learning, and encourage students to explore course content independently. Among them, at least one teacher mentioned using the sandwich teaching model to improve students' independent learning abilities. This model enhances students' participation and understanding by alternating theory and practice. Teachers use a variety of teaching materials, such as textbooks, online resources, video lectures, and laboratory practices, to improve students' independent learning abilities and evaluate student performance and outcomes through various methods. Classroom environment, including class size, seating arrangement, and classroom atmosphere, is considered critical to student understanding, engagement, and academic achievement. Finally, all teachers believed that family and social environment have an important impact on students' autonomous learning abilities, emphasizing the importance of an environment that supports and encourages learning in improving students' autonomous learning abilities.

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